



भारत सरकार खान सुरक्षा महानिदेशालय

GOVERNMENT OF INDIA
MINISTRY OF LABOUR & EMPLOYMENT
DIRECTORATE GENERAL OF MINES SAFETY



DGMS CIRCULARS
(Upto June-2017)

राष्ट्र की सेवा में 100 वर्ष से अधिक
A century plus committed to the service of the nation

D.G.M.S. CIRCULARS (Upto June 2017)			
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THE COAL MINES REGULATIONS 1957 & THE METALLIFEROUS MINES REGULATIONS 1961

RETURNS, NOTICES AND RECORDS

Mine codes—With the introduction of computers in the office of DGMS, every mine has been given a Mine Code and these Mine Codes have been communicated to all mines. Managements are requested to ensure that the Mine Code is used in all future communications with all offices of the Directorate General of Mines Safety.

(Cir. Genl. 2/1993)

CMR 4 & 5 / MMR 4 & 5

1. Monthly and annual returns—Returns should be written in ink and signed legibly by the owner, agent or manager of the mine or a person holding a power of attorney from the *owner*. [Section 85-B of Mines (Amend.) Act, 1983].

The designation of the person who signs the returns should be clearly indicated. If any person signs in Hindi or other vernacular, its English transcription should also be given.

To prevent difficulties due to sheets coming apart, it is advisable that:

1. the name of the mine is given on each page of the return;
2. each page of the return carries reference to the period to which the return relates; and
3. all sheets in each return are properly bound together.

[Cir. 2/1948, 19/1958, Mines (Amend.) Act 1983]

2. Address for correspondence for examinations and for mines returns—At present as required under the existing Rules and Regulations, correspondence concerning the examinations conducted by the Board of Mining Examinations under Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations, 1961, and the Annual and Monthly Returns to be submitted under the relevant Regulations are being addressed to the Chief Inspector of Mines (since designated as Director General of Mines Safety).

In order to cut down delay, it is required that in future annual, quarterly and monthly returns etc. may be addressed to :

The Director General of Mines Safety.

[Attention : The Deputy Director (Statistics),] Dhanbad, and all correspondence concerning examinations may kindly be addressed direct to :

The Chairman, Board of Mining Examinations, [Attention : The Joint Director of Mines Safety (Exam.)] Office of Director General of Mines Safety, Dhanbad.

(Cir. 41/1970)

3. Mention of Post Box No. in Correspondence— To facilitate quick delivery of unregistered letters in Dhanbad, the concerned Post Box No., as given below, should invariably be mentioned on the envelope :

1. Post Box No. 65 : For all correspondence addressed to the Secretary, Board of Mining Examinations, Dhanbad.

2. Post Box No. 73 : For all correspondence addressed to the Director-General of Mines Safety, Dhanbad.

CMR 6/MMR 6

Pumping in disused shafts—In case of pumping operations in disused shafts prior information should be sent to the DGMS and pumping shall not be started without making arrangements for mechanical ventilation.

(Cir.37/1973)

CMR8/MMR8

1. Substitute appointments of assistant managers and surveyors—When the services of Assistant Managers and Surveyors are transferred to another mine of the same management or terminated, the substitutes are not being appointed for a considerable time in some cases. Sometimes even the notice of termination of the services of an Assistant Manager or a Surveyor is not given for a long time in contravention of Reg. 8(2) of the Coal Mines Regulations 1957 which requires a notice to be given within 7 days of any appointment or termination of the services of such officials.

The requirements of law in this regard should be strictly complied with, and substitute appointments of Assistant Managers and surveyors should be made latest within two weeks of the permanent incumbent leaving the service of the mine.

(Cir. 34/1964)

2. Notice of Appointment/Termination of Engineers—Notice under Reg. 8 of CMR 1957 and MMR 1961 in respect of Appointment/Termination of an Engineer in Form I of the First Schedule should be accompanied by a supplementary form in the proforma given below :

Supplementary form to accompany Notice in Form I in respect of appointment/termination of Engineer.

1. Mine particulars :

- (i) Name of Mine : Mineral worked :
- (ii) Postal address of owner :
- (iii) Name and address of owner :
- (iv) Inspection Region to which the mine belongs :

2. Particulars of Engineer :

- (i) Name :
- (ii) Father's name :
- (iii) Date of birth : Age :
- (iv) Permanent address :
- (v) General qualifications :
- (vi) Engineering qualifications :

Degree/Diploma	Institution from which obtained	Date of obtaining Degree/Diploma

(vii) TECHNICAL EXPERIENCE : (a) In Mines

Name of Mine	Capacity	Period From.....to.....
1.		
2.		
3.		

(b) In places other than mines :

Name of Establishment	Capacity	Period From.....to.....
1.		
2.		
3.		

(viii) No. and date of approval certificate obtained, if any, from the Directorate-General of Mines Safety;
(This does not apply to Degree/Diploma holders.)

3. Aggregate H.P. of machinery in use under the charge of the Engineer at the mine.

4. Date of Appointment/Termination.

Date.....

Signature.,

Place.....

Designation : Owner/Agent/Manager
(Cir. 8/1968)

3. Notice of appointment of engineers & notice of temporary authorisation in the absence of engineer— According to Reg. 8(2) of CMR 1957 and MMR 1961, the owner, agent or manager is required to send the notice of appointment of engineer to the D.G.M.S. and to the J.D.M.S. In a number of cases it is not made clear whether both the authorities have been sent the notice. The notice should also be sent to the J.D.M.S. concerned and the fact indicated in the notice sent to the D.G.M.S.

The notice of temporary authorisation, in case of temporary absence of the Engineer [Reg. 33(3) of CMR 1957 and 34(4) of MMR 1961] should be sent to the Joint Director of Mines Safety concerned.
[Cir. 24/1972]

CMR9/MMR9

1. Standing orders for emergency— In order to ensure timely and effective action in case of major underground accident in a mine, it is necessary that each mine should draw up a standard procedure to be followed in the event of an emergency. The standing orders should include instructions for different categories of staff who would take action in the manner indicated in the Standing Orders. The instructions should be kept up-to-date at all times and be made available to the mine officials concerned

and to the local rescue station. It will also be necessary to have mock rehearsal of the Standing Orders at regular intervals of say three to six months.

(Cir. 58/1962)

Note : See Reg. 199A of CMR/190A of MMR Emergency Plan

2. Post-mortem examination in case of death by heart failure— Failure of heart may be caused in the natural way or as a result of any injury received while engaged in any operations connected with mining. It will, however, be appreciated that the fact of death having been caused due to heart failure can be established only by means of a post-mortem examination of the dead body.

In case it is felt that death has been caused by heart failure in any operation whatsoever, while sending information of accident in or about the mine to various authorities an intimation giving details of the occurrence and pointing out that it is not a mining accident should also be sent to the local Police. The police authorities may then take necessary action for sending the dead-body for a post-mortem examination. A copy of the post-mortem report should be submitted to D.G.M.S. as soon as possible.

In case of non-compliance with these instructions, the occurrence may be treated as an accident coming within the purview of the Mines Act.

(Cir. 37/1959 & 30/1960)

3. Necessity of post-mortem examination— Medical Officers employed in mines, too often attribute the cause of death to heart failure in case of sudden death in a mine without carefully assessing the evidence available to them. On postmortem examination, in many such cases, gross internal injury e.g. rupture of liver, fracture of cervical vertebrae etc. has been found. In one case, evidence of head injury was also found. Such mistake has occurred specially in cases showing no external injury. But it must be realised that serious internal injury may occur in the absence of any external injury. To avoid such confusion it is required that Medical Officers should withhold their opinion, unless the case is obvious, and advise postmortem examination in all cases of sudden death in a mine.

(Cir. 50/1970)

4. Correct information in notice of accident—While submitting statutory notices regarding accidents (or particulars of the persons killed/ seriously injured), mine managements do not pay adequate attention to the particulars required to be furnished. It is important for evolving an effective programme of accident prevention that the facts of the accidents are brought to light. In respect of serious accidents, official enquiries are not usually held, with the result that the only source of available information in a large majority of cases may be the notice sent by mine managements. The accident notice forms should, therefore, be filled in carefully on the basis of enquiries conducted under the provisions of Regulation 41(8) of the Coal Mines Regulations, 1957 or Regulation 44(8) of the Metalliferous Mines Regulations, 1961 (as the case may be). Some of the salient features which require particular attention are indicated below :

FORM IV-A

Item 2 : Place & Location in Mines

1.1 The information here is to be filled in respect of two different aspects i.e. place and location. The different categories under place may be :—

- (a) 'Underground' (Development area), Depillaring area, shaft. Gallery, Roadway, Incline, Longwall face, Goaf etc., or
- (b) 'Opencast working' or

(c) 'Surface'

The actual 'location' should be clearly stated by specifying :

- (i) the shaft, seam/vein, level number etc. (in case of an underground location) or
- (ii) the quarry and bench etc. (in case of a location in opencast workings) or
- (iii) the exact location on the railway siding, surface tram line, workshop, pit top, office etc. (in case of a location on surface).

In addition, in case of accidents occurring on surface, it should also be clearly mentioned whether or not that particular area falls within the mine leasehold.

Item 3 : (i) Classification of Accident/Occurrence

1.1 The entry here should be made according to the classification given in instruction (b) of the form IV-A. Care should be taken to see that this classification is in keeping with the 'cause' given under the next column.

1.2 Though it is the most important of the items to be filled in the proforma, it is usually the most neglected. While limitation of space requires that this entry should be concise, too much condensation also creates complication. Very often, the cause is reported as being : "injured by a piece of coal/stone while at work" or, "injured by a tub while at work" etc.

As may be seen, this does not give any meaningful idea of the 'cause' or 'description' of the accident. The former situation may arise out of any of the following :

- (a) piece of coal or stone falling from the roof or from side or from the face, or
- (b) falling from a basket, or
- (c) rolling down from a tub, or
- (d) due to flying pieces.

Likewise, the latter statement may relate to any of the following :

- (a) "injured by a runaway tub" or
- (b) "crushed between tubs and sides of roadways", or
- (c) "crushed in between tubs" or
- (d) "crushed while rerailing a derailed tub" etc.

Moreover, the information should describe the occurrence viz. :

Was it that 'piece of coal fell from the roof while a miner was dressing it'?

Or

Was it that 'while a loader was loading coal, a piece of coal suddenly fell from the roof and injured him'?

Or again,

Was it that 'when a miner entered a fenced-off goaf area and started picking coal, suddenly the roof gave way and a mass of roof coal measuring a meters x b meters x c meters (thick) fell down and buried the miner?'

Unless a clear indication of both the "cause" and 'description of the accident' is given, the data cannot be properly examined for finding ways and means to prevent the same. For example, reverting to the

first case above, instead of merely stating "injured by a piece of coal", the correct entry should have taken the form :

"While a miner (or loader or trammer etc.) was cutting coal (or loading coal or withdrawing props etc.) at (x depillaring/development face or y roadway or z junction) he was injured by a piece of coal or stone measuring (give dimensions) which fell from (roof or side or face or basket or tub etc. as the case may be) at a height of (give dimension)".

If the injuries resulted in the death of the person(s) involved, the information could be conveyed in the above sentence itself by adding the words "fatally injured" or could be furnished by adding a separate sentence e.g. "the injuries resulted in the death of the worker (instantaneously or x hours later etc. as the case may be)".

FORM IV-B

2. This form is to be enclosed with the accident notice (in Form IV-A) or is to be sent within a week of submission of the same. Very often this is not done leading to protracted and unnecessary correspondence. Managements are, therefore, advised to take action to ensure early submission of this form.

There should be no difficulty in this respect particularly in respect of those Serious accidents where notices are submitted late in view of the injury having taken more than 20 days to heal. If, at the time of submission of Form IV-B, particulars relating to items "Return to duty" and "compensation" etc. are not available, this information may be sent subsequently and a suitable foot-note may be added in the proforma (this difficulty is in respect of coal mines only; for non-coal mines, a separate Form IV-C exists for this purpose), (for coal mines also Form IV-C has recently been introduced).

2.1 The entry against item 7 (iii) in this form is often not made correctly. This information is necessary for calculating the "severity of the injury". The period should relate to the actual number of days that the worker has been incapacitated, i.e. the number of days that elapsed before the worker could perform the duties normally assigned to him (i.e. the duties he was attending to prior to the accident). Alternative light work given, if any, in the meantime (referred to in item 8 of the form) should in no way affect the procedure indicated above.

The case of workers who do not resume duties after being declared medically fit also needs a clarification. In such cases, the date on which the worker has been declared to be medically fit for resumption of his normal duties may be furnished against the date of resumption of duties, and a suitable footnote added for clarification. In such cases, the return should be accompanied by a copy of the Fitness Certificate issued by the certifying doctor.

(Cir. 79/1963)

5. Revised Forms IV-A, IV-B and IV-C for sending notices of accidents/dangerous occurrences—
In view of introduction of computerisation in D.G.M.S. and the experience gained, formats for notices in Forms IV-A, IV-B and IV-C have been revised. Managements are requested to send all the notices of accidents and dangerous occurrences in the new formats with immediate effect using the codes as given below and the mine-code as per D.G.M.S. General Cir. No. 2 of 1993. No column/item should be left blank.

Notice in Form IV-C should be sent within 15 days of the injured' returning to duty in case of all mines including coal mines.

[Cir. Legis. (SAP) 2/1993]

6. Reporting of every big or major roof fall— Occasionally roof falls occur in' mines which do not result in any serious or fatal accident, or could be termed as 'premature collapse of any part of the workings' so as to come within the mischief of the provisions of Regulation 9 of Coal Mines Regulations, (Notice of Accident).

All the same, every big or major roof in a mine whether it is in a development district or at a longwall face or at any other place in a mine, whether or not it is a working place and irrespective of the fact whether it was anticipated or not, is a useful pointer to general deterioration of roof condition at that place. It is therefore advisable to look into every such incident in a mine with a view to taking suitable precautionary measures, well in time.

Report of every such roof fall in a mine should be furnished to the concerned Joint Director of Mines Safety within 24 hours of the occurrence, giving all relevant

DGMS

FORM IV-A
(see regulation 9)
Notice of Accident/Occurrence

Form :

To :

1. The Chief Inspector of Mines/Director General of Mines Safety, Dhanbad-826 001.
2. The Regional Inspector of Mines/Director of Mines Safety----Region/Dy. Director in Charge of Sub Region.
3. The District Magistrate/District Collector.
4. The Electrical Inspector of Mines/Director/Dy. Director of Mines Safety (Electrical) (electrical accidents only)

Sir,

I have to furnish the following particulars of a fatal/serious accident/a dangerous occurrence (*) which occurred at the.....(**) mine,
of.....(owner).

1.0 Mine code (nnnnnn) :

2.1 Date of accident (dd/mm/yy)

2.2 Time of Accident (hhmm) :

3.0 Particulars of the mine (If mine code is not known) :

3.1 Mineral :	3.2 Village :
3.3 Post Office :	3.4 Pin code :
3.5 Police station :	3.6 Sub Division/Taluq :
3.7 District :	3.8 State :
3.9 Owner's address :	

4.0 Particulars of the Accident :

4.1 No./name of shift :

4.2 Cause code : (nnnn)

4.31 Place code (n) :

4.32 Working code (n) :

4.33 Site Code (n)

4.4 No. of person killed :

4.5 No. of persons seriously injured :

4.6 Location of accident :

4.61 Pit/Incline No. :

4.62 District/Panel/bench/outside working district :

4.63 Seam/vein :

4.64 Level, dip No. :

4.65 Distance from the face (in mtrs.)

4.66 Details not covered above :

(if within district)

5.0 Particulars of person(s) involved :

Sl. No.	Name of victim	Designation	Design Code (nn)	if Contractor Worker (Y/N)	Sex (M/F)	Age (years) (nn)	Hours at work (hhmm)	Nature of Injury and Cause of death
Killed 1.								
2.								
3.								
Seriously injured :								
1.								
2.								
3.								

6.0 Brief description of the cause of accident/occurrence :

7.0 Immediate last accident :

7.1 Type of accident :

7.2 Date of immediate last accident dd mm yy

Particulars in respect of every person killed or injured in from IV-B are enclosed/shall be forwarded within a week (*).

Date

Place :

Your faithfully

Signature :

Name in Block letters :

Designation : (owner/agent/manager)

Note-See overleaf for codes

*-delete whichever is not applicable

**-name of mine

CODES TO BE USED IN FORM—A

CAUSE CODE

CODE	LONG NAME
0111	Fall of Roof
0112	Fall of Sides
0199	Other Falls of Ground
0221	Overwinding of Cages/ Skips etc
0229	Other accidents/ Dangerous occurrences due to winding
0332	Rope Haulage
0334	Conveyors
0335	Dumpers
0339	Other Wheeled Trackless
0399	Other non-winding Machinery
0448	HEMM other than Dumpers
0499	Other Machinery
0500	Explosives
0600	Electricity
0775	Spontaneous Heating
0799	Other accidents/ dangerous occurrences due to dust/fires
0831	Fall of Persons
0883	Fall of Objects
0889	Others (falls other than ground movement
0999	Other than above

PLACE CODE

CODE	LONG NAME
1	Below Ground
2	Opencast
3	Above Ground

WORKING CODE

CODE	LONG NAME
1	Development
2	Longwall
3	Depillaring/stoping
4	Coal/Ore bench
5	O/B Bench
6	Waste Dump
9	Others

SITE CODE

CODE	LONG NAME
1	Haul Road
2	Rope Haulage Road
3	Other Roadways
4	Miscellaneous

RESIGNATION CODE

CODE	LONG NAME
20	Management
30	Subordinate Supervisory Officials
41	Loaders
42	Support Personnel
43	Dresser
44	Shotfirer
49	Other B/G Face Worker
50	Other B/G Worker
59	Trammer
60	Fitter
71	Dumper Operator
72	Truck etc. Operator
79	Other Operators
99	Any Other

For office use only	
ACCLASS	
PLCCODE	
COSCODE	
RESP	
OPERATION	
SCRUTINY	
DE	

Particulars of deceased/injured person(s) (to be submitted within 7 days of occurrence)

1.1 Name of Mine : _____

1.2 Name of Owner : _____

1.3 Mine code (nnnnnn) : _____

1.4 Date of accident (dd/mm/yy) : _____

1.5 Time of accident (hh:mm) : _____

2.0 Details of the injured/Deceased workers

[illegible]

3.0 Responsibility for the accident

Sr. No.	Name(s) of Person(s) held responsible	Desig. Code (nn)	Designation	Rules/Reg. contravened	Nature of contraventions	Action taken

4.0 As a sequel to this accident :

4.1 Loss of production (in tonnes) :

5.0 Could the accident have been averted, if so, how?

Date :

Place :

see overleaf for codes

4.2.2 Loss of manshifts :

(indirect loss)

Signature :

Name in block letters :

Designation : Owner/Agent/Manager

CODES TO BE USED IN FORM IV—B

INJURY CODES(N)

CODE	LONG NAME
1	Amputation
2	Fracture
3	Internal injury
4	Others

PARTS OF BODY CODES(NN)

CODE	LONG NAME
10	Head
12	Eye
31	Back
32	Chest
34	Pelvis
38	Spinal column
40	Upper limbs
45	Fingers
49	Other upper limbs
50	Lower limbs
99	Others

FORM IV-C

Particulars of injured person returning to duty

(to be given in respect of every person within 15 days of his return to duty)

1.0 General

1.1 Name of Mine :		1.3 Mine code (nnnnnn) :		<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td></tr> </table>									
1.2 Name of Owner :		1.4 Date of accident (dd/mm/yy) :		<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td></tr> </table>									
		1.5 Time of accident (hhmm) :		<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td><td style="width: 20px; height: 15px;"></td></tr> </table>									

S. No.	Name(s) of injured worker(s)	Date of return to duty (dd/mm/yy)	Whether returned to regular or other job	Permanent Disablement		Ex-gratia payment made Rs.	Statutory Compensation paid (Rs.)	Benefits to dependants or other benefits
				part(s) of body				
				Lost	gone out of use			
1.								
2.								
3.								
4.								

Signature :

Date :

Name in Block Letters :

Place :

Designation : Owner/Agent/Manager

particulars along with a sketch plan showing the site and dimensions of the fall and the action taken/proposed to be taken to deal with the situation.

(Cir. 63/1973)

7. Manshifts lost on account of accidents—The Directorate of Mines Safety compiles the frequency of the incidence of fatal and serious accidents in relation to persons employed in the mines. For a proper assessment of the incidence of accidents in mines there is a concomitant index viz. the Severity Rate. In respect of the fatalities, the standard number of mandays lost is 6000. For serious injuries resulting in permanent disablement the percentage of disablement as laid down in the Workmen's Compensation table may be utilised for computing the estimated number of mandays lost (reproduced

for ready reference as Annexure II). In respect of enforced absence from duty for the other cases, the data should be readily available at the mines.

The information in the table (Annexure I) in respect of each mine separately for the last 5 years i.e. from 1969 to 1973 shall be furnished. It is also requested that henceforth, the aforesaid information be furnished annually in the same table along with the annual returns on or before the 20th February each year.

Further information relating to resumption of duty after injury to be furnished in Forms IV and/or IV-C, as the case may be, should also be furnished promptly.

ANNEXURE I

Manshifts lost on account of serious accidents for the year.....

Name of Mine Mineral Worked State

Name of Owner District

Sl. No.	Date of Accident	Name of person injured	Date of fitness/ of duties	Duration of enforced absence (1)	In case of permanent injury		Remarks
					Degree of disablement (2)	Estimated number of manshifts lost (3)	

Notes: (1) Includes persons seriously injured in fatal accidents also.
 (2) Obtained as the number of full calendar days intervening the date of accident and date of resumption of duty/fitness but not including either date. It includes all intervening Sundays, Holidays etc. It also includes any other full days of inability to work because of this specific injury, subsequent to the injured person's return to work.
 (3) As per Workmen's Compensation Act.

ANNEXURE II

Scheduled Charges for Disabilities

Based on Workmen's Compensation Act (India) 1923

Sl.No	Description of Injury	Percentage of loss of Earning Capacity	Equivalent Man-Days lost
<i>Permanent Total Disabilities</i>			
1	Death	100	6000
2	Loss of both hands or amputation at higher sites	100	6000
3	Loss of a hand and a foot	100	6000
4	Double amputation through leg or thigh, or amputation through leg or thigh on one side and loss of other foot	100	6000

5	Loss of sight to such an extent as to render the claimant unable to perform any work for which eyesight is essential	100	6000
6	Very severe facial disfigurement	100	6000
7	Absolute deafness	100	6000
<i>Permanent Partial Disabilities</i>			
<i>(a) Amputation Cases-Upper Limbs (Either Arm)</i>			
8	Amputation through shoulder joint	90	5400
9	Amputation below shoulder with stump less than 8 inches (205 mm) from tip of acromion	80	4800
10	Amputation from 8 inches (205 mm) from tip of acromion to less than 4 1/2 inches (115 mm) below tip of elecraon	70	4200
11	Loss of hand or thumb and four fingers of one hand or amputation from 4 1/2 inches (115 mm) below tip of elecraon	60	3600
12	Loss of thumb	30	1800
13	Loss of thumb and its metacarpal bone	40	2400
14	Loss of four fingers of one hand	50	3000
15	Loss of three fingers of one hand	30	1800
16	Loss of two fingers of one hand	20	1200
17	Loss of terminal phalanx of thumb	20	1200
<i>(b) Amputation Cases—Lower Limbs</i>			
18	Amputation of both feet resulting in endbearing stumps	90	5400
19	Amputation through both feet proximal to the metatarsophalangeal joint	80	4800
20	Loss of all toes of both feet through the metatarsophalangeal joint	40	2400
21	Loss of all toes of both feet proximal to the proximal interphalangeal joint	30	1800
22	Loss of all toes of both feet distal to the proximal interphalangeal joint	20	1200
23	Amputation at hip	90	5400
24	Amputation below hip with stump not exceeding 5 inches (125 mm) length measured from tip of great trochanter	80	4800

25	Amputation below hip with stump exceeding 5 inches (125 mm) length measured from tip of great trenchanter but not beyond middle thigh	70	4200
26	Amputation below middle thigh to below knee	60	3600
27	Amputation below knee with stump exceeding 3 1/2 in (90 mm) but not exceeding 5 in (125 mm)	50	3000
28	Amputation of one foot resulting in end bearing	30	1800
29	Amputation below knee with stump exceeding 5 inches (125 mm)	40	2400
30	Amputation through one foot proximal to the metatarsophalangeal joint	30	1800
31	Loss of all toes of one foot through the metatarsophalangeal joint	20	1200
<i>(c) Other injuries</i>			
32	Loss of one eye, without complications, the other being normal	40	2400
33	Loss of vision of one eye, without complications or disfigurement of eye-ball, the other being normal	30	1800
<i>(d) Loss of Finger of Right or Left Hand</i>			
<i>(i) Index finger</i>			
34	Whole	14	840
35	Two Phalanges	11	660
36	One phalanx	9	540
37	Guillotine amputation of tip without loss of bone	5	300
<i>(ii) Middle Finger</i>			
38	Whole	12	720
39	Two Phalanges	9	540
40	One phalanx	7	420
41	Guillotine amputation of tip without loss of bone	4	240
<i>(iii) Ring or little finger</i>			
42	Whole	7	420
43	Two phalanges	6	360
44	One phalanx	5	300
45	Guillotine amputation of tip without loss of bone	2	120

<i>(e) Loss of Toes of Right or Left Foot</i>			
(i) Great toe			
46	Through metatarsophalangeal joint	14	840
47	Part, with some loss of bone	3	180
(ii) Any other toe			
48	Through metatarsophalangeal joint	3	180
49	Part, with some loss of bone	1	60
(iii) Two toes one foot, excluding great toe			
50	Through metatarsophalangeal joint	5	300
51	Part, with some loss of bone	2	120
(iv) Three toes of one foot, excluding great toe			
52	Through metatarsophalangeal joint	6	360
53	Part, with some loss of bone	3	180
(v) Four toes of one foot, excluding great toe			
54	Through metatarsophalangeal joint	9	540
55	Part, with some loss of bone	3	180

(Cir. 9/1974)

8. Intimation of minor accidents— Even minor accidents (viz., accident resulting in minor injuries only) which involve 5 or more persons are to be reported immediately) to the D.G.M.S., the Joint Director and the Deputy Director in-charge of Sub Regions (where they exist) in the same manner as for a fatal or serious accident stipulated under Regulation 9, giving full details of the cause of occurrence and other particulars relevant to the accident.

This is required so as to help the newly opened cell in D.G.M.S. for in-depth analysis of accidents, incidents, etc.

(Cir. Legis. 4/1976)

9. Notice of overwinding ,while lowering raising of materials—Notice in Form IV-A is required to be furnished to the prescribed authorities vide Reg. 9(1)(a) (xi) of CMR 1957 [and the corresponding Reg. 9(1)(a) (xi) of MMR 1961] whenever there occurs in or about a mine an overwinding of cages or other means of conveyance while men are being lowered or raised. Thus according to the said regulation, such a notice is not necessary when an overwinding occurred during material winding operation.

By virtue of Section 23 of the Mines Act, 1952, however, a notice is also required to be furnished to the specified authorities in prescribed form when an overwinding of cages or other means of conveyance occurs while materials are being raised or lowered. Since the regulations are made under the Mines Act, the provisions of the Act shall prevail over the regulations. Managements are therefore, advised to comply with the requirements of the Act in the matter of submission of notice as stipulated in Clause (e) of sub-section (1) of Section 23 of Mines Act, 1952.

(Cir. Tech. 8/1983)

10. Accident analysis at mines—Whenever an accident occurs in the mine the usual enquiries conducted by managers and other staff are of a rather cursory nature so that real facts of the accident do not often come to light. As a result, really suitable action cannot be taken by the managements to prevent recurrence of similar accidents.

For any effective programme of accident prevention it is necessary that (i) every fatal accident in a mine is enquired into thoroughly by a senior officer of a rank superior to that of an agent and that (ii) every really serious accident (i.e.) an accident causing an injury involving the permanent loss of the use of or permanent injury to, any limb or the permanent loss of or injury to sight or hearing) is enquired into personally by the agent or the manager. The information obtained as a result of these enquiries should be properly analysed by the senior officer so as to find out areas requiring attention. A proper system of reporting and analysing accident data should be evolved for this purpose.

(Cir. 15/1963)

11. Improving Quality of Accident Enquiry Report— 1.0 Enquiry into accidents and dangerous occurrences is one of the important functions of this Directorate. Through these enquiries many times we come to know of technological gaps in the techniques practised and grey areas in accident prevention. Lessons learnt from these enquiries can be utilised to bridge this gap. What is really required is collecting all the required evidence painstakingly and thereafter an intelligent analysis of the evidence in the light of Inquiry Officer's own observations and arriving at a logical conclusion. A proper presentation of the facts, analysis and conclusions in the enquiry report is equally important.

2.0 In the past, accident inquiry reports were finalised in H.O. Any deficiencies or shortcomings noticed were communicated to the concerned R.O./Z.O. Most of the accident enquiry reports are now being finalised in R.O./ Z.O. Hence it is important that the concerned Director or Director-General makes a critical scrutiny of the report before sending the same to H.O. The following observation may help Directors/DDGs in the field in discharging this responsibility in a much better manner.

2.1 *Writing of cause :*

'Cause' of an accident as given on the first page of the inquiry report is published in the annual publications of this Directorate. These publications are widely circulated not only within the country but outside also. It is of utmost importance that the 'cause' is written in correct language, is comprehensive so as to give the reader a broad picture about the occurrence of the accident and yet be concise. The second paragraph of the 'cause' should be compatible with the first paragraph. Following are but a few examples which will indicate that due care was not taken in drafting the cause properly :

Case 1. "On receiving information about pieces of coal falling from roof on a slice in a depillaring district, a mining sirdar went to the level and examined the roof by mining stick when a mass of coal measuring 1.2m x 1.2m x 0.5m fell on him at a height of 2.8 meters inflicting serious bodily injuries to which he succumbed after 45 days." 'Misadventure'

2.1.1. It will be appreciated that the language used to describe the accident could have been improved. Elaboration is also needed regarding the reason for falling of coal pieces. In the body of the report it was mentioned that supports in the slice and at the site of accident were in order but this fact is not reflected in the 'cause'. In the absence of this detail one starts wondering about the wisdom of classifying the accident as a case of misadventure.

Case 2. 'While a support crew of three dislodged a prop by 'basula' prior to blasting, a ledge of roof coal in a split gallery, set underneath it, a mass of roof coal of size approximately 4.8m x 2.0—2.6m x 1.1m thick fell from a height of 2.65 meters inflicting fatal injuries on one timber mazdoor and mining sirdar cum shotfirer who was present and serious injuries to the other timber mazdoor to which he succumbed 12 hours later while the Timber Mistry escaped unhurt.'

(1) "Had the roof been kept supported as per systematic support rules enforced under the provisions of Regulation 108",

(2) Had the splitting of pillars been not commenced in contravention of conditions of permission granted under the provisions of regulation 100, and

(3) "Had these workings been placed under the charge of an overman in working shift as required under the provisions of regulation 34(1) of Coal Mines Regulations, 1957, the accident could have been averted."

2.1.2 Although in the first paragraph there is stress on dislodging support with a 'basula' yet there is no mention of this unsafe practice in the second paragraph. Further, construction of sentence could have been better.

3.2 Relevant details not given on first page of the report:

The particulars on first page of the report should be comprehensive so that important statistical data can be compiled without going through the entire report. While going through the report of accidents due to falls of roof, it has been noted that details such as place of accident (depillaring or development district), type of fall (whether coal or stone), height from which the fall occurred, etc. are lacking in some of the reports.

2.3 Conclusions not logical:

Analysis of evidence keeping in view I.O's own observations is the heart of an enquiry report. In many of the reports a very casual approach to arrive at a conclusion has been noticed. Following are some of the examples.

Case 1

Cause : "While a timber mazdoor was withdrawing from goafedge he was struck by a mass of roof stone measuring about 1.5m x 1.2m and about 5 to 6 cms. thick, which fell from a height of 1.65m and extended into supported area injuring him seriously which proved fatal after two hours." 'Misadventure'

Result of investigation

During my inspection, I found the fall of immediate roof had extended into supported area because of presence of a fossil impression which was not visible from bottom. The main fall of white sandstone was along the goaf edge fencing. Though the fall was caused because of accumulation of pressure near the solid pillar due to over splitting and non-maintenance of diagonal line of face, still a particular person or persons cannot be pin-pointed for the fault because the extension of the fall within the supported area was also caused by the false bedding due to presence of fossil. So it has been classified as 'mis-adventure.'

2.3.1 'In earlier paragraphs in the report it is mentioned that extension of fall of shale roof beyond the goaf edge and within supported area might have been triggered due to non-maintenance of diagonal line of extraction.' If that was the cause, then could 'fossil impressions', which are common in some

areas be the cause of this accident? If over-splitting or non-maintenance of diagonal line of extraction was responsible for this accident, then why the management could not be held responsible? The answers to these questions are lacking.

Case 2

Cause : "While one worker was engaged in dressing roof stone after blasting in a stone drift in underground workings, a mass of roof stone measuring about 1.00m x 0.5m x 0.10m in thickness fell from a height of about 4.6m and killed him instantly."

Analysis of evidence :

".....From the evidence of eye witness, Shri Issaq, who stated that during dressing of roof stone after blasting in the ventilation drift, no mining sirdar or shotfirer was present. At this ventilation drift, roof and side dressing is done by M/s. B. G. M. L. workers. From this is it evident that dressing of roof and sides after blasting was not done properly before engaging the workers. Had the roof of the working place been kept effectively dressed and secured before engaging the workers as required under the provisions, the accident would not have occurred."

2.3.2 The paragraph regarding cause and that about analysis of evidence are contradictory. Whereas in the cause itself it has been mentioned that dressing operations were being done, the 1.0. concludes that, had the place been kept effectively dressed and secured, this accident would not have occurred. The 1.0. has not even mentioned the provisions of the regulations which were contravened.

3.0 I trust the Inquiry Officers will take more care in future while writing reports and that the senior officers will also guide them in presentation of the accident inquiry report in a manner befitting this old and prestigious organisation.

(DGMS Tech. Instruction 1/1986)

12. 'Minor Accident Register and analysis of records of accident' See circular under Sec. 83 of The Mines Act.

EXAMINATIONS AND CERTIFICATES OF COMPETENCY AND FITNESS

CMR 13

Amendment in Bye-laws for Managers' Certificate of Competency examination—

Under Reg. 13(4) of the Coal Mines Regulations 1957, the Bye-laws for the conduct of Examinations for the grant of Manager's Certificate of Competency have been modified and amended vide No. Board/Coal/3761/90 of 19th June 1990 of D.G.M.S. and its correction (both of which have since been published in the Gazette of India) as follows :

S. No.	Bye-law	Existing Bye-law	Amended Bye-law
1.	9 (i)	If a candidate appearing in two or more subjects secured not less than 50% of the marks in any subject taking written and oral test together, but fails in other subjects he will be exempted from appearing in the subject or subjects in which he has passed in the subsequent three examinations. In every such case the secretary shall duly inform the candidate about the result of the examination.	If a candidate appearing in two or more subjects after 1st January, 1986 has secured or secures not less than 50% of the marks in any subject taking written and oral test together but fails in other subject(s), he will be exempted from appearing in the subject or subjects in which he has passed in the subsequent examinations.

A similar amendment has been made in the Bye-laws for examination for grant of Manager's Certificate of Competency under Reg. 13 of Metalliferous Mines Regulations 1961 as follows. It has since been published in the Gazette of India also.

S. No.	Bye-law	Existing Bye-law	Amended Bye-law
1.	9 (i)	If a candidate appearing in two or more subjects secures not less than 50% of the marks in any subject taking written and oral test together but fails in other subjects), he will be exempted from appearing in the subject or subjects in which he has passed in the subsequent three examinations. In every such case the secretary	If a candidate appearing in two or more subjects after 1st January 1986 has secured or secures not less than 50% of the marks in any subject taking written and oral test together but fails in other subject(s), he will be exempted from appearing in the subject or subjects in which he has passed in the subsequent examinations.

		shall duly inform the candidate about the result of the examination.	
	9(2)	A candidate shall be deemed to have passed in the examination as a whole if he obtains not less than 50% of the maximum marks in the subject taking written and oral test together.	

(Cir. Legis. 1, 2, 3, 4 & 5/1991 and I & 2/1992)

CMR 14/MMR14

Certificate of experience or training—Of late, some cases have been noticed where candidates for the Competency Certificate examinations have submitted certificates on which even the signature of the manager was forged. In order to put a stop to this practice, the Board of Mining Examinations has decided that any certificate which is not issued under the official seal of the manager would be rejected. Managers are, therefore, requested to issue certificate of experience/training at their mines only under their official seals. The official seals used for the purpose may be of special type and kept under the personal custody of the manager himself. The total period of training should be written in words by the manager himself in his own hand.

(Cir. 58/1963)

CMR15/MMR15

1. Validation of Certificate of Fitness issued by Licentiate Doctor—Medical certificates issued by Licentiate Doctors who possess 15 years experience as medical officers in independent charge of Colliery dispensaries may be accepted for the purpose of Reg. 15(1) (c) (ii) of the Coal Mines Regulations, 1957.

(Cir. 7/1965)

In order to enable a proper scrutiny to be made of medical certificates issued by such doctors it is requested that information in respect of every medical licentiate medical doctor employed by every mine may be sent to the office of D.G.M.S early, in the proforma given below:

Proforma

Information about licentiate Doctors employed in Coal Mines—

1. Name and address of Mine:
2. Names and address of Owner:
3. Particulars of the Licentiate Doctor employed:
 - (a) Name (in full):
 - (b) Date of birth:

(c) Medical Qualification held; Licentiate in from Medical School/Colleges in (year)

(d) Registration No. and date.....

(e) Particulars of Coal Mines dispensaries of which independent charge has been held

*Delete which is not applicable.

Period	Name of coal mine where independent charge of dispensary held
(i)	
(ii)	
(iii)	
(iv)	
(v)	

I certify that the information given above is correct, and that independent charge was held by me of the dispensaries above during the periods mentioned.

Signature of Owner/Agent/Manager
.....Colliery

Signature with date of the Doctor concerned
Date.....
(Cir. 4/1966)

2. Acceptance of Medical Certificate issued by Licentiate Medical Practitioners for the purpose of examination—Medical certificates issued by Licentiate Medical Practitioners irrespective of their being in service or private practice will also be accepted for the purposes of Reg. 15(1) (c) (ii) of both the Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations, 1961.

3. Rank of Civil Assistant Surgeon—For the purpose of the Mines Act, 1952 and the Regulation, Rules and orders made there under a doctor holding an M.B. or M.B.B.S. degree from a University formed under an Act of the Indian union shall be considered as having a status equivalent to that of a Civil Assistant Surgeon.

(Cir. 5/1971)

4. Measures to expedite scrutiny of Application for Statutory Examination for Subordinate Supervisory Staff—It is seen that the applications submitted by the candidates for statutory examinations like that of Sirdar's, Shotfirer's, Gas-testing etc. are received which are not complete in all respects. Instead of rejecting the applications straightaway, the candidates are addressed when the deficiencies in their applications are pointed out, and they are advised to comply with the requirements. Invariably, complete desired information even then is not submitted. Some times no reference is given along with the certificate or required papers sent by them. Under such circumstances, it becomes difficult to connect up the papers resulting in a lot of delay to dispose off the application. This also entails a lot of correspondence which can be avoided.

It is felt that if the applications by the candidates are submitted to this Directorate after these are properly scrutinized at the mine level so that the same are complete in all respects with all required certificates attached therewith it will be a great help to deal with the

applications and approve the same without difficulty and examination can be arranged soon after.

It is suggested that desirous candidates at your mine may be advised to send their applications through their Mine Manager, and the officials at the mine level may be requested to forward the same after they are fully satisfied that the applications are complete in all respects. Any correspondence, if any, thereafter, can be made with the Manager of the mine. A note detailing the requirements is given in the Appendix.

Appendix

1. *Full name and Address*—Full name should be mentioned in the application form. It may be checked if the same name appears in all the certificates or documents attached with the application. In case of any change in name, an affidavit from a First Class Magistrate, followed by publication of such change in local newspaper as well as in the Gazette of India to that effect should be submitted. If any part of the name is deleted in any of the certificates, a clarification for the same may be sent alongwith the application. Present Postal address and Permanent Home address shall be given in the application form.

2. *Certificate of Age*—If the candidate has studied in a school, he shall submit a School Leaving Certificate. In case he has passed Matriculation or equivalent examination the certificate in original should be submitted. In case the candidate has not studied in any school, a certificate of age from the medical officer of the mine duly countersigned by the Manager shall be given.

3. *Certificate of Literacy*—For the purpose of literacy certificate, in case a candidate has not studied in any school, a certificate from the Manager that the candidate is literate and can read and write shall be attached.

4. *Medical Certificate*—A medical certificate granted by any registered medical practitioner certifying that the candidate is free from deafness, defective vision or any other infirmity, mental or physical likely to interfere with the efficiency of his work should be given.

5. *Character Certificate*—A certificate of character from a person of good repute as for the general good conduct and sobriety of the candidate should be attached.

6. *First Aid Certificate*—First Aid Certificate in original granted by the St. John Ambulance Association (India) should be submitted. Provisional Certificates are not accepted. Candidate should appear well in time for the First Aid Examination so that he can obtain the original certificate and submit the same alongwith the application.

7. *Fee*—The prescribed fee for examination is either to be submitted by a Treasury Challan or by a Crossed Indian Postal Order. It is preferable to send the fee through Crossed Indian Postal Order which should be payable to Director-General of Mines Safety at DHANBAD Post Office. The Postal Orders should be purchased only when the application is being submitted. On the reverse of the Postal Order the name and address of the candidate shall be indicated in place meant for it.

The prescribed fee as per Coal Mines (Amendment) Regulations, 1990 for the examinations is as follows:

(a) Sirdar's	Rs. 30/-
(b) Shotfirer's	Rs. 25/-
(c) Gas testing	Rs. 25/-
(d) Winding Engine Driver's First Class	Rs. 30/-
(e) Winding Engine Driver's Second Class	Rs. 25/-

8. *Certificate of Experience*—Every Certificate of practical experience must be in the prescribed form and should contain precise information about the capacity in which the candidate worked, the nature of work done and the dates of commencement and termination of experience at each mine. No certificate of practical experience shall be considered unless it is granted by the Manager of the mine duly dated and bears the official seal of the Manager.

(A) Following experience is required :

For Sirdar's Examination out of required 3 years of Training experience of 6 months each in Shotfiring, Timbering and Depillaring is necessary.

(a) Experience gained as miner or timberman in Depillaring area for 6 months shall be accepted towards the required experience in Timbering and Depillaring.

(b) Experience/training in Surveying/Engineering or as a Munshi can be accepted up to a maximum period of 1 year towards General Training.

(c) Experience as shotfirer in depillaring area in such development workings where timbering is essential shall be accepted towards training in timbering.

(d) Experience as Shotfirer in depillaring area is accepted towards depillaring training.

(B) Out of 2 years of practical experience required for Shotfirer's Examination, 6 months should be in connection with shotfiring of which 2 months has to be in the workings belowground of a mine.

(C) (1) For Winding Engine Driver's Examination a candidate must have practical experience of driving a winding engine or as assistant to a qualified Winding Engine Driver for a period of at least one year. If the experience is less than 5 years, the examination shall include a practical test. The nature of experience gained must be clearly shown in the Experience Certificate.

(2) The type of examination i.e.. Steam, Electric or Compressed air, for which candidate wants to appear must be clearly indicated in the application. If a candidate wants to appear for different types of examinations for winding-engines, separate application shall be made for each type of the examination.

9. (a) The candidate who had appeared earlier and failed in the examination should indicate the correct date and place of last Examination attended by him in the specified columns of the application form.

(b) In case of a candidate who failed in the examination earlier, it will be sufficient if he submits evidence of prescribed fee, valid First Aid and Medical Certificate but the date and place of last Examination in which he failed must be indicated correctly.

(c) If a candidate has already passed any of statutory examinations, he should mention the certificate number or the name, date and place of Examination at which he appeared and passed the Examination.

10. If a candidate submits an application for an examination and the original documents are already sent in connection with other statutory examination, or applies simultaneously for two different examinations, it will be necessary to submit original documents with each application separately. Attested copies of the same may be attached and a mention should be made indicating the Examination and the date for/with which the original documents are submitted.

(Cir. Exam. 1/1975)

5. Examinations for Gas testing, Sirdar, Shot-firer/Blaster and Mate's Certificate of Competency—Although the above examinations are being held in different Regions or Sub-Regions, the candidates are required to submit their applications to DGMS, Dhanbad. It has now been decided that applications for these examinations along with the required documents and fee should be submitted to the concerned Regions, Sub-Regional Offices. However, the Indian postal order accompanying the application should be payable to Director-General of Mines Safety at Dhanbad Post Office.

Candidates from Dhanbad will continue to submit their applications to DGMS, Dhanbad while those from Sitarampur shall submit their applications to D.D.G. (E.Z.), Sitarampur. You are, therefore, requested to advise all the candidates from your mine accordingly.

(Cir. Exam. 1/1979)

CMR16/MMR16

1. Amendments in the Scheme of Mine Manager's Statutory Examination and grant of Certificates— 1.0 The Bye-laws for the conduct of examinations under the Coal Mines Regulations, 1957 and Metalliferous Mines Regulations, 1961, for- the grant of Manager's Certificate of Competency published under Notifications Nos. Board/Coal/11578/72, Board/Met/8697/72 and Board/Met/8696/72, all dated 8.8.72, have been amended and published under notifications Nos. Board/Coal/I 1317/74, Board/Met/5810/74 and Board/Met/5811/74, all dated 13.8.74, respectively, in the Gazette of India, Part III, Section 4, on 14.9.74. The provisions of these amended bye-laws have come into effect on and from the 14th December, 1974.

A. The main features of the amendments in the Bye-laws are as follows :

(i) First Class Mine Manager's Certificate

Persons holding Degree in Mining Engineering or Equivalent Approved Qualification :

1.1 A person holding Degree in Mining Engineering or an equivalent qualification and possessing 2 years' service (after obtaining Second Class Mine Manager's Certificate) in an approved capacity shall now be required to appear only in one paper i.e. on Mine Management, Legislation and General Safety, in the Board of Mining Examination, instead of in two papers with the said period of experience (2 years) under the superseded bye-laws. The requirement of 4 years' experience with one paper examination, therefore, stands waived. (There is no change in the scheme of Qualifying Test Examination at an educational institution).

Person holding Diploma in Mining or Equivalent Approved Qualification:

1.2 A person holding Diploma in Mining or an approved qualification and having obtained Second Class Mine Manager's Certificate (by passing one paper examination or by passing qualifying test at educational institution) shall now be required to possess only 2 years' service after obtaining Second Class Mine Manager's Certificate in an approved capacity, instead of 4 years as provided earlier, to pass First Class Manager's Examination by taking 2 papers or 3 papers examination, as the case may be.

1.3 In view of the above amendments, any person who has already passed the First Class Mine Manager's Examination in the test held either in December, 1972, or in May, 1974, and the award of his certificate has been withheld for not possessing the prescribed service/experience of 4 years' service (after qualifying for award of a 2nd Class Manager's Certificate), he may apply mentioning the year of passing along with certificate of two year's service/experience in the specified capacity, for award of the withheld certificate. Such certificate will be valid from the date of coming into force of the bye-laws or the date of completion of the experience whichever is later.

(ii) Second Class Mine Manager's Certificate

Persons holding Degree in Mining Engineering or Approved Qualification:

2.1 A holder of Degree in Mining Engineering or an equivalent qualification from a University or Institution approved under Regulation 16 will be eligible for grant of a Second Class Mine Manager's Certificate if he possesses at least one year's experience as a Post-Graduate Trainee under the Directorate of Practical Training in Mining or equivalent approved training, instead of two year's similar experience prescribed earlier.

Persons holding Diploma in Mining or Approved Qualification :

2.2 For persons holding Diploma in Mining or equivalent approved qualification the period of three year's service in an approved capacity prescribed for grant of 2nd Class Mine

Manager's Certificate has been reduced to two years, whether they have passed Qualifying test at an educational institution (and have put in one year's P.G.P.T. experience) or have passed one paper examination on Mine Management, Legislation and General Safety with BME (after satisfying prescribed period of experience under Reg. 16).

2.3 In view of the above, persons who have passed in the examination held in December, 1972 or in May, 1974 and whose certificates have been withheld, may apply mentioning the year of passing alongwith certificate to two year's service experience as prescribed, for award of the withheld certificate. Such certificates will be valid from the date of coming into force of the bye-laws or the date of completion of the experience, whichever is later.

B. The main features of the amendments in the Notification are as follows:

3.0 The Notification of the Government of India No. S.O. 721(E) dated the 21st November, 1972 has been superseded by Notification No. S.O. 712(E) dated the 13th December, 1974, and accordingly this Directorate Circular No. 54 of 1972 dated 6th December, 1972 also stands superseded.

As would be noted, the new notification does not now relate to any exemption for holders of degree or diploma in Mining Engineering for the purpose of grant of a Manager's Certificate (since the same have been included in the recently amended bye-laws referred to above), but includes certain exemptions to the 'Field Students in respect of the First Class Mine Manager's Certificates.

4.1 According to the Notification dated 13th December, 1974 a person who does not hold degree or diploma in mining, i.e., to say who is a 'Field Student' will be granted a First Class Mine Manager's Certificate if he holds Second Class Manager's Certificate and possesses three year's service after obtaining Second Class Manager's Certificate and submits a certificate from the Board of Mining Examinations to the effect that he has passed in the prescribed three subjects viz. (i) Winning and working, (ii) Mine Management, Legislation and General Safety, and (iii) Ventilation, Fire, Explosions & Inundation in the First Class Mine Manager's Examination. In respect of a Certificate restricted to mines having opencast workings only,, a candidate needs to pass only in two papers viz. : in (i) Winning and Working and (ii) Mine Management, Legislation and General Safety.

4.2 Under the said notification concessions granted under the superseded notification to holders of degree and diploma in Mining in respect of other statutory certificates have been virtually retained.

C. With regard to the experience for the purpose of grant of statutory certificates, under the amended bye-laws and notification referred to above some relevant recent decisions of the board of Mining Examinations are as follows:

5.1 The candidates should submit details of experience in mines in prescribed forms. It is required that the experience should be obtained in a coal mine only if the certificate is desired for Coal Mines. Similarly, if certificate is required for Metalliferous mine, only

experience obtained in metalliferous mine, will be accepted. As provided in Regulation 16, the nature of any practical experience obtained in a coal mine shall be in workings belowground of a coal mine having an average monthly output of not less than 1000 tonnes.

Similarly for Metalliferous Mines, the practical experience shall be obtained in Metalliferous Mines having an average employment of not less than 60 in workings belowground or not less than 160 in all in the mines. Experience obtained in opencast mines using heavy earth moving machinery is approved in full irrespective of employment for the purpose of grant of certificates restricted to Opencast Mines only.

5.2 For the purpose of grant of Manager's Certificate for underground mines, experience/service obtained in opencast mines is acceptable only upto 25% of the required training/service (after obtaining Degree/Diploma/2nd Class Certificates as the case may be). The training in opencast mines will be inclusive of other experience/service to be accepted upto 50% of the total experience required.

However, in case of grant of Overman's/Foreman's certificate valid for underground mines, training/service should be obtained in the workings belowground of mines only.

D. This is also to inform you that no person shall be appointed to perform statutory duties in a capacity requiring the possession of a First/Second Class Manager's, Surveyor's, Overman's/Forman's, Sirdar's/Mate's, Shotfirer's/Blaster's etc. certificate, unless he has obtained a certificate granted by the Board of Mining Examinations.

Any candidate who desires to obtain a certificate on the basis of the exemption granted to him under the bye-laws/notification is required to furnish the following documents etc. immediately :

- (i) Enclosed Form II, duly filled in.
- (ii) All documents in original to support his claim.
- (iii) Evidence of age.
- (iv) Certificate of medical fitness.
- (v) Certificate of good character.
- (vi) Certificates of Education.
- (vii) Certificates of experience in prescribed form.
- (viii) Certificate of having passed a qualifying test.
- (ix) Two copies of photographs duly attested on the front.
- (x) Examination fees.

Therefore, if any person is working in a statutory capacity in terms of previous Circular No. 54 of 1972, he should apply and obtain the relevant statutory certificate immediately, but not later than 31st October, 1975 in any case.

(Cir. Exam. 3/1975)

Note : (1) Notification published in the Gazette of India Extra-ordinary Part II Section 3(88) dated 13.12.74, in supercession to S.O. No. 721(E) dated 31st Nov., 1972 is reproduced below. (DGMS Cir. 54/1972 is superseded).

(2) Para 'D' of above circular (Exam. 3/1975) has been amended by Cir. Exam. 1/1997.

NOTIFICATION

S.O. In exercise of the powers conferred by Sub-section (1) of Section 83 of the Mines Act, 1952 (35 of 1952) and in supercession of the Notification of the Government of India in the late Ministry of Labour and Rehabilitation (Department of Labour and Employment) No. S.O. 721(E) dated the 21st November, 1972, the Central Government hereby exempts all mines from such provisions of the Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations, 1961 which require the appointment of a person holding the qualifications specified in column (1) of the Schedule hereto annexed, subject to the condition that persons holding the qualifications specified in the corresponding entry in column (2) are appointed instead.

The Schedule

Qualification required to be possessed under the Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations, 1961 from which exemption is granted.	Qualifications which should be possessed by the person, to be appointed in place of persons possessing qualifications specified in column (1)
1	2
First Class Manager's Certificate	For persons who do not hold degree or diploma: 1. Second Class Manager's Certificate of Competency. 2. A Certificate from the Board of Mining Examinations that he passed in the following subjects prescribed for the First Class Mine Manager's Examination: (i) Mine Management, Legislation and General Safety; (ii) Winning and Working; (iii) Ventilation, Fire, Explosions and Inundation. 3. At least three year's service in a capacity specified in column (2) of the Annexure after obtaining Second Class Manager's Certificate of Competency.
1A. First Class Manager's Certificate restricted to Mines having opencast workings only	For persons who do not hold degree or diploma: 1. Second Class Manager's Certificate of Competency or Second Class Managers' certificate of competency restricted to mines having opencast

	workings only. 2. A Certificate from the Board of Mining Examinations that he has passed in the following subjects prescribed for the First Class Mine Manager's examination restricted to mines having opencast workings only: (i) Mine Management, Legislation and General Safety; (ii) Winning and Working. 3. At least three years' service in a capacity specified in column (2) of the Annexure after obtaining Second Class Manager's Certificate of Competency.
2. Manager's Permit	1. Diploma or Merit Certificate in Mining or an equivalent qualification from an educational institution approved under the second proviso to Sub-regulation (1) of Regulation 18 of the Coal Mines Regulations 1957 or the qualifications approved under the proviso to Sub-regulation (1) or the proviso to Sub-regulation (2) of Regulation 18 of the Metalliferous Mines Regulations, 1961. 2. At least one year's experience as a Post-Diploma Trainee under the Directorate of Practical Training in Mining or equivalent training in any capacity specified in column (4) of the Annexure. 3. An authorisation from the Chief Inspector after paying the prescribed fee for Permit Manager's Certificate.
3. Overman's / Foreman's / Sirdar's / Mate's and Shotfirer's / Blaster's Certificate	1. Degree in Mining or an equivalent qualification from a university or educational institution approved under the proviso to Sub-regulation (1) of Regulation 16 of the Coal Mines Regulations, 1957 or the qualifications approved under the proviso to Sub-regulation (1) of Regulation 16 of the Metalliferous Mines Regulations 1961; OR 1. A Diploma or Merit Certificate in Mining or an equivalent qualification from an educational institution approved under the second proviso to Sub-regulation (1) of Regulation 18 of the Coal

	Mining Regulations, 1957 or the qualifications approved under the proviso to Sub-regulation (1) or the proviso to Sub-regulation (2) of Regulation 18 of the Metalliferous Mines Regulations, 1961; and 2. At least one year's experience as a Post-Diploma Trainee' under the Directorate of Practical Training in Mining, or in a capacity specified in column (4) of the Annexure.
4. Surveyor's Certificate	1. Degree in Mining or an equivalent qualification from an educational institution approved under proviso to Regulation 17 of the Coal Mines Regulations, 1957 or the qualifications approved under the proviso to Regulation 17 of the Metalliferous Mines Regulations, 1961; and 2. At least six months' experience in surveying the workings belowground of a mine after obtaining Degree. OR 1. Diploma or Merit Certificate in Mining or an equivalent qualification from an educational institution approved under proviso to Regulation 17 of the Coal Mines Regulations, 1957 or the qualifications approved under the proviso to Regulation 47 of the Metalliferous Mines Regulations, 1961; and 2. At least one year's experience in surveying the working belowground of a mine after obtaining Diploma. All the foregoing requirements shall be subject to the following conditions and exceptions:
5. Provisions:	1. In order to be eligible for appointment in any statutory capacity in Coal Mines having workings belowground at least six months' experience shall be in workings belowground in a coal mine and similarly for appointment in any statutory capacity in metalliferous mines having workings belowground at least six months' experience shall be in workings belowground in metalliferous mines in a

	capacity specified in the relevant column of the Annexure. 2. In order to be eligible for appointment as Manager of First Class, a Second Class or a Permit Mine, having workings belowground, the experience referred to in paragraph (1) shall be in the following capacity: (a) for appointment as Manager of a First Class Mine the experience shall be gained in a subordinate capacity which according to the Coal Mines Regulations, 1957, or the Metalliferous Mines Regulations, 1961, requires the possession of a Second Class Manager's Certificate of Competency as the minimum qualification. (b) for appointment as Manager of a Second Class Mine the experience shall be gained in a subordinate capacity which according to the Coal Mines Regulations, 1957, or the Metalliferous Mines Regulations, 1961 requires the possession of an Overman's or Foreman's Certificate of Competency respectively as the minimum qualification. (c) for appointment as Manager of a Permit Mine the experience shall be gained in a capacity which according to the Coal Mines Regulations, 1957, or the Metalliferous Mines Regulations, 1961, requires the possession of a Sirdar's or Mate's Certificate respectively as the minimum qualification. 3. In order to be eligible for appointment as Surveyor of any mine having workings belowground at least six months' of experience in Surveying shall be obtained in the workings belowground of a mine of the type (coal or metalliferous) for which the exemption is sought. 4. In order to be eligible for appointment in a mine in any statutory capacity a person has to possess a Gas tasting Certificate granted either by the institution granting Degree or Diploma or by the concerned Board of Mining Examinations except where his appointment is restricted only to opencast metalliferous mines or where he has passed the qualifying test.

	5. Notwithstanding anything contained hereinbefore, in this notification, any training obtained at any time in a statutory capacity mentioned under item (a) of the Annexure may also be accepted for the purpose of the respective exemptions provided such training has not been taken into account for exemption from any other statutory examination.
Explanation	The experience mentioned under item (a) of column (2) of the Annexure includes any such training when obtained under due authorisation of the Chief Inspector.
Definition	Board means the Board of Mining Examinations under the Coal Mines Regulations, 1957 or the Board of Mining Examinations under the Metalliferous Mines Regulations, 1961, as the case may be.

Nature of practical experience required for the purpose of exemptions

For First Class Mine		Managers Training equivalent to Post-graduate Practical Training/Post-Diploma Practical Training
1	2	3
(a) To be accepted in full	Service in a capacity which requires post-session of a 2nd Class Manager's, Overman's or Foreman's Certificate as per the Mines Act, 1952	(i) Service in a statutory capacity other than Gas testing. Winding Engine Driver & Surveyor's (ii) Probationary Mining Engineers or in a similar capacity employed in mines
(b) To be accepted upto 50% of the total experience required subject to maximum period of 1 1/2 years	1. Dust sampling Incharge 2. Stone Dusting Incharge 3. Planning 4. Research 5. Sinking and Prospecting 6. Engineering 7. Teaching 8. Training Officer/ Instructor 9. Surveying 10. Rescue	1. Dust sampling Incharge 2. Stone Dusting Incharge 3. Planning 4. Research 5. Sinking and Prospecting 6. Engineering 7. Teaching 8. Training Officer/ Instructor 9. Surveying 10. Rescue
Note: Total Experience required	Total Experience training to be accepted	11. Work in other than statutory capacity in a

2 Years 3 Years 4 Years	1 Year 1 1/2 Years 1 1/2 Years	mining operation 12. Mining apprentice under the supervision of an official.
(c) Any other experience that may be approved by the Board.		

(No. S29014/6/74-MI)

3. Exemptions under Sec. 83—All opencast workings in mines engaged in working the mineral specified in Part A of the Schedule below from the provisions specified in column (2) Part B of the said Schedule, are exempted provided that all the conditions specified in column (3) thereto are fulfilled.

SCHEDULE
Part A

Kankar, Murrum, Laterite, Boulder, Gravel, Shingle, Ordinary sand (excluding moulding sand, glass sand and other mineral sands), ordinary clay (excluding caolin, china clay, white clay or fire clay), building stone, road metal, earth, fullers earth and lime stone.

2. Exemptions granted to holders of degree and diploma in Mining Engineering in respect of Manager's Competency Certificate etc.— This is to inform you that by a recent Notification issued by the Government of India in the Ministry of Labour and Rehabilitation under Sub-section (1) of Section 83 of the Mines Act, 1952, persons holding Degree in Mining Engineering from any recognised University have been exempted from passing Second Class Mine Manager's Certificate of Competency Examination if they have obtained at least two years' P.G.P.T. training under the Directorate of Practical Training in Mining or equivalent training. The Graduates have been exempted from passing First Class Mine Manager's Certificate of Competency as well, if they have passed a qualifying test either at their respective institutions or with DGMS by clearing two papers viz., (i) Winning and working; (ii) Legislation by external examiners and who have put in a service of at least two years in a capacity which requires the possession of a Second Class Manager/Overman/ Foreman's Certificate as the minimum qualification etc.

2.0 Under the same Notification, persons holding Diploma or Merit Certificate in Mining have been exempted from passing Overman Certificate of Competency after they have obtained at least one year's experience as Post Diploma trainee or in any statutory capacity. The Diploma and Merit Certificate Holders have been granted also exemption in respect of Second Class Manager's Certificate if they have passed a qualifying test as mentioned above and undergone one year's experience as a Post Diploma Trainee etc., and at least three years' service in any statutory capacity in mines.

3.0 It is further provided in the Notification that persons who have been exempted from possessing any statutory certificate granted under Coal Mines Regulations, 1957 will be eligible to work in metalliferous mines in corresponding capacity without passing any

further examination after they have gained an experience in a subordinate capacity for a period of at least six months in metalliferous mines having workings belowground and vice versa. For example, a person who is exempted from possessing Colliery Manager's Certificate will be entitled to work as First Class Manager of any underground metalliferous mine after putting in a service of at least six months in a subordinate capacity as Second Class Assistant Manager in metalliferous mines having workings belowground.

4.0 To assist the industry, it is proposed to institute a system of registration of persons who qualify for exemptions from grant of any statutory certificate for appointment at mines but for this purpose it will be necessary to amend the regulations. Action has already been initiated to do so. In the meanwhile, it will be the responsibility of the management to verify the requisite qualifications, certificates and documents of experience etc. before appointing a person to a statutory post in mines to which he may be eligible by virtue of the aforesaid Notification. In case of any doubt, the matter may be referred to the Zonal Director or Jt. Director for advice.

(Cir. 54/1972)

Note : *The above circular 54/1972 has been superseded by Cir. Exam. 3/ 1975, It is given here only for historical importance.*

CMR 17

Approval of Diploma in Mine Surveying—Further to Notification No. S.O. 1599 dated 28th June 1961, the Central Government has, under Reg. 17 of CMR 1957, approved the following Diploma vide Notification No. 80(E), Gazette of India, Extra-ordinary, Part-11, Section 3(ii) dated 25.1.1990.

This institution has been approved under Reg. 17 of MMR 1961 vide Notification No. S.O. 79(E), Gazette of India, Extra-ordinary, Part-11, Section 3(ii) dated 25.1.90 (amending the list published earlier vide No. S.O. 2795 dated 23rd Sept., 1963).

Government Polytechnic, Shahdol, Madhya Pradesh	Two-year Diploma Course in Mine Surveying

(Cir. Legis. 1 & 2/1990).

CMR 18/MMR 18

1. Exemption from the provisions of CMR'57/MMR'61 which require appointment of persons with statutory certificates—Vide notification No. S.O. 712(E) published in the Gazette of India, Extraordinary part II, Section 3(ii) on 13th December, 1974 certain conditional exemptions have been granted to all mines from such provisions of the Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations, 1961, which require the appointment of persons holding 1st Class Manager's Certificate, Manager's permit. Overman's, Foreman's, Sirdar's, Mate's and Surveyor's Certificates.

Since the Bye-laws for grant of the aforesaid certificates have not yet been suitably amended so as to incorporate these relaxations and concessions, certificates cannot be granted to candidates, even though they satisfy the conditions stipulated in the aforesaid notification. So, those who desire to obtain such certificates, have to appear in the regular examinations conducted by the Board as per the Bye-laws for the time being in force.

However, by virtue of the notification referred to above, persons, though they do not possess the above mentioned certificates, can be appointed in the statutory capacities requiring the possession of these certificates, provided they fulfill the conditions specified in the notification, referred to above and their appointments will be in order so long as the aforesaid Notification is in force.

A copy of the Notification, along with a list of approved Degrees and Diplomas in Mining Engineering, is enclosed for general guidance and information.

Since the Bye-laws for the grant of Manager's certificates have been amended vide Notifications Board/Coal/11317/74 and Board/Metal 5810/74 and 5811/74, published in the Gazette of India dated 14.9.74, and since the said amended Bye-laws provide for the relaxations and concessions to the Degree and Diploma holders in Mining Engineering, the Manager's certificates will be issued to them provided they satisfy the requirements of the amended Bye-laws. Consequently the Notification No. S.O. 721(E) Dated 21st November, 1972 was superseded by the subsequent Notification No. S.O. 712 (E) Dated 13.12.74, which covers only those cases for which the Bye-laws have not yet been suitably amended.

Therefore, para D of D.G.M.S. Circular No. 3 of 1975 stands modified to the extent indicated in this circular.

List of approved Degrees and Diplomas in Mining Engineering under Regs. 16 & 18 of CMR 1957/MMR 1961

DEGREE IN MINING ENGINEERING

Name of Institution	Degree, Diploma or Certificate awarded
1. Any University in India established by Law	Degree in Mining
2. Bengal Engineering College, Shibpure	Diploma in mining (issued upto 1929)
3. Indian School of Mines and Applied Geology, Dhanbad.	(i) Certificate in coal Mining (issued upto 1950-51) and (ii) Diploma of Associateship in Mining Engineering
4. The Institution of Engineers (India) incorporated by Royal Charter 1935.	Pass in Sections A & B of the Associate Membership Examination in Mining Engineering Branch.

DIPLOMA IN MINING ENGINEERING

Name of authority	Diploma or Certificate awarded
1. Diploma in Mining	Board of Technical Education Rajasthan, Jodhpur.
2. Licentiate in Mining Engineering	Central Board of Technical Examination, Mysore.
3. Diploma in Mining and Mine Surveying	Madhya Pradesh Board of Technical Education, Bhopal.
4. Diploma in Mining	Shri Jaychamarajendra Occupational Institute, Bangalore.
5. Diploma in Mining Engineering	State Board of Technical Education and Training, Andhra Pradesh.
6. Diploma in Mining and Mine Surveying	State Board of Technical Education, Bihar
7. Licentiate in Mining Engineering	State Board of Technical Education (formerly Technological Diploma Examination Board) Madras.
8. Licentiate in Mining Engineering	State Council for Engineering and Technical Education, West Bengal.
9. Diploma in Mining Engineering	State Council of Technical Education and Training, Orissa.
10. Diploma in Mining and Mine Surveying	Board of Technical Examinations, Bombay, Maharashtra.
11. Diploma in Mining & Mine Surveying (Recognised Mining Classes, Bhaga, Dhanbad).	State Board of Technical Education, Bihar
12. Final Merit Certificate (Evening Mining classes run by the Directorate of Mines & Minerals, Govt. of W. Bengal)	Mining Education Advisory Board, W. Bengal.
13. Final Merit Certificate (awarded upto 1958)	Mining Education Advisory Board Bihar & West Bengal.
14. Final Merit Certificate (awarded in 1959 and 1960 to students of Evening Mining Classes, Bhaga)	State Board of Technical Education, Bihar.

(Cir. Exam. 1/1977)

2. Qualifying Test conducted at the Institution of Engineers—The Board of Mining has decided that a candidate for Manager's Examination can appear only in one examination during a year i.e. either in the Qualifying Test conducted at the Institution or the examination conducted by the Board of Mining Examination. The same decision is applicable to the field students, who may appear either in 2nd Class Manager's Examination conducted by the Board of Mining Examination or at Institution of Engineer's Examination, Section A & B enabling them to get an exemption from 2nd Class Mine Manager's Certificate of Competency Examination.

The Board has further decided that in case a candidate appears at any examination conducted either by the Board or by an arrangement with the Board, and has failed, he will not qualify for grant of a certificate in that examination for a period of one year even if he

passes at any other Examination during the year). Therefore, a candidate will not be considered eligible to get a statutory certificate within one year of his failure in any particular class of examination.

(Cir Exam. 4/1975)

CMR19/MMR20

Classification of Winding Engine Drivers Certificate of Competency—As the control and method of operation of steam/compressed air engines on the one hand and the electrical engines on the other are different, a recent amendment made in the relevant bye-laws provides for the winding engineman's certificate to be valid for either of the engine-types aforesaid, or both. In order that application received for the grant of engine driver's certificates can be properly processed and classified, it is desirable that in every certificate of experience issued in this respect, specific mention is made as to the type of the winding engine on which the experience was obtained.

(Cir. 64/1967)

MMR 21

Payment of Examination Fees under Reg. 21 of MMR 1961—All intending candidates shall comply with the following instructions :

(i) Postal Challans

The fee should be deposited by Central Challan under the Head of Account "XXXII Miscellaneous Social Service Organisation Receipt of Director-General of Mines Safety Examination fees Central-Adjustable by Accountant-General, Bihar".

(ii) Postal Orders

(a) The fee paid through Crossed Indian Postal Orders should be made payable to the Director-General of Mines Safety at Dhanbad Post Office.

(b) For different examinations, the fee should be paid by Crossed Indian Postal Orders in the following denominations :

Sl. No.	Examination	Fee Payable	Denomination of Postal Order
1.	Manager's First Class	Rs. 50/-	One Postal Order of Rs. 5/-and the balance in any denominations
2.	Manager's Second Class	Rs. 30/-	
3.	Mine Surveyor's	Rs. 20/-	
4.	Foreman's	Rs. 20/-	
5.	Mate's	Rs. 10/-	
6.	Winding Engine Drivers Class I	Rs. 20/-	One Postal Order of Rs.2/-and balance in any denominations.
7.	Winding Engine Drivers Class II	Rs. 10/-	One Postal Order of Re.1/-and balance in any denominations.
8.	Blaster's	Rs. 6/-	

9.	Gas Testing	Rs. 4/-	Two Postal Orders of Re. 1/- each.

Refund of any fee paid under sub-regulation (1) of regulation 21 is permitted only where the candidate has died before the examination or where the fee has been erroneously paid.

(Cir.. 19/1971 and Govt. Notification No. GSR 947 dt. 13.7.72)

CMR24

1. Manager to return Certificate—It is the responsibility of the manager of every mine to ensure that as soon as any overman or sirdar gives up employment at his mine, his competency certificate is returned to him immediately.

(Cir. 59/1963)

2. Intimation for revalidation of an Overman's, Sirdar's, Engine Driver's, Shotfirer's and Gas Testing Certificate—The holder of an Overman's, Sirdar's, Engine driver's, Shotfirer's and Gas Testing Certificate employed in a mine in a capacity which requires the possession of the said certificate, is required to deliver such certificate to the manager of the mine in which he is for the time being employed.

Certificate holder may be informed in writing at least six months before the date on which the validity of the certificate expires to initiate action for its revalidation. Simultaneously a notice may be prominently displayed at the mine office indicating the names of certificate holders at the mine and the dates on which the validity of each certificate expires.

(Cir. 17/1968)

CMR 27/MMR 30

1. Renewal of Gas Testing Certificate— In order to assist the holders of gas testing certificate to have more than one chance of appearing at the renewal examinations for the certificates, it has been decided to entertain the applications sufficiently in advance of the date due for renewal of the certificate. The applications of the concerned officials may be forwarded to the office of D.G.M.S. at least six months before the due date for revalidation.

(Cir. 56/1966)

2. Periodical Medical Examination of Overmen, Sirdars and Shotfirers—The question of 5 yearly medical examination of Overmen, Sirdars and Shotfirers has been under examination for some time. A recent study of the cases of failure in this examination shows that there are very few such cases below the age of 40 years and almost all of them are curable ones. Most of the failures occur above the age of 40 or 45 years. There does not, therefore, seem to be any special need to require such persons to be medically examined periodically upto age of 40 years, excepting in doubtful cases.

The matter was discussed with the Indian National Overmen, Sirdars and Shotfirers' Association (INMOSSA) and it has been tentatively decided that:

(a) All candidates who qualify to obtain Sirdar's/Mate's certificate will be medically examined and certified by a qualified medical practitioner appointed under Regulation 27

of CMR 1957 or the corresponding Regulation 30 of MMR 1961, as the case may be, before issue of the Sirdar's/Mate's certificate.

(b) Therefore, medical examination at 5 yearly interval will be done only after an Overman/Foreman, Sirdar/Mate or Shotfirer/Blaster is 40 years old and above.

Provided that if the Joint Director of Mines Safety or Director-General of Mines Safety is of the opinion that any person as aforesaid, though less than 40 years of age, is medically unfit to carry on the statutory duties prescribed for him, he may require such person to be medically examined within a period of three months.

It is proposed to initiate action for amendment of regulations on above lines. In the meantime, the above mentioned proposals may be kept in view while asking the concerned staff to appear at medical examination for the purpose of revalidating their respective certificate under Regulation 27 of CMR 1957 and the corresponding Regulation 30 of MMR 1961.

(Cir. 12/1972)

It is clarified that until the regulations are amended, it will be necessary for the Overmen, Sirdars and Shotfirers to continue to appear at the Overman, Sirdar's and Shotfirer's 5 yearly medical examination for revalidating their respective certificates under Regulation 27 of CMR 1957 and the corresponding Regulation 30 of MMR 1961, as the case may be.

Further the question of providing alternative job to such officials declared medically unfit was recently discussed with senior mining engineers of the industry, when it was agreed that they may be offered suitable alternative jobs.

(Cir. 19/1972)

3. Standard of Statutory Medical Examination under Reg. 27 of CMR 1957 and Reg. 30 of MMR 1961—At present, before granting a statutory certificate, the candidates are required to furnish certificate of sound health. In accordance with the provisions of Regulation 15, Sub-Regulation 1(c), the candidate should be free from deafness, defective vision or any other infirmity, mental or physical, likely to interfere with the efficiency of his work. At present no standards are laid down as regards the examination to be conducted by the qualified medical practitioner. It has been found that in subsequent medical examinations conducted under Regulation 27 of Coal Mines Regulations, 1957 and 30 of Metalliferous Mines Regulations, 1961, a large number of candidates are found to be deficient as they fail to satisfy the medical standards as laid down under the examination bye-laws. They have to be cured of defective vision etc. before they are declared medically fit. This creates hardship to the candidates. To avoid such hardship in subsequent medical examination, the candidates undergoing training in mines for the statutory examinations of Overman/Sirdar etc. may be advised to get themselves medically examined keeping in view the standards of medical examination prescribed under the relevant bye-laws, reproduced in the Appendix below.

APPENDIX Reg. 27 of CMR 1957

No. Board-Col/13157/67—In accordance with the provision laid down in Reg. 13(5) of CMR 1957 and in supersession of all previous Notifications on the subject, the following bye-laws made under sub-regulation (4) of the said Regulations for conduct to medical examination under sub-regulation (1) of Regulation 27 of the Coal Mines Regulations, 1957 are hereby published.

Bye-laws for the Conduct of Medical Examination under Reg. 27(1) of CMR 1957.

1. Application for Examination— An application for a medical examination under sub-Regulation (1) of Regulation 27 of the Coal Mines Regulations, 1957 shall be made by the candidate to the Chief Inspector not less than four months prior to the date on which such medical examination is due.

2. Examination and Examiners— (i) So far as practicable the examiners appointed by the Chief Inspector for each medical examination under this Regulation shall be two registered medical practitioners. Every examiner shall be paid a fee of Rs. 2/-for every candidate examined.

(ii) The applicant may be required to appear for medical examination at such time and at such place as may be communicated to the applicant in writing; while at the place of the examination, every candidate shall conduct himself as required by the examiners.

3. Standard of fitness etc.— (i) For ascertaining the freedom of a person from deafness, defective vision or any other infirmity, mental or physical, likely to interfere with the efficient discharge of his duties, the medical practitioners appointed as examiners shall keep in view the standard laid down in First Schedule in these bye-laws. Notwithstanding these standards, however, if the examiners are of the opinion that any disability of the person is of such a nature and degree that it is not likely to interfere with the normal discharge of his duties for a period of five years, the examiners may declare the person to be fit.

(ii) If the examiners are of the opinion that the disability of the person is of such a nature and degree that it can be cured or controlled such that it is no longer likely to interfere with the normal discharge of his duties, the examiners may recommend that the person may be directed to get his disability cured or controlled, as the case may be, and to submit himself to another medical examination within such period not exceeding six months as they may specify. The Chief Inspector may, at his discretion and subject to such conditions as he may specify by an order in writing, permit the person to continue to act in a statutory capacity during such period.

(iii) The examiners shall submit their report in the form in Second Schedule to these bye-laws.

4. Identity of the candidate—Every candidate shall bring with him to the place of examination the certificate of competency held by him, and produce the same (along with

the authorisation issued to him for appearing at the examination) to the examiners for proving his identity.

5. *Successful candidate*—The certificate of competency of every successful candidate shall be retained by the examiners who shall immediately after the examination, forward the same to the concerned Regional Inspector of Mines for endorsement. The certificate duly endorsed shall be returned to the candidate through the Manager of the mine, if any, where he is employed.

6. *Provision for re-examination*—Where the Chief Inspector is of the opinion that due to special circumstances it would be advisable for a candidate who has failed to satisfy the examiners in an examination aforesaid to be re-examined he may arrange for a re-examination of the candidate by other examiners. The fee stipulated in Reg. 27(1) (b) shall payable for every such re- examination. Bye-laws 1 to 5 above shall also apply to every such re-examination.

First Schedule Standard of Physical Fitness

1. A candidate must be in good mental and bodily health and free from any physical defect likely to interfere with efficient candidate the Medical Board/Medical Officers shall make due allowance for the age of the candidate and the normal deterioration in health and physical fitness likely to occur at such age, so however that arduous nature of mining profession is kept in view.

2. Hearing in each ear must be good and there should be no progressive disease in the ear.

3. The following standard of visual acuity, with or without glasses, should be strictly observed.

(a) For underground workers

one eye	6/6
The other eye	6/12
or Each eye	6/9

(b) For surface workers

one eye	6/9
The other eye	6/18
or Each eye	6/12

Unocular persons should be declared unfit for underground work. For surface work unocular surface persons should have a vision of at least 6/12.

4. There should not be any active disease of the heart and lungs.

5. There should be no evidence of abdominal organs.

6. If hernia is present and the Medical Board/Medical Officers are of the opinion that it can be effectively controlled by use of truss, the candidate may be declared fit. In other cases he may be declared fit after a successful operation.

7. Hydrocele, if present, should not be large enough to impede his normal activities. If the hydrocele is large, the candidate may be declared fit after operation.

8. The limbs should be well formed and developed, and function of all limbs should be within normal limits.

9. There should not be any congenital malformation, or defect, or any deformity likely to interfere with candidate's normal duties.

Candidate should be free from chronic skin disease.

(Cir. 14/1972)

4. Medical examination under Reg. 27 of CMR—Reg. 27 of the Coal Mines Regulations 1957 was amended vide Govt. of India Notification No. GSR 614 (E) dt. 30.7.85 published in the Gazette of India Extra-ordinary, part-II, Section 3(1) dt. 30.7.85. The contents of the amended regulation are reproduced below for ready reference.

"(2) (a) A medical examination undergone in accordance with rule 29B of the Mines Rules 1955 shall also be deemed to be an examination for the purpose of sub-regulation (1).

(b) The application for endorsement of a certificate by Regional Inspector shall be accompanied by the certificate of fitness granted in terms of rule 29(B) of the Mines Rules 1955 and a fee of Five Rupees."

As would be seen the medical examination undergone in accordance with Rule 29B of the Mines Rules, 1955 is also acceptable for the purpose of Reg. 27. The application for endorsement of statutory certificate is required to be submitted to the Chairman, Board of Mining Examinations and Director General of Mines Safety, Dhanbad - 826001, together with the medical certificate of fitness issued under Rule 29B of the Mine Rules 1955, the prescribed fee of Rs.5/- by means of crossed Indian Postal Order payable to the Director General of Mines Safety, and a self-addressed envelope.

(Cir. Legis. 2/1989)

5. Re-validation of Foreman's Mate's, Engine Driver's Blaster's and Gas Testing Certificates—Under Regulation 30(1) (a) of the MMR, 1961 the holder of every Foreman's, Mate's, Engine Driver's and Blaster's Certificate has to pass the prescribed examination for medical fitness once in every five years and get his certificate revalidated by getting it endorsed to that effect.

For the benefit of persons holding more than one statutory certificate it is clarified that a person should revalidate either that certificate by virtue of which he is actually working at the time of applying or the highest certificate held by him. Other certificates held by him need not be revalidated. In such a case while applying for medical examination to

revalidate that particular certificate, the applicant must give details of all other statutory certificates held by him.

(Cir. 51/1971)

6. Need for coaching classes for supervisory officials and competent persons—A large number of field candidates appear at the statutory examinations conducted under Mines Act for grant of Overman, Foreman, Mining Sirdar/Mates; Winding Engine Driver's Certificate etc. The percentage of failures amongst such candidates is rather alarming; this is not surprising considering that the candidates do not have a facility for any regular coaching classes.

2.0 In view of the general shortage of such personnel in the industry, it is suggested that special coaching classes may be organised for the candidates appearing at the statutory examination.

(Cir. Exam. 2/1975)

7. Revalidation of Overman's, Sirdar's, Engine Driver's Shot-Firer's, Lamp Checkers and Gas Testing Certificate under Regulation 27(1) (a) of Coal Mines Regulation 1957—Under Regulation 27(1) (a) of the Coal Mines Regulations 1957 the holder of every Overman's Sirdar's, Engine Driver's, Shot firer's, Lamp Checker's and Gas Testing Certificate has to pass the prescribed examination for medical fitness once in every five years and get his certificate(s) revalidated by getting on it endorsement to that effect. Of late clarification has been sought from mine management through field offices of D.G.M.S. regarding revalidation of certificates for holder of more than one statutory certificate granted under CMR, 1957 for compliance with requirement of Regulations 27(1) (a) of the Coal Mines Regulation 1957. The matter has since been considered by this Directorate and subsequently by the Board of Mining Examination (Coal), and it has been resolved unanimously as indicated below :

"In case of a person holding more than one statutory certificate, it is clarified that such person should revalidate either the certificate by virtue of which he is actually working at the time of applying or the highest certificate held by him. Other certificate held by him need not be revalidated. In such a case, while applying for medical examination to revalidate that particular certificate, the applicant must give details of all other statutory certificates held by him."

(Cir.Legis. 1/2001)

CMR28

Submission of applications for medical examination under Reg. 28 of CMR 1957—It has been observed that in many cases applications for Medical Examination are submitted late. In some cases, these were received after the expiry of the date upto which the applicant could work with being declared medically fit. In certain cases the applicants continued to work as officials at the mine, without holding valid Medical Certificate. This is highly irregular and objectionable.

A serious view will be taken of such irregularities if any person is found to be working/employed as Manager/Asst. Manager, Surveyor or official of a mine in contravention of the provisions of Reg. 28 of CMR 1957.

(Cir. 47/1965)

DGMS

INSPECTORS AND MINE OFFICIALS

CMR 31/MMR 34

1. Experience of managers in large mines—The Safety in Mine Conference (1958-59) noted that the safety problems in larger mines are more complicated and of larger magnitude. It therefore recommended that in such mines, the managers should be persons of greater experience. In coal mines only such a person who has had not less than five year's experience after obtaining the Manager's Certificate should therefore be employed as manager of a mine which produces 20,000 tons or more of coal per month.

(Cir. 8/1959)

2. Charge Report of Manager—Where an outgoing manager of a mine hands over charge of the mine to an incoming manager, he should, in his handing over charge report, point out to the incoming manager the following:

- (a) All sources of danger present in the mine;
- (b) Important safety works under execution requiring attention of the manager;
- (c) Other important matters from the point of view of safety required to be attended to by the incoming manager.

A copy of every such charge report should be endorsed to the J.D.M.S. concerned.

(Cir. 41/1961)

Charge reports given by outgoing manager should be very thorough, giving a complete picture of the status of safety of the mine to the new manager. One such report is given below for guidance.

APPENDIX

MANAGER'S CHARGE REPORT: CMR 31(8)

Name of Mine	
Name of Owner	
Name of outgoing Manager	
Name of incoming Manager	

I. General information about the mine—The mine is very extensive and all the three seams viz. seam A, Seam B and Seam C out-crop in the property.

The seam had been worked from the out-crop side towards the dipmost side to a depth of 1100 ft. The rise side workings of Seam B have been extracted in many large and small areas under high flood level of the river. The pillars under the river are not within the regulation limit and are at a shallow depth.

A seam working of No. 1 Pit area have been developed in two or three sections under important structures and villages.

A seam in No. 4 Pit area has geological disturbances.

II. Sources of Danger—The following dangers are associated with this mine:

- (1) Danger of Inundation—(i) Surface and (ii) underground
- (2) Ventilation problems :—
 - (a) Ventilation difficulty due to long circuit
 - (b) Ventilation route; and
 - (c) Concentration of high percentage of CH₄ in a seam at No. 4 Pit area.
- (3) Fire in No. 1 Pit area.
- (4) Subsidence.

(1) (i) *Danger of Inundation (Surface)*—Observations are made of the water level at river and the Jore. All work-persons are to be withdrawn from the mine when—

- (i) the water level of the river reaches R.L. 345.85 near No. 1 Incline (Danger Mark No. 1);
- (ii) the water level of the Jore rises to a point of 2 1/2 ft. from the bed of the Jore near the foot-path bridge (banger Mark No. 2); and
- (iii) when water from the river starts flowing backwards in the Jore and reaches the base of culvert under District Board Road.

The above precautions are necessary because No. 1 incline mouth is close to the east bank of the river and if the level of water from the river reaches the reduced level at No. 1 Incline mouth, the workings under the river may collapse, and water will then rush towards the dip side of the workings where workers are employed for production.

The precaution against the rise of water level in the Jore is necessary due to fact that the overflow from the Jore may accumulate in the adjacent paddy fields and over the area of rise side workings of B Seam working (No. 5 Incline area) where many pillars are standing on small stocks below the high flood level. If any subsidence takes place during that time, water will rush to the dipmost side.

All surface drains are to be inspected and maintained in working order to prevent over-flow of rain water into the open goaf near No. 4 Incline. The Incline mouths and the surface subsidence's should be kept under watch and any abnormal inflow of water should be stopped by putting bunds or cutting diversion trenches where necessary.

(1) (ii) *Danger of Inundation (Underground)*—There are two dams in No. 5 Incline area at the places marked W₁ and W₂ on the plan. The purpose of these dams is that in case any subsidence takes place in the stocked area, they would prevent any inflow of water into underground workings. These dams should therefore be periodically inspected.

There are a few isolation stopping in No. 4 Incline to isolate the subsided area. During rains, water may accumulate behind these stopping. Pipes have therefore been provided to drain out water from that area continuously. These stopping should also be checked during the rainy season.

Every year during the rainy season a Jore watchman and river watchman should be appointed and they should be authorised in writing specifying the actions to be taken in case the water

level reaches danger mark (please see last year's authorisation book). During heavy rain, frequent checks should be made by Manager, Assistant Manager etc. to keep the watchman alert all the time.

(2) *Ventilation problems*—(a) Due to a long ventilating circuit the present fan is working at a very high water gauge which reduces the quantity of air. The Ventilation bottlenecks have been dressed and the airways have been cleaned to increase the area of airways. These airways require frequent cleaning, repairing (specially No. 5 Incline airway, return of B Seam workings and A Seam west side workings) and mud and cement plastering and should be frequently checked to detect any obstruction in the air passage which may occur due to collapse of the side packed walls at No. 5 Incline.

There are a number of stoppings in No. 2 Incline east side. These stoppings are to be checked regularly and kept leakage proof, otherwise heavy amount of air will be short-circuited through these stoppings and doors, to the fan drift which is close-by.

There are three doors at No. 5 Incline mouth. If by chance these are kept open, heavy amount of air will also be short circuited from No. 5 Incline resulting in heavy shortage of air in the New Pit area. There are also two sets of doors at A Seam No. 4 Pit (Tramming level). If these doors are kept open, the air will not reach the nearby districts of No. 4 Pit.

(b) The A -Seam in No. 4 pit area is recognised as a very gassy seam. Frequently blowers of gas have been met with. At present no work is being done there and dip side workings have been kept drowned with water. 3 samples are being taken every 24 hours in the two district returns and one in combined return of B and A Seam west section where a haulage is being worked. A part of the area in the west side is left to be developed, and the development should only be taken in hand after the erection of the new fan, and during development the following precautions should be taken:

- (i) Galleries should be driven with 3 advance bore holes, one in centre and two on either flanks.
- (ii) Brattice cloth should be kept extended as far as possible and should be maintained properly, otherwise gas may accumulate in the face.
- (iii) These galleries should be driven only by Pick Miners and blasting should be done in the dykes and jhama only on rest days. Other special precautions should also be taken when passing through dyke and jhama.
- (iv) Blowers may be met during the development work and they may continue for a pretty long time. Special precautions against the danger from such blowers are therefore required.
- (v) Only those persons who had previously worked in this area should be employed.

(3) *Fire in No. 1 Pit Area*—A fire occurred at No. 1 pit in the year 1955. This fire appears to have started in the depillared area in the middle section of the seam which was not sand stowed, and it extended from a fissure in the bottom section. This has been sealed off and fire has died down, but constant watch should be kept over the fire stoppings and they should be maintained properly by periodical mud and cement plastering.

(4) *Subsidence*—Some 20/25 years ago, the District Board Road (near the bridge) was affected by a subsidence. The underground workings in the vicinity have been since stabilized by hydraulic sand stowing.

The workings under D.B. Road in general are in good condition except for a few pillars near the cross-cut (from No. 2 Incline to No. 1 Incline) which are small in size. All pillars under the D.B. Road have been white washed and a watch is being kept for any fresh spalling over this area. Spot levels are being taken every month to record further subsidence if any.

In No. 1 Pit area, depillaring at present is being done under bustee where the overlying B seam has been depillared without sand stowing, and the mid-section workings of a seam have been developed and are standing on pillars. Spot levels are being taken every month on the surface and in the mid-section workings to record any subsidence in this area.

In B seam depillaring is being done in the dipmost area where the overlying C seam is standing on stocks and is water logged. Spot levels are being taken on the surface to record subsidence, if any, in this area.

III. Important Safety Works under execution requiring attention of Manager

(1) *Danger of Underground Inundation*—To overcome danger of inundation permanently, the following works are being executed:

(a) Stabilisation (by stowing) of the working under the river.

(b) Muttty packing under the Jore.

Both these works are in progress and top priority should be given to stowing under the river. Regarding mutty packing under the Jore, this is almost complete and we are in correspondence with the Department of Mines.

(c) Also, proposals are being made to isolate the dip side workings by constructing two water dams in B Seam near Haulage Engine and made two bulk-head doors at A Seam stone drift. The construction of these two dams can only be taken in hand after the works of shifting the present Haulage Engine and the erection of Fan are completed.

(2) *Ventilation*—To overcome ventilation difficulties permanently, the rise side workings are to be isolated from dip side workings by dams and bulk-head doors by installing a new fan at No. 5 Pit (Return). Installation of the fan is being taken up and work is being expedited. Special attention is to be given to this.

IV. Other important matters from the point of view safety required to be attended by the incoming manager

(i) The coal of A seam in the dip side workings is very soft in nature, and spalling takes place during development. The development workings should, therefore, be made as narrow as possible.

(ii) Resurvey of B Seam working in relation to Railway main line has been completed. The Plan should be made ready and sent to the Department of Mines.

Signature of the incoming Manager
Date.

Signature of the outgoing Manager
Date.

Every Manager should also prepare a detailed note on the status of safety of his mine immediately on his taking over charge of any new mine.

(Cir. 38/1962)

3. File of Safety Directives—It is desirable that when there is a change of manager, the outgoing manager should hand over to the incoming manager along with the charge report a personal file containing copies of all important directions concerning the mine issued by the D.G.M.S. or J.D.M.S. arising out of any incident/accident, inspection etc. and which are not fully covered by the regulations. A few examples of such directives copies of which should be kept in the Manager's file are given for guidance :

(1) In some mines there is more danger of fall of sides along the strike as the cleavage planes are parallel to the strike line. Instructions are issued in such cases to pay particular attention to the security of slices and galleries driven along the strike line.

(2) Conditions of depillaring, which are important for the incoming manager to take particular note of.

(3) Regular checking of the taper pin within the automatic contrivance which may shear as had happened in one incident.

(4) Instructions for checking the firing circuit voltage of ME-6 exploders.

(Cir. 25/1966)

4. Charge Handing Over : Reference Manual of Safety Directives—Attention is invited to Circular Nos. 41 of 1961 and 38 of 1962 issued by this Directorate on the subject of preparation of charge report at the time of change of manager. The object of such charge report is that the incoming manager is kept fully abreast of the various aspects of safety of the mine he is taking over. The circulars outlined the need for outgoing manager to point out to the incoming manager all important matters relating to the safety of the mine. Every incoming manager is then expected to prepare a comprehensive note on the status of safety in the mine after acquainting himself with all aspects of the work, etc.

In spite of the above directives, it appears that several important directives issued by this Directorate are not duly transmitted to the new manager whenever there is a change. The frequent change in the positions of managers brought about in the coal mines in the wake of Nationalisation and consequent large scale re-organisation had aggravated the position. This has led to a situation where the new managers (and through them, the next in hierarchy of supervision) are sometimes ignorant of specific directives on safety and this has been a contributory factor in some accidents.

In order to obviate any such transmission loss due to change of personnel, it is felt that there should be a bound book kept at the mine wherein all safety directives for the mine are duly recorded. This book thus serves as a reference manual on the status of safety in the mine and it should be one important specific item to be handed over by the outgoing manager to the incoming manager.

The reference manual as suggested above could also incorporate salient features of the mine. In this Directorate, a **History Sheet** is maintained in respect of each mine on analogous lines and it may be advantageous for the different Areas to consult the proforma of such history sheet at the Regional Offices and advise their individual units suitably. In the preparation of such a manual, care ought to be taken to see that all safety instructions and directives in respect of a mine are duly incorporated and the same is kept up-to-date regularly, under the signature of the mine manager and produced before the officer of D.G.M.S. when he is inspecting the mine.

(Cir. Tech. 9/1976)

5. Experience of managers of metalliferous mines—In metalliferous mine, only such a person who has had not less than seven years practical experience in mine after obtaining a recognised degree or diploma in mining engineering should be employed as manager of a mine having an average employment of 1200 or more in workings belowground.

(Cir. 28/1959)

6. Checking Managers Certificates at the time of appointment of managers—A case has recently come to the notice of this Directorate when a person holding a Sirdar's Certificate was impersonating as a holder of Manager's Certificate and also working as a manager off and on. It is the responsibility of the owners or their agents to appoint persons possessing the prescribed qualifications as managers. Therefore, before giving appointment to an applicant for the manager's post you are requested to check the certificate of competency issued to him and in case of any doubt refer the matter to this Directorate.

(Cir. 16/1969)

7. Residence of Assistant Managers—Assistant Managers should, as far as possible, be provided with quarters in close proximity to the mine.

(Cir. 1/1947)

8. Information to be sent in the event of regular manager proceeding on leave—Non-observance with the prescribed procedure results in avoidable correspondence in order to seek clarifications. There should be no deviation from the procedure laid down in the Regulations and all the relevant particulars (such as the name, qualifications and experience of the person authorised, the date of commencement and ending of the authorisation: the reason for authorisation) should be intimated at the first opportunity.

Sometimes an assistant manager of another mine of the same organisation is transferred to officiate as manager. This should normally be avoided unless there is no assistant manager at the mine concerned or the regular manager is proceeding on long leave (or unless required by D.G.M.S.). However, if an assistant manager of another mine is authorised, it is necessary to send along with the letter giving information about the regular manager proceeding on leave a notice in Form-1 notifying the transfer of the assistant manager. It is also necessary to indicate, in such a forwarding letter, the arrangements made to fill up deficiency in supervision caused by the transfer of the assistant manager. Of course, when an assistant manager of the same mine is authorised to act as manager, a notice in Form 1 is not necessary.

(Cir. 45/1964)

9. Manager's Permit— It is necessary for a person to obtain a Manager's Permit before he takes charge of a small mine. Failure to do so renders the person concerned, and the agent and owner employing him, liable to criminal proceeding.

In this connection, it should also be clear that a Manager's Permit is granted for the management of a particular mine and for a specified period only; and is not a general authorisation to manage any small mine.

(Cir. 17/1956)

CMR 31 A

Employment of Safety Officer—It is desirable that the safety officer should normally be the senior most assistant manager next in rank to manager. Of course it is necessary that the safety officer should also gain sufficient experience in the production and administration aspects to be able to act as manager of the mine. Therefore the duties of safety officer and assistant/dy. managers should be interchanged at regular intervals.

(Cir. 89/1966)

CMR 33/MMR 36

1. Need for strengthening of engineering section—1. It has long been the experience that the competency of engineering personnel employed in mines is generally not up to standard. Consequently, the present standards of machine maintenance leave a great deal to be desired resulting in greater hazards and lower efficiency in the use of machinery in mines. Unfortunately it has also been found that, but for a few notable exceptions, not much improvement is taking place in these poor standards. This is particularly regrettable in view of the fact that more and more machinery is now being installed in mines.

2. For maintenance standards of machinery to go up, it is essential that the competency standards of the engineering personnel employed in the industry improve. This can be done only through employment of duly qualified and trained persons. In its own interest therefore it is very necessary for the coal mining industry to employ and train more engineering graduates and diploma holders so that in due course, enough persons of required competency are available to hold charge of machinery in mines.

3. For position of electricians and mechanics also, it is advisable to employ properly trained persons only, a considerable number of whom is now available from the two Mine Mechanisation Training Institutes and from the various Industrial Training Institutes. The latter would of course require some orientation and training in properly equipped workshops and/or in mine Mechanisation Training Institutes. The skills of existing employees working in these capacities should be suitably upgraded by getting them to undergo the relevant refresher course at the Mine Mechanisation Training Institutes.

(Cir. 48/1967)

2. Appointment of qualified engineer in a mine—In accordance with provision of Regulation 36(1) of the Metalliferous Mines Regulations, 1961, the date after which no person unless he holds qualification as specified in the regulation shall, except with the previous permission in writing of the D.G.M.S. and subject such conditions as he may specify therein, be appointed as engineer in a mine of the description given in the regulation, is likely to be notified in the near future.

Therefore, arrangement for employment of qualified engineers, if not already employed shall be made so as to avoid confrontation with the problem after the date is notified by the Government in the official gazette.

(Cir. 45/1974)

3. Engineers performing duties of electrical supervisors—Some persons holding the electrical supervisor's certificate have been placed on the approval list for appointment as engineers in coal mines under Reg. 33 of the Coal Mines Regulations 1957. As the functions of the engineer under the Coal Mines Regulations are different from those of an electrical supervisor under the Indian Electricity Rules it may be noted that persons appointed as engineers will not be permitted to perform the duties of electrical supervisor in addition except in case of small mines and with the prior permission of Jt. Director concerned.

(Cir. 56/1967)

4. Enforcement of Reg. 36(1) of MMR 1961—Vide notification dated 17.10.75 issued under No. S. 66013/1/74-MI the Government of India in the Ministry of Labour, have notified 31.12.75 as the date of enforcement of Sub-regulation (1) of Regulation 36 of Metalliferous Mines Regulations, 1961, relating to appointment of qualified engineers.

The said Notification is reproduced hereunder:

"In pursuance of the second proviso to Sub-regulation (2) of Regulation 36 of the Metalliferous Mines Regulations, 1961, the Central Government hereby notifies the 31st day of December, 1975 as the date after which no person (unless he holds a degree or diploma in mechanical engineering or equivalent qualification approved for the purpose by Central Government) shall, except with the previous permission in writing of the Chief Inspector of Mines and subject to such condition as he may specify therein, be appointed to hold general charge of machinery and to be responsible for its installation, maintenance and safe working under Sub-regulation (1) of the said regulation in a mine of the description specified in the said second proviso to sub-regulation (1) of the said Regulation."

Managements of all Metalliferous Mines are therefore directed to take necessary steps for compliance with the provisions by the date mentioned above.

(Cir. Legis. 10/1975)

5. Notice of temporary authorisation of engineer—The notice of temporary authorisation, in case of temporary absence of the engineer [Reg. 33(3) of CMR 1957 and 36(4) of MMR 1961] should be sent to the Joint Director of Mines Safety concerned.

(Cir. 24/1972)

CMR 34/MMR 37

1. Size of Overman's District—It has been observed that in some mines the work-load on overmen is so high that it is physically not possible for them to perform their statutory duties properly. A question has arisen as to what should be the size of a normal district of an overman for the purpose of Reg. 34(1) of the Coal Mines Regulations, 1957 according to which at every mine, "one or more overmen shall be appointed to hold charge of the different districts of the mine on each working shift".

2. In this connection it has been decided that the size of overman's district may be determined on the following principles:—

(1) The size of an overman's district shall be so arranged that:

- (a) the number of persons of all categories under the charge of the overman does not exceed 100,
- (b) the distance between the first and the last working face is ordinarily not more than 750 m. (2,500 ft.) measured along the inspection route (but not taking into consideration the traveling done beyond the last ventilating connections for inspecting blind ends);

Provided that when the thickness of the seam is less than 1.5 m. (5 ft.) or when the workings are steeper than 1 in 5, the said distance may be limited to 450 m. (1,500 ft.); and

- (c) the output of the district is not more than 100 tonnes per shift.

Provided that if part of the output is from depillaring area the said limit of output may be increased to 125 tonnes.

(2) The criteria given in (1) above will not apply to—

- (a) A longwall face, which should be under the charge of one overman only in each shift irrespective of the output and number of men employed at the face; and

- (b) The mines in Assam which have specially arduous conditions of work. For these mines the size of an overman's district shall be determined in consultation with the Joint Director of Mines Safety.

(3) If any variation of the above mentioned directions becomes necessary in any mine due to any reason, the case shall be referred to the concerned Joint Director of Mines Safety.

(4) It is expected that the mine management shall not retrench any overman if he becomes surplus to the requirements of a mine in accordance with the criteria given in para 2 above.

(Cir. 48/1956)

2. Size of Foreman's District—The size of a foreman's district will, amongst other things, depend upon type of mine i.e., an opencast or underground mine; degree of mechanisation; steepness of workings; nature of working whether development drives or sloping district etc. Taking into consideration different factors, it has been decided that the size of a Foreman's district, may be determined as follows :

A. OPENCAST MINES

- (a) Manually worked or Semi-mechanised A Foreman's district shall comprise of two or more mate districts subject to a maximum of 4 such districts within a radius of 1 km in a hilly terrain or 2 km in flat country.

Provided that there shall be not more than 75 persons under the charge of one mate and the total length of working face in one or different benches in vertical plane shall not exceed 300 m in a mate's district when it is in a hilly terrain or 500 m in flat country as the case may be.

- (b) Fully Mechanised

A Foreman's district shall comprise of mechanised working in which not more than two power shovels are operating with ancillary equipment viz: dumpers, loaders and drills etc.

B. UNDERGROUND MINES

Assuming that a Foreman can look after a mine having working point 2000 m apart horizontally and 100 m apart vertically at the extreme points, with up to 100 men under his charge the workload for a Foreman may be determined from the following empirical formula:—

Workload = $DLW = 100$ points for Full workload 200000 for a Foreman.

where, D = Vertical distance in meters between extreme working levels,

L = Horizontal walkable distance in meters between extreme working points,

W = No. of workmen underground placed under the charge of a Foreman. Provided, however, that—

(i) a foreman shall not be asked to supervise work of more than 2 sloping districts;

(ii) at least one Foreman shall be appointed per shift; and

(iii) a Foreman shall supervise the work of not more than 2 mates.

The above criteria are given here for general guidance only. If any variation of the above-mentioned directions becomes necessary in any mine due to any practical difficulties, the advice of concerned Joint Director may be sought. At the same time, depending on local conditions, a Joint Director may stipulate additional number of foremen to be appointed in the interest of safety of workers, as a special case.

It is expected that no mine management shall retrench any Foreman if he becomes surplus to the requirements of a mine in accordance with the criteria given above.

(Cir. 34/1974)

CMR 35/MMR 38

1. Continuous employment of surveyor at a mine—Preparation of accurate and upto date plans and sections are no doubt important functions of the surveyors but what is more important is that the surveyors should be able to prevent the working from being made either contrary to the regulations or in a haphazard manner. This can only be achieved if surveyors visit the workings frequently and direct the course of workings. For this purpose it is essential that no surveyor is transferred, discharged or dismissed unless he is relieved by a duly qualified substitute.

(Cir. 22/1961)

2. Duties and responsibilities of surveyors—Under the provisions of Reg. 35(2) of Coal Mines Regulations 1957, a person appointed as a Surveyor for more than one mine is required to obtain prior permission from this Directorate. Most of the coal mines re-constituted after nationalisation consist of more than one mine within the meaning of Reg. 30 of CMR '57 and have more than one Surveyor. A question has been raised whether all the Surveyors so working in a mine are required to obtain prior permission under Reg. 35(2) of CMR '57 or it is for the senior most/head Surveyor to obtain such permission.

In this connection attention is invited to the provisions of Reg. 35(4) and it is hereby clarified that if a Surveyor is assigned duties by owner, agent or manager in respect of more than one mine, it is obligatory on the part of the Surveyor to obtain permission under Reg. 35(2).

Where more than one Surveyor are appointed each assigned with duties relating to one mine (as defined in Reg. 30 of CMR '57) and only one of them is authorised under Reg. 35(2), there has arisen some doubt as to who should sign the plans.

Inviting attention to the provisions of Reg. 49(1) (a) & (b) it is hereby clarified that a Surveyor who prepares a plan, is responsible for its accuracy and must sign the plan sections and tracings prepared by him. The question of authorisation under Reg. 35(2) is not relevant in such matters.

Similarly when a plan of re-constituted mine is prepared after correlation survey of different units, the surveyor who makes such survey and prepares or supervises the preparation of the correlated plan, shall be responsible for its accuracy and shall sign the plan.

Managements are requested to ensure that the relevant statutory provisions are clearly understood by all concerned and duly complied with.

(Cir. Tech. 3/1979)

3. Authorisation to a surveyor-Reg. 35(2) of CMR 1957—In D.G.M.S. General Instruction No. 22 of 1973, the criteria to be adopted while issuing an authorisation under Reg. 35(2) of the Coal Mines Regulations, 1957 to a surveyor to work as surveyor at more than one 'mine' as defined in clause (a) of Reg. 30 of CMR 57, were laid down.

As clause (a) of Reg. 30 has since been amended by Notification No. G.S.R. 614(E) dated 30th July, 1985 in as much as all excavations within the mine boundary now constitute the mine D.G.M.S. General Instruction No. 2 of 1976 is hereby withdrawn.

Cases for grant of such authorisation in respect of more than one 'mine' as defined in the Coal Mines (Amendment) Regulations, 1985 may be dealt with as per the proviso to sub-regulation (2) of Regulation 35 of the Coal Mines Regulations, 1957.

(DGMS Tech. Instruction No. 3/1986)

4. Appointment of surveyors in opencast metalliferous mines—For the preparation of plans of the Opencast Metalliferous Mines the management need not appoint a full or part-time surveyor and it will be enough if they get their plans brought up-to-date within twelve months by a qualified surveyor. Some associations of mine owners have engaged qualified surveyors for the preparation of plans of mines belonging to the members of the associations. This arrangement has also been approved.

(Cir. 15/1972)

CMR36

1. Supervision on Afternoon and Night Shifts—Accepting the view that in general, the standard of supervision on the afternoon and night shifts needs improvement the Safety in Mines Conference (1958-59) recommended that the strength of officials should be raised where it is not adequate particularly if the mine is working a seam of second or third degree of gassiness, and/or mechanised.

(Cir. 19/1959)

2. Notice to be given in the event of death of a certificate holder—

In order to ensure that no imposter falsely uses a certificate granted by D.G.M.S., it is recommended in the interest of all concerned that whenever a person holding a manager's, overman's, sirdar's or shotfirer's certificate etc. dies while in employment at any time, the owner, Agent or Manager of such a mine, as the case may be, should notify immediately the death of such a person to D.G.M.S. Wherever possible, the certificate of the deceased should also be submitted to D.G.M.S. for cancellation.

(Cir. 42/1959)

3. Authorisation to persons to handle electrical apparatus/jobs—It has been noticed that at times authorisations relating to above subject are being given to persons who are not competent, qualified and experienced. In some such cases, persons concerned have complained against such authorisation and have even expressed their ignorance of any knowledge of electricity.

It would be appreciated that authorisation of the persons in the absence of proper knowledge and experience does not serve any real purpose and may jeopardise the spirit of the rule completely. It is also the responsibility of the authority that the person being authorised is having proper knowledge and experience of the job for which he is being authorised.

In view of the above, authorisations, wherever required, shall be given only to competent persons assessing their competence by qualifications, experience and actual tests. Only after due verification authorisation may be issued giving full description for which authorisation stands and duly received by the person authorised in token of his acceptance.

(Cir. Genl. 6/1975)

4. Payment of staff for work done on contract—For the safe working of a mine, it is necessary that the supervising staff and shotfirers are appointed and paid by the owner/agent/manager and not by a contractor or by sub-contractor.

(Cir. 3/1952)

5. Employment of uniocular persons—In some cases doubts have been raised as to the fitness of one eyed persons for employment belowground. The matter was referred to the Central Government and they have expressed the opinion that as one-eyed persons have no stereoscopic vision, their judgment underground is apt to be defective. In view of this the Government of India do not consider it safe to employ uniocular persons underground. They have, however, expressed the view that if any management wishes to keep experienced persons who have lost one eye as a result of an accident etc., they may be found suitable occupation on the surface.

This circular applies only in case of persons employed as 'officials' or 'competent persons' under the Mines Act or under the Regulations and Rules etc. made thereunder.

(Cir. 40 & 41A/1959)

6. Employment of uniocular officials—It has been represented to this office that underground officials having one of their eyes defective had been thrown out of employment by some mine managements in spite of there being no objection from this office to their being employed in suitable occupations on the surface. Cases of all such persons shall be

sympathetically considered by the mine managements concerned and they may be offered alternative employment either on surface or in opencast workings.

(Cir. 57/1966)

For employment on surface, a uniocular official should have a vision of at least 6/12.

(Cir. 14/1972)

7. Utilisation of PGPT's for investigation work in mines—The Second Mines Safety Conference held on 9th and 10th July 1966 recommended, inter alias, that the services of post-graduate practical trainees might be utilised in making investigations concerning geological structures underground and gassiness of mines. The Directorate of Practical Training has no objection in utilisation of services if this work does not interfere with the training programme chalked out by the Directorate for the trainees in consultation with the mine management.

(Cir. 33/1967)

8. Number of officers to be kept on duty on holidays—Attention is invited to circular 48 of 1973.

A question has been raised whether on a day of rest or holiday one officer should be appointed for the whole of the period or three officers be appointed on shift basis. The matter has been examined, and it is considered advisable that—

(1) If underground work is in progress, then one officer should be appointed for each shift for as long as the work continues.

Provided that when such an officer has to go underground for supervision etc. of any job, he shall give charge to another officer on the surface for the period he is underground.

(2) If no underground job is done (work like pumping excluded), one officer may be appointed for the whole day.

(3) When work is done in different units of a mine, then a separate officer should be appointed for each such unit, and preferably he ought to be one who is regularly working or fully acquainted with the workings of the unit for which he is detailed to be on roster duty.

This is also to suggest that the names of the officers who are on roster duty, should be prominently displayed on a board specially designed for the purpose and which may be kept near the attendance cabin or office of the mine. A list of officers on duty should be kept with the attendance clerk as well.

(Cir. 41/1974)

CMR 37/MMR 40

1. Measures to make I.S.O. effective— The role of the Internal Safety Organisation (ISO) in promoting the cause of safety, does not need any more emphasis when viewed from the current safety scenario in mines. Though, the successive safety conferences in mines deliberated on certain principles of self regulation, it was the Fifth Conference on Safety in Mines held in 1980 which clearly spelt-out the structure, role and functions of the ISO in every mining company. The matter was also covered extensively in the recommendations of

the Courts of Inquiry of Kessurgarh Colliery and Sudamdih Colliery, wherein the role of Internal Safety Organisation was made specific. These recommendations have been circulated to the Industry vide DGMS Technical Circular No.5 of 1979. The Sixth Conference on Safety in Mines contemplated further on expansion of the role and functions of the ISO.

But, from its inception as one of the main recommendations of the Fifth Conference on Safety in Mines, the ISO's contribution to safety in mines has been unfortunately clouded. It is an accepted fact that more thrust is required in strengthening the role and functioning of this institution.

An analysis of the chronological sequence of the status of Internal Safety Organisation and its functioning in mines from inception, in light of the present safety scenario in mines, appears to convey the following as the major shortcomings.

1. The functioning of the ISO in mines, is far from meeting the desired objectives.
2. The formulated and effected Corporate level Safety Policy in mines by the mining companies have not been successful in mitigating the incidence of mining accidents and disasters.
3. Failure to effectively monitor the status of implementation of policy directives by the mining companies.
4. Ineffective Inspection of mines for assessment of safety status.
5. Failure to effectively propagate the theme of safety in mine across the entire cross section of the management.

Thus, there appears to be an urgent need for reviewing critically, the entire quantum of the concept of ISO, with a view to streamlining the efforts and in identifying the grey areas in the field of safety, for tackling the challenges effectively. In this connection, attention is also drawn to this Directorate's General Circular No. 2 of 1997, which was explicit in the role of ISO for meeting the challenges of the future.

It is therefore advised that the management of all mining companies, adopt the following measures as recommended in the 5th and 6th Conferences on Safety in Mines and also in the recommendations of the Courts of Inquiries of 'Kessurgarh' Colliery and 'Sudamdih' Colliery in reviving the institution of the ISO for justifying its role in improvement of safety standards in mines—

- (a) The ISO in every mining company, shall make an in-depth mine-wise, cause-wise analysis of all fatal/serious accidents.
- (b) The ISO shall monitor the impact of the 'Safety Campaigns' drawn up by Board of Directors based on the ISO's analysis of accidents as mentioned above, and also submit a report to the Board of Directors at intervals not exceeding 3 months.
- (c) The ISO shall be made independent of the production line at all levels.

(d) The Chief of ISO shall be of a senior rank, next only to the Dir(Tech.)M.D./Chief Executive of mining company.

(e) The ISO shall be multidisciplinary team, with a field set-up which shall be above the mine level.

(f) For ISO to be effective in its functioning, suitable policy shall be framed on the basis of the following guidelines :

- (i) A proper Safety Policy shall be drawn up at corporate level of the company.
- (ii) A suitable machinery shall be evolved for effective monitoring of the implementation status of policy directives.
- (iii) There shall be a system of periodic mine inspections **for** assessment of safety status.
- (iv) All mine accidents and dangerous occurrences shall be independently enquired into by the ISO.
- (v) The ISO shall make independent assessment of the safety implications in all cases of opening of new mine/district, use of new equipment, adoption of new method of work and all grievances on safety related matters.
- (vi) All applications for obtaining statutory permission, shall be studied and vetted by the ISO before submission.
- (vii) Findings of the ISO on safety matters shall be discussed in the Safety Committee at mines.
- (viii) The ISO shall periodically assess the proper functioning of the institutions of workmen's inspectors and the Safety Committees in mines.
- (ix) There shall be a system of auditing the safety standards at intervals of not more than a year, for each mine.

Therefore Owners, Agents and Managers of all Coal, Metalliferous and Oil Mines are requested to take all possible steps in achieving the set objectives of the institution of the Internal Safety Organisation.

(Cir. Gen. 1/1998)

DUTIES AND RESPONSIBILITIES OF WORKMEN, COMPETENT PERSONS AND OFFICIALS

CMR 38/MMR 41

Sleeping on Duty—Sleeping near running machinery or near tramlines is particularly dangerous.
(Cir. 4/1951) CMR 41

Duties and Responsibilities of Manager—1.1. There are certain important duties of the managers, which it appears are not being adequately discharged. Amongst them special attention is invited to the following duties and responsibilities of mine managers:—

(1) The manager shall make arrangements for all overman/foreman and other officials to meet him or an under manager or assistant manager once in every working day for the purpose of conferring on matters connected with their duties.

(2) The manager shall assign to every competent person his particular duties (defining his sphere of responsibility) shall on his appointment make over to him a copy of the regulations, rules and bye-laws and of any orders made thereunder which affect him, and shall take all possible steps to ensure that every such person understands, carries out and enforces the provisions contained therein in a proper manner.

2.1 The importance of proper communication between the manager and his subordinates needs no emphasis. It must be ensured that regular meetings (daily) are held between him and/or under manager/assistant manager and the overmen/foremen and other officials when all important information concerning mining operation is exchanged and necessary instructions to ensure safety of persons in the mine given. This has become all the more important with the increased tempo of mechanisation in mines and faster rate of advance of working faces. In this context, it is desirable that a separate record of all such meetings should be kept in a bound paged book in which any important information received and safety instruction passed on to the officials are recorded faithfully and promptly everyday. As a matter of fact in some countries, written instructions are given to all such officials every day at the beginning of their shift.

2.2 Much time is being spent by the assistant manager/supervisory staff of underground mines in conferring on the surface. It would be useful to establish an underground office to ensure that all such officials spend greater part of the shift underground and handing over/taking over charge of shifts by them also takes place underground. This will have an all round beneficial effect on discipline and efficiency at the mine.

3.0 Similarly it is necessary that all concerned officials and competent persons should be made fully aware of their statutory duties and responsibilities, and for this purpose standard written instructions ought to be drawn up. A copy of such instructions giving details of his particular duties and other related matters should be given to every official and competent person on his appointment, so that no person can claim ignorance of his duties and his sphere of responsibility is clearly defined as laid down in law. On alike considerations, all important instructions given

by the manager to the supervisory officials and other competent persons should be in writing to ensure strict compliance.

4.0 There is yet another important matter to which I would like to draw your attention. At the larger pits and specially after growth of public sector units, it has been observed that the manager of a mine is being increasingly burdened with extraneous matters with the result that he finds less and less time to devote attention to technical problems. This is an unhealthy trend which ought to be curbed. The manager of a large mine should not spend much time on non-technical matters like payment of wages, housing welfare amenities and even labour disputes, arising therefrom, which could be first looked into by other staff like Welfare Officer, Personnel Manager etc. And only in case of any difference of opinion the matter may be referred to the manager. The idea is that a suitable system should be evolved which allows sufficient time to the manager to devote his full attention to all important technical matters concerning mining operations.

(Cir. 13/1974)

CMR 41 A

Duties of Safety Officers—1.1 There appears to be some misunderstanding of the role and functions of Safety Officers vis-a-vis the duties entrusted to them under the statute. A pertinent question that has been is whether a Safety Officer is merely an adviser to the manager or he has also some responsibility along with the manager for removing the deficiencies or violations observed by him or others.

1.2 The question posed is rather ticklish, but there is no doubt that a Safety Officer should not be made responsible for getting the day to day defects rectified to the exclusion of the statutory responsibility enjoined in this regard upon supervisory officials appointed at the mine whose clear duty is to implement the requirements of Safety law in the district or area under their respective charge. However, if at any time a serious defect comes to the notice of a Safety Officer during the round of his visits underground (or at the surface) which could cause an urgent or immediate danger to the life or safety of a person, he should no doubt see that the danger is removed in his presence either with or without the help of shift supervisory staff or official incharge of the district, as the situation might warrant.

2.0 The work and usefulness of Safety Officers can be vastly improved if they receive guidance and encouragement from manager and senior officials. At present most of the Safety Officers do not appear to have a clear concept of the importance of their work towards creating safe working conditions which will ensure uninterrupted flow of production. A Safety Officer can make a major contribution in this direction by also concerning himself, on a systematic and planned basis, with the study of different work-systems with a view to pinpointing defective practices in say timbering and roof support, shot-firing and use of explosives, haulage layouts and tramming etc. and suggesting measures to bring about an overall improvement in both safety and efficiency at his mine. Similarly, arising out of analysis and in-depth study of accidents and incidents in the mine, it should not only be possible for the Safety Officer to suggest remedial action, but even predict potential areas where accidents are likely to occur if timely corrective measures are not taken. (Incidentally for this purpose preparation of charts and graphs depicting various types of analysis of accidents can prove very useful here.) The Safety Officers on their part are expected to keep themselves abreast of all technical literature relating to advances and researches made in

safety matters, and show initiative to bring about tangible improvements. A yard-stick of the success of a Safety Officer would be the reduction in number of manshifts lost and savings made in the cost of accidents at the mine as a result of his special efforts.

3.0 One of the functions of Safety Officer is to act as Secretary to the pit Safety Committee. It will be a good idea to fix the day of the month on which the committee meets, say first Tuesday or Saturday of every month and publicise this event at the mine on permanent display board(s).

4.0 Unfortunately, it is not often realised how much important the work of a Safety Officer is to the mine management. His work should command something like the degree of interest and attention commonly bestowed on other matters like Production and Industrial Relations. In this context, attention is invited to this Directorate's Circular No. 89 of 1966 recommending that the Safety Officer should normally be the senior-most assistant manager of the mine next in rank only to the manager.

5.0 Suitable action shall be taken to make the work of Safety Officers meaningful to achieve the desired purpose.

(Cir. 55/1974)

CMR 43/MMR 46

1. Statutory Report of Overman—It has been seen that the daily report forms currently used by Overmen, leave much to be desired. The information furnished by the sub-ordinate supervisory staff is usually of routine and casual nature, and as such it does not serve the desired purpose of the statutory reports.

In order to improve the quality and utility of such reports, revised forms of daily report of Overman has been prepared keeping in view the statutory duties prescribed for and/or normally expected of them. Copies of these forms are given below. It is requested that the same may be got printed and supplied for use to the said officials/competent persons.

It is recommended hat these new forms be introduced w.e.f. 1.1.1984.

(Cir. Genl. 6/1983)

OVERMAN'S DAILY REPORT

(Reg. 43(9) of CMR 1957)

I, the undersigned being a person duly appointed and authorised for purpose as required by Regulation 34 hereby declared that I have carefully examined the workings or parts of the mine named below which are under my charge and control, and have to report as follows :—

Name of Mine..... Name of Seam.....

Name of Districts (1).....,..... (2).....

Date..... Time.....

Name/Numbers of working places/parts of mine inspected :—

(1).....(2).....

(3).....(4).....

(5).....

A. Safety materials:

Supply made
during shift

Is stock
underground adequate?

Timber.....

Brattice.....

Sprags & other safety materials for safe working (specify).....

B. Ventilation & inflammable gas :

Their condition

Any deficiency

1. Ventilation appliance :—

(i) Air crossings

(ii) Stoppings

(iii) Doors

(iv) Brattices

(v) Other ventilation devices (specify)

2. Are any stoppings, brattices, air pipes lagging behind? Give particulars.

3. Is there any recirculation of air by auxiliary fans or other ventilation devices?

4. Use of flame safety lamps by mining sirdars/shotfirers & other competent persons.
(Mention clearly any deficiencies)

5. Indicate place where inflammable gas was detected during the, shift (with percentage)

6. Any working place where ventilation was found inadequate.

C. Haulage

	Their condition	Any Deficiency
1. Safely devices & appliances on haulage planes :		
(i) Stop blocks		
(ii) Runaway switches		
(iii) Inter-coupled stop blocks & runaway switches		
(iv) Drags		
(v) Manholes		
(vi) Drop Warrick or other devices against forward		

runaway of tubs.		
(vii) Re-railers (including portable re-railers).		
(viii) Tub-spacers		
(ix) Signaling points (from safe position)		
(x) Electric lighting at fixed points		
(xi) Other safety devices		
(xii) Rope, chains, signals brakes. Jig wheels, posts & other apparatus.		
(xiii) Tracks & Tramlines		
(xiv) Grading & packing of tracks & tramlines.		
(xv) Any other devices or appliances (Specify)		

2. Any derailments of tubs on haulage planes (Give details including place(s) of derailment & causes thereof)

3. Any workers found using haulage road for traveling purposes; if so, action taken.

D. Any danger observed during the shift at any place in the District(s) and action taken (clearly indicate places where fences were erected against dangerous places)

E. Support of Strata

(a) Deficiency if any, noticed in support of—

(i) freshly exposed ground (with 9 m of working places) (ii) in SSR of depillaring district.

(b) Whether any supports were withdrawn during the shift from a slice or stock under extraction. If so, give details.

F. Hand Plan

Has the tracing of the workings been brought up-to-date at the end of shift?

G. Any two working faces approached within 10 m of each other? If so, instructions issued to Shotfirer.

H. Any abnormal variation seepage of water observed at a working place (Give details)

I. Persons sent out of Mine

Any persons sent out of the mine for infringement of safety requirements or directions, and action taken.

J. Safety directions

Any directions given to secure safety & discipline of persons, and/district (Give details).

K. Conference with successor

Conference with successor, if any (Give details).

L. Any accident during the shift

(a) Cause of accident & other details:

(b) First-aid given by— M. Any other information or remarks:

M. Any other information or remarks

DESCRIPTIVE REPORT

I, the undersigned, hereby, certify that I have written the above report after making thorough examination.

Date..... Time.....

Signature.....

Countersigned Manager/Asstt. Manager

Date.....

2. Format of daily report of Overman/Foreman in opencast workings—

As per recommendation 2.7 of the Seventh Conference on Safety in Mines, formats of daily reports of Overman incharge of opencast workings (Reg. 43 of CMR 1957) and Foreman incharge of opencast workings (Reg. 46 of MMR 1961) have been devised. The same are given below.

(Cir. Genl. 3/1990)

Daily report of inspection by Overman incharge of opencast workings of a colliery under Regulation 43 of CMR, 1957.

Name of mine..... Name of owner.....

Date..... Shift and Shift hours.....

Taken over charge from.....at.....(time) on.....(date) at.....(place)

Rest interval.....to.....

Number of persons under my charge.....

Number of Mining Sirdars under my charge.....

Name/number of quarries and other workplaces under my charge:

(1)

(2)

(3)

(4)

Names/numbers of workings, temporarily disused quarries and other workplaces inspected:

Manual	Mechanised	Dumps	Other workplaces
(1)	(1)	(1)	(1)
(2)	(2)	(2)	(2)
(3)	(3)		

Pumping sites inspected.....
 Distance between first and last working.....
 place under my charge

Deficiency in Safely materials including safely belts

A. (1) HAULAGE	Condition	Deficiency

Safety devices & appliances on haulage plane

- (i) Stop block
- (ii) Intercoupled stop block and runway switch
- (iii) drags
- (iv) portable rerailers
- (v) tub spacers
- (vi) signalling arrangements
- (vii) condition of haulage track
- (viii) lighting arrangement
- (ix) sprags
- (x) others:

Any derailment of tubs and cause thereof—

- (2) Condition of other transport roads
 - (3) General condition of heavy machineries (where applicable)
 - (4) Stability of active dumps, supervision while unloading
 - (5) Arrangement for dust suppression
 - (6) Availability of spotters/pitman
 - (7) General lighting
-

(B) WORKINGS

- (1) Height and width of benches (mention size)
 - (2) Overhangs/undercuts
 - (3) Loose stones/material/trees within 3 metres of edges of bench
 - (4) Condition of footpaths
 - (5) Condition of drains around quarry
 - (6) Condition of pumps and their fencings
 - (7) Condition of fencing around the quarries
 - (8) Any danger observed and action taken.
-

C. BLASTING

Deficiencies observed, if any

D. Arrangement for FIRE FIGHTING and provision of fire extinguishers.

E. WELFARE AMENITIES

- (1) Rest Shelter
- (2) Children's shelter/creche
- (3) Drinking water

F. ACCIDENTS during the shift

First-aid given by.....

G. Period of inspections - from.....to.....

H. Any other information or remarks

Withdrawal of persons, if any; sign of heating or fire.

I, the undersigned hereby certify that I have written the above report after making thorough inspection.

Handed over charge to.....at.....(time) on..... (date) at.....(place)

Date..... Time.....

Signature
Overman
Name of Overman

Countersigned
Asstt. Manager/Manager.

Daily report of inspection by Foreman incharge of opencast workings of a mine under Regulation 46 of the Metalliferous Mines Regulations, 1961.

Name of mine..... Name of owner.....

Date.....Shift and Shift hours.....

Taken over charge from.....at(time) on.....(date) at (place).

Rest interval.....to.....

Number of persons under my charge.....

Number of Mining Mates under my charge.....

Name/number of quarries and other workplaces under my charge:

(1)
(2)
(3)
(4)

Names/numbers of workings, temporarily disused quarries and other workplaces inspected:

Manual	Mechanised	Dumps	Other workplaces
(1)	(1)	(1)	(1)
(2)	(2)	(2)	(2)
(3)	(3)		

Pumping sites inspected.....

Distance between first and last working place under my charge.....

 Deficiency in Safety materials including safety belts

A (1) HAULAGE	Condition	Deficiency

Safety devices & appliances on haulage plane

- (i) Stop block
- (ii) Intercoupled stop block and runway switch
- (iii) drags
- (iv) portable rerailers
- (v) tub spacers
- (vi) signaling arrangements
- (vii) condition of haulage track
- (viii) lighting arrangement
- (ix) sprags
- (x) others:

Any derailment of tubs and cause thereof—

- (2) Condition of other transport roads
 - (3) General condition of heavy machineries (where applicable)
 - (4) Stability of active dumps, supervision while unloading
 - (5) Arrangement for dust suppression
 - (6) Availability of spotters/pitmen
 - (7) General lighting
-

(B) WORKINGS

- (1) Height and width of benches (mention size)
 - (2) Overhangs/undercuts
 - (3) Loose stones/material/trees within 3 metres of edges of bench
 - (4) Condition of footpaths
 - (5) Condition of drains around quarry
 - (6) Condition of pumps and their fencings
 - (7) Condition of fencing around the quarries
 - (8) Any danger observed and action taken.
-

C. BLASTING

Deficiencies observed, if any

D. Arrangement for FIRE FIGHTING and provision of fire extinguishers.

E. WELFARE AMENITIES

- (1) Rest Shelter
- (2) Children's shelter/creche
- (3) Drinking water

F. Accidents during the shift

First-aid given by.....

G. Period of inspections - from.....;.....to.....

H. Any other information or remarks

Withdrawal of persons, if any; sign of heating or fire.

I, the undersigned hereby certify that I have written the above report after making thorough inspection.

Handed over charge to.....at.....(time) on..... (date) at.....(place)

Date..... Time.....

Signature

Overman

Name of Overman

Countersigned

Asstt. Manager/Manager.

3. Statutory Report of Foreman—It has been seen that the daily report forms currently used by Foreman under Reg. 46(10) of MMR 1961 leave much to be desired. The information furnished by the subordinate supervisory staff is usually of routine and casual nature; as such it does not serve the desired purpose of the statutory reports.

In order to improve the quality and utility of such reports, revised form of daily report of Foreman has been prepared keeping in view the statutory duties prescribed for and/or normally expected of them. The same is given below. It may be got printed and supplied for use to the said officials as early as possible.

(Cir. Genl. 3/1985)

FOREMAN'S DAILY REPORT

(Regulation 46(10) of MMR 1961)

I, the undersigned being a person duly appointed and authorised for the purpose as required by Regulation 46 hereby declare that I have carefully examined i the workings or parts of the mine named below which are under my charge and ¹ control have to record as follows:—

Name of Mine.....

Name of section (1).....

Names of working places

of mine inspected:— (1).....(2).....

(3).....(4).....

(5).....

A. Safety materials: Supply made during shift Is stock underground adequate?

Timber

Ducting

Other safety materials for safety working (specify)

B. Ventilation: Their condition Any deficiency

1. Ventilation appliance:—

(i) Doors

(ii) Ducting

(iii) Other ventilation devices (specify) condition of fan.

2. Are any ductings lagging behind? (Give particulars)

3. Is there any recirculation of air by auxiliary fans or other ventilation devices?

4. Any working places where ventilation was found adequate/inadequate,

C. Haulage

Their condition

Any deficiency

1. Safety devices appliances or haulage planes:

(i) Stop blocks

(ii) Runaway switches

(iii) Manholes

(iv) Drop warrick or other devices to arrest runaway of tubs

(v) Portable re-railers

(vi) Signaling points (from safe position)

(vii) Electrical lighting at fixed points

(viii) Other safety devices

(ix) Ropes, chains, signals, brakes, jig wheels, posts & other apparatus

(x) Tracks & tramlines

(xi) Grading & packing of tracks & tramlines

(xii) Any other devices or appliances (Specify)

2. Any derailments of tubs on haulage planes (Give details including place(s) of derailment & cause thereof)

3. Condition of traveling roadway/ladderway.

D. Any danger observed during the shift at any place in the district(s) and action taken. (Clearly indicate places where fences were erected against dangerous places).

E. Support of strata

(a) Condition of freshly exposed ground (within 9 m of working places) Deficiency in systematic support rules in sloping district,

(b) Whether any supports were withdrawn during the shift.

F. Foreman tracing plan/section has been in possession or not.

G. Have any two working faces approached within 3 m of each other? If so, instructions issued to Shotfirer.

H. Any abnormal seepage of water observed at a working place (Give details).

I. Persons sent out of mine. (Any person sent out of the mine for infringement of safety requirements or directions, and action taken).

J. Safety directions :

- (a) Whether all men were using protective equipments during shift,
- (b) Any directions given to secure safety & discipline of persons, and/or district (Give details).

K. Conference with successor if any (Give details).

L. Any accident during the shift.

(a) Cause of accident and other detail.

(b) First-aid given by

M. Any other information or remarks :

DESCRIPTIVE REPORT

I, the undersigned, hereby certify that I have written the above report after making thorough examination.

Date.....Time.....

Signature.....

Countersigned

Manager/Asstt. Manager/U.G. Manager

Date.....

4. A clarification regarding Duties of Overman under Regulation 43(8) (b) of CMR 1957—in accordance with sub-regulation 8(b) of Regulation 43 of Coal Mines Regulations, 1957, the overman shall not, except for "Justifiable cause" leave the district in his charge until he has finished the inspection required under these Regulations and any other duties that he is required to perform or until relieved by duty appointed substitute. As per recommendation of the Court of Enquiry into Topa Colliery accident that occurred on 16.7.82, it is necessary to make it clear in sub-regulation 8(b) of Reg. 43 that the expression "Justifiable cause" mentioned therein relates only to his duties enumerated in Reg. 43.

The aforesaid clarification may be brought to the notice of all mine officials under your control and compliance secured pending the proposed amendment of the Regulation in this regard in due course.

(Cir. Tech. 1/1984)

CMR 44 & 113

1. Statutory Report of Mining Sirdar—It has been seen that the daily report forms currently used by Mining Sirdars leave much to be desired. The information furnished by the sub-ordinate supervisory staff is usually of routine and casual nature, and as such it does not serve the desired purpose of the statutory reports.

In order to improve the quality and utility of such reports, revised form of daily report of Sirdar has been prepared keeping in view the statutory duties prescribed for and/or normally expected of them. The same is given below. It is requested that the same may be got printed and supplied for use to the Sirdars.

It is recommended that the new form be introduced w.e.f. 1.1.1984.

(Cir. Genl. 6/1983)

SIRDAR'S REPORT OF DAILY EXAMINATION OF THE MINE

(Reg. 44 & 113(3) (d) of CMR, 1957)

I, the undersigned being a person duly appointed and authorised for the purpose as required under Regulation 113 hereby declare that I have carefully examined the workings of the parts of the mine named below and have to report as under :

Name of Colliery.....

Name of Seam & District examined.,

(1) Date of examination :.....,

Began Ended

(a) First Inspection.....

(b) Second Inspection.....

(c) Third Inspection.....

(2) Number of persons working under my charge.

Any deficiencies noted in respect of					Whether any symptoms of spontaneous heating or fire noticed.
1	2	3	4	5	
Ventilation	Support of Strata (Roof &	Goaf Edges	Fencings	Sanitation	

3. Places examined:

(a) Working places:

1.
2.
3.
4.
5.

(b) Roadways in which persons have to pass during shift:

1.
2.
3.
4.

(c) Working places temporarily stopped:

1.
2.
3.
4.

(4) Safety instructions given:

(Give particulars of instructions
and name of persons to whom given).....

(5) Any person ordered out of the mine for

working at a place other
than that assigned to him

(6) Any inexperienced persons working in the district,
and if so, give name(s) of persons under
whose supervision he/they was/were/placed.....

(7) Safety materials etc.:—

Deficiency, if any

- (i) Timber
- (ii) Buntions (when height of working. place is more than 3 m.)
- (iii) Ladder (when height of working. place is more than 3 m.)
- (iv) Cage with suitable birds or other means of detecting carbon-monoxide.....
- (v) Other safety materials.....

(8) Traveled along second egress from surface
(not ordinarily used for traveling) and made
myself thoroughly acquainted with the same on.....

(9) Supports withdrawn during the shift:—

Place	No. of cogging sleepers withdrawn	No. of props. withdrawn	Other supports withdrawn
1.			
2.			
3.			

Means of withdrawal of support.....

(10) Dangerous places observed
during shift (Give details).....
Any danger reported by anyone (Give details of danger, and name
of person reporting).....
Action taken to remove danger.....

(11) Dangerous operation carried out under my personal supervision (Give nature & place of
danger)

(12) Entrances to places not in active use fenced off by me during the shift (Give particulars of
such entrances)

- 1
- 2
- 3
- 4

(13) Inflammable gas detected at following places (with percentage):—

- 1.

- 2.
- 3.

(14) Any abnormal seepage of water observed at a working place. (Give details)

(15) Any accident during the shift:

(a) Cause of accident & other details:.....

(b) First aid given by.....

(16) Conference with successor

(Give details of information conveyed and to whom),.....

(17) Any other remark:

Date..... Time,..... Signature.....

DESCRIPTIVE REPORT

For cases in which the persons making the examination is to write, who made the above report (Regulation 197) Thumb mark of Left Thumb mark of.....

I, the undersigned hereby certify that I have written the above report in the presence of and at the dictation of..... and have

read over to him in his language. He has made his left thumb-mark in my presence.

Date..... Time..... Signature.....

Countersigned
Manager/Asstt. Manager
Date:

CMR52

Accidents due to persons falling from cage in shaft—This is to bring to your notice that there have been four fatal accidents during the year 1981 in which persons fell down from the cage in shaft. The actual circumstances are indicated below:

(1) While a timberman carrying a piece of log was coming up along with the Mining Sirdar and two other co-workers in an ascending cage with partially dropped fence, he slipped in the

process of saving the log from falling and fell down in the shaft by 75 metres meeting with instantaneous death.

(2) While a miner was going down a shaft in the cage alone without a cap lamp, he fell down into pit bottom landing and died. '

(3) While a prop mazdoor was descending a shaft in a cage from the surface without the cage gates closed, he somehow got unbalanced immediately after the cage was lowered and fell down from the cage into the shaft. He crashed on the roof of the ascending cage and was killed on the spot.

(4) While traveling in an ascending cage a mining sirdar standing near one end of the cage lost balance and fell down to the pit bottom from a height of about 50 metres and died.

The above fatal accidents could have been averted had the provisions of Regulations CMR 52(1) (f), 44(1) (b) and 153(1), MMR 55(1) (f), 47(1) (b) and 147 been complied with.

It is, therefore, necessary that the provisions of Regulations mentioned above are strictly complied with.

(Cir. Tech. Sapicom. 13/1983)

CMR 55

Shoes worn by machine drivers and helpers—A number of accidents have taken place where men holding anchor prop have been killed or seriously injured. Usually, a coal cutting machine is at work at the face, and those holding the anchor props, slip and fall on the moving parts of the jib.

It has been noticed that the injured or deceased were wearing rubber-soled shoes while thus employed. To avoid such accidents, it is recommended that the men working with coal cutting machine should not use slippery shoes. They should stand on firm ground and in such a position that they are not pulled towards the coal-cutting machine./ Proper notches should also be cut in roof and floor to hold the anchor prop in position.

(Cir. 32/1960)

PLANS AND SECTIONS

CMR 58/MMR 60

1. All geological disturbances to be shown on plans accompanying applications—The plans with applications for permission under various Regulations of the Coal Mines Regulations 1957/Metalliferous Mines Regulations, 1961 for making workings beneath houses, roads, railways, rivers, tanks, waterlogged workings etc. sometimes do not show all known geological disturbances. It may be appreciated that in the absence of such details on plans, it is not possible to properly examine the cases. It is therefore requested that henceforth all plans enclosed with applications made under various Regulations should show all geological disturbances. All such plans should bear a clear certificate under Reg.64 of the CMR 1957/Reg. 66 of the MMR 1961 mentioning presence and/or absence of geological disturbances.

(Cir. 44/1971)

2. Standards of accuracy of mine plans and sections : Specifications of Limits of Error—In pursuance of Reg. 58(3) of CMR 1957 and Reg. 60(3) of the MMR 1961, it is hereby required that all plans and sections prepared or submitted in accordance with the provisions of the regulations shall be accurate within the limits of error as specified in the Appendix below.

APPENDIX SPECIFICATION OF LIMITS OF ERROR

Plans

3.1 Accuracy of Correlation with Survey of India National Grid—The positions of the surface reference stations and the centres of all mine shafts at the surface and reference points of underground surveys and also the boundaries of the mine and all surface features required to be shown shall be shown upon the key and Master Plans in their correct positions relative to the Survey of India National Grid within the limits of error of survey and plotting required by this Code (See para 2.3)

3.2 Plotting Errors—All surface and underground surveys made and carried out in accordance with this Code shall be plotted on the plan of the mine so that, in the case of a plan on the scale of 1/2,000, all points in the survey are correct by scale to their calculated co-ordinate position within a limit not exceeding 50cm. In case of a plan prepared on the scale of 1/1,000, the corresponding limit of error shall not exceed 25cm.

Surface Surveys

3.3 Triangulation Station Points— The position of every station point of triangulation with reference to the point of origin of the survey, calculated from an initial base line (or the Survey of India topo triangulation stations) shall agree with the position of that station point, calculated from a verification base line, within a limit of error not exceeding 1/5,000th of the linear horizontal distance of the station point from the point of origin.

3.4 *Traverses*—Every traverse made between station points of a triangulation and/or for the determination of the boundaries of the mine or for the determination of other important surface details, shall be closed Polygonally and shall be made within limits of error as follows :

(i) The total angular error of the traverse shall not exceed $30/n$ seconds when 'n' is the number of observing stations (including the initial and closing stations).

(ii) The error of closure (calculated by co-ordinates) after distribution of the total angular error shall not exceed $1/3,000$ th of the sum of the horizontal lengths of the drafts of the traverse.

Underground Surveys

3.5 *Instruments for Main Road Traverses*—Every traverse made to determine or check the position of an underground survey station or to check the position of the main roadways of a mine shall be made with a theodolite the smallest reading of which does not exceed 20 seconds of arc, and all measurements shall be made with a steel band or steel tape not less than 30 metres in length.

3.6 *Angular Error of Closed Traverses*— The total angular error of any underground traverse or check survey which has been closed polygonally shall not exceed $(20+x)/n$ second in which expression the value of 'n' is 10 seconds or the smallest reading in seconds of sub-division of the circle of the instrument employed (whichever is greater) and 'n' is the number of observing stations.

3.7 *Co-ordinate Error of Closed Traverses*— The error of closure of any underground traverse of check survey which has been closed polygonally (calculated by co-ordinates after distribution of the total angular error) shall not exceed $1/2,500$ th of the sum of the horizontal lengths of the drafts of the traverse.

3.8 *Co-ordinate Error of Open Traverses*—Where an underground traverse has commenced from and closed upon surface reference points upon survey stations of which the co-ordinates have previously been determined, but has not been closed polygonally, the error of closure (calculated by co-ordinates) shall not exceed $1/1,500$ th of the sum of the horizontal lengths of the drafts of the traverse.

3.9 *Subsidiary Surveys*— Subsidiary surveys, to determine the position of any line of face or goaf and the positions or road junctions made between any two stations of check survey, shall have a permissible limit of error of closure by plotting not exceeding $1/500$ th of the sum of the horizontal lengths of the drafts of the survey.

3.10 *Checking Subsidiary Surveys*—Where it is impracticable to maintain underground check survey stations, and/or where subsidiary surveys cannot be closed upon check survey stations, the difference in location of any point on the line of face or goaf as determined by any two or more such surveys shall not exceed 3 metres.

3.11 *Errors of Correlation by Wires*—The correlations of the surface and the underground workings carried out by :

(i) Single wire in each of/two or more shafts,

Or

(ii) two or more wires in a single shaft shall be deemed to be within the required limit of error when the difference in value of the azimuth of any reference line of the underground survey relative to the surface reference base line, as determined by two or more independent series of observations between wires, does not exceed two minutes of arc.

3.12 Errors of Magnetic Correlation—The correlation of the surface and underground workings by precise magnetic observations (carried out by magnetic observations on the surface reference base line and by magnetic observations on not less than two underground observation lines, each tested independently for magnetic attraction, and connected by traverse survey carried within the limit of error required by para 3.7 above) shall be deemed to be within the required limit of error when (after distribution of the permissible angular error in the traverse connecting the underground observation base lines) the difference of azimuth between those base lines so determined agrees with the difference of bearing between the base lines as determined by magnetic observation relative to the surface reference base line, within a limit of error not exceeding two minutes of arc.

3.13 Errors of Correlation by Direct Connection—For the correlation of the surface and underground workings by direct connections through adits and inclines the traverse connection from, or between the points of reference to the surface shall be carried out within a limit of error required by para 3.7 of the Code, and the correlation shall be deemed to be within the required limit of error when (after distribution of the permissible angular error in the traverse) the values of the azimuth of any underground reference line, relative to the surface reference base line, as determined by any two or more such independent surveys, agree within a limit of errors not exceeding one minute of arc.

Levels

3.14 Errors of Surface Levels—The leveling to determine mine surface bench marks shall commence from a railway bench mark and close upon a second railway bench mark within a limit of error not exceeding 2 cm. per km. After Survey of India bench marks are available, the railway bench marks and Survey of India bench marks shall be linked by a leveling within a limit of error not exceeding 2 cm. per km. and thereafter a note shall be made on the plan giving the correction relating to the surface bench mark value with the Survey of India leveling and National Datum lines.

3.15 Errors for Underground Bench Marks—The levels of shaft inset bench marks shall be determined by shaft measurements and shall be deemed to be within the required limit of error when any two or more measurements from the surface bench mark to the mine inset bench mark agree within a limit of error not exceeding 1/5,000th.

3.16 Error of Underground Leveling—All underground leveling made to determine or check the levels of underground bench marks shall close within a limit of error not exceeding 1/2,500th of the inclined length of the route of the leveling.

3.17 Subsidiary Levels—In the case of subsidiary levellings made to determine the level of any point on a line of face or goaf or of any other part of the workings and which are not closed

between underground bench marks, the difference in the levels of any such point as determined by any two or more such leveling shall not exceed 50 cm.

SUMMARY OF LIMITS OF ERROR

Plans

Plans on the 1/2,000 scale	50 centimetres
Plans on the 1/1,000 scale	25 centimetres
(i) <i>Triangulation</i>	
Position of stations of the triangulation as determined from initial and verification bases	1/5,000th of the lines horizontal distance of local point of origin.
(ii) <i>Traverses</i>	
Total angular error	30/n seconds
Error of closure	1/3,000th of the horizontal length of the traverse

Underground Surveys

(i) <i>Traverse closed polygonally</i>	
Total angular error	(20+X)/n seconds
Error of closure	1/2,500th the horizontal length of the traverse
(ii) <i>Traverse not closed polygonally but closed upon reference points</i>	
Error of closure	1/1,500th of horizontal length of the traverse
(iii) <i>Subsidiary Surveys</i>	
Error of closure by plotting	1/500th of horizontal length of the traverse
Difference of two or more determinations of any subsidiary points	3 metres

Correlations

By shaft wires	2 minutes of arc
By magnetic observations	2 minutes of arc
By direct connection	11 minutes of arc

Levels

Surface mine bench marks	2 cms. per km.
Inset bench marks	Two or more shaft measurements of established inset bench mark should agree within 1/5,000.
Inbye bench marks	1/2,500th of the inclined length of the leveling.
Subsidiary points	50 centimetres.

(Cir. 20/1966 & Cir. 42/1967)

3. Important Surveys—To comply with the standards of accuracy in preparation of mine plans, it is necessary that all important surface and underground surveys and leveling are done by experienced qualified surveyors themselves.

Examples of important surveys and leveling that should be personally carried out by qualified surveyors :

(a) *Surface Surveys*— Establishment of triangulation base lines.

(b) *Underground Surveys*—

(1) Main Road Traverses.

(2) Main Road Check Surveys—These should be made when any point of the workings of the mine has advanced at a distance of 500 metres from the previous check survey.

(3) Check surveys for Reference Points.

(4) Check surveys for barriers against waterlogged workings; before abandonment; and on change of ownership or on re-opening etc. as per regulation 65 of the Coal Mines Regulations, 1957.

(5) Correlation of underground and surface surveys.

(6) Joint Surveys.

(c) *leveling*—

(1) Establishment of surface and underground bench marks.

(2) Levels of workings about to be abandoned.

(3) Subsidence leveling.

(Cir. 28/1966)

4. Use of polyester film for original mine plans—The original mine plans are required to be prepared on mounted paper and tracings on tracing cloth are prepared from the original plans for various statutory purposes.

However, the non-availability of good quality drawing paper mounted on cloth, in the Indian market, through indigenous sources, has been causing concern to the mining industry in general.

The problem was discussed with Director, Survey of India, Eastern Circle, Calcutta, who opined that presently the best medium for preparation and maintenance of plans is the polyester tracing film (which is now being manufactured by some Indian firms), which has better dimensional stability than best of the mounted paper.

Use should, therefore, be made of polyester tracing film of 125 micro gauge for preparation of original mine plans and of lesser gauge for tracings of various statutory/other plans.

(Cir. Gem.2/1980)

CMR59/MMR61

1. Plans of Old Workings— In some mines the main underground plan does not show the old workings in the seam. This is a serious contravention of the provisions of Reg. 59(1) (b) (ii) of CMR 1957.

The plan maintained under this clause should show the position of all the workings of the seam or section. Failure to do so may result in the advancing galleries holing inadvertently into old workings, causing an inrush of gases or water.

Special attention should therefore be paid to this matter. A remark on the condition of the old workings (viz., date of abandonment or discontinuance, whether full of water or gases, and the reduced levels of the edges of workings, if available) should also be noted on the plan.

(Cir. 6/1955)

2. Joint Survey Plan—The plan kept under Clause (d) of Reg. 59(1) of CMR 1957 shall also on every occasion that the details required under Clause (a) of Reg. 59(4) are brought up-to-date in compliance with the provision of Reg. 58(3), be signed by the surveyor and the manager of the adjoining mine(s) having workings within 60 metres of the common boundary (or where the boundary is in dispute, within 60 metres of the boundary claimed by the owner of the mine concerned) signifying the correctness of the common boundary, or the disputed boundaries, as the case may be, and of the position of the workings in relation to one another.

(Cir. 12/1958)

3. Water Courses to be Re-surveyed— As in several cases the course of jores, nallas and other water courses has shifted to a considerable extent over the past few years from the course shown on the mine plans, it is necessary that every water course is re-surveyed and correlated with the workings belowground. Wherever any large discrepancy is noticed from the known data, it should be intimated to the J.D.M.S. The report should be accompanied by necessary plans explaining the change. If the re-survey indicates that any new danger has arisen, this should also be clearly indicated in the intimation aforesaid.

(Cir. 44/1959)

4. Particulars of dams to be shown on plans— The depth to which the dams are cut into the roof, floor and sides are important dimensions. Similarly, the materials used in the construction of a dam are also important details. These should be shown/indicated on the plan.

(D.G.M.S. Instruction dated 12.8.59)

5. Water Danger Plan— The surface contour lines and underground spot levels etc. and the permanent bench-mark required to be shown under Reg. 59(3) of CMR 1957 should be shown on a separate tracing of the underground workings of the mine, which should be kept up-to-date as required under Reg. 58(3)

The plan, which may be called 'Water Danger Plan', shall also show surface drainage system of the mine.

(Cir. 13/1958 & 30/1969)

6. Water Danger Plan : Measures to give warning of danger of inundation—Attention is invited to Circular No. 30 of 1969 regarding maintenance of a separate Water Danger Plan at the mine. This is to amplify that the plan to be so maintained should show the following features to serve the desired purpose of guarding against danger of surface and underground inundation—

(i) the position of the workings below ground; and every borehole and shaft (with depth), including opening, cross-measure drift, goaf, pumping station;

(ii) the general direction and rate of dip of the strata;

(iii) such sections of the seam as may be necessary to show any substantial variation in the thickness or character thereof and showing the working section;

(iv) the position of every dyke, fault and other geological disturbance with the amount and direction of throw;

(v) the position and reduced level of permanent bench-mark;

(vi) spot levels taken in workings belowground at easily identifiable points e.g.,

(a) along haulage roadways, at every roadway junction except in roadways where tramming is done by manual means in which case spot levels may be shown at points not more than 150 metres apart;

(b) in the case of the headings which have been discontinued either temporarily or permanently also at the end of such headings;

(vii) every source of water such as river, stream, watercourse, reservoir, water-logged opencast workings on the surface, and also the outline of all water-logged workings on the belowground lying within 60 metres of any part of the workings measured in any direction;

(viii) every reservoir, dam or other structure, either above or belowground, constructed to withstand a pressure of water or to control an inrush of water, along with reference to its design and other details of construction;

(ix) surface contour lines drawn at vertical intervals not exceeding five metres (or ten metres in the case of a mine where there are no workings belowground or in case of mines situated in hilly terrain, such other larger interval as the J.D.M.S. may permit by an order in writing and subject to such conditions as he may specify) over the whole area lying within 200 metres of any part of the workings;

(x) surface drainage system of the mine;

(xi) the highest flood level of the area;

(xii) warning lines to draw visual attention to dangers of inundation arising out of (a) surface water (b) unconsolidated strata, (c) water bearing strata and (d) underground water.

Note—The distance at which these warning lines may be drawn from the source of danger would vary depending upon the rate of progress of workings in a mine and cannot, therefore, be specifically indicated. This distance should, however, be such as to enable the management to take note of danger well in advance so that necessary permission for working within a statutorily restricted area could be obtained well in time.

2.0 In this context. Article 4 of Code of Coal Mines Surveying Practice recommended by the Technical Committee on Mining Standards in respect of Standards of Accuracy of Mine Plans, appointed by the Government of India, is reproduced in the Appendix, for ready reference and necessary action in respect of additional measures to be taken to give timely warning of danger of inundation.

APPENDIX

Extract from the Code of Coal Mines Surveying Practice
ARTICLE 4 : Measures to give Warning of Danger of Inundation

4.1 Responsibility—It is one of the important statutory duties and responsibilities of surveyors to record in a bound paged book 'the full facts when workings of the mine have approached to about 75 metres from the mine boundary or from disused or waterlogged working'. Besides this requirement it is recommended that warning lines should be drawn on plans to draw visual attention to dangers of inundation arising out of—

- (i) Surface water
- (ii) Unconsolidated strata
- (iii) Water-bearing strata, and
- (iv) Underground water.

4.1.2 The distance at which these warning lines may be drawn from the source of danger would vary depending upon the rate of progress of workings in a mine, and cannot therefore be specifically laid down, but this distance should be such as to enable the management to take note of the danger well in advance so that necessary permission for working within a statutorily restricted area could be obtained.

4.1.3 The following code of practice requiring measures to be taken for giving warning of danger of inundation are in addition to and not in substitution for any relevant provisions of the Coal Mines Regulations, 1957 or any amendments thereof.

4.2 Workings in the Proximity of Bodies of Water on the Surface or Underground

4.2.1 Location of Bodies of Water—Every effort shall be made to locate and to mark on the underground plan, Manager's plan, Overman's plan and on Water Danger plan, the limits of any surface or underground body of water which may constitute a danger within the boundary of a mine or within a distance of 60 metres outside the boundary.

4.2.2 Water in Old Workings—Where old workings exist which may constitute a danger, it shall be assumed, for the purpose of marking the above mentioned plans, that they contain water until the contrary is proved.

4.2.3 Position of Old Workings—All possible steps shall be taken to ensure that the outline of all old workings, in the same seam or in any other seam within 60 metres (being the shortest distance measured on any direction whether horizontal, vertical or inclined) thereof are shown correctly on the underground plan, Manager's plan, Overman's plan and Water Danger plan. Such outline shall be endorsed with the name of seam, reduced level of the water and the date on which such water level was recorded.

All old plans shall be regarded with suspicion until their accuracy has been verified, and every effort shall be made to obtain all existing information about old workings; if there is doubt about the position of old workings, this fact shall be mentioned on the plans.

4.2.4 Warning Line—In addition to showing the outline of any body of water which may constitute a danger, the above plans shall be marked with a green line verged yellow to indicate that any advance beyond that line will bring the workings within a distance of 120 metres of the body of water or such greater distance as may be fixed by the management.

4.2.5 Large Cautionary Zones—If the size of the cautionary zone is such that it covers the whole area of the plan, and no warning line can be shown, the words 'SURFACE WATER' or 'UNDERGROUND WATER' whichever are applicable shall be printed in green large type lettering across the plan, together with a note of the depth and reduced level of the water and its pressure if known.

4.2.6 Statutory Restriction Line—The underground plan, manager's, overman's and water danger plans shall also be marked with a green line verged green at a distance of 60 metres (being the shortest distance measured in any direction whether horizontal, vertical or inclined) from the edge of any body of water to indicate that any advance beyond that line can only be made with the permission of Chief Inspector of Mines.

4.2.7 Check Surveys—When approaching a body of water likely to constitute a danger, check surveys and levelings of the workings shall be carried out when a point has been reached 120 metres, or such greater distance as may be fixed by the management, from the body of water. Wherever possible, there shall be an independent check by a surveyor other than the one normally making surveys at the colliery.

4.2.5 Undersea Workings and Water Bearing Strata—The foregoing provisions shall not apply to undersea workings and water-bearing strata which may constitute a danger. These shall receive special consideration by the management.

4.2.9 Informing the Management—The surveyor shall inform the manager in writing, of all known facts when approach is being made towards a water cautionary zone. All reservations and doubts which may exist concerning the accuracy of the plans shall be fully explained.

4.3 Workings in the Proximity of Unconsolidated Surface Deposits

4.3.1 Definition of Unconsolidated Surface Deposits—For the purpose of this code the term 'Unconsolidated surface deposits' includes moss, peat, quicksand, and in addition, abandoned opencast workings, sand, gravel, silt, mud and any other fluid matter, other than water, lying above the rock head, and likely to constitute a danger.

4.3.2 Making the Plans—When the geological maps of the area or any investigation or local knowledge indicates the existence of unconsolidated surface deposits within the boundary of a mine or within 60 metres outside it, the limits and nature of such deposits shall be marked on the geological plan, underground plan, manager's plan, overman's plan & water danger plan. The limits so marked shall be endorsed in green large type lettering with the words 'UNCONSOLIDATED DEPOSITS' together with a note of their thickness.

4.3.3 Warning Line— In addition to showing the outline of any body of unconsolidated surface deposit as above, a warning line consisting of a green line verged yellow, drawn in such a position as to indicate that any advance beyond that line will bring the workings within a

distance of 120 metres, or ten times the thickness of the seam worked (whichever is the greater) of the unconsolidated surface deposits.

4.3.4 Large Cautionary Zone— If the whole area of the plan is overlaid by unconsolidated deposits and no warning line can be shown, the words 'UNCONSOLIDATED DEPOSITS' shall be printed in green large type lettering across the plan and the thickness of the deposit shall be shown.

4.3.5 Statutory Restriction Line—The underground, manager's overman's, and water danger plans shall also be marked with the green line verged green at a distance of 60 metres (being the shortest distance in any direction whether horizontal, vertical or inclined) from the edge of unconsolidated surface deposits to indicate that any advance beyond that line can only be made with the permission of Chief Inspector of Mines.

4.3.6 Informing the Management—The Surveyor shall inform the manager in writing of the full facts when approach is being made towards a cautionary zone for unconsolidated deposits, and all reservations and doubts which may exist concerning the accuracy of the plans shall be fully explained.

(Cir. Tech. 1/1976)

7. Maintenance of off-set plans of workings beneath surface features—Permissions under 105 and 126 of Coal Mines Regulations, 1957 have been granted for development of workings under different surface features stipulating inter-alia the dimensions of the galleries which may be driven.

The frequency and type of inspections to be made beneath such surface features have been stipulated in DGMS Circular No. 1 of 1960. It is observed (that with the passage of time and spalling from the pillar sides and some time due to robbing, the dimensions of the galleries increase beyond the permitted limits and the supporting pillars become less in size.

In view of the above managements are requested to prepare and maintain off-set plans on a scale having a representative factor of 500 : 1 in respect of all existing workings beneath the surface features and within a distance of 45 metres thereof in case of permissions granted under Reg. 105 and within a distance of 15 metres thereof in case of permissions granted under Reg. 126.

The job of completion of the off-set plans, referred to above, shall be completed within one year and the completion report shall be sent to the concerned Director of Mines Safety of the Region and the D.G.M.S.

(Cir. Tech. 11/1982)

8. Scale of mine plans—In exercise of powers under Rg. 55(1) (d) of the Coal Mines Regulations 1957, the D.G.M.S. has required (vide the Directorate's Notification No. 1632 dated 8th Dec., 1980 published in the Gazette of India, Part-11, Section 3(i), G.S.R. 76 dated 17th Jan.. 1981) the owners/agents/managers of all coal mines to prepare and maintain all the new and reconstructed mine plans on a standard metric scale, having representative factor of 2000:1 or 1000:1

(Cir. Legis. 2/1981)

9. Geological Plan—A scale of 16" to a mile (1"-330 ft or a R.F. of 1:3960) is considered suitable for the purpose.

The plans may be made out from the relevant sheets of GSI maps. In case, however, GSI maps on this scale are not available, the smaller-scale GSI maps may be enlarged to this scale. Fuller details of geological features and disturbances etc. should then be filled in, the information being obtained from the field and collected from the locality. All known information should be shown on the plan.

(Cir. 3/1958)

10. Scale of Geological Plan—The Mine Geological Plan may be maintained at a scale having a representative factor of 5000:1 or on any other scale on which the statutory plan showing the workings of the mine is prepared.

(Cir. 65/1964)

CMR 61 / MMR 63

1. Plans of abandoned or discontinued workings— It is very essential to have the up-to-date and complete plans of the abandoned or discontinued workings at a mine in the interest of safety of persons employed in the neighbouring mine as well as of the public. Their non-submission constitutes a serious violation and also a continuing offence so long as it is not remedied and complied with. Therefore correct and up-to-date plans of the discontinued or abandoned workings as required under Reg. 63 of the MMR 1961 shall be submitted

(Cir. 7/1967)

2. Checklist for Abandoned mine plans under Regulation 61 of CMR 1957— When any mine or seam or section thereof is abandoned or the working thereof has been discontinued over a period exceeding 60 days, the owner of the mine is required to submit, within 30 days of abandonment or 90 days of discontinuance, to the D.G.M.S. two copies of Abandoned Mine Plans and Sections. These are, in fact, true copies of up-to-date plan and section of the workings of the mine or part, maintained under Regulation 59(i) (b) and (c) with additional information regarding location of the mine etc.

To cut down procedural delay in processing and recording the AMPS, it is hereby advised that these A.M. Plans be submitted to the Dy. Director-General of Mines Safety of the concerned Zone.

From past experience it can be said that at times the plans and sections submitted lack in vital details which also raise doubts about their accuracy. Consequently considerable time and energy has to be spent to get the desired information. To guard against such eventualities in future managements are advised to ensure that the plans being submitted are verified for details as per the check list given in the appendix.

APPENDIX

Check list for submission of abandoned mine Plans under Reg. 61 of CMR 1957

1.1 From DGMS/AMP/I

(i) Two copies of the (printed) forms obtainable from the Dy. Director-General of the concerned Zone shall be submitted, duly filled in along with the plans.

(ii) Factual information about all the items in the forms shall be furnished correctly and fully.

1.2 Plans and Sections :

(1) Two copies of the plans/sections shall be submitted on tracing cloth/ polyester tracing film only.

(2) The plans/sections shall be true copies of the original plans/sections, which are being maintained at the mine under Reg. 59(1) (b) and (c) and a certificate to this shall be incorporated on both the sets of tracings. The plans shall, however, show as given below :

2.1 Reg. 58(1) :

- (a) (i) Name of owner :
- (ii) Name of mine :
- (iii) Purpose for which the plan/section is prepared.
- (b) True north or magnetic meridian with date of the latter :
- (c) A scale, at least 25 cms. long and suitably sub-divided.

2.2 Conventions as per second schedule

2.3 Plans to be brought up-to-date before abandonment or at the time of I discontinuance.

3.0 Reg. 59(1) (b):

(i) Position of workings, belowground.

(ii) Position of boreholes and shafts (with depth), incline openings, cross-measure drifts, goaves, fire stoppings or seals.

(iii) Every important surface feature within the boundaries such as Rly., road, river, stream, water course, tank, reservoir, opencast working and building which is within 200 mtrs of any parts of the working measured horizontally and H.F.L. of river(s) and stream(s).

(iv) General direction and rate of dip of strata. (v) Sections of the seam(s).

(vi) The position of every fault, dyke, and other geological disturbances with amount of throw and direction.

(vii) (I) an abstract of all statutory restrictions in respect of the working, if any, with reference to the order imposing the same.

(II) end of the workings marked with dotted lines and last date of survey.

- 4.0 Reg. 56 (1) (c) : Vertical mine sections, where average inclination exceeds 30 degrees from the horizontal.
- Reg. 59 (2) : Multi-section workings lying within 9 mtrs. to be shown in different colours on a combined plan separately.
- Reg. 59 (3) (a) : Surface contour lines at vertical intervals, not exceeding 5 mtrs.
- Reg. 59 (3) (b) : Spot levels along all important drivages and at the ends of the headings.
- Reg. 59 (3) (c) : Bench mark on the surface in relation to M.S.L.
- Reg. 59 (4) (a) (i) Settled and/or claimed boundary of the mine.
- (ii) Up-to-date working of all the mines situated within 60 mtrs from the boundary.
- 5.0 Reg. 61 (1) : Distance and bearing of at least one shaft or opening, in relation to T.J.P. (Tri-junction-pillar) or any permanent surface features.
- Underground spot levels at the end of all workings.
- Position of water dam(s) with dimensions and particulars of construction.
- 6.0 Reg. 64 (2) : A certificate of correctness of the plan (as printed in the original plan).
- Reg. 64 (3) : The tracing should bear the index No. of the original plan, from which it is traced and should be certified to be true copy of the original plan by the surveyor and countersigned by the Manager.

7.0 If certain particulars as given above are not shown in the plan due to its non existence or non applicability, certificates to this effect shall also be clearly given on the body of the plans.
(Cir. Legis. 1/1987)

3. Submission of Abandoned Mine Plans under Regulation 63 of MMR 1961— When any mine or in case of a mine to which Reg. 142 applies, any part thereof, is abandoned or the workings thereof have been discontinued for a period exceeding four months, the owner of the mine must submit, within 30 days of abandonment/five months of discontinuance, to the D.G.M.S. two copies of Abandoned Mine Plans and sections. These are in fact, true copies of up-to-date plan and section of the workings of the mine or part, maintained under clauses (b), (c) & (d) of Reg. 61(1), with additional information regarding location of the mine.

To cut down procedural delays in processing and recording the AMPs, managements are hereby advised to submit these A.M. Plans to the Dy. Director-General of Mines Safety of the concerned Zone.

From past experience it can be said that at times the plans and sections submitted lack in vital details which also raise doubts about their accuracy.

Consequently considerable time and energy has to be spent to get the desired information. To guard against such eventualities in future you are advised to ensure that the plans being submitted are verified for details as per the check list given in the appendix.

Appendix

1.1 From DGMS/AMP/L

- (i) Two copies of the (printed) forms obtainable from the Dy. Director General of the concerned Zone/Director General, Dhanbad shall be submitted, duly filled in, along with plans;
- ii) Factual information about all the items in the form shall be furnished correctly and fully.
- (iii) The owner/agent/manager shall sign the form with name and his designation.

1.2 Plans & Sections :

- (1) Two copies of the plans/sections shall be submitted on tracing cloth/ polyester tracing film only.
- (2) The plans/sections shall be true copies of the original plans/sections, which are being maintained at the mine under Regulation 61(1) (b) (c) & (d) and certificate to this effect shall be incorporated on both the sets of tracings. The plans shall, however, show as given below :

2.1 Reg. 60 (1)

- (a)
 - (i) Name of owner :
 - (ii) Name of Mine
 - (iii) Purpose for which the plan/section is prepared.
- (b) True north or magnetic meridian with date of the latter :
- (c) A scale, at least 25 cms long and suitably sub-divided.

3.0 The plans to be brought up-to-date before abandonment or at the time of discontinuance.

4.0 Reg. 61 (1) (b) :

- (i) Position of workings, belowground.
- (ii) Position of boreholes and shafts (with depth), drive, cross- cut, winze, rise, excavation (Sloped ground) and every tunnel and air passage connected therewith.
- (iii) Pillars or blocks of minerals left for support of surface features. (iv) Every important surface feature within the boundaries such as Rly., road, river, stream, water course, tank,

reservoir, opencast workings and building within 200 mtrs of any part of the workings measured horizontally.

(v) General strike of vein and mineral bed.

(vi) The position of every fault, dyke, and other geological disturbance with amount of throw and direction.

(vii) (I) an abstract of all statutory restrictions in respect of the workings, if any with reference to the order for imposing the same,

(II) end of the workings marked with dotted lines and last date of survey.

- 5.0 Reg. 61 (1) (c) : Transverse sections as per requirement.
 (d) : Vertical sections as per requirement.
 (f) (vi) : Surface contour lines at vertical interval not exceeding 5 mtrs.
- (vii) (I) : the highest flood level.
 (II) : bench mark on the surface in relation to M.S.L.
- (2) : Multi-section workings lying within 10 mtrs. to be shown in different colours on a combined plan.
- (3) (a) (i) : Settled and/or claimed boundary of the mines.
 (ii) : Up-to-date workings of all the mines situated within 60 mtrs. from the mine boundary
- 6.0 Reg. 63 (1) (i) : Distance and bearing of at least one shaft or opening, in relation to T.J.P. or any other permanent surface feature.
 (ii) : Underground spot levels at the end of all workings.
 (iii) : Position of water dam(s) with dimensions and particulars of construction.
- 7.0 Reg. 66 (2) : A certificate of correctness of the Plan (as printed in the original plan).
- Reg. 66 (3) : Every tracing should bear the index No. of the original plan from which it is traced and should be certified to be true copy of the original plan by the surveyor and countersigned by the Manager.

8.0 If certain particulars as given above are not shown on the plan due to its non existence or non applicability, certificates to this effect shall also be clearly given on the body of the plans.
 (Cir.Legis. 2/1987)

4. Submission of Abandonment Mine Plan (A.M.P.)— Provisions of Reg. 61 of the Coal Mines Regulations 1957 require submission of plans and sections to the D.G.M.S. within 30 days of abandonment or 90 days of discontinuance of a mine or seam or section thereof. Apart from the statutory requirement, these A.M.Ps. serve useful purpose both for the mine operators and the community.

Unfortunately, the submission of A.M.Ps. has fallen down sharply in the recent past.

Managements are requested to ensure submission of A.M.Ps. to the D.G.M.S. within the time frame stipulated in the regulations. In respect of the abandoned mines/seams for which A.M.P. had not been submitted, the same may be done as early as possible.

(Cir. Legis. 3/1992)

CMR 62 / MMR 64

1. Survey instruments and materials—According to Reg. 62 of the Coal mines Regulations, 1957 and the corresponding Reg. 64 of the Metalliferous Mines Regulations, 1961, it is the responsibility of the owner or agent of the mine to "provide accurate and reliable survey instruments and materials for the proper carrying out of all survey and leveling work and for the preparation of the plans and sections required under these regulations; and no other instruments shall be used in connection with any such survey or leveling work". It is noticed that some of the mines have not provided such instruments with the result that the mine surveyors find it difficult to prepare plans accurately. Managements are therefore requested to take necessary corrective actions.

(Cir. 75/1965)

2. Mine Surveyor : Facilities and workload—At several mines inadequate facilities are provided to surveyors to carry out their work. Therefore, the surveyors working at such mines find it extremely difficult to comply with the recommended standards of accuracy.

In addition to their statutory functions, surveyors look after numerous other jobs such as civil engineering works, preparation of bills etc. All these additional jobs leave surveyors with insufficient time to do justice to the important functions for which they are statutorily responsible and liable for penal action.

Now that high quality precision survey instruments are available in the country through indigenous sources, there is no reason why the same cannot be provided.

Further a surveyor shall be provided with due assistance of chainmen in the field and draftsman etc. in the drawing office. Therefore, before fixing the workload of a surveyor in the mine, the facilities, both in respect of instruments and personnel, provided to a surveyor shall be taken into account.

(Cir. 18/1972)

CMR 63

Numbering of plans—The plans submitted along with any application for depillaring, and also those required to be submitted along with other applications made under CMRs should be suitably numbered for future reference.

(Cir. 19/1960)

MEANS OF ACCESS AND EGRESS

CMR 66

Winding Arrangements at Second Outlet—In exercise of powers under the proviso to Reg. 66(2) of CMR 1957 it is clarified that the mechanical equipment for winding cannot be considered to be "so installed and maintained as to be constantly available for use" unless—

- (a) in case of a steam engine, the steam is available all the time; and
- (b) in all cases, a winding engine-man and a banksman are posted at the pit top all the time, whenever any person is present belowground.

(Cir. 22/1960)

MMR 75

Ladders and platforms—During the past few years number of fatal accidents by falling from the ladderways has been persistently high. In most of the cases, persons fell down from ladders between two platforms 10 to 15 m. vertically apart and fixed to the sides of the shaft by iron spikes, while ascending or descending.

Though the Regulation 75(i) of the Metalliferous Mines Regulations, 1961, stipulates provision of platforms at not more than 15 m intervals where the inclination is more than 30°, and 10m intervals where inclination is more than 60°, it is highly desirable that this vertical interval should be reduced further and platforms may be provided at closer intervals of 3 m.

(Cir. Tech. 6/1978)

TRANSPORT OF MEN AND MATERIALS-WINDING IN SHAFTS

CMR 71

Coming into force of Reg. 71(5) of CMR 1957—In exercise of the powers conferred by sub-regulation (5) of regulation 71 of the Coal Mines Regulations, 1957, the Central Government hereby appoints the 1st day of March, 1974 as the date on which Regulation 71 of the said Regulations shall come into force.

(Cir. 26/1974)

CMR 72/MMR 79

1. Notice about new winding installations— Notice under Reg. 72 of CMR 1957/Reg. 79 of MMR 1961 regarding new winding installations should be submitted in the form given below.

Further, whenever a need to deviate from the original arises, a revised notice incorporating full details of the changes and the reasons thereof should be submitted to the DGMS immediately.

NOTICE ABOUT NEW WINDING INSTALLATIONS REG. 72-CMR/79-MMR

1. General

- (i) Name and Address of mine
- (ii) Name of Mineral
- (iii) Name and address of owner
- (iv) When the installation is proposed to be put in use.

(a) *Shaft/Winze*

- (i) Name and other particulars
- (ii) Vertical or Inclined; if inclined, give angle with horizontal
- (iii) Depth/Inclined distance to which it is working
- (iv) Cross-section, shape and dimensions
- (v) Thickness of alluvial cover, and its nature
- (vi) Particulars of shaft/winze walling if any
- (vii) Particulars about insets of pits worked
- (viii) Over run space at bottom

(b) *Shaft Fittings etc.*

- (i) Particulars of keps (including those at insets)
- (ii) Other arrangements at insets
- (iii) Particulars of protective roofing
- (iv) Particulars of signaling equipments
- (v) Guide Ropes or rigid guides— (Give type) Number
Maker's name & Address (Also give Challan No.)
Type, Size, Clamps or cheese weights
Particulars of Sump.

(c) *Headgear (a drawing should be attached)*

- (i) Maker's name and address
- (ii) Size of Members
- (iii) Weight of headgear
- (iv) Details of foundations
- (v) Fleet angle of winding rope
- (vi) Pulley
 - Construction (one piece or other type)
 - Material
 - Diameter (over flanges and over rope tread)
- (vii) Pulley-groove Shape Depth
- (viii) Pulley shaft Diameter Manner of attachment to the pulley
- (ix) Particulars about dogs or similar devices [under Regulation 83(3)]
- (x) Clearance between safety hook and detaching bell or plate when the cage or other conveyance is at top of the shaft.

2. Winding Engine

(a) Drive

- (i) Maker's name and address (Also give Challan No.)
- (ii) If steam/compressed air— Size and number of cylinders.
Working pressure
Number of strokes
- (iii) If electric

Type	BHP	RPM
Voltage	Amp	Cycles

Also give following particulars :

Starter Control Gear	Speed Control Gear	Reversing Gear	Auxiliary Transformer
Maker's name Type Capacity Voltage rating Current rating Voltage ratio			

- (iv) If diesel
 - Size and. number of cylinders
 - Number of strokes : HP
- (v) State whether the drive is directly coupled to the drum or through gears etc.
If through gears etc. give—
Type of gear
Gear Ratio
- (vi) Capacity to lift maximum unbalanced load

(b) Drum (a drawing should be attached) '.

- (i) Maker's name and address (also give Challan No.)
- (ii) Type of drum
- (iii) Size of the drum

- (iv) Flanges or horns on the drum
- (v) Drum shaft
 - Diameter
 - Manner of attachment to pulley
 - (Also mention whether free or fixed)
- (vi) Method of securing rope end
- (vii) Number of idle coils of rope on the drum when the cage is at the bottom of the wind
- (viii) Diameter and width of brake race

(c) *Brake*

If more than one, give the following particulars about each brake :

- (i) Maker's name and address (Also give Challan No.)
- (ii) Type
 - Power operated/Automatic or not
 - Yes/No
- (iii) In what position does it normally remain [Reg. 74(2) (b)]
- (iv) Maximum slip with double the normal weight on unclutched drums

(d) *General*

(In each case give maker's name and address with Challan No.)

- (i) Depth indicator (mention of caution bell is provided)
- (ii) Speed indicator/Speed recorder [Reg. 84(b)]
- (iii) Particulars of automatic contrivance [Reg. 84(7)]
- (iv) Any other fittings

3. Suspension Gear etc.

(a) *Winding rope etc.*

- (i) Maker's name and address (Also give Challan No.)
- (ii) Construction
- (iii) Breaking-load
- (iv) Date of purchase (give reference)
- (v) Maximum speed of rope :
 - General :
 - Man-winding :

(b) *When/if winding men & material*

- (i) Weight of cage and attachment
- (ii) Weight of materials
- (iii) Weight of rope
- (iv) Factor of safety

(c) *When/If man-winding*

- (i) Weight of cage & attachment
- (ii) Weight of men
- (iii) Weight of rope
- (iv) Factor of safety

(d) *Chains*

- (i) Maker's name & Address (Also give Challan No.)

- (ii) Size
- (iii) Number
- (iv) Date of purchase (Give reference)
- (v) Test certificate particulars (Give reference)
- (Mention proof load to which tested and other test, if any)

(e) Distribution Plate

- (i) Maker's name & address (Also give Challan No.)
- (ii) Type & Size Material
- (iii) Date of purchase (Give reference)
- (iv) Test certificate particulars
- (Give reference. Also mention proof load to which tested, and give details of other tests, if any)

(f) Detaching hooks

- (i) Maker's name and address (Also give Challan No.)
- (ii) Type
- (iii) Capacity
- (iv) Date of purchase (Give reference)
- (v) Test certificate particulars
- (Give reference. Also mention proof load to which tested and give details of other tests, if any)

(g) Capel

- (i) Maker's name & address (Also give Challan No.)
- (ii) Type
- (iii) Length of tapered portion of socket
- (iv) Date of purchase (Give reference)
- (v) Test certificate particulars
- (Give reference. Also mention proof load to which tested and give details of other tests, if any)

(h) Cage/Mean of conveyance

- (i) Type and number of decks
- (ii) Floor area
- (iii) Number of persons intended to be carried [ref., Reg. 76(ii)]
- (iv) Type of gates
- (v) Other particulars

(Cir. 40/1959, 33/1962 & Tech. 4/1986)

CMR 73 / MMR 80

1. Repair of winding drum shaft— During an inspection, the drum shaft of a winding engine 5.75 inches diameter was found to have cracked in two pieces at a place just inside the boss of the right-hand cheek. The place where the drum shaft had cracked was found to have some metal deposited by welding. The cracked section of the shaft showed crystalline growth underneath the keyway, radiating from the corner of the keyway towards the surface. The shaft had apparently cracked due to stress concentration imposed by welding, aggravated by the corner stress on the keyways. In another recent case also the drum shaft of a winding engine

had broken under similar conditions. As the breaking of such a vital component of a winding engine can result in very serious consequences, it is essential that drum shafts of windings engines are not repaired without express permission from D.G.M.S.

(Cir. 67/1963)

2. Winding engine drum shafts to be of axially drilled design— The winding engines for deeper pits have usually large size drum shafts. As is well known such drum shafts are liable to have forging stresses and manufacturing defects. In U.K., therefore, it is a statutory requirement that the drum shafts having 10 inches diameter or more should have a central axially drilled hole. This is with a view to relieve stresses during manufacture and to test the material for internal flaws etc. In some other countries the drum shaft is manufactured from stress free 'annealed steel, which is further relieved of stresses during manufacturing process. The material before its use is thoroughly tested by ultrasonic test for possible faults (e.g. shrink holes) occurring in the ingot structure.

The above practices may be noted for proper design and manufacture of drum shafts so that they do not fail in service prematurely.

(Cir. 42/1964)

3. Defects in drum shafts of winding engines— There was failure of winding drum shaft of a downcast pit winder. An inquiry into the incident revealed that the failure of the drum shaft was due to welding of the shaft as well as presence of looseness in the keyway. The depth of the key way was only 5/16" whereas as per accepted standards such as, British Standards Specifications, the minimum depth for the diameter of the shaft should have been 0.89".

In order to avoid similar incidents in mines it is recommended that

(1) Where the drum shafts have been repaired/welded in any way particulars of the same should be furnished to this office as per this office circular No. 67 of 1963.

(2) Proper attention should be given to the fitting of keys.

(3) The shafts having keyways with splayed edges should not be used. The keyways should be deep. Where keyways cannot be made deeper, two keys should be fitted.

(Cir. 45/1965)

4. Guarding against failure of winding engine drum shafts— Investigations into a number of incidents connected with breakage of shafts of winding engine drums, headgear sheaves, speed reduction gears etc. have revealed that in the majority of cases examined, the breakage occurred adjacent to either a key way or the journals where repair was done by welding on a portion of the shaft where its diameter was sharply reduced. The breakage of shafts were owing to fatigue of the material at the place of fracture. Fatigue can be accelerated at keyways, deep notches made by machines, portions with sharp variation in diameter, etc. by the stress concentration at such places. Fatigue can also be imposed by welding, if proper care is not taken during welding and the welded part is not subsequently normalised.

Currently, there may be in use for winding purpose several old engines, which were formerly used for haulage or similar purposes and the drum or gears shafts of which have been in service for nearly 15 to 20 years. These shafts are more likely to break due to fatigue.

In the interest of safety the following precautions with respect to selection, repairs and examination of drum, gear and sheave shafts shall be complied with:

(i) Repairs of shafts shall not be done by welding unless the job is executed under the control of an expert and the shaft is subsequently normalised in a recognised workshop. Further, the welded shaft shall be ultrasonically tested and certified to be free from defect. Each such repair shall be brought to the notice of this directorate, in writing, with details of the repair, heat-treatment and testing before the shaft is put into use after repairs.

(ii) The existing installations shall be carefully checked to ascertain if shafts repaired by welding, except as under (i) above, are in use. In case any such repaired shaft is in use it shall be replaced as early as possible.

(iii) Shafts of old engines shall be thoroughly checked and tested to ensure that they are free from defects.

(iv) While ordering shafts for new installations or as replacement parts for old ones, it shall be ensured that the shafts are made from suitable steel of tested quality and ultrasonically examined for defects. The keyways shall be made to standard dimensions and the shaft shall be free from notches and sharp changes in diameter.

(Cir. 47/1970)

5. Emergency Stop Valve on steam/compressed air operated winding engines—

Investigation into a few cases of overwind in steam operated winding engines has revealed that while hoisting was in progress the engine driver tried control the supply of steam to the engine but could not do so because the steam regulating valve accidentally became inoperative. The valve was either stuck up or one of its components failed. In the situation the supply of steam to the engine was not instantly stopped and the motion of the cages could not be controlled by the brakes. The driver lost presence of mind and failed to put the engine valve lever to neutral position and by the time steam was stopped by the screw type stop valve an overwind of cage occurred.

Since it is likely that the operation of steam regulating valve may get obstructed while the engines are working, the engine driver under unexpected situation may lose the presence of mind and that the supply of steam to the engine cannot be instantly stopped by the conventional screw type valve generally provided on the steam range, it is considered safe to provide a suitable non-screw type spring loaded stop valve, either electric solenoids operated or mechanically operated by levers, immediately before the engine regulating valve so that during any emergency the engine driver can easily and effectively cut off the supply of steam to the engine from his operating position. Installation of above said emergency stop valve will be useful with automatic contrivances as well.

Therefore, one emergency stop valve as described above before the engine regulating valve on each steam winding engine installation shall be provided.

This also applies to compressed air operated engines.

(Cir. 43/1970)

6. Maintenance of headgear pulleys—An incident occurred in one of the mines when the bearing block of one of the headgear pulleys was found to have worn out in the middle to such an extent that the block was cut into two sections and the headgear pulley shaft was found to be rotating on the bottom plate below the bearing block. Later the other headgear pulley bearing block was also found to have worn out considerably.

This incident brings to light of importance of regular examination and lubrication of the headgear pulley bearings. Headgear pulleys constitute a vital part of the winding installation and if not properly maintained can lead to serious accidents.

(Cir. 65/1963)

7. Installation and maintenance of headgear sheaves—The sheaves are not properly and regularly inspected by competent persons resulting in considerable damage to winding ropes working on the sheaves and at times accidents. Headgear sheaves have been found in use with excessively worn grooves, cracked or loose spokes which not only affect the winding ropes but are also very dangerous. The sheaves constitute a vital part of the winding installation and therefore, should be given necessary attention and care.

The Reg. 73(4) (b) of the Coal Mines Regulations, 1957 and corresponding Reg. 80(4) (b) of the Metalliferous Mines Regulations, 1961 specify that the grooves of the sheaves or pulleys shall be suited to the diameter of rope but this aspect is hardly checked either during the installation or during maintenance inspections.

The following shall be complied with in respect of all winding installations as every mine :—

(i) The sheaves should be sufficiently strong in construction to withstand the maximum pressure exerted by the winding ropes under most severe conditions, but should not be very heavy to cause slipping on the rope due to inertia.

(ii) The tread or the groove should amply support the rope and support up to 120° on the groove is considered satisfactory.

(iii) The sheave flanges should be strong to safely withstand the pressure of the moving rope and should be adequate to prevent the rope from slipping off the sheave.

(iv) For Round and Flattened strand ropes the radius of the sheave groove should be equal to the radius of the rope plus 10% and for Locked coil ropes the groove radius should be equal to the radius of the rope plus 5%.

(v) During inspection of the sheave inter-alia the shape of the groove and its tread thickness should be properly checked.

Following schedule of inspection should be normally followed for head-sheaves etc.:—

(1) The shape of the sheave groove and the minimum thickness of material on the tread (between two spokes) should be correctly measured whenever a new sheave is installed. For shape of the groove suitable plaster mould should be taken and a drawing of the groove can be made from the mould for future comparison. The measurements should be recorded in a paged register.

(2) The groove and the thickness of material on tread should thereafter be regularly checked at interval of not more than six months. Each time a drawing of the groove should be made and compared with the original drawing. Any variation, due to wear or any other reason, should be clearly recorded in the inspection register. The minimum thickness of material on tread should also be recorded.

(3) Inspection of the groove and tread should also be made nearly three months before the due date of replacement of the winding rope working on the sheave so that, if necessary, the sheave can be corrected or replaced for the new rope.

(4) Besides the above routine inspection of the general condition of the sheave, spokes, axle and bearings etc. should be made at least once every seven days and the findings should be recorded in the register.

All reports of inspections mentioned above should be examined by the Colliery Engineer and be signed by the Manager and the Engineer.

(Cir. 68/1973)

8. Breakage of cross-head guide of a winding engine—An investigation into an accident revealed that when the khalasi had released the brakes and pushed the lever in position with steam to lower the north cage, the north side piston moved slightly forward and then its advance was arrested by the accumulated condensed steam in the cylinders. Because the crank did not move, the force on the piston was transmitted to the cross-head resulting in breakage of the top guide which was comparatively not very secure and strong.

This incident brings to light the danger of condensed steam in the steam cylinders. Such water in cylinders can result in a serious damage to the winding engine and create a dangerous situation. It is therefore, necessary that the winding engine drivers should drain the condensed steam from the engine cylinders and also from the steam supply mains whenever winding engine is started after it had been kept stopped for a period of 30 minutes or more.

This incident should be brought to the notice of all winding engine khalasi at mines, and they should be instructed to take the above precaution to avoid recurrence of such dangerous incidents.

(Cir. 85/1963)

9. Construction of parts of winding gear—According to Reg. 73 of CMR 1957 every part of a winding installation should be of sound construction, suitable material and adequate strength.

Recently incidents of breakage of cast iron spur pinions, wheels of speed reduction systems and headgear sheaves have been reported. In one of these incidents, a fine crack was noticed by a Head-fitter on a spur-wheel near keyway on the boss of the wheel. The key was lightened and winding resumed. After a while when a loaded tub was being wound, the spur wheel broke into six pieces. On examination, the fractures near the boss of the wheel showed heavy carbon segregation, large grain formation and blow holes. The casting was, therefore, defective. It was further found that the wheel boss was loose on the shaft and the key was not matching with the keyway.

The casting of all parts like gear wheels, pinions, headgear sheaves should be made from good quality pig iron and the casting should not contain any flaws. All such parts should be made in reliable work-shops having proper facilities for manufacture and quality control. The casting should be made in accordance with the Indian Standard Specifications and only standard keys should be used in assembly of the parts on a shaft.

(Cir. 39/1964)

10. Proper locking of keys etc. on rotating parts of winding engine and its accessories—In an accident that occurred in a mine this year, 11 persons were injured when the cage in which they were descending a shaft 122 m deep landed heavily at the pit-bottom. The ascending cage also went above the banking level due to over speed. Two of the injured persons received serious injuries from the impact.

An enquiry into the accident revealed, amongst other things, that the 'automatic contrivance' for prevention of overspeeding and overwinding, though installed, had not yet been connected to the winding engine with the result that the winding engine driver was guided by the depth indicator and the warning bell only. But it so happened that the taper pin connecting the bevel pinion which drives the warning bell operating mechanism had fallen out of its position during the wind. The key connecting the worm wheel, which drives the pointer of the depth indicator had also fallen out of its position more or less at the same time. This unusual coincidence of circumstances had made both the warning bell and the depth indicator simultaneously inoperative. The attention of the driver was not drawn towards these defects until the wind was nearing completion and it was then too late for him to control the speed and prevent the accident.

Therefore keys fitted on the gears or elsewhere on any rotating part of the engine and its accessories and any taper pin used for fixing any rotating part on its shaft should be provided with suitable locking device to ensure that the key or pin cannot be accidentally displaced.

(Cir. 63/1964)

CMR 74/MMR 82

1. Cover over winding engines—There are still many mines where the winding engines are not housed in a proper room but are placed out in the open. In most of these cases, even a shelter or cover is not provided. As a result, the brakes get wet and slippery whenever it rains, and conditions become suitable for occurrence of over winds etc. All managements concerned therefore, should see that every winding engine is either housed in a proper room or is provided with proper cover overhead and on the sides.

(Cir. 28/1961)

2. Safety of winding engine brakes—In an incident at one of the coal mines, the suspension rod of the safety weight of a power brake of King type (manufactured by M.J.A. King) failed due to fatigue after 7 years use. It appeared that the fatigue had occurred due to stress concentration at the thread root.

It is recommended that wherever such type of brakes are in use the following precautionary measures should be taken against recurrence of similar incident :—

(1) An attachment should be fitted to the safety weight which would, enable application of the brake in case the suspension rod breaks. The attachment may comprise of a chain attached to the safety weight or a safety weight fitted on separate lever(s).

(2) A stress relieving groove should be made below the threaded portion of the suspension rod. The diameter of the groove should not be more than the root diameter of the thread, and the length should not be less than half the diameter of the thread root. The ends of the groove should be tapered. This should be done for all threaded members that are subjected to pulsating load.

(3) Stresses should be relieved by normalisation once at least in every two years.

(Cir. 9/1966)

3. Safety precautions in steam powered winding engines—Investigation into an overwind from a steam powered winding engine revealed that the steam range connected between the boiler (vertical type) and the steam regulating valve of the winding engine was not fitted with a steam separator. In between a few broken pieces of the guides of the stop valve situated near the boiler were carried with steam through the steam range to the engine regulating valve while the engine was in motion. This steam valve was fully opened. The engineman could not close the regulating valve to control the motion of the cages and the ascending cage got over wound with speed.

In order to prevent such accidents and to supply dry steam to the engines the following measures are recommended :—

(1) A suitable 'U' bend with a suitable drain valve, at the bottom of the bend, to drain any accumulation of foreign of matter etc. should be fitted if the steam range is long and a steam trap to deal with condensate should be fitted near the engine.

(2) When the steam range is not long, suitable steam separator or strainer should be fitted on the steam range near the engine. A steam trap may also be fitted with the separator.

(3) A suitable stop valve should be provided near and before the regulating valve of the engine.

(4) The steam regulating valve should be regularly opened and inspected and the drain valves be regularly drained.

You are requested to check the steam powered installations at your mines and ensure that the installations comply with the above recommendations.

(Cir. 44/1970)

4. Approval of steam operated brake—This is to inform you that a type of steam operated brake has been developed by M/s. R. Banerjee Engineering Works, Raniganj (Burdwan) of use on winding engines particularly on steam Winders. The proto-type has been inspected and its manufacture and performance have been found satisfactory.

Following are some of the salient features of the equipment.

The brakes are operated through a brake engine provided with suitable cataract for adjustable time lag in the application of the brakes; bypass arrangement of the cataract in the slow banking range; emergency stop and arrangement for connecting to automatic contrivance.

The equipment being found satisfactory it has been approved by the Directorate for use on steam winders to conform to the provisions of Reg. 74(2) of the Coal Mines Regulations 1957 and Reg. 82(2) of the Metalliferous Mines Regulations, 1961.

(Cir. 66/1970)

5. Approval of power operated brake for windine engine—This is to inform you that a type of power operated brake "SIMPLEX" developed and manufactured by M/s. Biswakarma Engineering Works, West Bengal, has been approved by this Directorate for use on winding engines.

Following are some of the salient features of the brake equipment :

The brakes are designed to remain 'ON' and are released through a brake engine, operated by steam or compressed air; a suitable cataract for adjustable time lag in the application and release of the brakes; brake engine controlling valves are cylindrical piston type with piston and piston rods of suitable alloy steel; emergency stop valve to cut off power to the engine in emergency and arrangement for connecting to automatic contrivance.

It has been found that in a number of winding installations the brakes do not conform to the provisions of the Reg. 74(2) (a) and (b) of the Coal Mines Regulations 1957 and Reg. 82(2) (a) and (b) of the Metalliferous Mines Regulations, 1961. Therefore, a power operated brake equipment can be used to make the brakes efficient and also to conform to the provisions of the Regulation.

(Cir. 21/1971)

6. Amenities in winding engine house—The following amenities should also be provided in every winding engine house :—

(1) There should be a proper seat for winding engine driver. The seat may be in the form of a chair with a proper back rest, and it should be reasonably comfortable (The design of the seat should not be such that the driver is tempted to lie down and sleep during comparatively inactive periods).

(2) The winding engine house should be adequately ventilated and lighted.

(Cir. 61/1964)

7. Accidents/incidents due to overwinding of conveyance in shafts—

1.0 An in-depth analysis of accidents/incidents due to winding system in mines during the years 1984 to 1988 has revealed that:

(i) Out of 90 accidents/incidents connected with winding operations, 25 i.e. 27.8% were due to overwinding (Appendices 'A' & 'B'); and

(ii) Out of the 25 cases of overwinding

- (a) 17 occurred in coal mines and 8 in metalliferous mines;
- (b) 24, i.e. 96% were due to improper maintenance of brake and failure of automatic contrivance (Appendix 'C');
- (c) 9 occurred in shafts having depth not exceeding 100 metres, 8 in shafts having depths between 101 and 200 metres and remaining 8 in shafts exceeding 200 metres in-depth (Appendix 'D');
- (iii) A number of defective practices were responsible for the above cases of overwinding. The most repeated amongst these were;
 - (a) Attempting to control the speed of steam winder by reversing the steam supply to the engines in absence of proper braking system, particularly when the conveyance was near the landing;
 - (b) Deliberately keeping the emergency brakes defunct by spragging the re-set lever of the automatic contrivance.

2.0 With a view to minimise accidents/incidents connected with winding operations :

2.1 Managements are requested to ensure that the winding installations fully comply with the provisions of Regulations 74(2), 74(4), 75(3), 76(6) and 76(7) of the Coal Mines Regulations, 1957 and in case of Metalliferous Mines with the provisions contained in Regulations 82(2), 82(4) 83(3), 84(6) and 84(7) of the Metalliferous Mines Regulations, 1961; and

2.2 It is recommended that :

2.2.1 automatic contrivance, including power brake, be provided with all winding engines used for man-winding;

2.2.2 suitable pit-bottom buffers be provided in all shafts used for man-winding in order to prevent injury to persons due to hard landing of cage-conveyance;

3.0 It is further recommended that each mining company should :

3.1 acquire and use testing facility for destructive and non- destructive testing of winding rope and suspension gear.

3.2 establish a well-equipped quality control cell which should not only ensure purchase/procurement of good quality equipment/apparatus, but should also monitor the performance of the same during use.

3.3 set-up a task force to survey all winders and winding installations and to frame and thereafter monitor implementation of a time bound programme for their renovation/replacement as deemed necessary; and

3.4 arrange for proper training for systematic testing and maintenance of the winding installations to be imparted to all those who are responsible for the up-keep of winding equipment, such as, engineers and supervisory competent personnel.

APPENDIX 'A' ACCIDENTS/INCIDENTS DUE TO WINDING								
Year	Fatal		Serious		Incidents		Total	
	Coal	Metal	Coal	Metal	Coal	Metal	Coal	Metal
1984	5	-	5	1	4	4	14	5
1985	4	1	3	2	4	3	11	6
1986	5	3	4	2	8	1	17	6
1987	2	2	5	2	7	1	14	8
1988	-	-	4	-	3	2	7	2
TOTAL	16	6	21	7	26	14	63	27

APPENDIX 'B' OVERWINDING IN MINES			
Year	Coal	Metal	Total
1984	1	1	2
1985	3	2	5
1986	4	1	5
1987	7	3	10
1988	2	1	3
TOTAL	17	8	25

APPENDIX -C' ANALYSIS OF OVERWINDING (CAUSE-WISE)			
Cause	Coal	Metal	Total
BRAKE NOT MAINTAINED	10	4	14
FAILURE OF AUTOMATIC	6	4	10
SUDDEN REVERSAL OF WINDER	1	—	1
TOTAL	11	8	25

APPENDIX 'D' ANALYSIS OF OVERWINDING (ALL MINES-DEPTHWISE)	
DEPTH OF SHAFT (M)	NO. OF OVERWINDS
0-100	9
101-200	8
201-300	2
301-400	3
401-500	1

Exceeding 500 TOTAL	2 25

(Cir. Tech. Sapicom 1/1990)

8. Incidents related to falling of cages in shafts— 1.0 In the recent past four incidents occurred in which cages fell down in shafts. Incidents of this type are fraught with serious danger to human life and thus are a matter of great concern for all of us.

2.0 Enquiries into the aforesaid incidents revealed that:

(a) The brake was not effective to hold the drum when maximum torque was applied in either direction thus contravening the provisions of Reg. 74 of the CMR, 1957, Reg. 82 of the MMR, 1961.

(b) The depth indicator was not reliable and also the dial gauge was not properly graduated to show the correct position of cage during its wind. Under these circumstances it is difficult for a winding engine driver to apply the brakes in time so as to bring the cage to rest appropriately thereby increasing the possibility of over-travel/over-wind.

(c) Automatic contrivance particularly the slow banking and over-winding devices, installed as required under Reg. 76(7) of the CMR, 1957/Reg. 84(7) of the MMR, 1961 were not maintained in proper working order.

(d) The winding rope was eccentric to catch plate opening.

(e) The cage/conveyance would not have fallen down in shaft had "Dogs" or other devices for holding the same in the event of over-travel/over-wind been provided above the top most landing or the guides, runners or receivers been sprung as required under Reg. 75(3) of the CMR, 1957/Reg. 83(3) of the MMR, 1961.

3.0 In order to avoid such incidents, the following recommendations are made :

(a) In shafts less than 100 metres in depth (where automatic contrivances are not provided) an over travel mark shall be permanently made at pit top structure. This mark shall be made in relation to the bottom structure of cage when the clearance between the top of rope cappel to the catch plate opening is at least 50 cms. This position shall also be marked on depth indicator dial prominently.

(b) In shafts more than 100 metres in depth (where automatic contrivances are fitted), while ascending cage travels above the top-most landing overwind switch shall be so set that in the case of over-wind the cappel band does not enter the catch plate opening. This mark shall be prominently made on pit top structure as well as on the depth indicator dial.

(c) When the cappel band has entered the catch plate, lowering of cage/conveyance shall be undertaken only in the presence and under the direction of Engineer or other Competent Person.

(Cir. Tech. Sapicom. 6/1985)

9. An analysis of a few shaft accidents with emphasis on role of contributory cause—A table showing the total number of fatal accidents and the fatalities resulting there from which

occurred in the coal mines under Dhanbad Region Nos. 1, 2 & 3 during the years 1970 and 1971 is given below:

Year	Total number of			Falls of Roof			Haulages			Shafts		
	Acci- dents	Fatali- ties	Sr. in- juries	Acci- dents	Fatali- ties	Sr. in- juries	Acci- dents	Fatali- ties	Sr. in- juries	Acci- dents	Fatali- ties	Sr. in- juries
1970	82	88	4	37	42	3	16	16	0	6	6	0
1971	71	94	21	34	49	13	9	9	0	7	8	2

It may be seen from the above table that 'falls of roof account for the largest number of fatalities (50%, of the fatalities in the two-year period of 1970 and 1971). Haulage, falls in shafts other than due to falls of sides, do not make an insignificant contribution by a tally of 8% of the total fatalities.

An attempt has been made in the subsequent paragraphs to analyse the factors which contributed towards some of these fatalities. The exercise starts with a dissection of accidents in shafts. It would be followed by a similar treatment of accidents due to haulage. By virtue of their importance, accidents due to 'falls of roof would get an exclusive review, which would be the last to follow.

You may find a slight departure in the approach towards analysing those accidents, greater attention being focused on the contributory factors, such as the defective practices in vogue at the collieries which led to the unhappy occurrences. For waging a successful war on accidents an understanding of the circumstances associated with an accident is as important as the direct action leading to it.

Accidents in shafts : Accident A—Consider why a pit bottom trammer who, during a full day in coal winding, had gone up to surface to drink water, should fall out of the cage while on the return journey. Admittedly, the cage gates were of a defective design or the on setter had failed to lower the cage gates before the commencement of winding. But surely there is plenty of space even in a single-tub cage for one person to remain inside it while it is in motion. A further probe revealed that the trammer was not carrying a cap-lamp or any other light. In fact, it was the practice at this colliery not to issue cap-lamps to pit-bottom trammers. In all probability, the trammer while moving inside the cage in total darkness to avoid getting wet from dripping water stumbled against the monkey catch with fatal consequences.

How could the accident have been avoided? The provision of cage gates of prescribed design and lowering them in position before commencing winding operation would no doubt have averted the accident. But the non-provision of a cap-lamp to the trammer was an equally important contributory factor. The plea of the management that there is adequate general lighting arrangement at the pit bottom and therefore it was not considered necessary to issue cap-lamps to them rings a hollow sound. What would happen if there is power failure—not an uncommon occurrence these days—or that the trammers are required to come out through a second outlet. It should also be carefully analysed why a pit bottom trammer has to leave his working place and go to surface during the shift.

Accident B—A contractor was asked to lower 4.2 metre long props at a certain shaft, on a weekly day of rest. For this job the contractor employed matti packing mazdoors with no previous experience of the work entrusted to them. The usual banksman and onsetter were not

employed leaving this task also to the matti packers. The work commenced and cage roof was removed, props were loaded in the cage. The loaded cage was lowered to pit bottom. When there was some difficulty in removing the props from the cage, discussion took place amongst the matti packers at the pit bottom. It was agreed that the cage should be slightly raised. While one of the persons was inside the cage, another transmitted three raps to surface, instead of the usual four raps connecting slow hoisting of the cage. The winding engineman commenced a normal winding. The persons at the pit bottom did not know how to stop the cage when they saw it shooting beyond the desired position. A short while later the props in the ascending cage knocked against the descending cage. The person, who was inside the cage, also fell off the cage along with the props.

This accident brings to light several weaknesses in the local management. First, the contractor should not have engaged people with no past experience of the job. In addition there was no competent person to guide the raw recruits at pit bottom; dispensing with the services of regular on setter and banksman perhaps to save payment of overtime wages to them, was a major factor in the causation of accident. Above all does the function of managerial personnel end with the award of a contract? The fact that they allowed the things to come to such a pass clearly proves that they had abdicated their functions.

Accident C—Tragedy struck one of three stowing mazdoors who were engaged for changing a 1.5 metres long leaking pipe of a 15 cm. diameter stowing range in a 212 metres deep shaft. It was Sunday, a weekly day of rest. The stowing incharge after issuing work order had gone home. So had the assistant manager after sanctioning work. The three mazdoors, seated on top of the cage, without the protection of safety belts, had removed the bolts and nuts joining the damaged pipe to other pipes. One person held the upper end of the pipe to be removed, the second person the lower end, while the third started pulling it out. The pipe suddenly eased out. All three lost balance. Two persons fell inside the cage and the third-one right up to the pit bottom landing.

On a weekly day of rest it is but natural to attend to one's family-needs and also to relax or to partake in recreational activities. The buck is therefore passed on from the higher authority to the lower till it reached the bottommost rung of the ladder. Being unable to shift the baby elsewhere they are tempted to finish job in as short a time as possible even if this means cutting the corners here and there. They do succeed in their efforts sometimes which gives them supreme confidence in their work and the laws of the game become an object of ridicule. It is this cavalier approach to the problem that makes some of them a victim now and then. Considering the small number of persons employed on Sundays on repairs/maintenance work in shafts and headgear, the small number of fatalities in fact represent a high fatality rate on the basis of only those people who are exposed to this hazard. Therefore, it is time that this important risky part of the mining operations was treated with the attention it deserves. A break up of the various jobs into their small components detailing how these should be done and ensuring that the safe and the best methods are followed is a must to tighten up the performance under this head.

Accident D—It was 7 p.m. on a Sunday evening. A typical mazdoor was seated on a horizontal member of a headgear frame, a manila rope tied round his waist, ready to tension a newly installed guide rope. A sharp shower started. He was asked to climb down, untying the manila rope from his waist. He commenced the descent but he slipped and fell down the shaft, 114-metres deep, meeting his end.

The partial darkness, the shower having made the headgear members slippery contributed to the accident. But this accident highlights the importance of extending protection to a person while he is climbing up or descending a headgear frame. In how many mines this is being practiced? Not many or not any. If we wish to learn a lesson at the cost of a human life now is the opportunity.

I earnestly seek your co-operation in putting to an end the practice of persons walking across the pit bottom landing. Year after year precious lives are lost on this account.

Accident E—A young and promising life was terminated on 24.2.1971 when a munshi, who started his mining career on 10.2.1971, was crushed below a descending cage. Either being over jealous or out of curiosity he invaded the landing to see why the cage was taking so long to give him an empty tub.

Accident F—An accident occurred when a banksman signalled the winding engineman to operate the engine without receiving signals from the on setter. A loaded tub which had only partially been caged ran back and fatally injured a trammer. How can such accidents be prevented? Being on the spot you should be able to critically watch the performance and actions of persons at key positions such as banksman. Add to it their general demeanor and family background. This may enable you to spot out those who may be victims of hallucination or some other psychological disturbances. They may either be engaged in less important jobs or a measure of check introduced in their functioning.

In the light of the above discussion please take a close look at the practices at your mine. And, if it reveals any weakness, be prompt in remedying it.

CMR 75/MMR 82

1. Emergency Stop Valve on Steam/Compressed Air Operated Winding Engines—This is to inform you that investigation into a few cases of overwind in steam operated winding engines has revealed that while hoisting was in progress the engine driver tried to control the supply of power to the engine but could not do so because the regulating valve accidentally became inoperative. The valve was either stuck up or one of its components failed. In the situation the supply of power to the engine was not stopped and the motion of the cages could not be stopped by the brakes. The driver lost presence of mind and by the time supply of power was stopped by the screw type stop valve over-wind of cage occurred.

Since it is likely that the operation of regulating valve may get obstructed while the engines are working, the engine driver under unexpected situation may lose the presence of mind and that the supply of power to the engine can not be instantly stopped by the conventional screw type stop valve generally provided on the steam/compressed air range it is considered safe to provide a suitable non-screw type, spring loaded, stop valve either electric solenoid, operated or mechanically operated by levers immediately before or after the engine regulating valve so that during any emergency the engine driver can easily and effectively cut off the supply of power to the engine from his operating position. Installation of above said emergency stop valve will be useful with automatic contrivances as well.

All managements are requested to provide at an early date one emergency stop valve as described above on each steam/compressed air operated winding engine installation.

(Cir. Tech. 2/1975)

2. Skip winding equipment in inclined shaft/winze—In respect of the Skip Winding installation in an inclined Shaft/Winze, the following guidelines be adopted with immediate effect: -

(1) The life of draw bars and hangers of the skip/conveyance shall not be more than three years if they are made of mild steel as per I.S. 226.

(2) No winding rope shall be used or continued in use if the static factor of safety is less than ten times the maximum static load.

(3) The haulage track of skips/conveyances shall also be provided in accordance with Reg. 83(2) (a) and shall be examined in accordance with Reg. 91(1) (b) (ii) of MMR 1961. Report of such examination shall be maintained in accordance with Reg. 91(2).

(Cir. Tech. 14/1982)

3. Distance between the cage receivers at the pit top—It has been noticed that sometimes the distance between the cage- receivers at the pit-tip is much more than the distance between the keps-seats when the keps are in the 'ON' position, with the result that if the suspension chains are loose, the cage can move off the keps and move down suddenly in the shaft to a depth till the suspension chains become taut. In a recent accident, while two surface trammers were engaged in taking out tubs from a cage, the cage moved off the keps and fell down a distance of about 2.7 m. One of the trammers lost his life by falling off the cage and down the shaft. While in this particular case the cage moved down such a length mainly because the suspension chains were very loose and the engine brake was not 'ON' when the cage fell with the result that the sudden jerk made the engine more slightly, it would be advisable to take the following precautions:

(1) Clearance between the cage and the receivers on either side should be less than the maximum length of the cage seat on the keps.

(2) When the cage is on the keps, the winding engine brake should be locked in 'ON' position.

(Cir. 15 & 15A/1962)

4. Shaft signaling—According to Reg. 75(1) of CMR 57 and 83(1) of MMR 1961 the signals may be transmitted either by mechanical or electrical means. However, in cases where winding depth is more than 150 metres, it is considered desirable that two independent means of transmitting the signals should be provided between the top of the shaft and the landing(s) in the shaft. One of the signaling arrangements must be by electrical means.

(Cir. 35/1966)

5. Lowering heavy material in cages—Investigation into a few incidents of overwind in shafts has revealed that while lowering heavy loads like props, machinery etc. in the shaft, care was not taken to suitably balance the load in the other cage to eliminate unbalance as far as possible and the descending cage was landed roughly with speed and the ascending cage was over wound causing at times damage to the headgear and its fittings. In winding installations

where automatic contrivances are fitted and are maintained in proper working order even though an overwind may be averted yet the winding ropes and the cage suspension gears can be subjected to a heavy shock load due to sudden braking of the drum while running at a high speed.

In order that such accidents are averted, following precautions shall be taken and necessary written instructions to persons concerned shall be issued: —

- (1) Heavy loads should not be lowered except under the supervision of a competent person who will ensure that the material is properly secured in the cage.
- (2) Before lowering the loaded cage he shall ensure that the other cage has been suitably loaded for balance.
- (3) The competent person supervising the operation shall be present till the completion of entire operation including unloading in a midset when the same is required to be done.

(Cir. 32/1968)

6. Installation and maintenance of rope guides—Majority of winding pits in India are provided with wire ropes to guide the cage or other means of conveyance for its safe travel in the shaft but it has been found that the guide ropes attract and are given least attention towards installation and maintenance. A number of accidents have resulted due to either breakage of a guide rope or due to sticking of the cage/bucket or the rider on a guide.

The following salient points are hereby brought to your notice towards installation and maintenance for rope guides :—

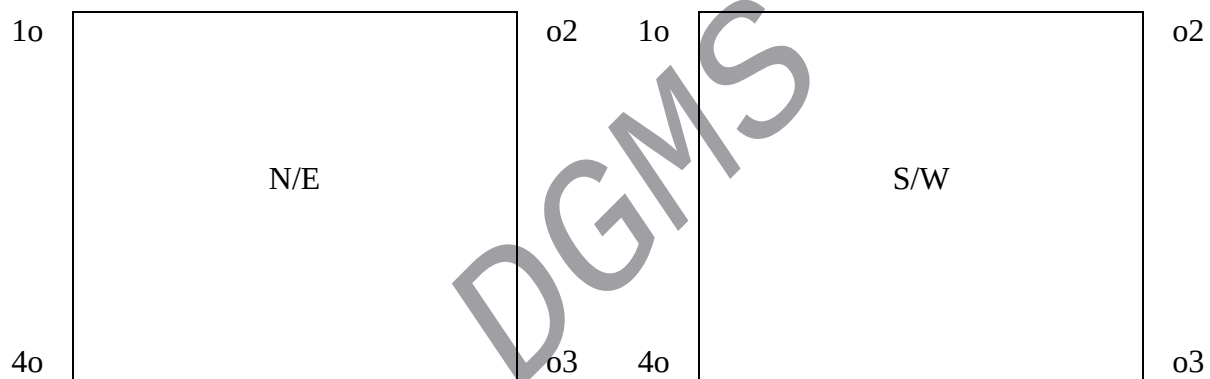
- (1) Guide rope attachment at the top and bottom should be of adequate strength to not only safely suspend the rope but to withstand normal and abnormal vibrations/jerks likely in the guide from various factors.
- (2) The top/bottom fixtures should be provided with suitable tensioning arrangement so that the required guide tension can be maintained during its use.
- (3) Suitable extra length of guide rope should be kept on top for future lowering and the extra length should be securely clamped on suitable clamps on the headgear so that the fixture can safely withstand the load of the guide rope during examination of its suspension fixtures or during tensioning of the guide rope.
- (4) The top fixture should be provided with a suitable device by which the guide rope can be given a part turn to shift position of outer wires/rods coming in contact with the guide shoes. This will provide uniform wear on the outer wires/rods of the rope during its service life.
- (5) Guide rope must be installed to remain vertical. Verticality of rope is very important.
- (6) Bottom attachment, if by cheese weights, should be staggered in weight to eliminate resonance in vibration.

(7) Bottom attachment whether cheese weights or clamps should be kept well free from contact or any debris in the sump for which suitable arrangements must be provided through drains, etc., and suitable inspection gallery, ladderway etc., for regular inspection for the attachments.

(8) Guide rope should be properly lubricated at regular intervals. Frequency of lubrication will depend upon the shaft condition and the lubricant. In fairly dry shaft the frequency may be one month. Suitable lubricant adhesive to the steel rods should be used. Lubricant should be free from acid. Properly lubricated guides will be not only protected against corrosion but also reduce abrasive wear.

(9) Each guide rope should be properly inspected at regular interval but not exceeding one month. Inspection of the portions where the cage/means of conveyance normally rests on landings, where guide is exposed to ventilation exhaust, mid shaft position, top and bottom portions in or about the fixtures should be specially inspected for wear, corrosion, broken wire etc.

(10) Proper record of each guide should be maintained in separate bound register where proper identification of each guide shall be shown by a sketch such as.



Reference of guide rope of North/East cage may be given in inspection report as N1, N2 or E1, E2 etc., similarly for the other cage.

In inspection report suitable columns should be made on following heads:—

- (1) Name of mine and pit number.
- (2) Name of supplier of guide rope.
- (3) Original nominal diameter (mm.), construction of guide rope and date of installation.
- (4) Type—Galvanised/Ungalvanised.
- (5) Pit condition:
 - (a) Dry/wet
 - (b) Downcasting/Upcasting

- (c) Pit water—(PH value) when last tested
- (6) Top and bottom fixtures—clamps/cheese weights
- (7) Measurement of diameter of rope
 - (a) Portions where measurements taken
 - (b) Maximum and minimum diameter (mm.)
 - (c) Broken wire if any
 - (d) Pitting/corrosion
 - (e) % reduction in diameter with respect to original diameter when new
- (8) Guide rope should be replaced—
 - (a) When reduction in diameter is between 12% and 15% of the original diameter when new,
 - (b) 12% reduction in diameter if the rope is effected by corrosion of medium degree and extended to most of the portion in the shaft,
 - (c) Corrosion of heavy degree,
 - (d) 15% reduction in diameter of the rope any where along the length,
 - (e) When the outer rods have lost more than one third (35%) of their depth by wear or corrosion or both or the rope no longer appears safe for use due to any defect such as broken wires etc.

This circular shall apply to rubbing ropes also.

(Cir. Tech. 11/1976 & 6/1982)

7. Provision of cage catcher, pit bottom buffer and automatic contrivance—A Committee consisting of representatives from DGMS, BCCL, ECL, TISCO, CMRS and CMPDIL was constituted to look into the requirement of Cage Catchers, Pit Bottom Buffers and Automatic Contrivance. The Committee has since concluded its deliberations. The salient features of the recommendations of the Committee are as follows: —

1.0 Cage Catcher: Considering the fact that there had been a few cases of free fall of cage after overwinding in the past, the provision of cage catcher as required under Reg. 75(3) of Coal Mines Regulations 1957 and Reg. 83(3) of Metalliferous Mines Regulations 1961 should be complied with.

1.1 Whereas for the new headgear installations, sophisticated design of cage catchers having shock absorbing units should be provided, in the existing headgears where there is problem of space, simpler design of cage catchers with adequate strength could be provided.

1.2 Mining companies should decide upon the specifications of the cage catchers depending on the headgear design.

Drawings of a simple design of cage catchers being used at some of the mines could be seen at/collected from the mechanical wing of D.G.M.S. Dhanbad for guidance and further development.

2.0 Pit Bottom Buffers: Use of Pit Bottom Buffers was recommended by the Markham Court of Enquiry. In U.K. about 50% of the shafts had been provided with buffers.

Taking into account all factors involved, the Committee recommended that, in the first phase. Pit Bottom Buffers should be provided in all new winding installations where the winding depth is 200m or more and the same should be provided in the shafts where there is history of frequent overwinding irrespective of depth.

2.1 In designing the stroke of the buffers, it should be ensured that the maximum deceleration is 25g for 40 milliseconds and the Buffer comes to its original position automatically even with full designed load on the cage.

2.2 Adequate facilities should be provided to keep the sump clear for safe working of pit bottom buffers and such facilities should be thought of at the planning stage itself.

3.0 Automatic Contrivance: Since there were instances of overwinding even in shafts having depth less than 100 m, automatic contrivance should also be provided in man riding shafts having depth between 75m and 100m in a phased manner.

4.0 Man Winding Speed; Maximum winding speed specified in DGMS instruction dated 10.9.1959 issued under Reg. 76(7) (a) of the Coal Mines Regulations, 1957, need not be revised. Higher man winding speed may be considered on merit of the case depending on provision of rigid guides, slow and fast brakes etc.

5.0 Managements are advised to initiate suitable action for early implementation of the above mentioned recommendations of the Committee, in all mines where applicable, for better safety of work persons.

(Cir. Tech. 1/1993)

CMR 76/MMR 84

1. Fixing of the Detaching Plate or Bell of Safety Hook in the headgear—It is necessary always to support the detaching plate or bell in such a manner that before its passage into the detaching plate or bell, the safety hook is not obstructed and is not liable to be fouled by any supporting joist or rail. In particular, the gap between the joists or rails supporting a detaching plate or bell should be considerably wider than the overall span between the wings of the safety hook.

(Cir. 13/1961)

2. Dangerous occurrence due to mis-match of Detaching hook and its catch plate—

Recently a serious dangerous incident occurred in a mine involving fall of cage after overwind. During overwinding of cage, the detaching hook got detached after its wings hit the catch plate but the hook in detached condition could not rest properly on catch plate as resting area of projected fins on catch plate was very less; the fins broke and the cage had a free fall till it rested luckily on the keps.

There had been similar incident in the past also when the cage broke the keps and had a free fall in shaft causing total devastation.

Fortunately persons were not in the cage on either occasion so major accidents were avoided. In the earlier case, lower capacity detaching hook was used whereas the catch plate of the earlier detaching hook of higher size was allowed to remain; in the later case, there was some mismatch in detaching hook and catch plate at some level.

As a safe practice, after detachment of detaching hook, projected fins of the hook must sit on the catch plate having *adequate resting area* on both sides. To have this adequate resting area, clearance between catch plate hole and detaching hook width should not exceed 4mm. *While purchasing equipment, a copy of the approved drawing may be collected from the manufacturer.* However for a ready reference the table given below may be useful.

TABLE

Sl. No	SWL of detaching hook	Width of detaching hook	Bore of catch plate	Thickness of catch plate	Min. resting area of projected fins on either side of hole of catch plate
1.	5 & 8 tonne	178mm	181mm	25mm	430 Sq. mm
2.	10 tonne	203 mm	207 mm	25 mm	700 Sq. mm
3.	12 tonne	254mm	257 mm	32 mm	850 Sq. mm

In future, the following recommendations are to be complied with strictly while *installing new suspension gears and during subsequent maintenance operations—*

- (a) the capel should pass smoothly through the catch plate bore,
- (b) the catch plate shall be fitted properly so that the winding rope remains at its centre of catch plate hole and also the *chamfering of catch plate* around its hole is placed downward to facilitate smooth entry of capel into the catch plate in case of overwind.
- (c) The catch plate shall be so installed on girders that in case of over winding, no part of the structure obstructs the detaching hook to enter the catch plate holes smoothly.
- (d) Catch plate is a part of detaching hook so it must have the same identification number as the detaching hook supplied with it.
- (e) Before installation of detaching hook, engineer shall measure the fin to fin distance of detaching hook in detached condition and shall also measure catch plate hole dia and the extent of resting area of projected fins on both sides of catch plate hole shall be recorded.

(f) As required under Regulation 81(2)(a) of Coal Mines Regulations 1957 and Regulation 89(2)(a) of Metalliferous Mines Regulations 1961, the detaching hook shall be taken apart for examining wear and tear once at least in every six months and during such process *copper pin* of the detaching hook *shall be replaced* by a new one having identical specification and dimensions. The replaced copper pin shall be *checked for any partial shear*. If any partial shear/abnormal indentation is observed, the matter must be referred to manufacturer of the detaching hook as well as to this directorate to ensure its suitability for further use of the detaching hook.

Such resting area and position of catch plate shall be rechecked during *each recapping* of winding rope and the measurement shall be recorded. The resting area of projected fins on either side of catch plate hole as mentioned above shall not be less than what has been indicated in the table.

[Cir. (Tech.) 5/1997]

3. Automatically Recording Speed Indicators of indigenous make— The design for automatically recording speed indicator (Patent No. 72361), submitted by Shri Deoji Mawji Pitroda C/o Khimji Dossa & Sons, Lower Upper Jharia Colliery, P.O. Jharia has satisfied the necessary tests at the Central Mining Research Station, Dhanbad.

The above apparatus with a suitable clock mechanism for time-based speed graph incorporated in the apparatus, is now approved for use with winding engines in the coal mines.

(Cir. 23/1962)

4. BGML's Electronic Automatic Contrivance Cum Speed Recorder—M/s Bharat Gold Mines Ltd., Suvama Bhawan, P.O. Oorgaum, Kolar Gold Fields-563120 (Karnataka State) have been granted permission vide No. Mech. (HQ)/App/BGML/83/AC/765/10393 dt. 21st July 1983 to manufacture and supply Electronic Automatic Contrivances cum Speed Recorders for use in mines subject to the following conditions which may be amended at any time if considered necessary in the interest of safety.

Conditions—(1) The Electronic Automatic Contrivances cum Speed Recorders should fully conform to the design and the details submitted in the drawing(s). Any modification made hereafter in the contrivances cum recorders should be immediately communicated to this Directorate and its approval should be obtained.

(2) The material used in the manufacture should be of standard quality conforming to the national standards where available for such materials. The manufacture should be based upon sound engineering principles and should give evidence of good workmanship.

(3) A detailed scheme of inspection and quality control of the components and assembly should be drawn out to ensure that the finished product is in no way inferior to the approved one. This Directorate should be informed of this scheme of inspection and quality control.

(4) Competent personnel should be employed for the execution of the scheme of inspection and quality control and should as far as possible be independent of the production department so that their decisions are not influenced by considerations other than the quality of product.

(5) Adequate and effective testing facilities should be provided to ensure accuracy of the product.

(6) Complete and reliable records shall be kept to show that the equipment is checked at various stages during manufacture to ensure that it is made according to the specifications and the quality is maintained.

(7) An effective system shall be maintained for identification, segregation and disposal of the materials and components rejected during inspections of the quality control section.

(8) Representative of the D.G.M.S. shall have the right to enter the works, make inspections and enquiries as considered necessary to ensure that proper quality control is exercised. He shall also have the right to draw samples for independent testing, if necessary.

(9) Every unit shall be supplied with instructions regarding proper use, care, operation and maintenance of the equipment. On every unit a suitable name plate shall be fixed in a conspicuous place which shall bear the approval mark of the D.G.M.S.

(10) If at any time any one of the conditions subject to which this permission has been granted is violated or not complied with, this permission shall be deemed to have been revoked with immediate effect.

(Cir. Approval 1/1985)

5. Maximum man-winding speeds—It is considered that, as a general practice, the following speeds should be taken as maximum speeds of winding for man-winding purposes [Reg. 76(7) (a)].

Depth of shaft	Maximum rope speed during man-winding
Upto 100 metres (such shafts are not required to be fitted with an automatic contrivance)	2 m/sec.
101-300 m	4 m/sec.
301-500 m	5.5 m/sec.
501-700 m	7 m/sec.
701-1000 m	8 m/sec.
1001-1500 m	10 m/sec.
Above 1500 m	12 m/sec.

Though the Regulation does not apply to sinking shafts, the maximum man-winding rope speed in such cases may be fixed at 1.5 m/sec for depths up to 150 metres (when no guides are provided), 2.5 m/sec for depths of 151-500 metres and 3 m/sec for depths exceeding 500 metres.

(DGMS instruction dt. 10.9.59).

CMR80 / MMR 88

1. Use of galvanised winding ropes in wet situations— Experience of the performance of winding ropes used on wet shafts particularly up cast ones shows that the ropes are adversely affected by moisture in the shaft. The moisture affects the wires, the core and their lubrication

considerably and ropes have to be discarded prematurely due to corrosion and pitting. Use of galvanised ropes in such situations would be beneficial and desirable. It is therefore, recommended that suitable galvanised winding ropes should be used, as far as possible, in wet shafts particularly upcast ones.

(Cir. 23/1972)

4. Trial installation of indigenous winding ropes—

(1) Conditions of Approval should be carefully noted.

(2) The users of indigenous winding ropes should maintain a detailed record of the defects, troubles etc. if any, experienced by them in the use of the ropes, and keep this office informed.

(3) The date when an indigenous winding rope is installed should also be intimated to this office, giving amongst other particulars, the name of the manufacturer, name/number of pit, and the winding depth.

(4) As per one of the Conditions of Approval, 25% of the experimental winding ropes shall be taken off from service after 1 year's use at pits having winding depths between 100 and 200 metres, and after 9 months use at pits with winding depths less than 100 metres. The ropes so taken off shall be subjected to break-down tests at the Central Mining Research Station, Dhanbad or any other approved test house. The names of the mines so selected will be intimated in due course. At all such pits, the manufacturers concerned have agreed to replace the old winding rope with a new one at 50% of the original selling price. It may be added that all the remaining experimental winding ropes shall also be subjected to breakdown tests after they have given service for 2 years, if they have been used on pits having winding depth between 100 and 200 metres or after 15 months use in the case of pits having less than 100 metres of winding depth.

(5.1) In addition to the detailed breakdown tests mentioned in the preceding paragraph, regular samples of the winding ropes, at least three metres in length, should be cut off from the ends before the rope is installed and again at the time of recapping at intervals of 4 months when the winding depth is between 100 and 200 metres, and at intervals of 3 months when the winding depth is less than 100 metres. In all such cases the rope samples should be tested at an approved test house for the following tests :

- (i) Breaking load test on complete rope;
- (ii) Tensile test on individual wires;
- (iii) Torsion test on individual wires;
- (iv) Reverse bend test on individual wires;
- (v) Micro-examination of wires;
- (vi) Length of lay.

(5.2) A record of the results of the tests should be kept, and a copy of the Test Certificate forwarded to this office. The use of the winding ropes shall be discarded if the factor of safety falls below 10 or if there is reduction in the thickness of outer wires by 35% or more of the original thickness, or if there is any doubt about their safety for any reason whatsoever.

(6) The winding ropes should be properly lubricated, handled and stored as per the recommendations of the manufacturer. In this connection your attention is also invited to the Code Practice for the selection, installation and maintenance of wire ropes recently published by the Indian Standards Institution.

(Cir. 22/1966)

5. Facilities to manufacturers of indigenous winding ropes— Recently it has been brought to the notice of this Directorate, that the various manufacturers are not getting desired facilities for conducting the inspection of winding rope(s) which is obligatory on them. It is also stated by them that the location and the date of installation of such rope(s) are not brought to their notice. The inspections by the manufacturers have been incorporated for the benefit of users and you are required to avail of the same.

Managements are requested to extend whole hearted co-operation to the manufacturers. It is also requested to inform them immediately the date of installation of each such Indigenous winding rope(s) installed at the mines to facilitate inspection by the manufacturers or their authorised representatives.

(Cir. Tech. 6/1979)

6. Conical white metal rope capps for winding—Reg. 80(5) (d) of the Coal Mines Regulations, 1957 specifies that the tapered portion of the socket shall not be less than 8 times the diameter of the rope. The matter was examined while according approval to indigenous manufacture of cage suspension gears and it was found that adherence to the above specification with adequate angle of taper in the basket of the cappel may not provide enough clearance in the opening of the detaching plate of safety hooks of smaller capacity. In order to obviate the problem without affecting the strength for capping it was decided that—

(1) For ropes up to 26 mm diameter size the taper length of the basket of conical white metal type cappel shall not be less than $6\frac{1}{2}$ times the nominal diameter of the rope and for rope size bigger than 26 mm diameter the taper length shall be generally in accordance with the specification of the aforesaid regulation.

(2) The angle of taper in the basket of the socket shall not be less than $4\frac{1}{2}^\circ$.

The N.C.B. specification referred above specifies a taper length of about 7.3 times the diameter of the rope and angle of taper to about $4\frac{1}{2}^\circ$.

(Cir. 37/1974)

7. Application for extended use of winding ropes under Reg. 80(4) of CMR 57— It has been observed from applications for extended use of winding ropes in coal mines, that necessary information in respect of the ropes is not furnished. You are requested to furnish information as in Annexure along with application for extended use of the rope beyond permitted period.

Annexure

1. Name of Colliery.

2. Pit number and identification of rope.
3. Whether rope life has been restricted to less than 3 1/2 years; if so, give period.
4. Reason, if any, for restriction of rope life.
5. Date of installation of the rope.
6. Diameter and construction of the rope (new rope).
7. Date when the sample was cut for testing.
8. Condition of shaft : Upcast/Downcast/Dry/Acidic water. (Strike out what is not applicable).
9. Ratio Pulley tread dia : Rope dia. Ratio Drum dia : Rope dia.
10. Top rope or bottom rope.
11. Whether the sample of the rope has passed over the headgear pulley during winding.
12. Whether rope samples have been previously tested (if tested, attach test reports).
13. Reason for testing the sample.
14. Winding duty (coal or men).
15. Average number of winds per day.
16. Results of the monthly examinations (Dia. and pitch of the rope). Give last three examination reports.
17. Observations during examination of the recapping samples.
(Cir. 77/1963).
18. Any other observation regarding condition of the rope (Broken wire/wavyness/corrosion/pitting on wires etc.)
(Cir. 26/1969)

8. Permission for Use of old winding ropes — Certain mine managements make use of winding ropes once used and removed from service, for winding purpose in the same or other installations without obtaining permission from this Directorate. Such instances naturally do not come to the knowledge of this Directorate unless detected by its officers during inspections. In a number of cases it has been found that the ropes developed serious defect within a short period of their use again and if they were allowed to continue they might have resulted in accidents. Accidents were, therefore averted by timely detection and removal of the ropes from service. Such practice is unsafe and is very undesirable.

In the interest of safety, any length of winding rope that has been once used and removed from any installation for whatever reasons should not be used again on the same installation or any other installation for the purpose of winding unless permission is obtained from this Directorate. In case of emergency, however permission of the D.G.M.S. or the J.D.M.S. concerned should be obtained and soon after the matter should be regularised by obtaining a written permission from the Directorate.

In case of Coal Mines all such applications should be supported by test certificates of two samples from the rope, one from each end cut not more than three months prior to the date of application and tested comprehensively in an approved test house.

For non-coal Mines all such applications should be supported by test certificates of two samples drawn from the rope one from each end, when the rope has been used for winding depth not exceeding 500 metres or when rope ends were changed during its use; but where rope has been used for winding from deeper depth and rope ends have not been changed during use, only one sample from the **cappel** end may be tested. The samples should not be drawn more than 3 months prior to the date of the application and be tested comprehensively in an approved test house.

(Cir. 40/1970)

9. Particulars of winding ropes and re-capping—The particulars of winding ropes etc. should be recorded and the report of periodical recapping etc. made in proforma given below:

Particulars of Winding Ropes

- (a) (i) Name and address of Manufacturer
- (ii) Name and address of Supplier
- (iii) Particulars of Purchase (date etc.)
- (b) Particulars of Rope
 - (i) Number of Certificate (attached)
 - (ii) Quality
 - (iii) Construction
 - (iv) Diameter
 - (v) Breaking load
 - (vi) Length of Rope
- (c) Particulars of Use
 - (i) Date of Installation
 - (ii) Place of Installation
 - (iii) Maximum static load attached to the rope
 - (iv) Factor of Safety [(b) (v)/(c) (iii)]

(v) Diameter of headgear pulley

(vi) Pulley/Rope ratio

(vii) Diameter of winding drum

(viii) Drum/Rope ratio

(ix) Angle of deflection of the rope from the vertical plane of headgear pulley

(x) Particulars of Safety Hook etc. and date on which first installed

(xi) Due date for replacing the rope [within 3 1/2 years —Temp. Reg. 4(5)]

(d) (i) Name and designation of competent person authorised to examine the ropes etc.

(ii) Signature of competent person (with date)

(iii) Counter signature of Manager (with date)

Particulars of Recapping of Winding Ropes

		1st	2nd	3rd	4th	5th	6th
(i)	Date of recapping						
(ii)	Length of rope cut at the time of recapping						
(iii)	Whether the cut piece was tested at any approved test house? (If so, details of the test-results should be given here with a reference to the certificate number)						
(iv)	Due date for next recapping						
(v)	Date and particulars of any overwind(s) during previous six months.						
(vi)	Signature of competent person (with date)						
(vii)	Signature of. Manager (with date)						

(Cir. 1/1956)

Record of particulars of wire ropes—It has been reported by manufacturers of steel wire ropes that in the rope records maintained at the mines inter alia the name of the manufacturer of the wire rope is not recorded.

In this connection attention is drawn to Reg. 80(3) (a) and 91(3) of the CMR 1957 and corresponding Reg. 88(3) (a) and 99(c) of MMR 1961. The service engineers of rope manufacturers are finding it extremely difficult to locate ropes for inspection, follow up and record.

It is, therefore, requested that all records of winding and haulage ropes should be maintained to provide following particulars:—

1. Name of the rope manufacturer;
2. Size of rope (mm);
3. Type (Round strand/flattened strand/locked coil);
4. Construction of rope;
5. Quality of steel (Imported/Indigenous);
6. Tensile strength (Kgf/mm²);
7. Breaking strength (Tonnes);
8. Total length (Metres);
9. Date of installation and date of its receipt and Indent No.
10. Due date of replacement;
11. Reasons for premature replacement (if any);
12. Period of extension obtained (Reference of permission letters to be given);
13. Dates of recapping;
 Note: Examination report of rope samples cut during recapping should be separately maintained.
14. Remarks, if any. Type of storage etc.

(Cir. Tech. 4/1976)

10. 'Bent Wire' type capels prohibited for winding purposes—Accidents have indicated that bent wire type rope capel is not suitable for winding purposes. To make a proper job, this type of capping requires exceptional care which can usually not be given in a mine. Therefore wherever a 'bent wire' type capel is used with a winding rope in any mine, it should be replaced with a proper white metal capping of either the tapered block type or the reliance wedge type at an early date. Till this has been done, the 'bent wire' type capel should be recapped at intervals of not exceeding two months.

(Cir. 12/1961)

11. Correct procedure of making White Metal Capel—As is well known, the white metal type of capel is most satisfactory, and can be made to take the full breaking load of the rope. However, if such a capel is not made properly it can also be a source of danger as happened in a case recently when due to white metal not properly gripping the rope and the bent back wires, there was relative movement between the bent back wires and the main rope inside the capel leading to fatigue in bent back wires which cracked at the turn over portion and the rope inside the capel snapped;

It is very important that wherever white metal capel is used whether in winding or haulage, necessary precautions should be taken to make the white metal Cappel in a proper manner. In this connection an extract from "The Ropeman's Handbook" published by the National Coal Board, U.K. is reproduced below. It shows the correct method of making white metal cappel, which should be strictly followed to avoid accidents.

Extract from the Ropeman's Handbook

The way to make the White Metal Cappel is as follows :—

1. Before cutting off the old cappel or rope end, fit sufficient temporary seizing or clamps to prevent the rope from "kicking" (loosening its lay) when cut through. With locked coil ropes, clamps are absolutely necessary and about four clamps for every inch of rope diameter should be used.
2. Thread the socket onto the rope and push it along out of the way.
3. Seize the rope with soft iron wire for a length XY [Fig. 1(a) equal to twice the diameter of the rope, leaving the rope end free of this seizing for a length YZ equal to the length of the socket barrel less half a rope diameter. Since copper wire is liable to cause corrosion of the steel rope wires, soft iron wire, either tinned, galvanised, or zinc coated should always be used for seizing ropes.

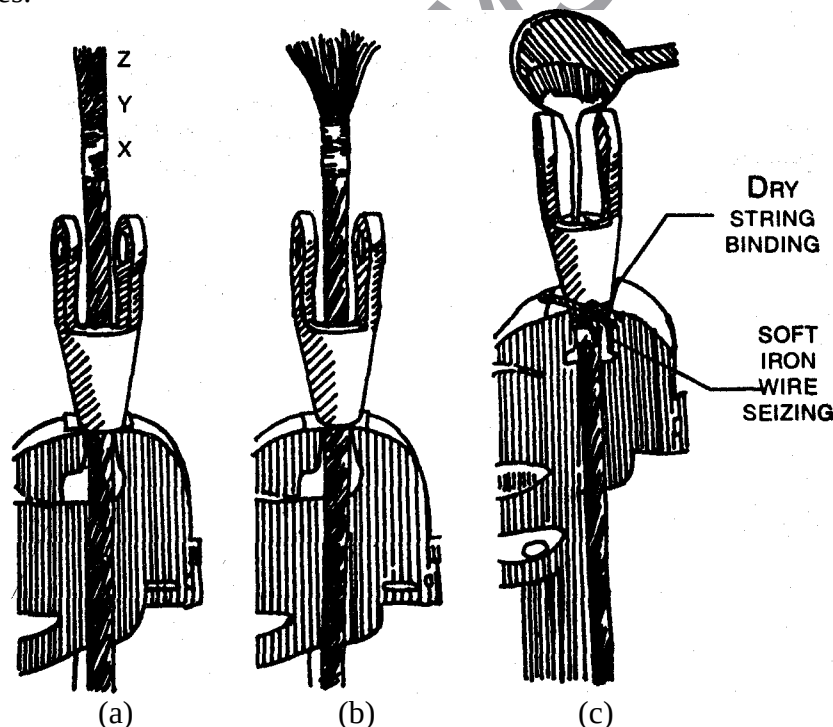


Fig. 1 : MAKING A WHITE METAL CAPPEL

4. Unlay the rope end beyond the seizing, separate all the wires out into a brush, but do not bend any of them too sharply at the seizing and do not straighten the wires. Cut out the fibre core or cut as deep into the brush as possible [Fig. (b)].

5. Clean all the wires carefully with petrol, emery cloth etc. and remove all dust and grease before going any further. This cleaning is most important. Do not let the petrol run into the unopened rope or it will wash out the lubricant and allow corrosion to occur next to the capel.

6. Pull the brush or opened wires into the socket and fix the socket upright in a soft jawed vice or clamps with the large end up, ready for pouring the metal. See that the rope hangs straight down under the socket for a length of at least 36 rope diameters [Fig. 1(c)]. With large ropes it may be necessary to do the capping at bank level to get sufficient rope under the upturned socket.

7. Make a dry string binding round the rope at the small end of the socket to prevent the molten metal from escaping [Fig. 1(c)]. Don't use damp clay for this purpose as it will give off steam and may cause blow-holes in the metal.

8. Heat the socket evenly with a blow lamp to a temperature of 212°F (100°C), the temperature of boiling water. At this temperature drops of water placed on the socket will fly off.

9. Dust powdered resin among the wires in the socket. This acts as a flux and helps the metal to grip the wires.

10. Heat the standard white metal to temperature of 650°F (350°C); and pour it, in one ladleful if possible while it is at this temperature or not more than 25°F (14°C) above or below. The pouring temperature should be measured with a thermometer. If the metal is poured too hot it may affect the rope wires, whereas if it is poured too cold it may not flow or grip the wires properly.

11. Allow the capel to cool before using it. If there is not enough time for natural cooling, let the metal become solid and then apply wet sacking or direct a current of cold air on to the socket. Do not dip the socket in cold water or use it until it has cooled to air temperature.

12. Finally lubricate that part of the rope near the socket. The last inch of each wire is sometimes hooked back before pouring the metal to give a better grip. This is not necessary, except perhaps with short sockets, but there is no harm in the practice provided that the hooked ends do not stop the metal being poured down amongst the wires.

There are seldom any faults with this type of capping. Sometimes the wires are not properly cleaned or the cleaning is left to an assistant who forgets to do it. If white metal is poured on greasy wires the grease will float on top of the molten metal showing that the cleaning has not been properly done. If such a mistake does occur, the capel should be cut off and the job started again. This will be better than clearing a wrecked shaft.

(Cir. 62/1963)

12. Approved Institutions for testing of winding ropes—The names of laboratories, institutions or test houses which have been approved in pursuance of Reg. 80(3) (b) of CMR '57 for the purpose of testing winding ropes (vide Ministry's Notification No. SO—dated 26th April, 1960), are reproduced below:

List of Approved Test Houses for Winding Ropes

Name of Laboratory, Institution or Test House	Address
1. Government Test House	11/1, Judge's Court Road, Alipore, Calcutta-27
2. Messors Garden Reach Workshops (P) Ltd.	Calcutta
3. The Director of Inspection (Met), Directorate General of Supplies and Disposals (Inspection Wing)	Tatanagar
4. National Physical Laboratory	Hillside Road, New Delhi-12.

Notification

13. Indian Standard Specifications for Winding Ropes—The following specifications for winding ropes have been published by the Indian Standards Institution, copies of which are available from Indian Standard Institution, Head Quarters, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi-2.

Specifications for Steel Wire Ropes for winding purposes in Mines: IS: 1855 of 1961.

Winding ropes used in mines should therefore comply with these national standards.
(Cir. 76/1964 & 54/1974)

14. Steps to prevent abnormal deterioration and premature snapping of winding ropes—Investigation into premature snapping and abnormal deterioration due to wear and strong corrosion of winding ropes have revealed that in majority of cases one or more of the following were responsible:

1. Unsatisfactory head-sheave groove, large fleet angle, slipping of rope on head-sheaves and unsatisfactory condition of winding drums leading to abrasive or plastic wear of wires.
2. Corrosion in wires due to adverse pit conditions, unsuitable lubricant, and lack of lubrication leading to corrosion-fatigue in the wires.

It has been also noticed that proper attention is not paid in the selection of winding ropes and for its examination during use. Through this Directorate Circular No. 77 of 1963 guide lines were given for examination, record and discard of winding ropes. Proper inspection and care of the rope during its service needs hardly any emphasis but it has been found that even statutory inspections are not properly made and the observations are not properly recorded.

Through D.G.M.S. Circular No. 23 of 1972 recommendation was made for use of galvanised ropes at watery and up casting pits but it is found that even in very watery conditions or where the pit water is acidic ungalvanised ropes are used. Use of suitable galvanised ropes preferably with independent wire rope core (I.W.R.C.) is recommended for such situations. The condition of pit water, whether acidic or alkaline, should also be regularly checked to facilitate selection of rope and the lubricant.

Selection of the lubricant is very important and the wire rope manufacturers generally advise in the matter keeping in view the match ability of the lubricants used during manufacture of the rope. Besides selection of the correct type of lubricant it is equally important to ensure the quality of lubricants procured through proper analysis before their use on the rope. Unsuitable

lubricant can do more harm than good and can accelerate corrosion. Lubricant and its frequency of application on rope will depend upon the local conditions under which the rope is used. It should be, however, ensured that outer surface of the rope is properly lubricated so as to protect the wires from moisture and gases.

Selection of proper head-sheave to suit a particular size and type of rope and maintaining the sheave groove in proper shape is very important for satisfactory performance of ropes. The head-sheave should not be unnecessarily heavy to cause slipping of the rope on the sheave during acceleration and deceleration of the-rope speed. The angle of contact of the rope in the groove, the clearance in the groove and the angle included between the flanges are important in respect of the shape of the groove. This Directorate Circular No. 68 of 1973 gives some guide lines on maintenance and selection of head-sheave.

In order that the winding ropes can give satisfactory performance and incidents of breakage and premature discard can be eliminated, it is requested to take necessary measures to ensure compliance with the aforesaid recommendations.

(Cir. Tech. 7/1975)

15. Further precautions to prevent abnormal deterioration and premature snapping of winding ropes—Attention is once again invited to Circular No. 7 (Tech.) of 1975, regarding snapping of winding ropes. Since 1975, there have been nine cases of rope snapping. This situation is viewed with great concern. The failure occurred primarily due to the same reasons, such as:—

- (1) Unsatisfactory head-sheave groove, large fleet angle, slipping of rope on head sheaves and unsatisfactory condition of winding drum leading to abrasive or plastic wear of wires.
- (2) Corrosion and pitting in wires due to adverse pit conditions, unsuitable lubricant and lack of lubrication leading to fatigue in wires.

The recommendations given in Circular No. 23 of 1972, No. 77 of 1963, » and No. 68 of 1973 cover adequately the requirements for proper care, maintenance and examination of winding ropes and head sheaves. The recommendations covered under these Circular have not been implemented satisfactorily so far.

It is further recommended that—

1. In watery pits water garlands at suitable intervals shall be provided to arrest water in shaft and arrested water shall be led to pit bottom pumping station through a suitable shaft water range.
2. In sand stowing pits, the stowing pipe ranges should be carefully installed, and maintained to prevent any leakage in shaft.
3. Short term refresher courses be organised at Vocational Training Centers for those responsible for maintenance and examination of winding installations, such as mechanical fitters, foremen and colliery engineers to update their knowledge.

In order that winding ropes can give satisfactory and safe performance, you are requested to take necessary measures to ensure strict compliance of Circular No. 23 of 1972, 77 of 1963, 68 of 1973 as well as the above recommendations immediately.

(Cir, Tech. 5/1981)

16. Approval of winding ropes of M/s. Usha Martin Black (Wire Ropes), Ltd. make—This is to inform that winding ropes of Round and Flattened stand construction manufactured by M/s. Usha Martin Black (Wire Ropes) Ltd., Tatisilwai, Ranchi is permitted for winding purpose in shafts having winding depth up to 600 metres. For inclined shafts, however, the winding length in the shaft from the bottommost level to the top-most deflecting sheave shall be considered as the winding depth. For winding from depth in excess of 600 metres permission may be specially considered on the merit of individual cases.

The winding ropes used on shafts having winding depth in excess of 350 metres shall, however be treated as ropes on experimental basis to start with. All care and precautions regarding installation, inspection and testing of rope samples hitherto prescribed should be strictly complied with. Testing charges of the rope while in service shall be borne by the user except in cases where it is otherwise directed by the Director-General of Mines Safety.

For each installation of rope intimation should be furnished, by the user along with the details of installation on the lines of the proforma circulated with D.G.M.S. Circular No. 25 of 1969 (dated 1.7.1969) immediately after the rope is put into use so that the conditions for its use can be timely intimated by ,this Directorate. The proforma is reproduced below for reference.

The field service of the rope manufacturer will regularly inspect the ropes specially those installed for winding from depth in excess 350 metres at intervals of not exceeding 3 months and regularly submit the inspection report to the user, Joint Director of Mines Safety concerned and the Director General of Mines Safety indicating clearly any condition which adversely affect performance of the rope. A copy of the report may also be sent to the Director (Marks), I.S.L, 5 Chowringhee Approach, Calcutta-13.

Particulars of Winding Installations

1. Place of installation.
2. Name of the rope manufacturer.
3. Specification of rope (true copy of test certificate supplied by the rope manufacturer should be furnished).
4. Winding depth (in metres)
5. Length of each rope installed.
6. Date of installation of rope
7. Normal life of imported ropes in the pit.
8. Whether life of ropes has been restricted (if so, give period).

9. Ratio of pulley tread diameter/drum diameter and rope diameter.
10. Fleet angle subtended by the rope.
11. Whether the pit is used for man/coal-man or coal winding or used for idle second outlet.
12. Average number of winds per shift.
13. Whether the pit is upcast/downcast.
14. Whether the pit is dry/wet/very wet and sand stowing.
15. Whether the pit water is alkaline/acidic.
16. Trade name or the rope lubricant used and name of supplier.
17. Frequency of lubrication.

(Cir. Tech. 10/1975)

17. Use of indigenous wire ropes—(1) It has been found that while installing indigenous winding ropes the restrictions stipulated in the permission accorded to the manufacturer for the use of the ropes are not taken care of and often winding ropes particularly those permitted on experimental basis are installed on pits which remain idle except in emergency OR where the winding depth is more than that permitted for the rope OR where the average life of imported winding ropes has been less than that stipulated for use of the ropes. Such permissions to the indigenous rope manufacturers containing conditions for use of the rope are sent to you for information. You are, therefore, requested to ensure before installing a rope on any installation that the conditions stipulated for use of the rope are fully satisfied on the installation.

(2) It has been further found that while sending intimation of installation of winding ropes necessary care is not taken to:

- (i) Submit the intimation immediately after the installation of the rope.
- (ii) Furnish correctly the particulars of the winding installation with (i) above. Generally particulars on the items 7,8,14, & 15 of the proforma has been subsequently found erroneous.

You are requested to ensure that in future correct information is sent in time and where necessary more details may be given to provide a clear picture of the conditions of the installation.

(3) That in majority cases the conditions in respect of testing of rope samples and submission of test results stipulated in the permission accorded after submission of intimation of the installation of rope are not complied with. This is a very serious omission and you are hereby requested to ensure that all the conditions stipulated in the permission letters are fully complied with otherwise I will be constrained to stop use of the winding installation.

(4) In spite of the fact that in all circulars issued by this Directorate from time to time in respect of permission accorded to indigenous manufacturers of wire ropes you were requested to comply with conditions concerning the use and to co-operate with the supplier in the maintenance of the ropes, it is generally found that you are failing to do so. The field service engineers of the manufacturer are not extended proper help in collecting relevant particulars of the installation and rope samples for testing and for inspection of their ropes. The field service extended by the manufacturer is very useful to the industry as well as to this Directorate and it should be best utilised.

(Cir.Tech. 11/1975)

18. Provision of spare winding rope at the mines—In the light of nationalisation of coal mines a question has been raised whether spare winding ropes as required under Regulation 80(2) (e) of CMR 1957 has to be stocked at each mine or can be stored at central places for catering to a number of mines in that area. The matter has been considered and the following directives are given for storing spare winding ropes.

1. Store-Location and requirement

1.1 Spare winding ropes for catering to the mines in an area can be stored in a centrally located place from where the ropes can be sent to the mines without much delay.

1.2 Each store where winding ropes are stored, proper shed for storing, protecting the ropes against moisture, dust and heat should be provided.

1.3 In each store where ropes are stored proper arrangement for storing the reels of ropes either suspended or resting on side flanges should be available to turn the reel from time to time and replenish external lubricant of the rope, if necessary.

2. Minimum length of spare rope and record

2.1 At least one length of the longest length for six lengths of ropes of same size and type used at the mines catered by the store, can be kept as the spare length for the six lengths of ropes. The installations earmarked for the spare rope should be indicated in a ledger maintained for the purpose.

2.2 Each store should maintain a ledger where the names of the mines having winding pits catered by the store; number of winding pits in each mine; the size, type and length of rope required for each pit; total no. of ropes in use at a time and the maximum length of rope of one type required are correctly recorded.

3. Storage of rope

3.1 The ropes shall not be stored in coils and shall not be issued to the mines in coils irrespective of the length.

3.2 Spare rope shall not be generally stored for a period in excess of two years from the date of receipt of the rope in the store. Spare ropes when issued should be replaced by new ropes as early as possible from the date of issue of the rope.

3.3 Ropes of 29 mm. dia. and above, which are heavy, should be stocked preferably in the required lengths unless the reel does not become very heavy and presents difficulty in handling.

3.4 For ropes of special construction and for the pits having winding depth in excess of 300 metres, it is desirable to store spare ropes in required lengths only to save wastage of rope, difficult handling during issue or otherwise and storing long length in spare on the winding drums.

(Cir. Tech. 13/1975)

CMR 81/MMR 89

1. Care while purchasing cage suspension gear of indigenous make—Cage suspension gears of indigenous make are being used at some of the mines. While purchasing such gear, it should be ascertained that it is mechanically sound and that it has been subjected to necessary tests with regard to safety and has withstood the tests satisfactorily.

(Cir. 10/1960)

2. Replacement of worn out shackle pins of cage suspension gear—Reports reveal that at times the worn out pins of shackle assembly of cage suspension gears are being replaced by pins manufactured by unapproved manufacturers. This may lead to failure of c.s. gear as the replaced parts may not be properly forged/heat treated or the material of such pins may not be suitable for the purpose.

In the meeting of Chief Engineers of various mining companies and D.G.M.S. held on 9.2.96, it was decided to use only approved types of pins at the time of replacement. It may please be ensured that at the time of procurement of c.s. gear sets from approved manufacturer, some spare pins shall also be procured from the same manufacturer so that at the time of replacement, proper types of pins are available and only approved types of pins are used.

This recommendation may be implemented with immediate effect in the interest of safety in mines.

(Cir. Technical 2/1996)

3. Information regarding installation of approved indigenous cage suspension gear components— Recently it has been brought to the notice of this Directorate, that the various manufacturers are not getting desired facilities for conducting the inspection of Cage Suspension Gears, which is obligatory on them. Manufacturers have informed that the location and the date of installation of such gears are not brought to their notice. The inspections by the manufacturers have been incorporated for the benefit of users and this benefit should be availed.

It is requested that whole hearted co-operation should be extended to the manufacturers. Further they should be immediately informed of the date of installation of each such indigenous component like cappel, safety hook, chain assembly etc.

(Cir. 17/1967, 7/1969 & Tech. 8/1979)

4. Precautions with reliance type rope cappel—In a recent incident during coal winding, the limb of 29 mm reliance type rope cappel slipped from the rope and the cage crashed at the pit-bottom. To prevent such accidents, the following measures are recommended :

(1) *Examination while purchasing and while installing*—At the time of purchase and before installation, a detailed examination should be carried out of cappel or other cage suspension gears. They shall be installed only after being fully satisfied of the quality.

(2) *Cappel bands should not foul with detaching plate*— The winding rope and detaching plate shall be co-axial during the entire winding cycle so as to ensure that the cappel bands do not foul with the detaching plate at any point during partial or full overwinding.

(3) *Over-winding clearance*— The overwinding clearance shall be adequate as indicated in Reg. 75(5) of CMR 1957 or Reg. 84(4) of MMR 1961. This space shall be checked afresh when any set of new suspension gears is installed, so as to ensure that the overwinding space is maintained.

(4) *Maintenance of overwinding protection*— The overwind protection when-ever required to be provided shall be suitably set and maintained in good working order.

(5) *Damage to suspension gear*—In case of any external object hitting the suspension gear assemblies, the entire set shall be immediately checked for any defect before continuing any further winding. Such checks shall also be carried out when there is any doubt of such external disturbance to cage gears particularly after lowering of long materials like wooden props, pipes etc.

(6) *Supervision during installation/during examination*—Supervision at the time of installation and subsequent examination of cage suspension gears when in use shall be done strictly as per statute. For the cappels it is important that the various dimensions of clearances between the wedges, between the white metal cone (safety block) and the bottom of the wedges, the distance between the first pressure band and the bottom of the wedge etc. etc. as observed at the time of installation and during subsequent re-capping and examination shall be correctly recorded in a bound register at the mine. Whenever any abnormality is observed, a proper investigation shall be carried out and suitable remedial measures taken.

All the existing winding installations should be checked in the light of these recommendations and suitable action taken.

(Cir.Tech. 1/1980)

5. Extension of life of indigenous suspension gears—The life of indigenously manufactured Cage Suspension Gears has been restricted generally to six years, vide Circular No. (Approval) 3, dated 7th April, 1979. Such suspension gears could be considered for extension of life if the condition is found satisfactory.

To determine the satisfactory condition of such cage suspension gears, the following examination/test procedure shall be followed:—

(1) Cage Suspension Gear and components shall be physically and carefully examined to ascertain that the same is free from any defect—such as distortion, elongation, corrosion etc.

(2) Cage Suspension Gear shall be examined to ascertain that the wear on components is within permissible limits as indicated in the enclosed Annexure "Norms of discard".

(3) Periodic Heat treatment shall be carried out in line with DGMS Circular No. 77 of 1964.

(4) Proof load test for three times the actual safe working load for which the cage suspension gear/components are designed shall be carried out.

(5) Each component shall be tested for Ultrasonic and Magnetic crack detection for any flaw.

(6) Any other test or examination which may be considered necessary for any particular Cage Suspension Gear/component.

Application with the results of the above examination/test shall be sent to the Director of Mines Safety of the concerned Region who may consider extension of life beyond six years upto maximum of ten years from the date of first installation.

Annexure

NORMS OF DISCARD OF CAGE SUSPENSION GEAR COMPONENTS

Rope Capps (Wedge Capps)

(1) The tightening bands being damaged, becoming out of shape due to mishandling or any other reason,

(2) marked pitting/corrosion appearing on the bands and the body,

(3) deformation in the body or excessive wear on the outer or inner surface,

(4) where the last tightening band could be tightened upto 6 mm. or less measured from the bottom of the tapered wedge.

(5) wear to an extent of 5% to 6% or more on the eye portion of the cappel,

Safety Hook

(1) Wear on the centre pin exceeding 5%. If wear is within 5% the pin can be replaced after proper reaming of the hole,

(2) wear exceeding 10% in top and bottom shackles and pins,

(3) in the top portion of the safety hook if slackness in the pin is more than 1.6 mm,

(4) (a) wear on the outer plate shall not be more than 0.3 mm,

(b) Pitting/corrosion on the inner/working plates,

(5) (a) obliquity in the hole for the copper pin,

(b) obliquity of holes in the top and bottom shackles (outer) limited to 10%,

(6) where the shackle eye has rubbed on the plates and the wear due to such rubbing exceeds 1.6 mm,

(7) any deformation, pitting/corrosion or any other defect on the projected fins of the working plates as well as the portion which rests on the catch plate.

Note—The detaching plate of safety hook is considered as a part of the hook. In case of any notch/groove due to rubbing of rope otherwise on the circumference of the plate hole, the plate should be rejected. If there is no defect like corrosion, groove in the hole of the plate and obliquity in the holes of the tightening bolts, the plate can be allowed further use after proper heat treatment and tests for cracks etc.

Distribution Plates

(1) Marked pitting and corrosion,

(2) Obliquity in the holes exceeding 10% of the original dia,

(3) Where the shackle eye has rubbed on the distribution plate and wear due to rubbing exceeds 1.6mm.

Shackles and Pins

(1) Wear on shackle eye sides exceeds 1.6 mm,

(2) Wear on the shackle eye hole exceeds 10% of the original diameter,

(3) Obliquity in the hole exceeds 10% of the original diameter,

(4) Wear on pin exceeds 10% of the original diameter.

Suspension chain slings

(1) Marked pitting and corrosion,

(2) The wear on the contact surface of the links exceeds 10% to 12% of the nominal diameter of the link.

(Cir. Tech. 8/1980)

6. Manganese steel suspension gear—The suspension gear manufactured from 1.5% Mn - steel can be considered for relaxation of cleaning, examining and annealing etc. Even this equipment, however, requires heat treatment in furnace with perfect temperature control at intervals not exceeding 4 years. In foreign countries, the gear is sent back to the manufacturers for such treatment. Such treatment in this country should, therefore, be carried out in workshops approved by the D.G.M.S. for this purpose.

It is extremely dangerous to carry out heat treatment of 1.5% Mn - steel in an open charcoal (or similar) fire.

(Cir. 23/1961)

7. Safety hooks for sinking shafts—Cases have been noticed where the 'shear pin' of the detaching hook has been found to have been damaged after a use of only 15- 20 days in a sinking shaft. This is apparently due to the wide swing of the winding ropes in a sinking shaft and due to the fact that detaching hooks in a sinking shaft not infrequently strike riders, shaft covers and other objects in the shaft. Such damage to the shear-pin introduce an additional danger in sinking shafts where safety hooks are used.

Every detaching hook in use in a sinking shaft should be taken apart, cleaned and carefully examined as to wear and deformation etc. once at least in every 7 days. If a shear pin shows any sign of deformation, it should be changed immediately. A record of every such examination and every change of shear pin should be kept in a bound book kept for the purpose and personally examined by the manager.

(Cir. 44/1960)

8. Record of annealing etc. of cage suspension gears—The record of inspection of suspension gear and of annealing, cleaning, etc. should be kept in the form given below.

Inspection, Annealing etc. of suspension Gear (CMR 81)

No.....shaft	Side cage						
Annealing of cage chains detaching hooks etc. Every six months [Reg. 81(2)(a)].	1	2	3	4	5	6	7
	Date of annealing	Defect noticed	Action taken	Remarks	Due date of annealing	Signature with date of competent person	Signature with date of Manager
Inspection of Detaching plate [Reg. 81(2)(b)]	Date of Inspection	Diameter of detaching plate	Extent and details of any wear noticed		Action taken	Due date for next inspection	

(Cir. 1/1956)

9. Heat Treatment of 1.5% Manganese Steel Suspension Gear—Whereas relaxations have been granted by the DGMS in respect of six monthly heat-treatment of 1.5% manganese steel cage suspension gear subject to certain conditions, it has been since decided, in the light of experience gained in U.K. where this type of gear has been vastly used, that:

(i) Parts of suspension gear made of 1.5% manganese steel in the hardened and tempered condition need not be re-heat-treated in service;

(ii) Parts of suspension gear which are in the normalised or normalised and tempered condition and which can be hardened and tempered without the possibility of deleterious effect, for example distortion or cracking, may be hardened and tempered when the next heat-treatment becomes due. Subsequently, such parts need not be re-heat-treated in service;

(iii) Parts of suspension gear which cannot be hardened and tempered without the possibility of deleterious effects, such as described above, must be subjected to a stress relieving heat-treatment at the prescribed intervals.

In this connection the period for the stress relieving heat-treatment may now be specified as follows :

Where the conveyance,

(a) is in sinking shaft	four years
(b) lands on baulks or keps	five years
(c) does not land on baulks or keps	seven years

In the light of the aforesaid remarks, the managements concerned may apply to the DGMS for further relaxations or exemptions as the case may be, from the heat-treatment of the 1.5% manganese steel gear in use at their mines.

(Cir. 77/1964)

10. Approved workshop for heat treatment of suspension gear— The work-shops of M/s. Garden Reach Workshops Ltd., 43/46 Garden Reach, P.O. Calcutta-24 have been approved for the purpose of heat-treatment and testing of suspension gears used in mines, as follows :

1. Annealing : suspension gear parts made from wrought iron.
2. Normalising : suspension gear parts made from wrought steel and mild steel including 1.5% manganese steel.

Subsequent to any heat-treatment, each part shall be tested to appropriate proof load and certified by this workshop.

Facilities for tempering the suspension gear parts after normalising or after hardening in water or oil are not yet available in the workshop, but are likely to be provided in the near future.

(Cir. 13/1963)

11. Approval of MAMC for heat treatment of cage suspension gear—Mining & Allied Machinery Corporation Ltd., (MAMC), Durgapur, having the necessary facilities for heat-treatment of 1.5% Mn and other steels have been approved for heat-treatment of cage suspension gears.

MAMC have informed that they would require about two weeks time for heat-treatment after the parts are received by them. The parts will be first examined for wear, deformation and

cracks etc. If found satisfactory they will be heat-treated and subsequently re-examined for cracks etc. Proof load test will not be done at present at MAMC and the facilities at Central Mining Research Station, Dhanbad can be availed for the purpose.

Aforesaid facilities at MAMC may be availed of so that the cage suspension gears are given periodic heat-treatment as required by this Directorate. While sending the parts for heat-treatment it is necessary to send a copy of the original certificate of the material, heat-treatment and tests of the parts for the guidance of MAMC.

(Cir 20/1972)

12. Approved heat-treatment of suspension gears— The Indian Standard Wagon Co. Ltd., Burnpur, having necessary facilities and know-how for heat-treatment of 1.5% Manganese and other steels has been approved for heat-treatment of cage/skip suspension gears for winding and has been enlisted in this Directorate as an approved establishment for the purpose,

While sending the gears for heat-treatment you are requested to furnish to the works full details of the steel, type of heat-treatment given earlier and now required and also whether the component is new or used.

One of the following heat-treatments is generally given to the cage suspension gears :

- (1) Normalize— To refine the grain structure and to relieve the stresses.
- (2) Normalize and temper—To refine the grain structure and to give required mechanical properties.
- (3) Normalize, harden and temper—To refine the grain structure and to give the optimum mechanical properties.

(Cir. Tech. 4/1975)

13. Non-Destructive Testing of suspension gears or its components, vital parts of machinery and winding ropes— In Coal Mines Regulations, Reg. 81(2) (a) and in Metal Mines Regulations, Reg. 89(2) (a), there is a provision that all cage chains in general use and other parts of suspension gear between rope and the cage or other means of conveyance including the detaching hook, shall be taken apart, cleaned and carefully examined as to wear and tear by gauging and for rust and cracks once at least in every six months or if necessary at shorter intervals. The present visual method of detection of cracks and flaws does not indicate the correct health of cage suspension gear or its components.

In view of above, it is recommended that magnetic and ultrasonic tests or any other N.D. Test, if considered necessary, shall be done every six months or earlier if required to detect any crack or flaw in the suspension gear or its components which are in regular service. Any harmful crack or flaw detected as a result of such test shall be immediately reported to the Director of Mines Safety of concerned region and this office, and use of such suspension gear or its components shall be discontinued forthwith.

It is further recommended that N.D.T. methods may also be adopted for testing of vital components of machinery, such as drum shafts, brake tie rods, fan blades etc. periodically at suitable intervals.

Similarly magnetic defect graph may be used for testing of winding ropes at an interval not exceeding six months.

The test results of all the above tests shall be maintained at the mine.

(Cir. Tech. 10/1982)

14. Code of Practice for in-situ Examination of Winding Drum Shaft by Ultrasonic Flaw Detection Testing Technique and Recommended Frequency of Testing—Safety and efficiency of the winding engine installation have always been the concern of all and it is necessary that the winding engine installation and components are of good quality and high reliability. The problem is more critical due to existence of large number of old engines. In order to ensure reliability of the same it is necessary to monitor the condition of winding installations periodically to prevent failure of the winding equipments and components during service which may result in loss of life and property. It is necessary to adopt planned preventive maintenance in addition to periodical visual examination.

Non Destructive Testing (NDT) is a means for ascertaining and monitoring the health of vital components. Keeping this in view, the Directorate had issued a technical circular (10 of 1982) recommending adoption of NDT method for testing the vital components of winding engine and other equipment. However when implementing the method, difficulties were felt due to non-availability of standards of acceptance or rejection. Therefore, a code of practice has been evolved and this has been accepted by the various agencies for carrying out in-situ testing of drum shaft. A copy of the code of practice is in appendix I. The code of practice may be followed in respect to all winders of mines with immediate effect. The norms of the acceptance/rejection as stipulated therein shall be strictly adopted.

I would like to further stress that non-destructive testing of vital components needs to be carried out periodically. This is necessary as most of the winders in our country are old and aging process has started long back.

The frequency of such testing is given below :

<i>1. Component</i>	<i>Heavy Duty</i>	<i>Medium Duty</i>	<i>Light Duty</i>
(a) Drum Shaft Electric Winder	Once in a year	Once in two years	Once in four years
(b) Drum Shaft Steam/Compressed Air Operated	Once in a year	Once in two years	Once in two years

The duty is based on number of hours the winding engine is working per shift which is given below :

2. Heavy Duty	Winding Engine working more than	3hrs/shift
Medium Duty	Winding Engine working between	1 1/2 hrs to 3hrs/shift
Light Duty	Winding Engine working less than	1 1/2 hrs /shift

I am sure that in the interest of safety, all mining companies shall take immediate action for implementation of the above recommendations.

Appendix I

Code of Practice/or in-Situ Examination of Winder Drum Shafts by Ultrasonic Flaw Detection Testing Technique.

1. *Scope*—This recommended practice covers the ultrasonic testing method and acceptance norms for in-situ examination of winder drum shafts, by pulse echo direct contact method.

2. *Equipment*—An ultrasonic pulsed echo type of instrument shall be used for this testing. The system shall have a minimum capability for examining at frequencies from 0.5 to 5 MHz.

The ultrasonic instrument shall be calibrated for Time base Linearity and Amplitude Linearity.

In general. Normal beam probes, of 2 MHz. frequency & 20/25 mm diameter shall be used of scanning of the shaft.

Other probes may be used for evaluating and pin-pointing the indications, whenever required.

3. *Couplants*—Couplants having good wetting characteristics like machine oil/lubricating oil or grease shall be used. Same couplant shall be used for calibrating the ultrasonic instrument and during the examination of the shaft.

4. *Reference Blocks*—Standard 500mm long bar shall be used for calibration of the ultrasonic instrument and for achieving the required test range. Standard IIW blocks (V 1 and V2) shall also be used for calibration of the instrument, as and when necessary, to check the linearity of the instrument.

5. *Surface Condition*—The surface condition of the area which will be scanned shall be smooth and even to enable good contact of the probe during testing. The end surfaces of the shaft shall be perpendicular to the horizontal axis of the shaft. In case the same is not even and smooth and not perpendicular to the horizontal axis of the shaft, the same shall be dressed accordingly using grinding/filling, etc. Further the surface of the area to be examined shall be free from extraneous material such as loose scale, paint, dirt, etc.

6. *Testing Method*—Generally, end surfaces will be available for scanning ultrasonically when winder drum shaft are required to be examined in in-situ condition. However, wherever possible, length-wise scanning from diametrically opposite faces of the shaft shall be done.

While scanning, a 15% overlap on each pass of the scanning shall be maintained. The probe shall be given a slight rotary movement for proper coupling.

Horizontal distance of the C.R.T. shall be calibrated for the desired length of Shaft by using standard length bar. As far as possible the distance calibration shall be done in such a manner, so that the back wall echo is located approximately at 3/4th of the horizontal base line,

Adjust the instrument controls to obtain a back wall echo approximately 100% of the full screen height (FSH) from opposite side of the shaft. For scanning, amplification may be increased by 6 to 12 dB, if required. However, in case of detection of defect indications, the same shall be evaluated by increasing gain of the instrument by 6 dB in addition to the gain at which back wall echo was set earlier at 100% FSH.

Whenever a flaw is detected with normal beam probe, efforts shall be made to cross check the same by using suitable angle beam probe, keeping in view the accessibility for such testing.

The bearing portions of winder drum shaft shall be circumferential ly scanned using normal beam probe of suitable frequency by removing the covers. Efforts shall be made to test portions of the fillet and surface areas below drum cheeks of the drum shaft by suitable angle beam probes, keeping in view the accessibility for such testing.

Any change in the probe unit, couplant and instrument test range setting from that used for previous calibration, shall require recalibration of the instrument.

During examination of the shaft, monitor the back wall echo for any significant reduction in amplitude. Reduction in back wall echo amplitude may indicate not only the presence of a discontinuity but also poor coupling of probe unit with surface of the shaft.

7. Recording—Record all information as regards to the instrument, probe, couplant, calibration gain, test range and test positions of the defect indications, for further evaluation.

8. Report—The report shall contain the details in respect of test location, equipment used, date of test, team of engineers conducting test conditions, couplant used and test results. Necessary drawings shall also form pan of the report.

9. Acceptance Criteria—Winder drum shafts are considered to be under the category of "Components subjected on normal stresses" and hence are classified as Level - III forgings. Keeping the above in view the following acceptance criteria shall be followed in relation to the permissible indication patterns enclosed herewith, while carrying out the ultrasonic testing of shafts from end faces and length-wise scanning wherever the same is approachable:

(i) Isolated defect indication which results in defect echo of 100% FSH (Full screen height) and still keeps the back wall echo to 90% FSH, is permissible.

(ii) In case of distributed (non-isolated) indications, which result in defect echoes of more than 75% FSH and causing the back wall echo to drop to below 25% FSH are not permissible.

(iii) More than five (5) defect indications per metre length and each having echo height of more than 35% FSH and two such consecutive indications less than 60mm apart are not permissible.

(iv) The frequency of defects of more than three (3) per metre of circumference and each having echo height of more than 35% PSH, is not permissible.

(v) If no back wall echo is obtained during testing due to any unforeseen reasons, the whole surface of the shaft shall be checked ultrasonically by diametrically testing the complete length of the shaft, for which shaft may be removed for complete checking.

Further the whole surface area shall be tested by magnetic particle flaw detection technique for detection of any impermissible surface cracks.

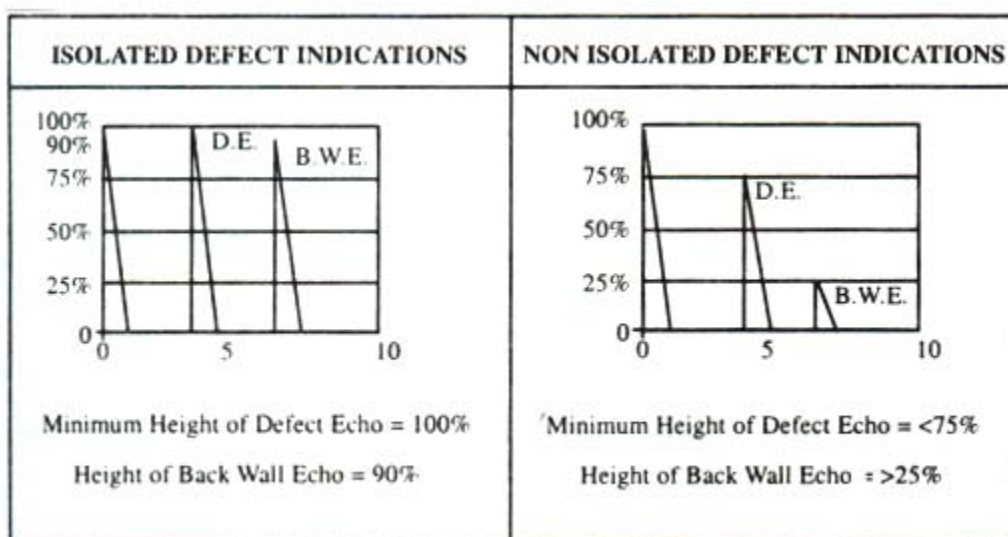
Note—The above in-situ ultrasonic testing of winder drum shaft shall be supplemented by magnetic particle inspection of the areas below the bearing cover plates and other accessible surface areas of the drum shaft for detection of any impermissible surface cracks.

Permissible Indication Patterns

Acceptance criteria for in-situ examination of winder drum shafts by ultrasonic flaw detection testing technique

ISOLATED DEFECT INDICATIONS

NON ISOLATED DEFECT INDICATIONS



Isolated indications: Not more than 5 indications per metre length; Minimum distance between two indications 60mm.

Non isolated indications: Those which are not isolated.

(Cir. Tech. 8/1999)

15. Routine tests of cage suspension gear components—After discussion held amongst the senior officials of DGMS, users and manufacturers of cage suspension gear components, it has been decided to carry out tests for chemical analysis, microstructure, izod impact value and hardness for at least 10 percent of the cage suspension gear components being used company wise at any test house agreed to between the user (s) and manufacturer (s) as routine tests before the same are supplied by manufacturer to the users. For this purpose, extra material is to be provided with CSG as appendix in some of the parts of the C.S.G. as agreed upon by manufacturer and user. These tests are in addition to the other 100 percent routine tests like

proof load testing and evaluation of internal surface and sub surface flaws by N.D.T. techniques.

At least 25% of the above mentioned routine tests shall be carried out at any National Test House and rest 75% of the routine tests may be carried out in any test house as agreed between the user industry and manufacturer.

Since it is the responsibility of the user to ascertain quality of C.S.G. supplied to the mines, managements are requested to see that the above recommendations are complied with fully.

(Cir. Tech. 7/1994)

16. Routine testing of cage suspension gear components—Attention is drawn to Cir. (Technical) 7 of 1994 stipulating that at least 25% of the routine tests of cage suspension gears shall be carried out at a National Test House.

The matter has been further discussed with user industry and now it has been decided that atleast 50% of the routine tests of the cage suspension gears shall be done at any National Test House and rest 50% of the routine tests may be done at DGMS approval test houses.

It is to clarify that it is the responsibility of the users to ascertain quality of the c.s. gears being purchased by them for their mines.

Both the user as well as the manufacturer may collaborate as to ensure that the above recommendations shall be complied with strictly henceforth.

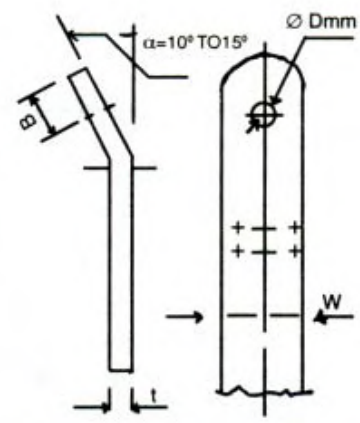
(Cir. Tech. 4/1997)

17. Attachment of bridle chain to cage hanger—Inspections of attachment of bridle chains to cage hangers have revealed that at some of the installations the fitment between D-Shackle pins and cage hangers was not proper causing excessive wear. This happens mainly due to abnormal clearance between shackle pins and cage hanger hole as well as improper inclination, width and thickness of cage-hangers.

To deal with the above difficulties some guidelines are given in the sketch.

Safe Working load mm		Bore dia D mm	Thickness of hanger t in mm	Width of hanger w mm	B
KN	Tonne				
50	5	30	25	100	90
80	8	39	25	150	120
100	10	39	25	150	120

Note—1. For details of cage shackle refer to DGMS approved drawing and design of cage suspension gear for winding in mines.
 2. To avoid axial movement of the shackle pin, washer of appropriate thickness shall be welded to either side of the cage hanger bore.



DETAILS OF CAGE HANGER
Fig. 2. Attachment for bridle chain

It is recommended that the guidelines are adopted as early as possible but not later than a period of one year from the date of issue of this circular (30th Nov. 1987). If required, the existing cage hangers may be modified suitably.

(Cir. Tech. 7/1987)

CMR 83/MMR 88

1. Examination of winding ropes—Under the regulations, winding ropes should be examined by the engineer or other competent person once in a week and every 30 days. In addition, a special examination of a portion of the rope cut off at the time of recapping is to be done.

It has been seen that the above examinations of winding-ropes are not being done in a systematic manner and a note for guidance of persons concerned is given below.

The examination of the cut off portion of rope (including the portion in the cappel) at the time of recapping is particularly important as it would indicate the type of deterioration, if any, affecting the rope and the advance of that deterioration at the cappel end. The results of every such examination are to be recorded in a bound paged book, a specimen form for such record is enclosed.

It is also recommended that samples of rope after examination of recapping samples should be properly tagged and preserved for reference.

A NOTE ON EXAMINATION OF WINDING ROPES*

- *References : 1. A.E. McClelland. Pit Examination of Wire ropes.
2. N.C.B. Information Bulletin No. 55155.
3. The Ropeman's Handbook : N.C.B. Production Department.

I. Introduction—It is important to remember that anyone can make a routine examination and write in the Record Book 'in good order' after each examination, until the rope breaks. It takes a skilled person to make a useful examination and to make a note of how deterioration is advancing so that the senior officials can have the rope taken off before it breaks.

II. General considerations—(1) The first requisite for reliable rope examination and maintenance, is the careful selection of a competent person to be entrusted with this responsible work. The second requisite is that he should be given all available training.

(2) In examining a rope at the colliery the competent person should not merely look for broken wires. He should first endeavour to discover the type or types of deterioration affecting the rope as by the complete examination of recapping samples and should then note the symptoms of advance of such deterioration in other parts of the rope with a view to establishing the degree of deterioration reached.

(3) If the observations in such examinations are briefly but clearly recorded by the competent person in his own note book (apart from the entries in the Statutory Record Book) he will then have a case history for each rope readily available. These will be invaluable to him in advising his seniors regarding the date of discard of the rope concerned and will be very useful data for the maintenance and examination of later ropes working in the same position.

(4) Laboratory examination and testing of sample of rope by experts, where available, forms an extremely useful complementary service but the rope-man should be permitted to retain at the colliery sufficient length of each recapping sample for his own examination. Such laboratories can also help in giving instruction to the rope-man.

(5) Non-destructive methods of testing or inspection should not be regarded as possible alternatives to visual examination. Few of such methods are applicable to wire ropes and, even if these should prove entirely satisfactory in the future, they should be regarded as aid to normal inspection methods. Non-destructive methods of testing, and in fact all methods of testing, tend to measure the present condition of a rope without establishing the type of deterioration at work. Enlightened visual examination at colliery, or in the laboratory, establishes the type of deterioration and therefore enables a more accurate forecast to be made of the advance of deterioration.

III. Tools for rope examination—(1) Suitable calipers for measuring the rope diameter.

(2) A straight edge for measuring rope lay and micrometer gauge for measuring wire diameter and loss in wire diameter in opened samples of rope;

(3) A light hammer (a carpenter's cross pane pit hammer) with which to sound for loose outer wires and for corrosion product under those wires;

(4) A watchmaker's eyeglass, which can be held in the eye, to facilitate study of cracks, fractures and pits in wires;

(5) A tout bladed pocket knife with which to scrape off corrosion product and expose any pitting; the pocket knife might well have a slim and needle-pointed implement with which to explore the size and depth of scale-filled pits; and

(6) A short sample length of each rope when new for ready comparison with the respective rope in service. Such a sample should be securely seized at each end, treated with lanoline to prevent corrosion and labelled for recognition purposes.

IV. Type of examination—Three types of examination are required by law for ropes used for raising or lowering persons. These are :

1. Weekly examination [Reg. 83(1) (b)/91 (1) (b) of the Coal/Metalliferous Mines Regulations].

2. Monthly examination [Reg. 83(1) (c)/91 (1) (c) of the Coal/Metalliferous Mines Regulations].

3. Examinations of recapping samples [Reg. 80(6)/88(6) Coal/Metalliferous Mines Regulations],

Weekly examination—In weekly examination, the whole rope is examined roughly, by passing the rope at a speed not exceeding one metre per second, and only the more obvious faults can be sought (broken wired, loose wires, distortion or irregular lay in the ropes etc.).

When examining a preformed rope it must be remembered that broken outer wires are not easily found because their ends do not stick out of the rope. However, when the rope is passed slowly through a handful of clean cotton waste the broken ends usually pick up shreds of waste and thus draw attention to themselves. In addition, it is necessary to look carefully at the rope.

Monthly examination—This examination is to be made once at least in every 30 days, by passing the rope at a speed not exceeding 0.5 metres per second. For the purpose of this examination, the rope should be cleaned of any encrusted dirt and grease at all places particularly liable to deterioration and at other places, not more than 30 metres apart, throughout the length and any reduction in the circumference of the rope and the superficial condition of the wires as to wear, corrosion, brittleness and fracture of every such place in noted.

Special places to be examined are :

- (i) the cappel end,
- (ii) the rope over the headgear pulley with the cage at bank,
- (iii) the rope leaving the drum with the cage at the bank,
- (iv) the rope over the headgear pulley with the cage at pit bottom,
- (v) the rope entering the drum with the cage at pit bottom, and (vi) any other places where deterioration is likely, such as :
 - (a) where the rope stands in the hooding in an upcast shaft,
 - (b) at the ends of the scroll where such a drum is used.
- (vii) if the dead end of winding rope is anchored to the drum shaft, the piece of rope inside the drum must be examined.

It may be mentioned that cases of winding ropes breaking by fatigue inside the drum are known to be due to the rope inside the drum napping slightly as the drum rotates, thus causing fatigue where the rope is sharply and repeatedly bent at the rope hole. This trouble can be prevented by clamping the rope to a drum spoke or to straps fixed between two drum-spokes. Better methods of fixing the dead end of the rope are by capping it and bolting the capping to the barrel or side of the drum, or to an internal or external rope reel.

Examination of recapping samples

The regulations require that, except in Koepe system, before every recapping a length including the capping, of at least two metres shall be cut off the rope. Every piece of rope so cut off shall be opened and its internal condition examined. This is to be the most thorough examination, but as much of the procedure outlined below as possible, should also be carried out for the weekly and monthly examinations :

1. Diameter and lay—Measure the diameter across the crowns and not across the flats or valleys which would give too small a reading, See if it has lost a serious amount since the rope was new, say anything more than 5 percent (one twentieth) of the rope diameter when new. If it has, find out why, never accept a large, a sudden, or a local loss in diameter without searching for the cause.

If external wear is sufficiently heavy to explain the matter, the situation is not serious unless the wires are greatly reduced, and they should not be allowed to lose more than one-third of their thickness,

If wear does not explain the loss in rope diameter, the trouble is probably internal and more serious. Internal corrosion may have eaten away the steel where the various wires touch one another, thus allowing the wires to draw closer together and shrink the rope.

An examination of the inside of the recapping sample will show if internal corrosion is increasing at the capel end in which case it will be necessary to decide whether such corrosion might not be more advanced further up the rope. Tapping the outside of the rope with a light hammer should give a solid metallic sound and feeling. A dull sound will suggest that there is rust inside the rope. If the hammer bounces or chatters, the outer wires have become loose on the inner or core wires, perhaps due to internal corrosion. A stranded rope can be slightly reduced in diameter as a result of crushing of the fibre core, but this is not important.

Length of lay should also be measured from time to time, particularly at any point showing local distortion or reduction in diameter. A local increase in length of lay may indicate some serious internal fault such as a nest of broken inner wires.

2. Appearance of outside of rope—Note if there is any distortion of the rope, waviness, locked coil wire out of lock, looseness of outer wires, damage as distinct from deterioration etc. Distortion, waviness and wires out of lock probably mean an accumulation of twist towards the capel end, perhaps due to badly fitting pulley groove. Loose outer wires may be the result of untwisting in a rope or the result of a dangerous amount of wear or internal corrosion. Local damage may mean flapping and striking the detaching plate, a protruding rivet head or plate edge on the drum, something dropped down the shaft etc.

3. Condition of wires on outside—If there is external corrosion, consider whether the lubricant is suitable for the conditions and if it is renewed often enough. If wear is heavy, notice whether it is plastic which means heavy pressure against something. Other wear (abrasive) just means rubbing. Notice whether there is any chain pitting or other signs of surface embrittlement and if there are any broken-wires.

4. Condition of wires inside rope—The wires inside the rope can only be examined in the recapping samples cut from the rope unless a stranded rope is untwisted slightly while still in use. No attempt should be made without the consent and personal supervision of the engineer to untwist a rope while it is in use.

The examination of a sample rope should be commenced by measuring the diameter and lay, followed by an examination of the outside, and the sample should not be unlaid before this is finished. The inside should then be examined.

In the recapping sample of a stranded rope the condition of the fibre core should be noted whether it is lubricated or dry together with the condition of the wires touching the fibre (lubricated or dry, bright or corroded etc.). Then the condition inside the strands (lubricated or dry, bright or corroded, grooved or unworn etc.) should be examined. Broken or cracked wires and the position of the breaks (at the fibre core, where the strands touch one another etc.) should, of course, be noted. Finally, decide whether the recapping sample is in any worse condition than the one cut off at the previous recapping.

With a locked coil rope, strip off and examine each layer separately. One layer can be removed without its wires becoming mixed with those of other, by seizing or clamping the sample about 3 inches from each end. Spring the ends of the outer layer apart as far back as the seizing and work another seizing under these ends to hold the remaining layers while the outer seizing and the outer layer of wires are removed.

Wires from the sample should be bent double, at least once in one direction and once in the opposite direction by hand, to see if they break at hidden fatigue cracks. Some outer wires from stranded ropes should be bent at worn crowns and some at other parts from inside the rope. If any wires snap regularly at worn crowns and nowhere else, it will probably be due to surface embrittlement. If embrittlement has occurred, a number of hair cracks opening across the worn crown will be seen. A watchmaker's magnifying glass with a magnification of 2 or 3 will be very useful for this work as it can be held in the eye, leaving the hands free.

When a wire is taken out of a strand of a Lang's Lay rope it will be wavy in shape and will show a large hump, followed by a small one, followed by a large one etc. The outside of a large hump lies on the outside of the rope where the external wear or worn crown will be found. The outside of the small hump lies against the fibre core and between the two will be found the nicks where the wires of one strand touch the wires of the next strand. The inside of the curves of humps represents the inside of the strand.

When studying fractures in wires, the type of the fracture and its position in the wire should be noted. This can be estimated from the brief explanation given earlier. From this it should be possible to decide the cause and find the remedy.

To find whether the steel in a galvanised or anti-corrosive rope is corroded or only the Zinc blackened, dip the wire into ordinary commercial concentrated hydrochloric acid (spirit of salt). The wire will fizz and bubble strongly until all the zinc has gone; this will take about half a minute. Clean the wire with waste, taking care not to get the acid on finger, or clothes. Corrosion scale on the steel should be scraped off to find whether there are corrosion pits underneath. If there are, they should be prodded with a pin to find the depth and examined through the eyeglass at the same time.

It is important to remember that a wire is no stronger than its weakest part. A deep corrosion pit every 2 inches, with good wire between, is as serious as continuous pitting all along the wire. It is necessary to go about one 'rope lay' away from damage in a wire before getting clear of its effect on that wire. After such a distance the wire becomes locked in the rope by the surrounding wires and will take up its load again, even if broken.

Keeping Records—There is no point in making a careful and useful examination of rope if the results are not recorded. A written record of each rope should be kept for the use of ropeman

and senior official, in addition to the entries made in the statutory Record Book. A separate book for each rope is best, giving the size, structure, maker's strength of the rope and whether it is galvanised or not, when it is put to work, and the usual rope life in that shaft. The note should include a record of all examinations, recapping, accidents etc. Examples of a suitable style for such notes are given below :

"Recapping sample 1/7/51.

Dia. $1\frac{3}{32}$ in. Outside-well laid up, lubricant dry, zinc dark but steel O.K., light wear all round. Inside fibre dry and nearest wires dry with dark zinc but steel O.K. Inside of strands well lubricated and bright. Only light nicking. No broken or cracked wires. Sample in sound order. About the same as last sample."

Six months later after the next recapping the following might be written :

"Recapping sample 1/1/52.

Dia. $1\frac{1}{16}$ in. Outside-well laid up, lubricant dry, zinc blackened and corrosion getting through to steel. Moderate wear all round.

Inside fibre and nearest wires dry with blackened zinc and small corrosion pits on steel. Lubricant inside strands going blacky but wires still bright. Only light nicking. One outer wire cracked next to fibre, looks like corrosion-fatigue. Corrosion getting a hold. lubrication needs looking into."

By doing this, the examination will begin to be of very real value.

Laboratory Test—If the recapping samples are sent to a testing station for examination and test, a visit to the station to see the tests carried out would be useful.

Tests carried out at Testing Stations are usually :

1. tension, 2. torsion, 3. reverse bending.

In tension testing the breaking strength of the wire is found in a testing machine and the sum of all the wire strengths gives the Aggregate Strength (not the Actual Breaking Strength) of the rope. The broken end of wire after this test will show a tension fracture.

In torsion testing the two ends of a length of wire are fixed in the two holders of a machine one holder being turned to twist the wire. This measures the 'ductility' (toughness and freedom from brittleness) of the wire and is an excellent way of finding small faults or fatigue cracks. A new ungalvanised wire will stand up to perhaps 36 twists over a length equal to 100 times the wire diameter, but the same wire with very small fatigue crack will probably break after two twists or less.

In reverse bend testing the wire is clamped in a vice fitted with specially rounded jaws and is bent backwards and forwards over these rounded jaws until it breaks. This also tests the ductility but over a very short length, and is of more use for new than worn wires.

When to remove a rope—Generally speaking a rope should be withdrawn from service when:

1. The factor of safety falls below 10 or such other limit fixed by Chief Inspector of Mines (i.e. when the reserve of strength is no longer sufficient to ensure that the rope can repeatedly carry the shock loads, etc. with safety).
2. The loss of strength in the rope due to wear, corrosion or both is approaching 16% of the original strength.
3. The loss of strength in the rope due to fatigue, corrosion fatigue, surface embrittlement, or cracked and broken wires of any kind, is approaching 10% of the original strength.
4. The outer wires have lost about 15% of their depth as a result of any kind of deterioration.
5. The outer wires are becoming loose and displaced for any reason.
6. The rope has become kinked, distorted or damaged, and the damaged piece cannot be removed.
7. Examination of the rope leaves any doubt as to its safety for any reason whatsoever.

Form

[See Regulation 80(6)/88(6) of Coal/Metalliferous Mines Regulations 1957/1961]

Record of Examination of	Rope	Serial No.
Colliery.....		
Pit.....		
Over or Under Rope.....		
Date Cut Off.....		
Date received.....		
Type of rope.....		
Right or Left Hand Twist.....		
Dia. Or Circ. or Width and Thickness.....		
Construction and size of wires.....		
External wear and corrosion.....		
Internal wear and corrosion.....		
Lubrication and condition of core.....		
Broken wires.....		
General Remarks.....		
Signature.....	Designation., Date.....	

(Cir. 77/1963 and Tech. 1/1981)

2. Failure of capping of winding rope—In the Jharia coalfield recently, a cage fell down in the shaft due to failure of white metal capping.

2.0 Enquiry revealed that the winding rope snapped at the entrance to the cappel. The quality of capping left much to be desired. Proper inspections of winding rope as required under Reg.

83(1) (c) of CMR 1957, read with this Directorate's Circular No. 77 of 1963 were also not carried out.

3.0 Necessary steps should be taken to comply fully with the provisions mentioned above. In addition, while making white metal rope capping procedure laid down in Circular No. 62 of 1963 may be systematically adopted to avoid such incidents in future .

(Cir. Tech. Sapicom. 7/1985)

3. Breakage of winding rope—Recently in a mine one of the winding ropes snapped while winding coal-

The rope in question had been in use for three years in a pit the output of which was about 4500 tonnes per year. The shaft was fairly watery. The rope broke at a point 27.5 m. from the cappel end where it was found kinked. The inner wires were found badly corroded pitted; and water entered inside the rope through the distorted strands due to the kink.

In a balanced winding system a winding rope cannot get kinked in a normal operation. The only time a kink may take place is during installation. If during installation the rope is stretched on the ground in front of the drum a kink may take place while winding the rope on the drum.

Proper procedure in this case would be to wind the rope on drum directly from the-storage reel. Similar precaution should be taken while purchasing a portion of rope out of a full reel.

Instructions outlined in Circular 77 of 1963 should be implemented in their entirety. The following additional steps are suggested :

1. The rope should be thoroughly inspected personally by a competent engineer every month.
2. Suitable rope dressing should be used without mixing up with grease. The dressing should be applied in the manner suggested by the manufacturer.
3. Ropes should be thoroughly cleaned particularly at the interstices between strands before new dressing is applied.
4. Dressing should be applied as soon as the old dressing shows signs of cracking at the strand interstices.
5. Ropes should be wound on winding drum directly from the reel and not by stretching them on the ground in front of the drum.

(Cir. 69/1965)

4. Examination of cages—The design of cage hangers should as far as practicable avoid extensive forgings. It is also desirable that cages should be taken out of service once at least in every six months and stripped off for a thorough examination, and repairs if necessary. All load carrying components of the cage e.g. hangers etc. should be suitably heat-treated before the cage is reassembled for further use.

(Cir. 34/1962)

5. Examination schedule of steam engines used for winders and haulages—In the recent past there have been a number of cases where the internal components of steam engine failed causing difficult and dangerous situations. For instance, seizure of piston ring of steam engine during man-winding caused suspension of cages in shaft for long duration. This also required special efforts to rescue the men from the cages.

To avoid or atleast minimise such occurrences, it is suggested to adopt the following examination schedule for steam engines used with winders :

Schedule

Daily

(1) Examine and tighten, if necessary, the following :

- (a) piston rod cotter and its locking,
- (b) connecting rod cotter and jib with their locking,
- (c) nuts and bolts of cross head guide,
- (d) nuts and bolts of connecting rod,
- (e) nuts and bolts of eccentric strap,
- (f) steam inlet and exhaust manifold packing,
- (g) nuts and bolts of foundation,
- (h) plummer blocks holding down bolts.

(2) Examine piston rod and valve rod pickings for any leakage of steam. Replace, if necessary.

(3) Top up lubricants for bearings and cylinder sleeves etc.

(4) Check drain cocks of steam chest and cylinders.

(5) Check knocking sound of engine, gudgeon pin etc. after starting. Eliminate the same.

(6) Check steam pressure gauge functioning.

Weekly

(1) Check and tighten the nuts of cylinder head, crank and steam chest.

(2) Examine steam ranges and cylinders for adequate lagging with insulating material.

(3) Check lubricating pipe line for clogging and clean if required.

(4) Replace cotton tape of syphon lubricator. Replace grease cups, where necessary.

Monthly

- (1) Remove steam chest cover so that the valve operation can be observed.
- (2) Valve-nuts and locking nuts are to be checked.
- (3) Check eccentric valve rods to ensure proper setting of D-Slide valve.
- (4) Check engine for any leakage of valve.
- (5) Check for correct lead and cut-off of each cylinder so as to ensure equal lead and cut-off at both ends of cylinder.
- (6) Check cross head for its play in the slippers so as to ensure the play within specified limits.
- (7) Examine the main eccentric and connecting rod bearings for wear. Adjust, if necessary.

Yearly

- (1) Check cylinder throughout its bore for extent of scoring and wear. Check piston-rings for their-correct fitment.
- (2) Check rings for knife edges and if necessary, the same should be rounded off to avoid any deterioration of proper lubrication of cylinder.
- (3) Check quality of piston rings and piston, which are used with engine. Proper selection of these parts be made at the time of replacement, if any.
- (4) Check suitability of packing to avoid leakage of steam and its bursting.
- (5) Check all gunmetal bushings and replace if found beyond the permissible limits of wear.
- (6) Check the ovality and deflection of both the gudgeon pin and crank pin.
- (7) Check for wear the pins and lockings of stevenson link motion.
- (8) Check piston rod and connecting rod for any flaw by adopting suitable non-destructive testing method.
- (9) A lubrication chart shall be put up in the winder house indicating clearly the points of lubrication, grade of lubricant/grease etc. corresponding to each point and duration at which lubrication shall be carried out. Lubrication chart shall be strictly adopted.
- (10) Any other examination, which may be necessary in respect of any particular engine, may be adopted.

The above Schedule shall also be adopted for steam engines used with haulages.

(Cir. Tech. 4/1982)

CMR85/MMR93

1. Precautions in lubricating guide ropes—In a recent accident in a coal mine while a mazdoor was engaged in lubricating guide ropes of a cage in shaft 91m in depth, by standing on top of the cage, he slipped and fell down the shaft through a vertical distance of about 90m and died instantaneously.

As brought home by this accident the practice of lubricating guide ropes by persons standing on the top of the cage is fraught with danger. You are, therefore, advised to see that the guide ropes are lubricated by persons standing inside the cages. For this purpose suitable windows should be provided in the side of the cages and the lubricant should be applied to the guide ropes with a suitably designed appliance fitted with a long handle.

(Cir. 22/1969)

2. Precautions during erection, examination and repairs etc. of headgears—Accidents have occurred during erection, examination and repairs etc. of headgears when the persons working thereon did not take adequate precautions like use of safety belts, ladders with railing, etc. Under the present regulations, no specific precautions are laid down in this regard though definite requirements are prescribed for shafts.

Nevertheless it is felt highly desirable that the precautions and the requirements specified under the regulations while carrying out any examination repair etc. in shafts should be taken and complied with while carrying out similar work in the headgear also.

(Cir. 47/1971)

Deletion of circulars on winding and haulage equipment—In a recent review of the circulars relating to winding and haulage equipment issued in the past it was observed that some of the circulars have either outlived their usefulness or they require updating/revision. Accordingly an exercise was undertaken to identify the deletion/amendment/revision which is necessary to remove any element of confusion or conflict. The results of this exercise are detailed below. You are requested to carefully note the same.

	DGMS Circular Nos.	Amendments to be made :
(a)	Circular No. 68 of 1965	Delete
(b)	8 of 1967	—do—
(c)	35 of 1962	—do—
(d)	27 of 1967	—do—
(e)	Circular No. 39 of 1969	Delete Refer to DGMS/Tech. Cir. No. 4 of 1985
(f)	56 of 1970	—do—
(g)	29 & 29 A of 1973	—do—
(h)	6 (Tech.) of 1975	—do—
(i)	Circular No. 15 of 1975	In the first line on page 2 of the Circular, Figure 7 be read as 9.
(j)	DGMS (Tech.) Circular No.4 of 1985.	In the First line that "The Owners, Agents Agents and Managers of all Coal Mines" delete the word coal.

(Cir. Tech. 3/1986)

Note—The above amendments have been carried out in this volume of DGMS Circulars.

TRANSPORT OF MEN AND MATERIAL—HAULAGE

CMR 87/MMR 95

1. Installation of power cables belowground—Installation of power cables along haulage roadways should be generally avoided. The cables should be installed along travelling or other road-ways where roof and sides are adequately supported, and there is good ventilation.

Wherever cables are installed, they should be so placed and secured as to ensure maximum protection against mechanical damage of all kinds, and particularly that due to their own weight, bending or twisting, traffic and ground movements. Damage to cables or crushing at points of their support should also be avoided. Supports for cables should be spaced sufficiently close to prevent dangerous sagging.

(Cir. 15/1965)

2. Size of rails and specifications of other materials for haulage roads—

In a report (on Standard of Haulage Track, March, 1966) the Technical Committee on Mines Standards has observed that efficient transport is vital for the economical and safe operation of a mine and their efficiency can be greatly impaired if the system breaks down frequently or requires excessive operational manpower or needs frequent attention. The Committee has also pointed out that incidence of serious accidents on haulage as a percentage of all such accidents mines has increased more than twofold from 7.1% in 1955 to 18% in 1964, adding that poor standards of track are the cause of the majority of the haulage accidents in mines. The Committee has recommended that haulage track should generally be constructed of heavy section rails, properly ballasted and constructed to high standards.

In respect of rail size for mine haulage track, the Committee has recommended adoption of 15 kg/m rail section for general purpose and has added that a suitably heavier section should be used where the gradient is steeper than 1 in 6 or where mine cars of capacity higher than 1.5 cu.m. (53 c.ft.) are in use; the minimum section on locomotive tracks should also be 15 kg/m

While statutory provisions in this respect will be amended in due course, these recommendations are being brought to the notice of all concerned so that arrangements for compliance therewith may be made early.

The recommendations of the Technical Committee in respect of specifications of other track equipment are reproduced at Appendix A, and those in respect of construction layout and inspection etc. of the rail track at Appendix B.

Appendix A

Recommendations of the Technical Committee on Mines Standards in respect of Material for use on Mine Haulage Tracks

Sleepers and rail fastenings—The length of the sleepers should not be less than the gauge plus 60 cm subject to a minimum of 1.5 m. Where locomotives heavier than 5 tonnes are in use the sleeper section should be not less than 20 cm to 12cm. Wooden sleepers should be not less than 15cm wide and 10cm thick. The sleepers should be sawn from good, clean, sound timber free from bark, dead wood, large knots, fungoid growth, rot, insect attack, serious cracks and endshakes etc. and must be well-seasoned. Sleepers should be straight, well-sawn and cut square at the ends with top and bottom parallel.

According to available information, the average life of treated timber is 7 to 17 years, depending on mine conditions, compared to 2 to 5 years for untreated timber. While using treated timber, however, the question of fire risk must be taken into account, and inflammable preservatives should not be used.

Length of dog spikes should be at least one cm less than the thickness of the sleeper.

Steel sleepers of suitable sections can be used in conjunction with wooden sleepers, or steel sleepers alone can be used, depending on availability.

Concrete sleepers have not proved satisfactory for mine use due to their tendency to break under load. Pre-stressed construction gives better qualities but adds to the cost when concrete sleepers are used. The rail should be laid on a chair plate, and between this chair plate and the sleepers is placed a felt or rubber pad (one ply of old conveyor belting is quite suitable).

Sleepers should be spaced at 90 cms. Rail joints should be free, with two sleepers for supporting the end rail placed not more than 30 cms. apart.

Ballast—Ballast provides an elastic bed for the track, distributes the applied load over a larger area and holds the sleepers in place. Selected mine rocks and/or fused boiler clinker are very suitable as ballast as the mass will bind wall together when laid down and yet remain porous to allow drainage and so maintain an elastic road bed. The material size should, as far as possible, be plus 1 cm minus 6 cm.

In locomotive and main haulage tracks, a layer of coarser ballast should be laid under the sleeper, and finer material used between the sleepers. In order to stabilise the track, the ballast bed should be wider than the sleeper length, by about 30 cm on either end.

Lighter ballasting may be used in hand-tramming lines.

Other materials — Gauge ties of suitable design should be employed at suitable intervals to help in maintaining the gauge of the track. They are specially valuable where the available timber has poor holding qualities. Where used there should be two ties to each rail length. On curves, gauge ties should be used on each side of every joint—an arrangement which gives a very rigid construction with staggered joints.

Haulage track on steep roadway should be properly anchored.

Switches and crossings should also be properly designed. The NCB standards can be used with advantage.

Appendix B

Recommendations of the Technical Committee on Mines Standards in respect of Construction Layout and Inspection of Haulage Track

Preparing a haulage roadway—The need for a straight or near-straight haulage road arises from the need for greater stability of the rolling stock. It pays therefore to lay and maintain a haulage road straight. In main haulage and locomotive roads, the floor and sides may be dressed and ballasted, if necessary. All sharp changes of gradient should be eased off by vertical curves, so as to eliminate, as far as possible, the possibility of dangerous jerks which can result in uncoupling of cars or tubs. Vertical curves need not be uniform throughout the whole line; each case should be treated on its merits, with due regard to the expenses involved and the saving effected in the rise and fall.

Curved track should always be set out with as large a radius as possible. A larger radius gives easier running of the rolling stock and so reduces wear on wheels axle-boxes, locomotive sides roads etc. as well as on track, with consequent reduction in the up-keep and maintenance costs.

While laying main haulage roads, the line of the proposed track should be clearly marked on the roadway; the grade line also should be clearly marked on the side of the roadway (at a predeter-mined height above the final level). Cross levelling of the track is facilitated if the grade line is marked on both sides of the roadway. The floor of the roadway should be excavated, where necessary, and roughly graded out at a depth of 20 to 30 cm below the final rail level. This is particularly important with locomotive track.

Track construction and layout—Rail joints should be square across the track and not staggered. Sleepers should be placed on each side of rail joint as close to it as the fishplates will allow.

Curves—The curved track should always be set out with as large a radius as possible. The minimum radius of a curved track depends upon wheel diameter, wheel gauge, rail gauge, wheel-base, design of couplings, speed, and super-elevation etc.

Many formulae are available for determining the minimum radius of curve but, whatever be the formula used, it is important that the job is laid out on drawing board before making a final choice.

The amount of super-elevation required is dependent on the radius of the curve, speed at which the train is travelling and the gauge of the track. This should be also settled by the use of available formula. If for any reason, it is impracticable to superelevate the outside rail, a. check rail should be provided along the inside rail for the full length of the curve.

Tools and labour requirements—For a track-laying gang, the following tools are required :

6 shovels	1 rail drill
6 picks	2 holding up bars (Sleepers to rails)
4 beater picks	1 straight edge
6 crowbars	1 cant block
2 crowbars with claw for withdrawing spikes	1 spirit level
4 spiking hammers	2 rail gauges
4 spanners (for fishbolts)	1 track space gauge
2 spanners (for each screw)	1 chisel
3 pairs rail tongs	1 hand hammer
2 augers	1 age
2 rail lifting jacks	1 plumb-bob
1 rail bender or cramp	1 length of cord
1 rail saw	1 tram for carrying tools and materials

At least six men are required for laying new track. For routine maintenance work this gang can be split into two groups of three each for good results. It is important that track layers are properly trained in job.

Inspection and maintenance—For efficient working of the haulage system, all haulage tracks

should be inspected at regular interval and maintained in good conditions. The person in-charge of each gang of track layers should walk the length of his section of roadway everyday noting any defects; only after such an inspection he can properly organise his work of carrying out the necessary repairs.

Regular attention is required to be paid to the following amongst other factors :

1. examination of all fastenings, fishplates and bolts,
2. examination of all curves to check super elevation and alignment,
3. examination of all crossing and junction work,
4. checking and correction of alignment, levels and clearances along the whole length of the track.

(Cir. 58/1966)

3. Position indicators for jazz rails and curves—Runaways of tubs generally occur due to snapping of rope, due to disconnection of coupling between the tubs and that between the rope and the first tub. Enquiries into such occurrences revealed that when a train is running over portion of track where jazz rails are provided or where grade changes sharply or when a train is negotiating a curve, the drivers don't usually control speed of train. This may perhaps be due to the haulage engine-drivers not being aware of the position of the train with respect to the jazz-rail, curves etc.

If a suitable position indicator is, therefore, provided on each direct rope haulage engine showing to the engine driver places where he should reduce speed of train to avoid undesirable jerks on the rope, coupling etc. incidents of runaways can certainly be reduced. Action should be taken accordingly.

(Cir. 32/1969)

4. Maintenance of haulage track—A large number of haulage accidents occur in mines due to bad laying and indifferent maintenance of tracks. The First Safety in Mines Conference (1958-59) recommended that track standards should be improved. The Conference was of the view that it is in the interest of managements themselves to keep the track in good condition and recommended that, to improve the standard of track laying in mines, all tracks should be placed under the charge of a suitable competent person. This person could then be made responsible for proper laying and maintenance of track.

(Cir. 26/1959)

5. Accident while guiding the rope on drum of direct haulage for proper booking—An engine driver lost life in trying to correct the booking of the rope by hitting it with his leg from being the drum when it was in motion. His leg was caught between the rope by hitting it with his leg from behind the drum when it was in motion. His leg was caught between the rope and drum. He lost balance and the central switch was inadvertently pulled by his hand resulting in faster rotation of the drum. He was pulled in and got pressed between the drum and rope and was killed instantaneously.

It is thus considered imperative that in respect of all haulage engines, a booking pulley should invariably be installed in front of the haulage to guide the rope while it is coiling on the drum.

The above accident also focuses attention on the need for ensuring that no person guides or adjusts a moving rope on to a drum except with a lever or other proper appliance as stipulated in Regulations Reg. 87(2) (b) of CMR 1957 and Reg. 95(2) (b) of MMR 1961. A long lever or other proper appliance should be provided for this purpose and, in addition the following safety measures should be taken :—

- (i) Haulage drum should be suitably guarded in the front and rear by substantial guards made from expanded metal in iron frame.
- (ii) Booking of rope should be corrected as far as possible from behind the drum when the rope is not very tight.
- (iii) While paying off the rope from the drum, care should be taken not to pay off excessive amount so as to make the rope very slack.

(Cir. 8/1973)

6. Proper fixing of rollers, etc.—In an accident on a direct rope haulage road, fatal injuries were inflicted to a trammer by one of the track rollers provided for supporting the rope. Track roller was not securely fixed and while a set of loaded tubs was being hauled on a grade of about 1 in 3, it got dislodged by the rope and rolled down the haulage road. It gained sufficient momentum and hit one trammer on his chest as he was coming up the road. He succumbed to the injuries after a few hours.

Therefore on rope haulage roads, all rollers, pulley and sheaves etc. provided to either support the rope or to alter the direction of the rope shall be securely fixed.

(Cir. 70/1973)

7. Material of sprags—Use of sprags is common in mines to control the free movement of tubs. Sprags are also to keep the tubs stationary on slopes. Sprags are mostly made of wood but in absence of any specification, their quality varies. Failure of such sprags resulting in runaways leading to accidents is not uncommon in mines. In a recent case, while a loaded tub was being

pushed manually down an incline having a gradient varying from 1 in 47 to 1 in 25, the wooden sprag used to control its movement broke and the tub ran amuck for a distance of 240 meters. A worker engaged in pushing another set of loaded tubs on the same track at that time was run over and killed.

It is recommended that a strict control should be exercised on the sprags provided at the mine and a periodical check made to ensure that the sprags are always in fit condition for continued service. Needless to say sprags made of iron pipes or other harder material will serve the purpose better. Use of poor quality wooden sprags should be discontinued.

(Cir. Tech. 10/1976)

8. Endless haulage rope clips—For endless rope clips, the following guide-lines are laid down :—

- (1) The clip should be tested to stand a slip load of three times the full force for which the same is used.
- (2) 1% of the clips in use should be tested for slip load every month.
- (3) Whenever major repair is done on the clips, the same should be subjected to slip test.
- (4) Record of test results should be maintained in respect of 1, 2 and 3 above according to clip serial number wise. The pull should be calculated on the maximum gradient of haulage run. Minimum number of two clips should be used, one in the front and the other on the rear of the cars/train of cars so as to take care of undue rolling of cars or train of cars on undulating haulage roadway.
- (5) The minimum number of clips to be used with a set of cars/trains of cars should be decided for each haulage system by the Manager duly complying with item 1, 2, 3 and 4 above and the same should be notified in writing to all concerned persons associated with supervision, use, maintenance and repair of the same system. Notice shall also be prominently exhibited at every attaching and detaching point.

The following types of clips are considered for use for the present:—

- (i) Screw clips
- (ii) Wedge clips
- (iii) Cam clips
- (iv) Smallman clips
- (v) Aspinall overhead haulage clips.

The use of lashing chains should be discontinued
It will be appreciated if prompt action for implementation of the above guide-lines are taken.

(Cir. Tech. 5/1980)

9. Standardisation of specifications of direct rope haulages—In mines in India at present different types of haulages are used extensively. A need was always felt to rationalise some of the basic and broad features of a direct rope haulage for operational advantages and in the interest of safety. Accordingly a sub-committee on mine safety equipment was constituted. It recommended the broad mechanical and electrical details which are given in the Appendix for information and adoption with immediate effect.

For the existing installations of direct rope haulages in mines, all out efforts should be made to improve them by carrying out some modifications/ additional provisions, if required, so as to meet the given details.

APPENDIX
Broad Specifications of Direct Rope Haulages
Mechanical Details

(1) The different parameters of Direct Rope Haulages from 50 KW to 150 KW should be as follows :—

Rating of the haulage	50KW	75KW	100KW	150KW
Rope dia, mm	19	22	25	25
Drum width, mm	1000	1200	1500	1500
Drum width	900	1000	1200	1200
Flange dia, mm	400	1600	1950	1950
Rope capacity of the upto 1100 drum (m)	upto 750	upto 800	upto 1100	
Motor power, KW	50	75	115	50
Motor rpm (Syn.)	1000	1000/750	750	1000

Max. static rope pull, kgf.	2500	3000	4000	4000
Rope speed, m/sec.	1.5/1.8	2/2.2	2.5/2.7	3.4/3.6

- (2) Direct haulage should be provided with service brake as well as emergency brake on the drum. Emergency brake should have the capacity of 3 times the maximum static torque and the service brake have a breaking capacity of 1.2 times the static torque.
- (3) Direct haulage should also be provided with speed indicator, distance indicator and over speed tripping arrangement.
- (4) Jaw Clutch : A Jaw clutch should not be provided in the haulage as its incorporation in the system would be linking with all the above mentioned safety features with the drums and as such this may unnecessarily complicate the mechanism. The motor should run with power 'ON' while the empty tubs are being lowered. The absence of clutch would help to keep the lowering speed within limits.

Electrical Details

A. General

- The Selection of electricals to be determined mainly on the basis of (1) duty cycle of Haulage operation and (2) conditions of installation and operation.
- (1) Slow speed running and its duration.
 - (2) No. of start-stops and inching operation in each cycle and in each stage of operation.
 - (3) Over loading and its duration.
 - (4) Overspecd running and its duration.
 - (5) Total duty cycle with acceleration and Retardation time.
 - (6) Braking or plugging if any.
 - (7) Ambient and Environmental conditions.

B. Selection of Drive

- Type—Whether slipring or squirrel cage motor to be determined as per measurements of Haulage installation. Enclosure as the case may be.
- Rating—Output voltage, speed and torque as per requirements of haulage and available supply system.
- Duty—To be determined as per requirements as mentioned in para.
- Other—As per IS : 325 and 3682, having class of insulation corresponding to min. 80°C rise.

Minimum requirements

- (i) 100% over speed for 5 mts.
- (ii) 15-20 nos. of inching operations in each cycle during acceleration and slow speed running.
- (iii) Slow-speed running for 1/3rd period of duty cycle at 1/3rd of rated speed on full load.
- (iv) Duty cycle 10 mts.
- (v) Acceleration time 1 min. and Retardation time 10.30 sec.
- (vi) 15% overload for 1 min. continuous.

Selection of rotor Resistance

Grid : Selection of rotor resistance and its no. of steps to be determined considering torque speed requirement of haulage and drive motor rotor data, the duty factor time determined from actual duty cycle of haulage and duration of operation in each step.

Minimum requirements

- (1) 30% speed and 35% Torque at 1st notch for inspection speed.
- (2) 30% speed and 60% torque at 2nd notch for slow speed running.
- (3) 30% speed and 100% Torque at 3rd notch; slow speed running to cope with sharp bend and undulation in track.
- (4) 100% duty factor of 1st, 2nd and 2nd and 3rd notch.
- (5) 20% duty factor for 4th and onwards notch cor acceleration.
- (6) Maximum developed torque shall not he more than 250% and minimum not less than 180%- (from 4th notch and onwards).
- (7) Maximum permissible temperature rise of resistance bank not to be more than 70°C.
- (8) The resistance unit shall he shock proof, vibration proof and rust proof. Suitable torque-speed characteristics for rotor resistance shall be adopted.
- (9) Maximum unbalanced motor resistance, if selected, shall be restricted to 150% of normal F.L. Current.
- (10) Fully enclosed or F.L.P. construction.

Liquid

If liquid rheostat is used, the following additional protection is to be taken care of :—

- (1) Low electrolyte level-protection.

- (2) Provision to check connection of electrolyte.
- (3) Provision of adjustment of electrodes at maximum position when semi master controller is in off position.
- (4) Sufficient cooling arrangement for cooling the electrolyte.
- (5) One contactor should be provided for shorting the rotor of motor when semi master controller is in fully 'ON' position.

C. Selection of Control Gears

The following basic elements/features to be considered while selecting the control gear

- (i) supply isolation device (with reversing and interlocking provision).
- (ii) forward - reverse operating device with the Mech. & Elec. interlocking.
- (iii) short circuit protection (preferably with ACB).
- (iv) overload protection (preferably magnetic oil dashpot type)
- (v) under voltage protection.
- (vi) earth leakage protection.
- (vii) over speed protection.
- (viii) over travel protection .
- (ix) current, voltage and speed indicator.
- (x) on, off and earth leakage indication.
- (xi) earth leakage test and re-set arrangement.
- (xii) off position mech. and elec. interlocking of drum controller/master controller/semi-master controller.
- (xiii) circuit for emergency brake.
- (xiv) emergency stop push button.

Minimum requirement

- (1) operating line contactor shall be of AC-4 duty-class and handling of motor line current by drum controller to be restricted as far as possible.
- (2) matching and minimum setting characteristics of over current relay, circuit breakers and line contactors shall be provided.
- (3) operation of haulage, during lowering shall be made with power supply to motor 'ON'. Lowering under gravity shall be prohibited during normal use.

(Cir.Tech. 13/1982)

10. Common contraventions in haulage installations—Haulage installation in mines still account for a sizeable number of fatalities every year and cause-wise it occupies a position just below falls of roof and sides. Recently, a survey of haulage installations at some mines was carried out by this Directorate to ascertain the state of these installations.

2. The main contraventions observed during survey are listed below :

- (i) non-provision of proper inter-coupled stop-block and run-away switches at specified places.
- (ii) use of defective couplings.
- (iii) improper maintenance of haulage rope.
- (iv) unauthorised riding on tubs or their buffers.
- (v) uncontrolled movement of tubs.
- (vi) lack of adequate supervision.

3. An analysis of fatal accidents due to cause group 'Haulage' reveals that the two most prevalent causes are :

- (a) uncontrolled movement of tubs; and
- (b) use of defective couplings and their failure;

and the fatalities are shared equally by persons authorised to work at or use haulage roadways (trammers, clipmen, line mazdoors etc.) and unauthorised persons of various categories.

4. Our desire to achieve ZAP would remain an idle dream unless concerted efforts are made by all concerned to remove the defects high-lighted during the course of survey aforesaid. This can be achieved by honest and sincere compliance with the different provisions of statute together with relevant D.G.M.S. Circulars issued from time to time, a compilation of which is enclosed for ready reference.

5. In addition it is recommended that :

- (a) internal Safety Organisation in every mining company may launch a drive once every year to improve in totality the health of haulage installations in every mine.
- (b) the Agent/Manager and other supervisory personnel may ensure that unauthorised persons do not travel by haulage roadways and also that they remain at safe locations when rope or tubs are in motion.

(c) persons authorised to work at or use haulage roadways are thoroughly trained in their jobs so that they may perform their assigned duties safely.

6. An efficient and healthy haulage installation is the very life line of the mine as it leads to improved production, productivity and industrial relations at the mine. I am confident, therefore, that for the well being of the industry and that of the persons employed therein, every single unit, big or small, would pay due heed to the aforesaid suggestions.

ANNEXURE

The main contraventions observed during the aforesaid survey are indicated below vis-a-vis the statutory provisions :—

(a) Uncontrolled movement of tubs—Provisions have been made under Reg. 89(2) (c) of the CMR 1957/Reg. 97(2) (c) of the MMR 1961.

(b) Use of defective couplings—DGMS Technical Circular No. 3 of 1982 gives the detailed procedure for the examination/maintenance of the tub couplings required under provisions of Reg. 89 (1) (d) of the CMR '57/97(1) (d) of the MMR' 61.

(c) Inadequate maintenance of haulage rope and unauthorised riding of tubs or their buffers—DGMS Technical Circular No. 28 of 1973 gives details of care and maintenance required for haulage rope under provisions of Reg. 91(1) of the CMR 1957/99(2) (A) of the MMR 1961. Regarding riding of tubs or buffers, provisions have been made under Reg. 88 (3) of the CMR 1957/96(3) of the MMR 1961.

(d) Non-provision of proper intercoupled stop block and runaway switch, drag and sprag—The provision of the above contrivance have been made under Reg. 87(3) (a) (b) (c), 89(2) (b) of the CMR, 1957/95(3) (a) (b) (c), 97(2) (b) of the MMR 1961.

(e) Neglect in supervision—Duties of supervisory personnel have been specified under Regulation 38, 41, 42, 43, 50 and 53 of the CMR 1957/41, 44, 45, 46, 47 and 56 of the MMR 1961.

(Cir. Tech. 8/1985)

11. Crossing of two haulages—Whenever two intersecting systems of haulage are in operation, there is danger to persons employed nearby due to fouling of the rope of one system with that of the other haulage. The inherent danger is to persons being pressed against pillar sides by the rope of one haulage being pulled by the other.

Recently, in one accident, a loaded set of tubs being pulled by a direct haulage fouled with a level endless haulage rope this endless rope was pulled upwards. On getting released, it inflicted grievous injuries on a trammer which proved fatal shortly thereafter. In another case a loaded set being hauled up by a direct haulage fouled with the over-rope of a level endless haulage. This rope pinned a supervisory official against a pillar side that resulted in his death.

It is advised that where such haulage systems exist, particularly in belowground workings, adequate precautions should be taken to avoid any fouling of one with the other. Cross over/under bridges or other suitable foolproof devices should be provided at all such junctions and steps should be taken to ensure that there is no fouling of the ropes or that the safety of persons nearby is endangered.

(Cir. Tech. 2/1977)

CMR 88/MMR 96

1. Travel along haulage roadways—Every year there are a number of fatal accidents on haulage roadways to persons travelling on them unauthorisedly. Recently there had been two accidents to haulage attendants while they were proceeding to their place of duty along haulage roadways. Both the persons were run over and killed by runaway tubs. The place of duty of both the persons was not the haulage roadway on which they were killed. One was haulage engine khalasi of an endless haulage plane killed on the main haulage dip, the other was an underground trammer, proceeding underground along the main haulage dip.

The above underlines the gravity of the danger to persons walking along haulage roadways where they are not expected to do so. It is emphasised that nobody should be on the haulage roads unless he has business to be on that road. Haulage roads should not be used, be it an official haulage attendant or anybody, just for the purpose of travelling. This point should be emphasised in the different safety classes and the V.T. Centres and rigidly enforced.

(Cir. 2/1972)

2. Conditions for exemption for travel along haulage roadways— Where a separate travelling roadway cannot be provided and persons have to travel along a part of the haulage roadway, and an exemption has to be granted, the following precautions may be specified and enforced :—

1. There shall be provided and maintained effective two way means of transmitting signals between the two ends of the part of the roadway where persons may be permitted to travel.
2. The manager should fix specific periods for travelling; and notices specifying these periods should be posted prominently at the top and bottom of, and also at all regular stopping places along the haulage roadway.
3. Any person who of necessity has to travel along the roadway outside the period fixed for travelling should not be allowed to do so unless and until a special signal has been given to the haulage engineman.

4. Inexperienced persons should not be permitted to travel the roadway or part unless accompanied by an experienced person.

(Cir. 4/1948)

3. Travelling roadways : how they should be—It has been noticed that where the travelling roadways are circuitous and much longer than the haulage road, the workers are tempted to use the haulage roadways and accidents continue to occur because of this practice. The length of travelling roads should therefore be as short as practicable.

The alignment of the travelling roadway should not be changed frequently; otherwise the workers may not be familiar with the new alignments and may then walk along the haulage roads.

(Cir. 70/1964)

4. Travelling roadways to be in intake air—One of the reasons for the workers' reluctance to use a travelling roadway is hot and humid atmosphere of return air passing through it. It is apparently desirable that the travelling roadways should be in the intake air, as far as possible.

Such travelling roadways would also be helpful in expeditious withdrawal and/or evacuation of workers in an emergency arising out of a fire etc. in any part of the mine. In this context attention is also drawn to the provisions of Reg. 135(3) of CMR 1957 according to which one of the intake airways to be provided in every fiery seam of the second or third degree of gassiness shall be used as a travelling roadway.

It is, therefore, recommended that all efforts should be made to see that the travelling roadway in every underground mine (coal/metal) is in the intake air, and when this cannot be arranged, the matter should be brought to the notice of the concerned Director of Mines safety for advice.

(Cir. Genl. 2/1984)

5. Provision of manholes in tramming levels—Reg. 96(6) of MMR 1961 prescribes that manholes for refuge of persons while haulage is in motion, shall be provided at certain interval. There have been instances when persons walking in the tramming levels have met with accidents mainly because drives in the metalliferous mines are narrow and there is insufficient clearance between the track and the sides.

In the interest of safety, it is desirable that manholes of prescribed dimensions are also provided in the tramming levels at intervals of not more than 20 meters, whether there is any mechanical haulage or not.

Owner, Agents and Managers of all metalliferous mines are requested to take immediate action in the matter so that accidents in tramming levels could be prevented.

(Cir. Genl. 7/1975)

CMR 89 / MMR 97

1. Stoppage of set riding—Reg. 89(3) of the CMR 1957 states that no person shall ride on any tub or haulage rope except with the written authority of the manager. Every year a number of fatal accidents occur involving persons riding on tubs. It is therefore desirable that set-riding should be discouraged and the manager should not authorise any person to ride any tub or haulage rope except with prior permission from the DGMS. Where set-riding is in vogue, it should be stopped forthwith.

(Cir. 16/1965)

2. Accidents due to faulty shackles in tub-couplings—Every year accidents take place on the haulage planes due to failure of tub-couplings. The usual causes of these accidents are : (a) breakage of coupling, (b) breakage of drawbar, (c) defective coupling. Of these defective couplings have been responsible for the majority of accidents.

A coupling may be defective either due to its improper design, or by virtue of its misuse. It is therefore necessary that not only approved type of attachments between tubs and between the haulage rope and a tub or a set of tubs should be used, but, what is equally important is that the couplings and attachments are maintained properly and their design is not allowed to change due to wear and tear.

Improper use of shackles (D-links) attached to the drawbar ends had been recently responsible for loss of three lives in two fatal accidents. In one of these accidents the pin of the shackle was not locked by a split pin and in the other case an ordinary piece of wire had been used to lock the pin. Further the opening of the shackle between the eyes was more wide. When the opening of a shackle between the eyes is more than sufficient to thread the shackle in the drawbar, the pin of the D-link has a tendency to bend and damage the locking pin. In order to avoid such accidents it is recommended that—

(1) The pin of the drawbar shackle (D-link) should either be suitably riveted at the end or in place of the pin a bolt and nut with locknut and a locking pin should be used.

(2) The gap or opening of the shackle (D-link of the drawbar) should not be larger than the width of the drawbar end by more than 6 mm.

(Cir. 35/1967)

3. Examination and maintenance of tub couplings—There have been in the recent past a number of accidents in the mines leading to run-aways causing fatalities. It appears that sufficient attention is not being paid at mines to proper examination and maintenance of tub couplings.

In this connection, your attention is invited to the provisions of Reg. 89(1) (d) of Coal Mines Regulations 1957 requiring fortnightly examination of tub couplings etc. by a competent person. The engineers appointed at the mines are expected to oversee that such examination had been

done properly and prescribed records duly maintained, and for this purpose carry out sample checks.

In order to ensure timely examination of the tub couplings, it is necessary that all tubs at the mines should be numbered prominently and each coupling also stamped with a number and year of its manufacture as had been advised earlier vide Circular No. 59 of 1964.

The competent person(s) who has been appointed for coupling and un-couplings of tubs should be instructed to the effect that he shall not use any tub coupling which is found by him to be defective, and if any defect is noticed, he should bring the same to the notice of a mine official immediately.

(Cir. Tech. 3/1982)

4. An analysis of a few fatal haulage accidents—Haulage accounted for nearly 14% of the total fatalities that occurred in the two year period 1970-71. The important factors having a bearing on some of these fatalities are discussed below:

1. The Coal Mines Regulations, 1957, specially Chapter IX, embody several provisions which, when honoured sincerely, are bound to prevent most of the accidents that occur on haulage roadways. For eliminating the remaining few the gamut of haulage practices at each mine would have to be reviewed, vulnerable areas spotted out and carefully attended to. It is said that wise people learn from the mistakes of others. Shall we not do likewise from the past accidents?

2.0 Set riding

2.1 On a direct haulage system, set riding was prohibited at a particular mine. But a trammer was expected to accompany each set of tubs by walking some distance behind it. One day when a trammer was unauthorisedly riding an ascending set of loaded tubs near the cappel end of the rope, a derailment occurred. The trammer fell down, was dragged for quite some distance by the ascending train of derailed tubs and met his end on the spot.

2.2 At another mine, the management on receipt of this Directorate's Circular No. 16 of 1965, prohibited riding on sets. To place himself in the clear, the manager had also obtained thumb impression from the trammers that they would abide by the restrictions imposed by the management. But imagine the mental frame of a trammer who had to make frequent trips in a shift between shaft level and No. 28 level. Would he not be tempted to steal occasional ride when he was sure of the absence from his beat of managerial or senior supervisory officials ? On one such surreptitious ride he happened to slip from his perch and was run over by the ascending set of tubs.

2.3 The point brought out in these two accidents is to eliminate the root cause of the accidents, the temptation to ride. Asking a person to accompany a set of tubs is in itself defective. The apprehension that it is impracticable to do away with the system has been found misplaced at those mines which have boldly opted to discontinue the same. Why not eliminate it altogether from our mines ?

3.0 Riding on tubs

3.1 While waging a successful battle on riding on sets, please do bear in mind that, where the working sections are far off from mine entrances, it is not uncommon for categories of workpersons other than trammers to avail themselves of the short cut of free ride at the end of the shift. A water spraying mazdoor at a mine having nearly 1.75 kms long haulage roadway failed to step off a moving train when it had almost reached the top most level, as the other hazree mazdoors were able to do. He fell in between two loaded tubs and was dragged in this conditions till the haulage came to stop. Death came instantaneously.

3.2 It is difficult to believe that the trammers or the junior supervisory personnel were not aware of the clandestine practice of hazree mazdoors riding on the train of tubs. By not dissuading the unauthorised trippers from doing so or by not bringing the practices to the notice of the managerial personnel they brought about this accident.

4.0 Accidents at curves

4.1 At some mines it is not uncommon for the miners to crowd at the junction of haulage roadway with **tramming** levels so as to stake a claim on empty tubs as these negotiate the curve. Why have the miners at all to come to the haulage curve? Is the supply of empties erratic or that the miners have no faith in the munshi to equitably distribute the tubs or, the general level of discipline at the mine is low? Or is it merely a time established practice at the mine? Whatever may be the answer, the practice is extremely dangerous and does take a life or two every year. The solution lies in attacking at the very roots of the cause which draws miners to the haulage curves and accidents would automatically be prevented.

4.2 There is yet another defect associated with the practice of miners taking charge of empties from haulage curves. This is highlighted when the tramming levels are long and there is no **co-**ordination in the activities of miners, who push empties inbye and trammers who lower loads outbye. In the resulting confusion precious lives are lost for no ostensible gain. By one stroke of keeping the miners/loaders away from the active zones on tramming levels, a large number of persons would be shielded from accident hazard.

4.3 While on the subject of haulage curves it would be worthwhile ascertaining whether trammers have to guide tubs, loaded or empty as these negotiate curve. If this be necessary then be sure that the haulage curve has not been thoughtfully designed and laid. Immediate steps have to be initiated to rectify the situation as this is one of the most dangerous practices on haulage roadways, leading to avoidable accidents;

5.0 Transport of heavy loads

It is a common feature at several mines to carry heavy items of machinery such as pumps, motors, parts of coal cutting machines, rails etc., up to the far off corners of the mines, with the help of haulages. Usually these items are loaded on special tub chassis (bogey) and attached to the haulage rope via a dak tub or a rake of tubs. The manner of attaching the bogey to the dak tub or other tubs is left to the ingenuity of persons entrusted with the task lowering the machinery. Often the device holds and the work is accomplished without any mishap. But sometimes, there is failure of the attachment used, resulting in loss of human life and damage to equipment. A simple device, say a length of cut rope of the same strength as the main haulage rope, with approved type of a cappel at both ends, can be safely used to couple up the bogey to other tubs, avoiding all uncertainties. Should this be a feature in any mine, necessary steps should be taken by the management in the matter immediately and the Dy. Director (Mechanical) appraised of the steps taken.

6.0 Safety devices

It is a sad commentary on the performance of an old and established industry like coal mining that elementary safety features like man-holes and run-away switches are not provided on all inclined haulage planes. Two to three fatalities every year are attributed to the non-provisions of these features. The purpose of having these on haulage roadways and the dangerous consequences of not so doing are too obvious to be described here. The stop-block and run-away switch at the top of an inclined haulage plane should invariably be intercoupled and constantly maintained in effective working order.

7.0 Another neglected item of safety device on an inclined haulage plane is the buffer at the dip end of the haulage road-way. Its strength vis-a-vis the load it is supposed to hold should be considered. If this exercise was undertaken specially at those mines working steeply inclined seams, one would be saving a few lives by attending to this.

8.0 There is no denying the fact that there is pressing need for improving the status of safety on haulage roadways in our mines. Managements should act before the situation gets worse otherwise it would mean loss of more lives.

(Cir. 6/1972)

5. Loading of Tubs—An accident occurred in one of the mines when 12 empty tubs were being loaded on a haulage roadway dipping at 1 in 6. The tubs were placed against a buffer. The loading of the tubs was started from both end and the tubs in the middle were empty. When two tubs had been filled from buffer ends at the dip side and four from the rope end on the rise side and the loading of the fifth tub was in progress, the tubs started moving of their own accord. The sixth tub was raised above the rail level and got overturned pinning one loader against the side of a pillar. He was crushed to death.

An enquiry into the accident revealed that the empty tubs got derailed due to angular thrust of the tubs on the rise side. Calculations show that the movement due to the upward reaction of the angular thrust would topple a tub if the reaction is more than half the weight of the tub.

This accident could have been avoided if the loading was done systematically from the dip side. It is therefore advisable that whenever loading of tubs is done on a high gradient, the tubs should be loaded one after the other from the dip side and simultaneous loading of tubs from the dip and rise ends with the tubs in the middle remaining empty should be avoided, as far as practicable.

(Cir. 28/1963)

6. Design of Haulage Rope-Cappel—Under provisions of Reg. 89(1) (c) of the Coal Mines Regulations, 1957 and Reg. 97(1) (c) of the Metalliferous Mines Regulations 1961 attachment of following description between haulage rope and a tub or set or a train of tubs or any means of conveyance is hereby approved by this general order. Existing types of attachment not in conformity with the following and not specially approved separately should be replaced as early as possible but not later than 31.12.1977 —

1. Conical cappel with white metal:
 - (a) Open type socket.
 - (b) Closed type socket.
2. Conical cappel with Zinc cone and tail strand-open type socket.

The types of sockets are shown in the sketches giving principal dimensions for the sizes of wire ropes commonly used in mines for haulage.

In white metal capped conical cappel besides the design and manufacture of the socket white metal capping of the wire rope is very important. Necessary instructions and precautions for such capping have been earlier circulated through this Directorate Circular No. 62 of 1963 which should be followed for satisfactory results.

In inserted cone type cappel following dangers should be taken care of:

- (a) The cone may fall out of the rope.
- (b) The rope strands may be crowned together on one side of the cone and be unequally loaded.

The tail strand should be at least 0.6 metre long beyond cone and it should be bedded properly and be axial in the zinc cone for safeguard against (a). For safeguard against (b) the zinc cone should be provided with six suitable grooves for the rope strands properly shaped and distributed over the cone.

Following shall be broadly the specifications of the conical sockets, white metal, zinc cone and tail strand and pins.

2. *Definition*—Capping—The complete rope and terminal.

Socket—The metallic body of the capping.

Basket—The tapered portion of the socket.

Cappel—The wire wrapped around a rope to hold its wires in position when cutting and/or capping the rope.

3. *Design*—The design of the above mentioned types of capping shall generally be as in N.C.B. specification No. 461/1965 and No. 353/1966 till appropriate I.S.S. for capps for haulage wire ropes are published.

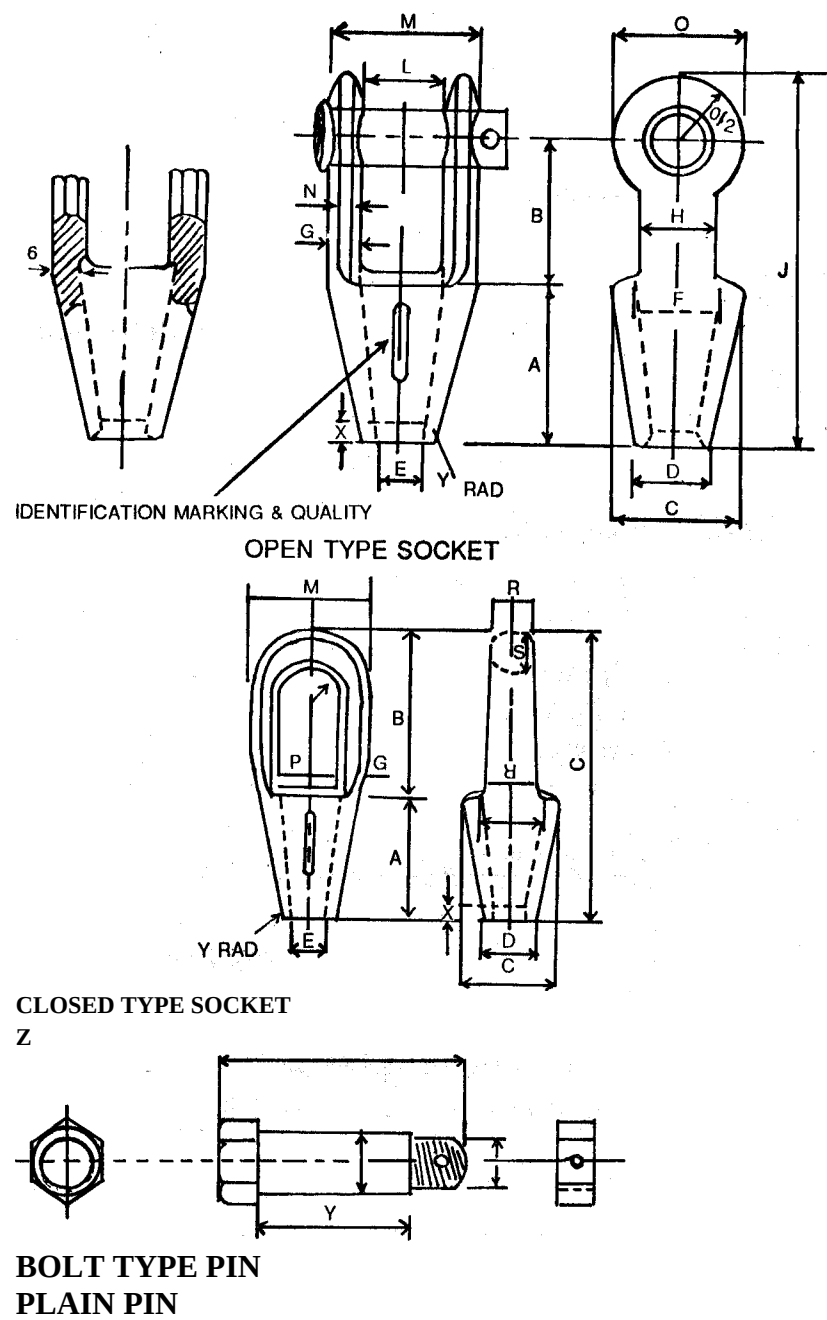
4. *Material*—(i) For sockets; Pins and Link & Closed Shackle Steel conforming to 11 Mn. 2 to IS: 4432/1967 or 20 Mn. 2 to IS: 1570-1961 or 20 Ni 55 Cr50 Mo20 to IS: 4432-1967 or any other steel permitted in writing by the DGMS.

(ii) White Metal—Grade 5 of IS: 25 of 1961 (Metal to be free from zinc and other impurities not exceeding 9.2%).

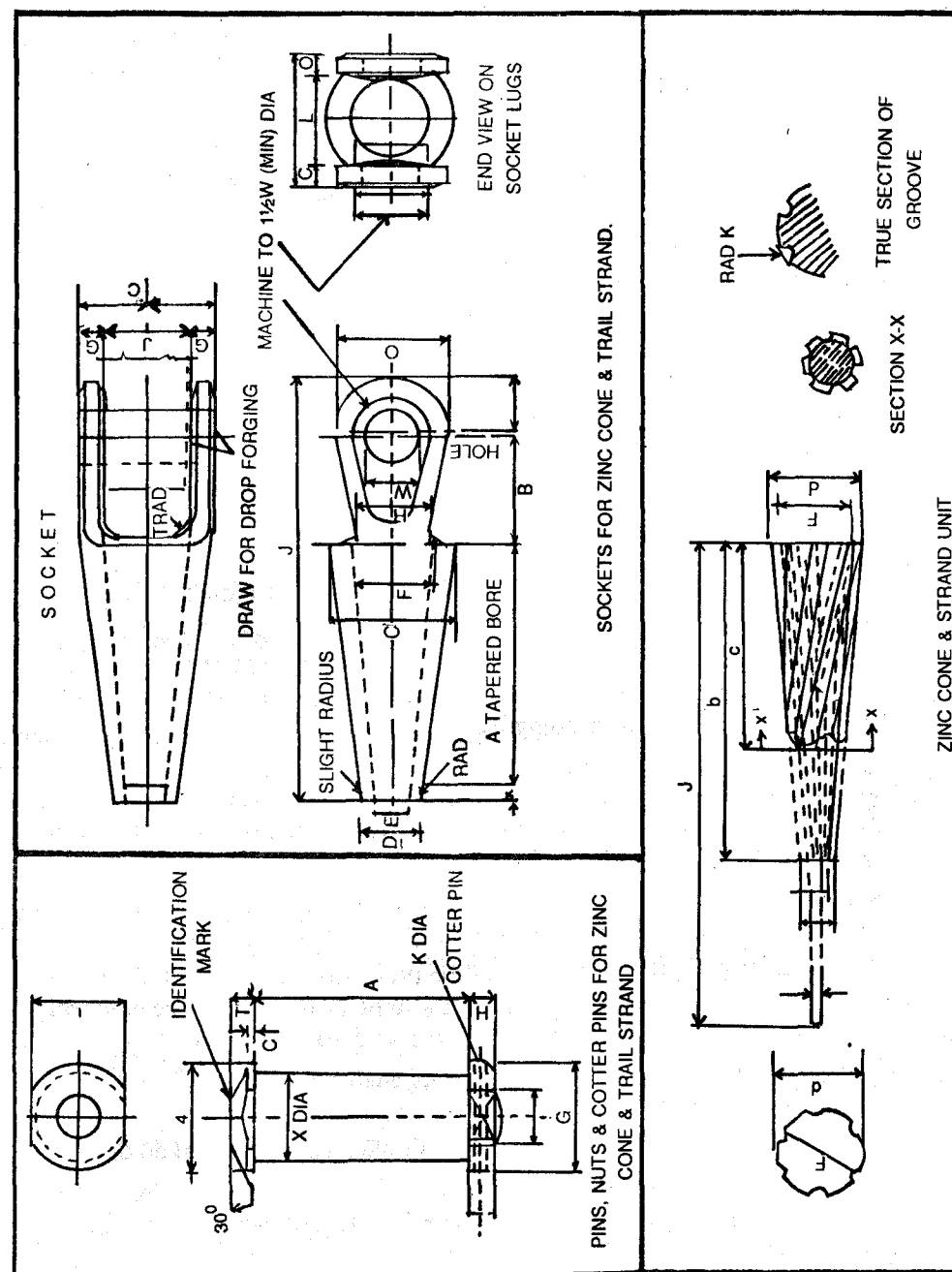
(iii) Zinc—Not inferior to grade Zn 98 to IS: 209-1966.

(iv) Nuts & Washers—Steel 747 to IS: 1870-1966.

(v) Tail strand of rope—Galvanised steel wire strand, type 'B' Galvanising, 6/1 construction, tensile strength of wires between 140 kg mm^2 and 150 kg mm^2 .



DETAILS OF PIN FOR SOCKETS



5. Factor of safety—The factor of safety in the design shall not be less than EIGHT in relation to the S.W.L. for which the unit is rated.

6. Manufacture and workmanship—(i) Manufacturer shall be reliable having at his works adequate facilities for proper forging, machining, heat treatment and preferably testing the product.

(ii) Every part of the unit will give evidence of good workmanship, good finish, free from any defect and will be made within the standard limits of tolerance in the dimensions.

(iii) Sockets and pins shall not be forged before machining except for small sizes which can be machined from solid rolled section.

(iv) Forgings shall be neatly and cleanly made and finished, fins and flashes be dressed to level surface.

(v) Taper in the socket shall be machined uniformly and smoothly. The smaller end of the basket shall terminate in a short parallel length with radius machined at the orifice.

(vi) Outside and inside faces of the lugs shall be machined.

(vii) Pin holes shall be drilled or otherwise machined from solid in one operation and at one setting. The axis of the pin when fitted shall be at right angles to the axis of the socket basket. The surface of the hole and pin shall be smooth and well finished.

(viii) For sockets where gas cutting is used to assist in rough shaping adequate excess material will be left after gas cutting for removal of surface defects, effect of gas cutting by machining or grinding.

(ix) While the manufacturer shall be fully responsible for components made and supplied from his works the user shall be also fully responsible to ensure that each cappel put in use fully conforms to the prescribed specifications and proper care is taken in its use.

7. Heat treatment—After all forging and machine gas cutting the sockets and pins shall be either suitably normalised or normalised and tempered.

8. Testing—(i) Each finished unit shall be proof load tested to a load not less than THREE TIMES the S.W.L. for which the unit is designed. The unit shall satisfactorily withstand such proof load without any deformation.

(ii) The sockets, pins and connecting links shall be magnetically- ultrasoni-cally tested for cracks and flaws etc.

(iii) Any component in which any defect is noticed shall be marked defective and shall not be used.

9. Marking—(i) Each unit shall be legibly and permanently stamped on unwearable portion with following:

- (a) Size
- (b) S.W.L.
- (c) Date of manufacture—
- (d) Manufacturers' reference No.—
- (e) Abbreviation of the material—Symbol ‘M’ for 1 Mn2 and 20Mn2, 'A' for alloysted
- (f) DGMS Approval No-

**Principal dimensions of Sockets, Pins, Zinc cone and Tail strand for
Haulage rope capping**

Table I : Open Type Socket Ref. Fig. ‘3A’

Dia. of rope (mm)	A	B	E	F	G	J	L	M	O	X	Y
16	69.8	63.5	18.25	31.8	11.11	158.8	31.8	58.73	50.8	7.93	1.6
19	76.2	66.7	21.43	38.1	12.7	174.62	38.1	69.9	63.5	9.52	2.00
22	85.7	76.2	25.4	44.5	14.3	196.9	42.9	77.8	69.9	11.1	2.4
25.4	104.8	88.9	28.6	50.8	17.5	236.5	47.6	88.9	85.7	12.7	2.4
29.	114.3	101.6	31.8	57.2	19.00	261.9	50.8	93.7	90.0	13.2	2.8
32	133.4	111.1	34.9	63.5	23.8	296.9	54.0	111.1	104.8	15.9	3.2

Table II : Closed Type Socket Ref. Fig. ‘3B’

Dia. of rope (mm)	A	B	E	F	G	H	M	P	R	S	X	Y
16	69.8	88.9	18.3	31.8	11.1	27.0	63.5	31.8	20.6	19.0	7.9	1.6
19	76.2	101.6	21.4	38.1	12.7	33.3	74.7	38.1	25.4	23.8	9.5	2.0
22	85.7	114.3	25.4	44.5	14.3	39.7	84.1	44.5	28.6	25.4	11.1	2.4
25.4	104.8	130.2	28.6	50.8	17.5	46.0	100.0	50.4	35.0	28.6	12.7	2.4
29	114.3	142.9	31.8	57.0	19.0	50.3	114.3	57.0	38.1	31.8	14.3	2.8
32	133.0	152.4	35.0	63.5	23.9	60.3	123.9	63.5	41.3	38.1	15.9	3.2

Table III : Pinns for Sockets Ref. Fig. '3C'

Dia. of rope (mm)	K	Q	S	T	U	V	Z ₁	Z ₂
16	23.3	74.6	4.0	6.3	15.9	60.3	81.0	81.0
19	28.6	85.8	4.8	7.1	12.0	71.4	92.9	92.9
22	31.6	95.3	4.8	8.0	22.2	81.0	109.5	103.2
25.4	33.1	109.5	5.6	9.5	28.6	90.5	127.8	119.1
29	41.3	114.3	6.4	11.1	31.8	95.3	136.5	125.4
32	47.6	136.5	8.0	12.7	38.1	112.7	162.0	149.2

Table IV : Sockets for Zinc cone and Tail strand Fig. '3D'

Dia. of rope (mm)	A	B	C	E	F	G	J	L	O	T	V	X	Y
16	133.4	63.6	69.9	20.6	44.5	12.7	239.7	49.2	63.5	19.0	31.8	9.5	3.2
19	155.6	69.9	82.6	23.8	50.8	15.9	274.6	55.6	69.9	19.0	34.9	11.1	3.2
22	177.8	79.4	92.0	27.0	57.8	17.5	312.7	61.9	79.4	22.2	41.3	12.7	3.2
25.4	196.9	88.9	101.6	30.2	63.5	19.0	346.0	68.0	88.9	25.4	44.5	12.7	3.2
29	215.9	101.6	114.3	33.3	69.9	22.2	387.4	76.0	101.6	25.4	50.8	15.9	4.8
32	238.1	108.0	123.8	36.5	76.2	23.8	109.1	82.6	108.0	31.8	54.0	15.9	4.8

Table V : Pins and Nuts for Zinc cone and Tail strand Fig. '3E'

Dia. of rope (mm)	C	H	J	K	T	V	X
16	3.2	9.5	22.2	4.8	7.9	77.0	31.8
19	1.8	9.5	28.6	4.8	7.9	89.7	34.9
22	4.8	12.7	34.9	6.4	9.5	100.0	38.1
25.4	4.8	12.7	34.9	6.4	9.5	100.5	44.5
29	4.8	15.9	38.1	7.9	11.1	125.4	50.8
32	4.8	15.9	41.2	7.9	12.7	134.1	54.0

Table VI : Zinc cone and Tail strand units Fig. '3F'

Dia. of rope (mm)	A	B	C	D	E	F	H	J	K
16	9.5	142.9	73.0	40.5	14.7	35.3	6.4	685.8	3.2
19	9.5	168.3	85.7	45.2	15.9	38.9	7.1	685.8	3.6
22	11.1	190.5	98.4	50.8	18.7	43.2	8.3	711.2	4.4
25.4	12.7	209.5	104.8	56.2	21.0	48.8	9.5	812.8	4.8
29	12.7	228.6	117.5	61.1	22.2	51.6	10.3	914.4	5.6
32	14.3	254.0	130.2	67.5	24.6	57.2	11.5	1000.6	6.0

- Notes :
1. Dimensions are in mm.

2. For dimension not given in the relevant table refer to relevant N.C.B. specification.

3. Drawing for sockets for Zinc cone and Tail strand type capping is for socket made by drop forging. Chamfer in the socket lugs is not obligatory for other type of forging or/when machined for solid rolled bar.
- (Cir. Tech. 12/1976)

7. Design of endless rope haulage clips—1. The sub-committee of Mine Safety Equipment has formulated the designs for the endless haulage rope clips for attachment between endless haulage rope and tub or a train of tubs. These designs are approved under Coal Mines Regulation 89(1) (c) or Metalliferous Mines Regulation 97(1) (c) by this circular. All other designs approved in the past are hereby superseded by the designs shown in the enclosure of this circular. Clips or any other form of endless haulage rope attachments existing in the Industry and not conforming to the design shown in the enclosure referred, should be gradually replaced latest by 31st December, 1985.

2.0 Material—The material can be any one of the following:—

- (a) 11 Mn₂ conforming to IS-4432-1967.
- (b) 20 Mn₂ conforming to IS-1570-1961.
- (c) Any other steel not inferior to those stated above.
- (d) Other parts, from the steel as indicated on respective drawings.
- (e) The cheeks of small man clip and body of screw clip may be manufactured from steel conforming to IS-1030-1974 carbon steel castings for general engineering purpose (Second Revision).
- (f) Any other steel approved in writing by the Director-General of Mines Safety.

Only tested and certified material shall be used and some random samples shall be periodically tested to ensure better quality of the material.

3.0 Heat-Treatment—Every clip after all forging and welding operations shall be given proper heat-treatment in a recognised establishment at the following temperature and certificate of heat-treatment shall be obtained:—

Designation of steel	Normalising Temperature	Hardening Temperature	Tempering Temperature	Quenching Agent
	⁰ C	⁰ C	⁰ C	⁰ C

11Mn ₂	870-910	870-910	550-660	Water or oil.
20 Mn ₂	870-910	870-910	500-660	Water or oil.

4.0 Hardness—250 H.V. maximum for the jaws, liners etc.

5.0 General Requirements—

- 5.1 Each component of clip shall have staticfactor of safety of not less than 7 in relation to maximum static load attached to the rope.
- 5.2 Forged components shall avoid sudden changes in cross- section/thickness or shape.
- 5.3 Forging shall be such that the fibres of material are not transverse to the line of pull in endless haulage clips.
- 5.4 The bodies of the endless haulage clip shall be forged or cast without any welding. Pin or bolt holes in the bodies shall be drilled as far as possible. In all cases the holes shall be drilled or bored in axial alignment at one setting, neutral to the outside diameter of the eye.
- 5.5 Safe working load of Endless Haulage Clips—The safe working load of different types of endless haulage clips shall be as indicated below:

Drawing No.	Type of Endless Haulage clip	Safe working load
DGMS/84/1	Screw	0.70 Tonnes
DGMS/84/2	Cam	0.80 Tonnes
DGMS/'84/3	Small man	0.60 Tonnes
DGMS/84/4	Wedge	0.25 Tonnes

6.0 Manufacture and workmanship

- 6.1 The-manufacturer shall be reliable having at his works adequate facilities for proper forging, machining, heat-treatment and preferably testing facilities for the product. Forge welding steel is not desirable. Electrical welding should be done, where necessary and where arc welding is done, slag shall be carefully cleaned at each stage. Holes, if any, shall be drilled instead of being punched. Jointing shall be done by electric welding and not smithy welding.
 - 6.2 Every part of the unit shall give evidence of good workmanship and good finish, shall be free from any defect and made within standard limits of tolerance in the dimensions and finishing etc.
 - 63 The clips shall be so manufactured as to correctly match with the size and construction of the rope.
 - 6.4 While the manufacturer of the clips shall be fully responsible for the quality of the clips and the conformity with the prescribed specifications, the user on the other hand will be fully responsible to ensure correct quality, type, size and Strength of the clips before it is used.
- The user shall also ensure that each endless haulage clip put in use fully conforms to the prescribed specifications and proper care is taken in its use.

7.0 Marking—Each clip shall be legibly marked on non-vital part as follows—

- (a) Normalised Clip with Mark (N).
- (b) Hardened and tempered clip with Mark (OM).
- 7.1 The stamps used for marking shall be of 5 mm size. Care shall be taken that the indentation is neither too sharp nor excessive in depth.
- 7.2 Each clip shall be legibly marked at a non-vital part with the following: (a) Manufacturing identification mark (Year of manufacture).
- (b) Safe working load.
- (c) Type of given heat-treatment.
- (d) Identification mark bearing with manufacturers certificates of lest and examination.
- (e) Rope Diameter

8.0 Test and Examination—8.1 Testing: Atleast 10% of the clips in a lot shall be tested for slip, to a load not less than 3 times the safe working load for which the clip is designed and shall then be tested for cracks etc. by magnetic and ultrasonic test. In case of crack being either visual or by a magnetic and ultrasonic test and any clip failing in proof load test, another lot of same

number shall be tested and in case any clip fails in the subsequent test, each clip of the lot shall be tested.

8.2 At least 2% of the clips shall be subjected to chemical analysis and hardness test. A test certificate to this effect shall be furnished to the user in prescribed proforma.

8.3 A certificate of testing stating identification number of the clip shall be obtained.

8.4 Any clip not passing the above test shall not be used.

8.5 1% of the endless haulage clips in use shall be tested for slip load every month by the user.

8.6 Whenever major repairs are carried out on the clips the same shall be subjected to slip test particularly and any other test as may be necessary.

8.7 Records of test results shall be maintained in respect of above against the Sl. No. of each endless haulage rope clip.

The pull on the clip shall be calculated on the basis of maximum gradient of the haulage run. Atleast two clips shall be used with each set of tubs, one in the

front and the other on the rear of the tub/train of tubs, so as to take care of the undue rolling of tubs or train of tubs on undulating haulage roadway.

8.8 The maximum number of endless haulage clips to be used with a set of tubs/train of tubs shall be decided for each haulage system by the manager duly complying with the above and the same shall be notified in writing to all concerned persons associated with supervision, use, maintenance and repair of the system. Notices to this effect shall be prominently exhibited at every attaching and detaching points on the haulage roadway.

9.0 *Inspections*—Fortnightly inspection as prescribed in the regulation should be conscientiously made and report of each examination should be kept. Any clip involved in a derailment or accident should be specially inspected at the earliest opportunity and if suspected to have been damaged, it should not be used unless certified by a competent person superior in rank to the one making the inspection and the report of such inspection should be kept.

10.0 *Repair and Rejection*—Wear and tear of any component shall not be built up through welding. The components shall be discarded when maximum loss of cross-section due to wear over any portion exceeds 15% of the original cross-sectional area of the portion.

11.0 *Certificate of test and Examination*—The supplier shall provide certificate of test and examination in the form given at Appendix I with every consignment of the clips.

12.0 *Particulars to be supplied at the time of Enquiry or order*—The following particulars shall be supplied at the time of enquiry or order:—

- (a) Type of clip,
- (b) Diameter of rope and construction,
- (c) Specification of material,
- (d) Heat-treatment desired,
- (e) Further tests for chemical analysis, if required.

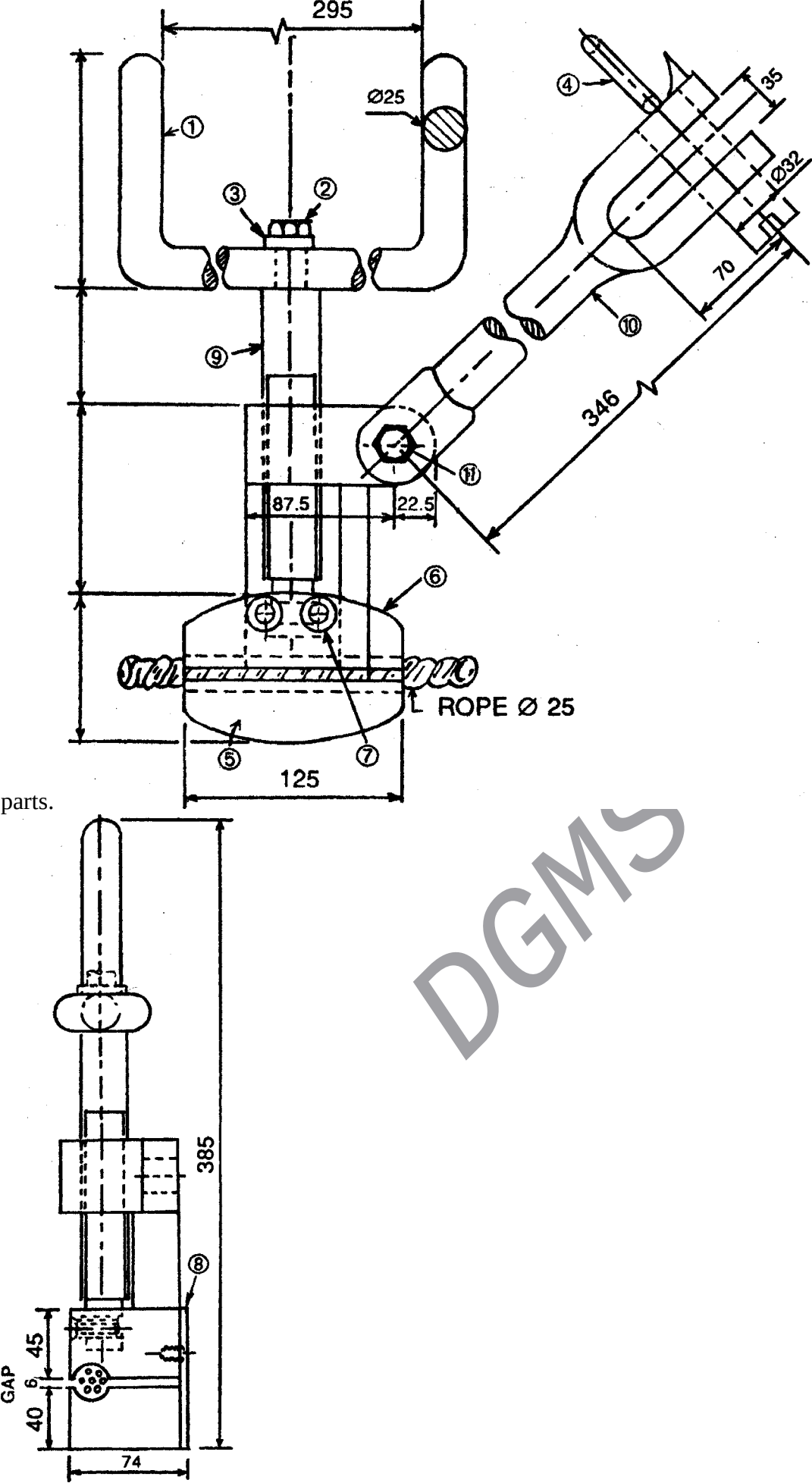
13.0 Record (by the user)—Record of the clips in use stating the reference number, date of manufacture and date of use shall be maintained. If the clips are procured from more than one manufacturer, the name, address and other relevant information in respect of each shall be recorded in a bound paged book.

(Cir. Tech. 3/1985)

DGMS SCREW CLIP DRG. NO. DGMS/84/1 Size-25mm DIA Date - 7.8.84			
SL No.	NAME OF PARTS	NO.OFF	MATERIAL SPECIFICATION
11	BOLT WITH NUT	1 SET	11 Mn 2 or 20Mn ²
10	HOOK	1	11 Mn 2 or 20Mn ²
9	SPINDLE ADJUSTING BOLT	1	11 Mn 2 or 20Mn ²
8	UPPER JAW BACK COVER	1	11 Mn 2 or 20Mn ²
7	CS.K. SCREW M10xl.25x25LTH	2	IS :- 1365-1968
6	UPPER JAW	1	11 Mn 2 OF IS:- 4432-67/20 Mn 2 OF IS :-1570-61/IS:-1030-74. G2
5	LOWER JAW WITH BODY	1	” ” ” ” ”

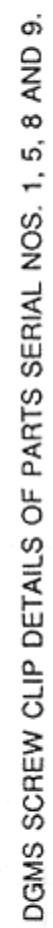
4	LOCKING DEVICE	1	11 Mn2 OR 20Mn 2
3	WASHER M12	1	MS IS :- 2016-1967
2	HEX/SCREW M10xl.25x20LTH	1	IS :- 1365-1968
1	HANDLE		11 Mn2 OR 20 Mn2

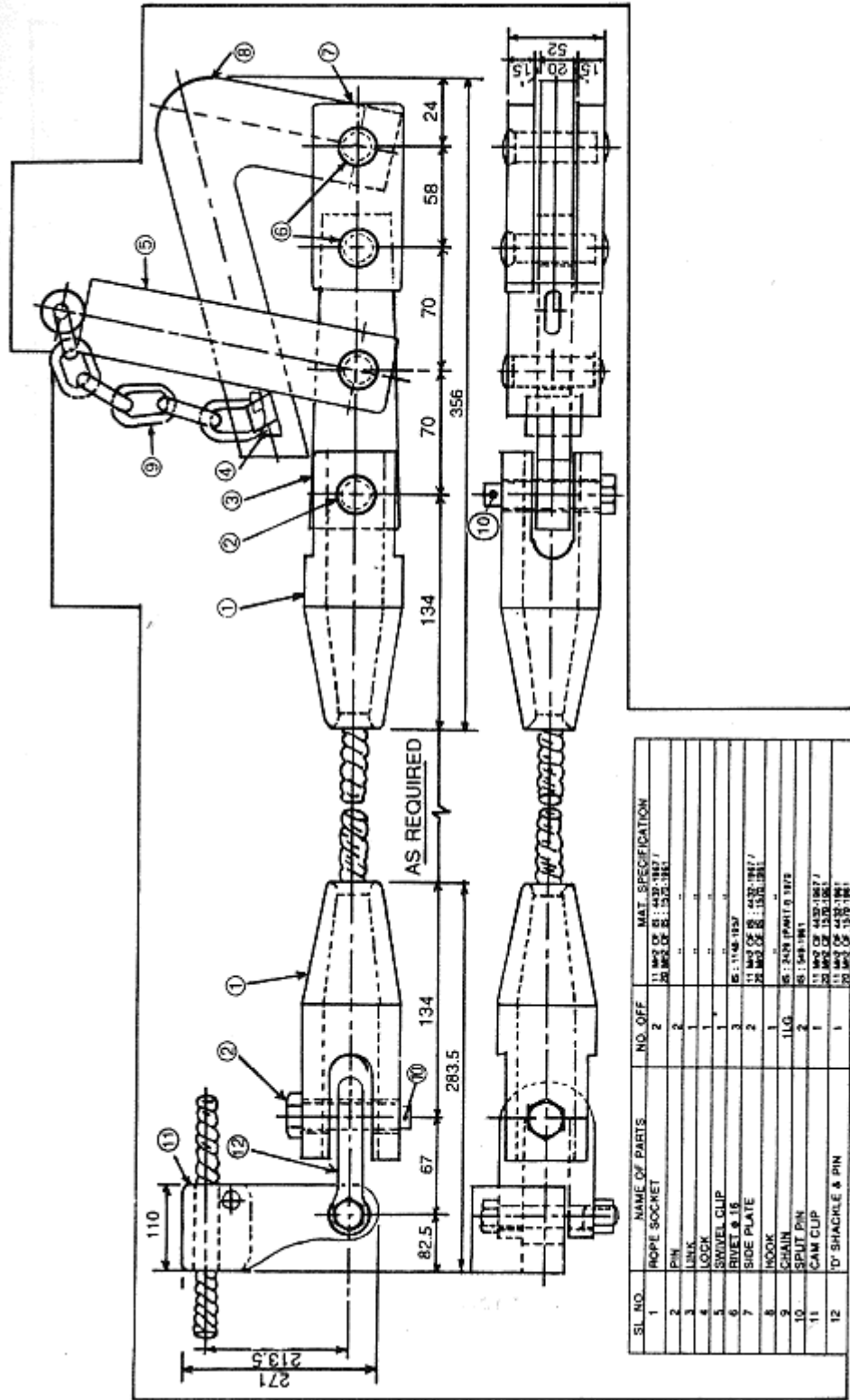
Note : Details of parts are shown in following drawings bearing the serial numbers of



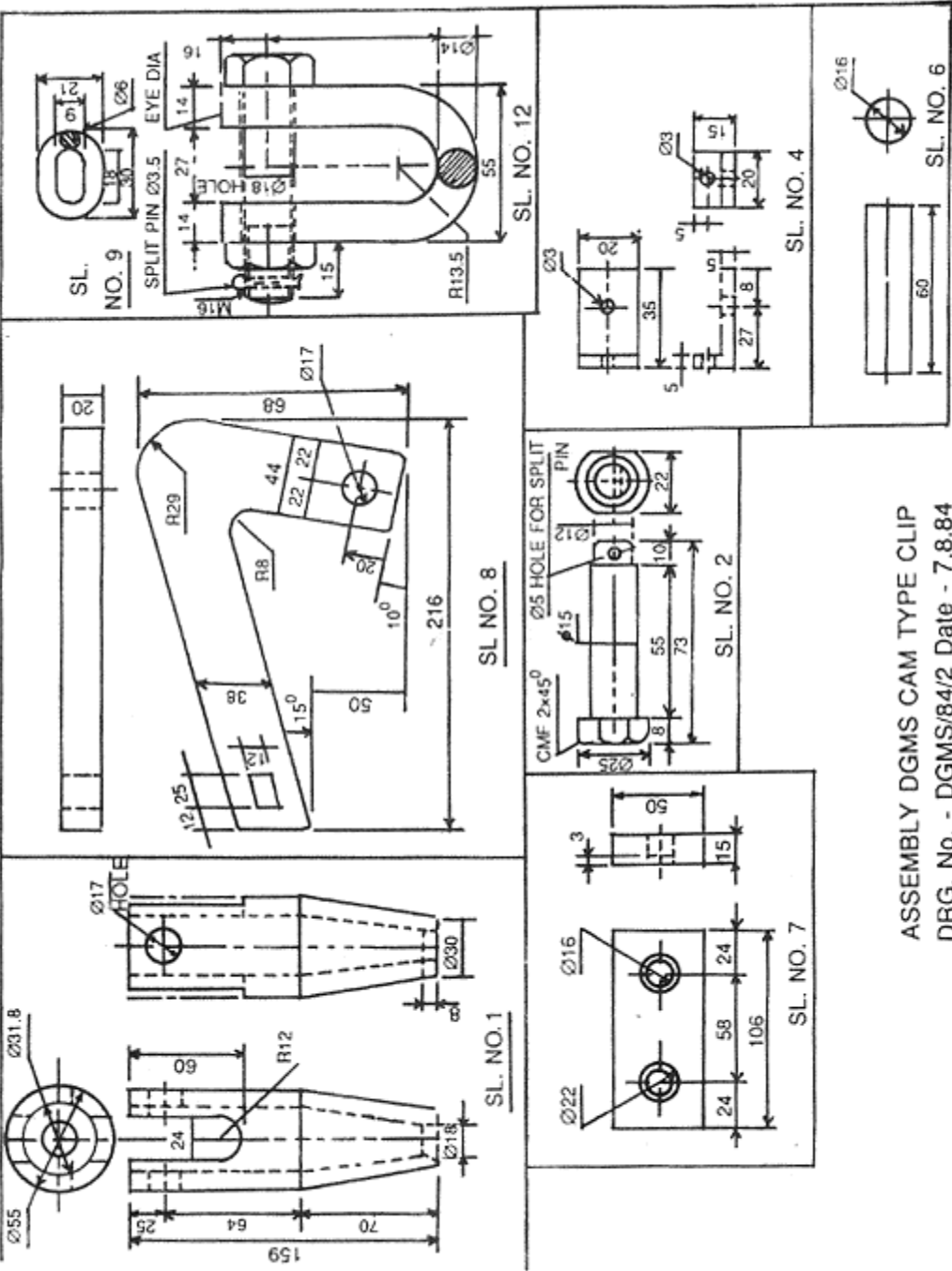
parts.





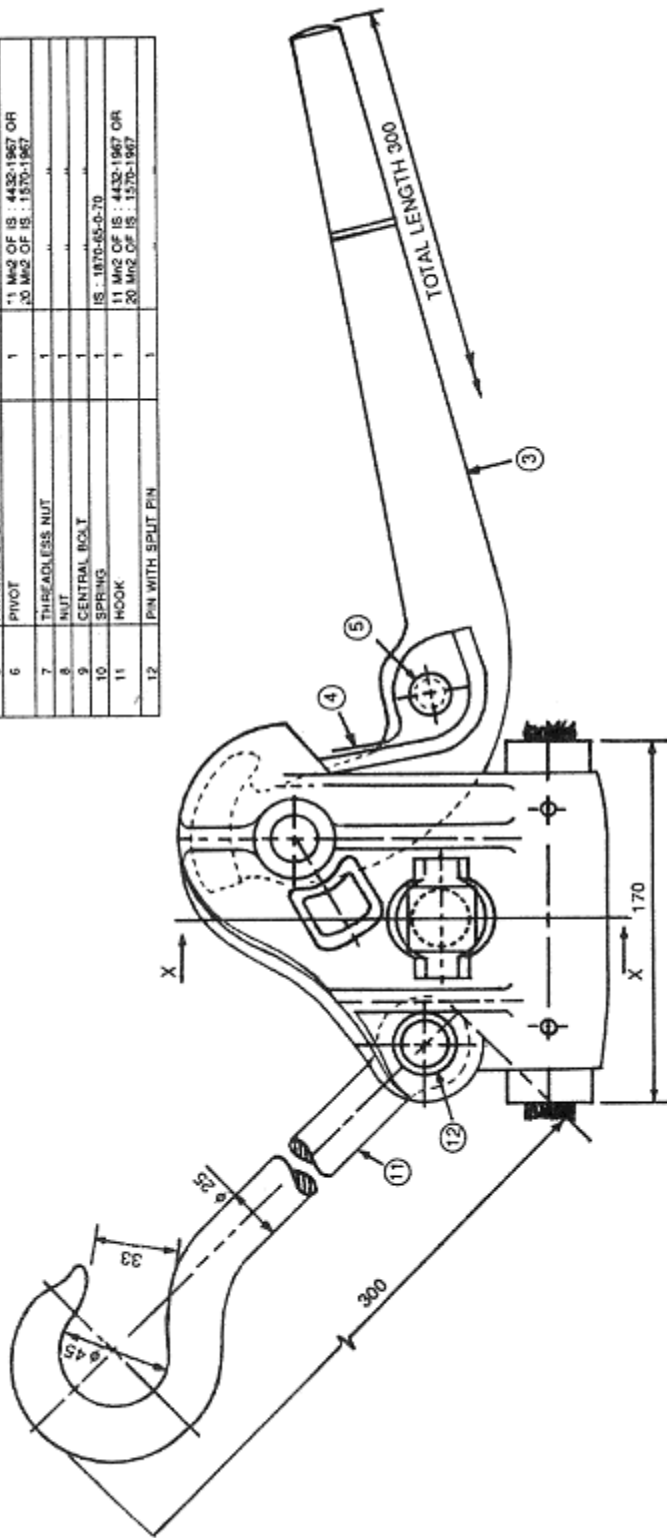


ASSEMBLY OF DGMS CAM TYPE CLIP (DRG NO. DGMS/84/2 DATED 7.8.84)
(DETAILS OF PARTS SHOWN IN FIG. NOS. 5B AND 5C WITH PART SERIAL NUMBERS)

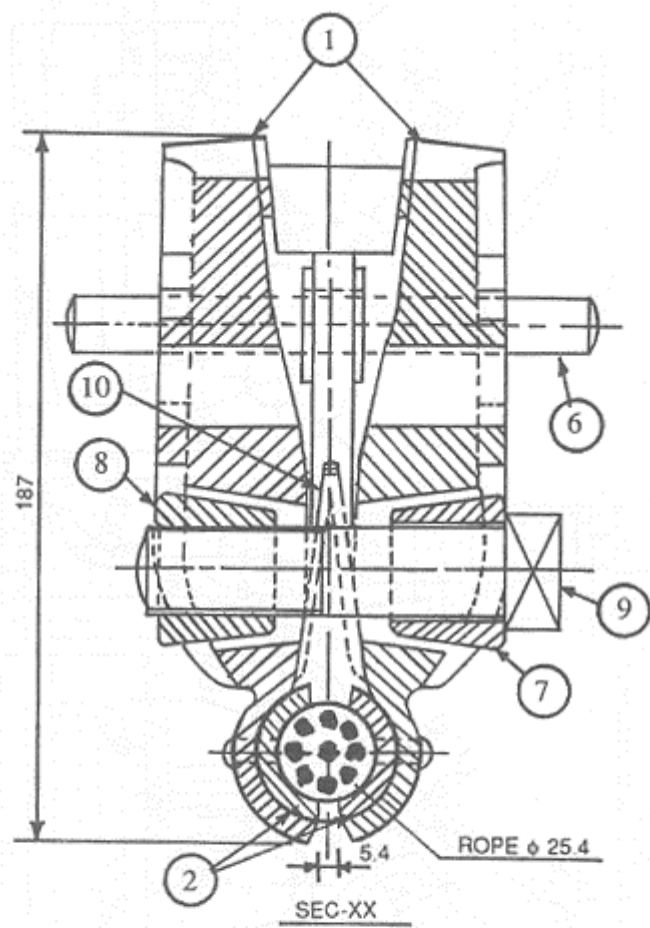


ASSEMBLY DGMS CAM TYPE CLIP
DRG. No. - DGMS/84/2 Date - 7.8.84

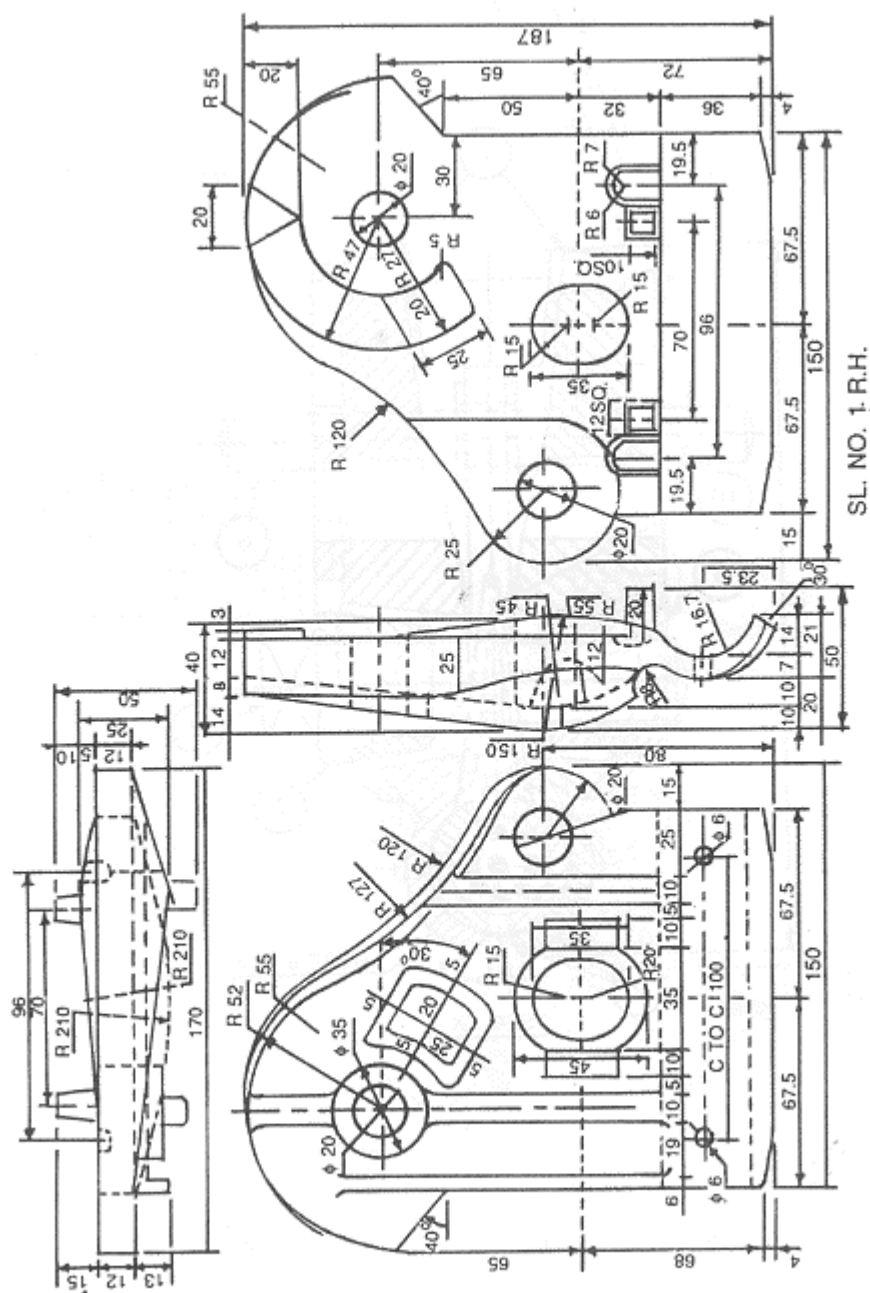
S/L NO.	NAME OF PARTS	NO. OFF	MAT. SPECIFICATION
1	CHEEKS	2	11 M2 OF IS : 4432-1967 OR 2M2 OF IS : 1570-1967 OR IS : 1530-1974 OR 4
2	UNEARS WITH RIVET	2 (LH+RH)	M4 OF IS : 220-1979 M4 OF IS : 2155-1962 FOR RIVET
3	LEVER	1	11 M2 OF IS : 4432-1967 OR 20 M2 OF IS : 1570-1967
4	SAFETY CATCH	1	IS : 1075-71-C-4 IS 540
5	PIN WITH SPLIT PIN	1	11 M2 OF IS : 4432-1967 OR 20 M2 OF IS : 1570-1967
6	PIVOT	1	"
7	THREADLESS NUT	1	"
8	NUT	1	"
9	CENTRAL BOLT	1	"
10	SPRING	1	IS : 1075-65-0-70
11	HOOK	1	11 M2 OF IS : 4432-1967 OR 20 M2 OF IS : 1570-1967
12	PIN WITH SPLIT PIN	1	"



DGMS SMALLMAN CLIP : ASSEMBLY DRG. NO. DGMS/84/3 DATED 7.8.84

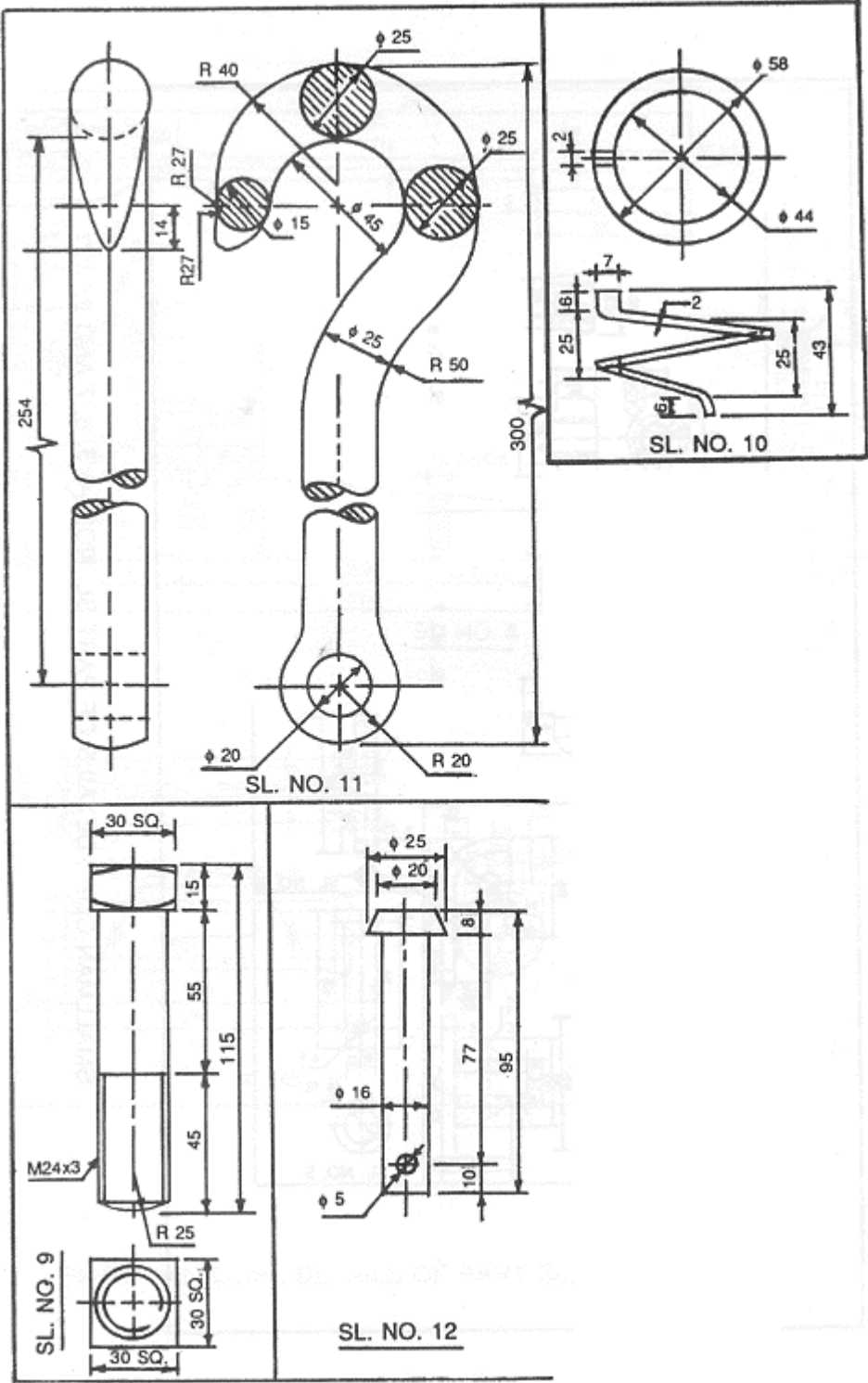


DGMS SMALLMAN CLIP : END VIEW

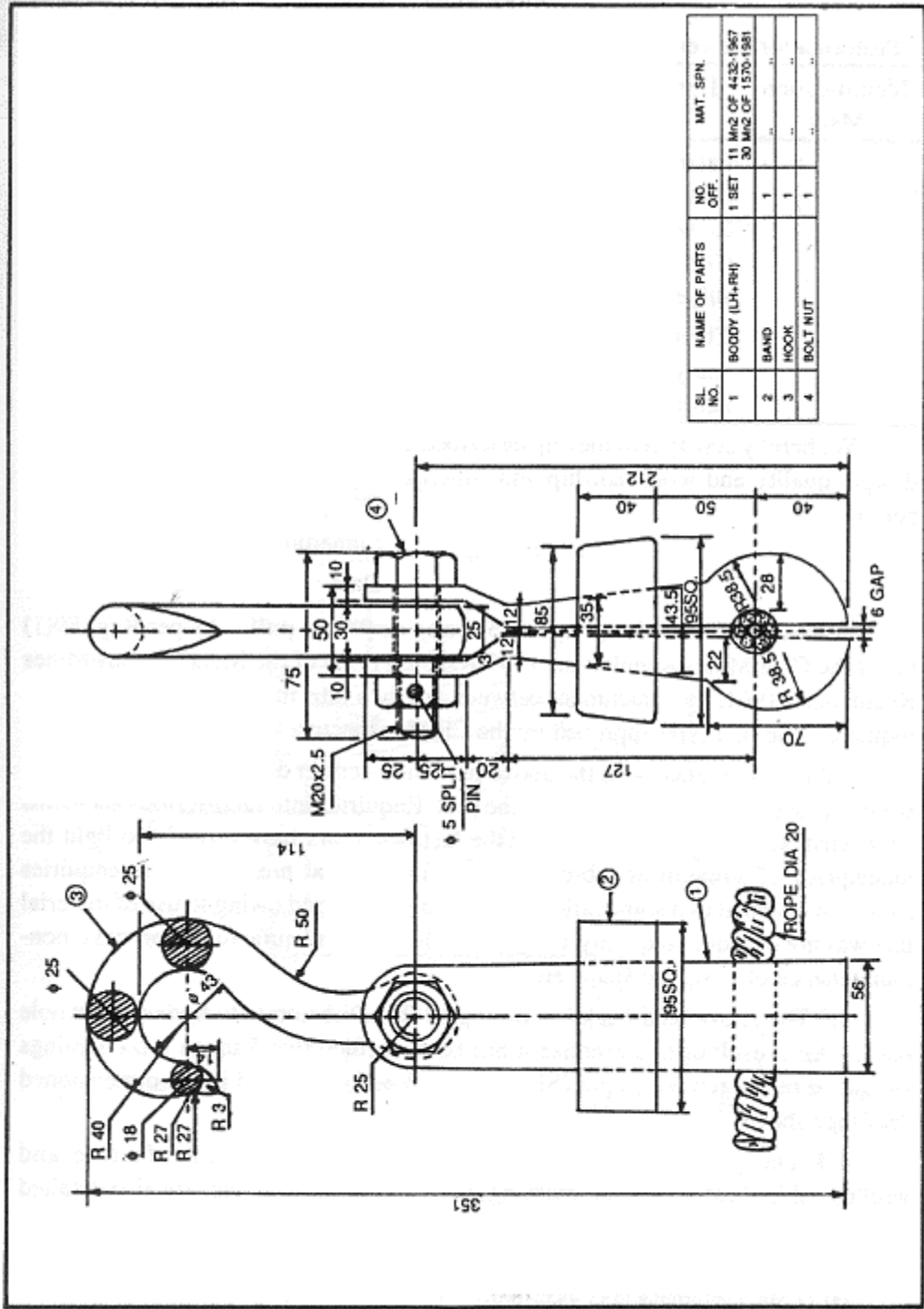


SMALLMAN CLIP : DETAILS OF PART SL. NO. 1. R.H.





SMALLMAN CLIP : DETAILS OF PARTS SL. NOS. 9, 10, 11 AND 12.



WEDGE CLIP : DRG. NO. DGMS/84/4 DATE-13.8.84

APPENDIX I

Proforma for the certificate of test and examination of Endless Haulage Clips

Identification Mark	Description	Number tested	S.W.L.	Slip Test
	Particulars of heat treatment to which the Clip has been subjected Chemical analysis and hardness			

We hereby certify that the clip described above complies in all respects to the design, quality and workmanship and subsequently examined by the competent person.

Signature :
Date:

8. Design of Tub Couplings of 5 tonne drawbar pull—As per Reg. 89(1) (c) of the Coal Mines Regulations 1957/Reg. 97(1) (c) of the Metalliferous Mines Regulations 1961, the attachment between any two tubs in a set or train of tubs is required to be of a type approved by the Chief Inspector.

1.2 In compliance with the above provision certain designs of tub couplings were approved by this Directorate in the past. Enquiries into fatal/serious accidents connected with haulage system over the last few years have brought to light the inadequacy of strength of tub couplings being used at present. These enquiries have also revealed that some failure of couplings occurred owing to use of material that was not of required quality, adoption of defective manufacturing process, non-maintenance of designed shape etc.

1.3 The above feed-back has prompted this Directorate to review the whole matter. As a result of this exercise it has been decided that 5 tonne tub-couplings should be manufactured as per (Sl. nos. 1, 2, 3 & 4) indicated in the dimensioned drawings shown.

1.4 The guidelines regarding material to be used, manufacture and workmanship, heat-treatment, marking, test and examination etc. are also detailed below. These may be fully complied with.

2.0 Material—The material shall be any one of the following :

- (a) 11 Mn₂conforming to 1S-4432-1967.

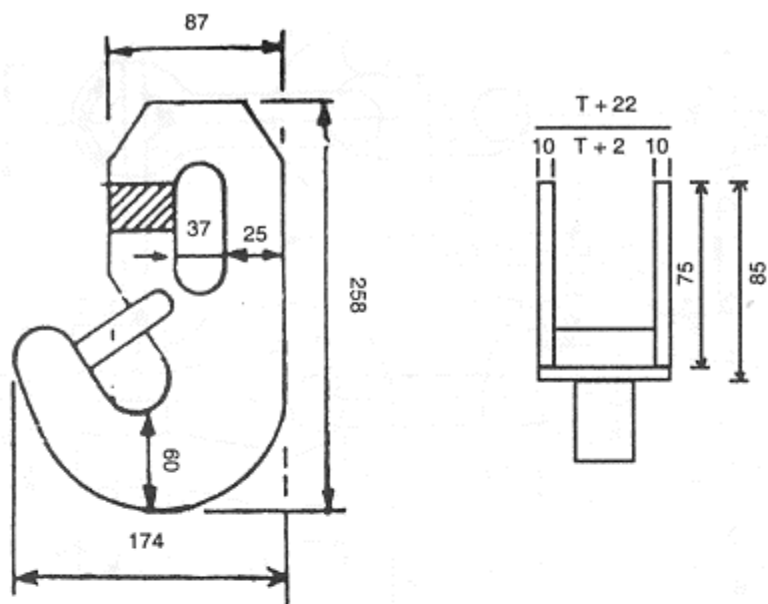


Fig. Hook Coupling (Drawbar pull upto 5t)

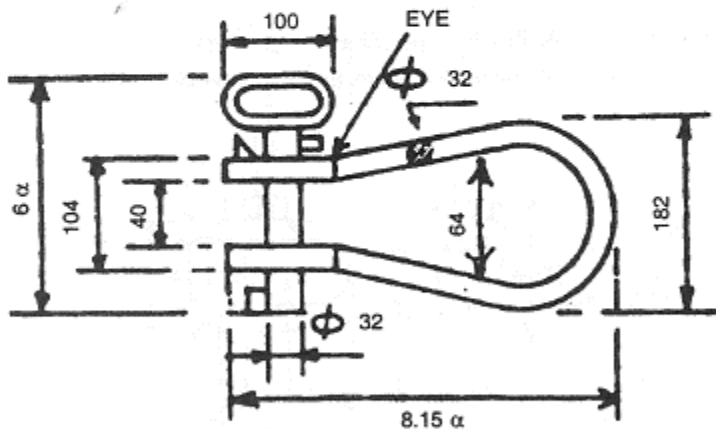
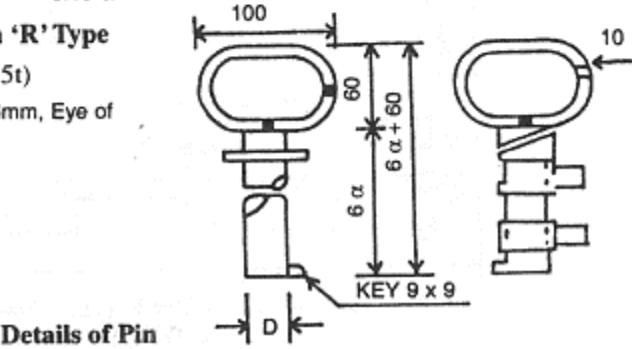


Fig. Single Shackle & Pin 'R' Type
(Drawbar pull upto 5t)
α = 36mm, W = 64mm, D = 36mm, Eye of shackle = 82.8mm



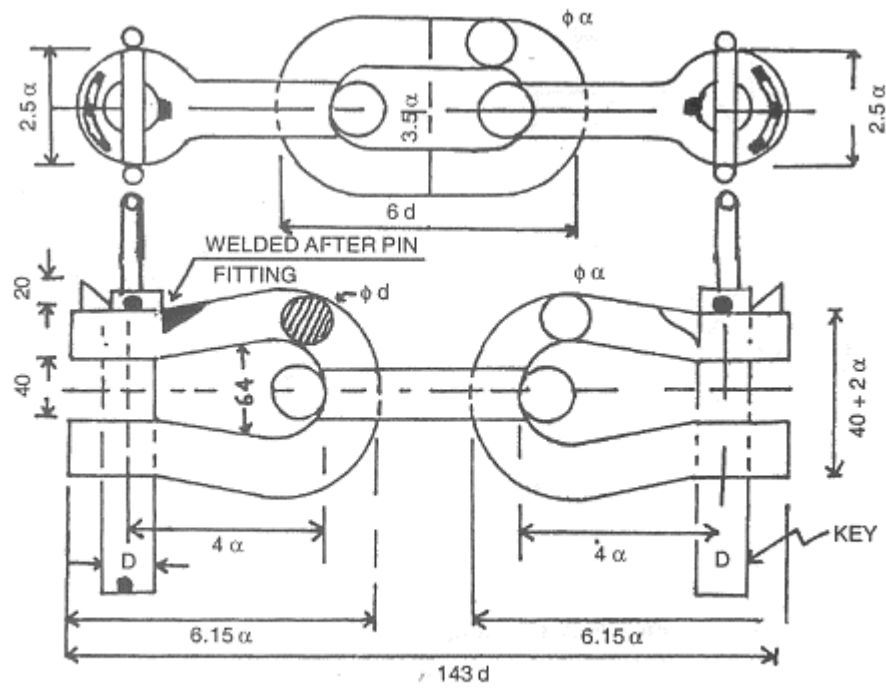


Fig. Two Shackle & Pin R Type (Drawbar pull 5t)
 $\alpha = 36\text{mm}$ minimum, $D = 36\text{mm}$ minimum, $W = 64\text{mm}$, Eye of shackle = 92.8mm

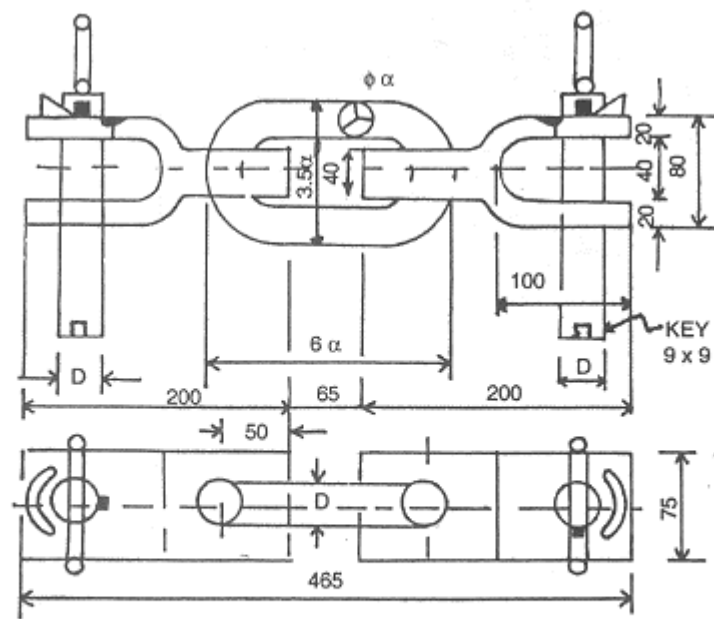
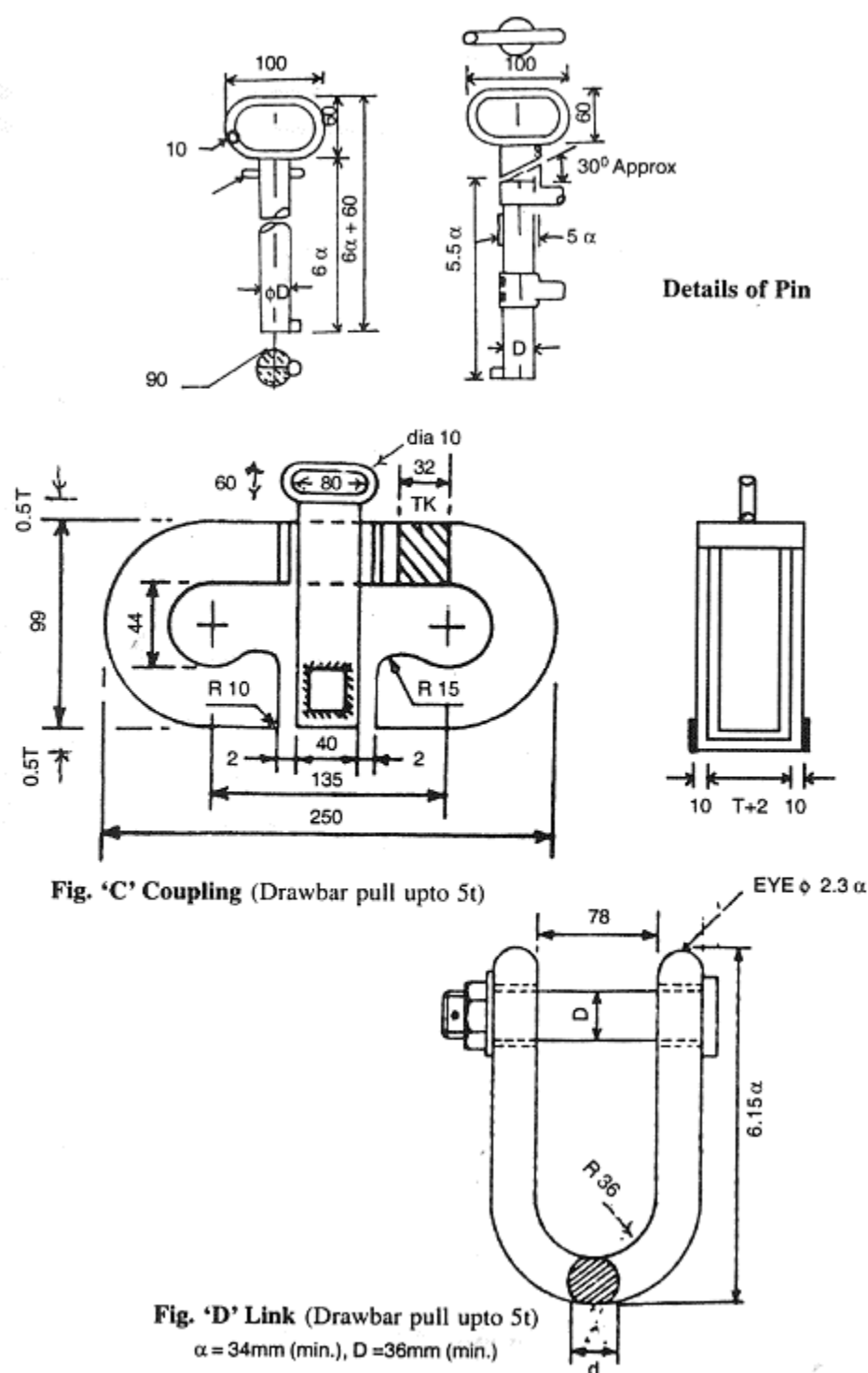


Fig. Two Shackle & Pin F Type (Drawbar pull 5t)
 $\alpha = 36\text{mm}$, $D = 36\text{mm}$, $W = 64\text{mm}$, Eye of shackle = 92.8mm



- (b) 20 Mn₂ conforming to IS-1570-1961.
- (c) 20 Ni 55 Cr 5 Mo 20 to IS-4432-1967.
- (d) Any other steel not inferior to those stated above and approved in writing by the **DGMS**.

Only tested and certified material shall be used and some random samples shall be periodically tested to ensure proper quality of material.

3.0 Manufacture and Workmanship—

3.1 Coupling shall be manufactured by forging in a workshop having adequate forging, machining, heat-treatment and preferably testing facilities for the product. Forge welding of steel is not desirable. Electrical welding shall be done where necessary and where arc welding is done, slag shall be carefully cleaned at each stage. Holes shall be drilled and not punched. Jointing shall be done by electrical welding and not by smithy welding.

3.2 Every part of coupling shall give evidence of good workmanship and good finish, shall be free from any defect and made within standard limits of tolerance in the dimensions and finishing etc.

3.3 While the manufacturer shall be fully responsible for quality of the coupling and its conformity with the prescribed specifications, the user on the other hand shall be fully responsible to ensure correct quality, type size and strength of the coupling before it is used. The user shall also ensure that each coupling fully conforms to the prescribed specifications and proper care is taken in its use.

4.0 Heat-treatment

Every coupling after all forging and welding operations shall be given proper heat treatment in a recognised establishment at the following temperature and certificate of heat-treatment shall be obtained.

Sl No	Designation of steel	Normalising °C Temp.	Hardening °C Temp	Tempering °C Temp	Quenching No. Agent
1	11 Mn ₂	870-910	870-910	550-660	Water or oil
2	20 Mn ₂	860-900	2860900	550-660	Water or oil
3	20 Ni 55 cr 50 Mo 20	*	820-850	*	Water

* Suitable temperature may be adopted so as to attain the optimum properties.

5.0 Marking

5.1 Each coupling shall be legibly marked on non-vital part with the following:

- (a) Manufacturer’s identification mark (Year of manufacture).
- (b) safe working load.
- (c) type of heat treatment given.
- (a) identification mark bearing manufacturer's certificate of test and examination.

5.2 The stamp used for marking shall be of 5 mm size. Care shall be taken that the indentation is neither too sharp nor excessive in depth.

6.0 Test and Examination

6.1 Atleast 10% of couplings shall be tested to not less than 3 times the maximum drawbar pull likely to be imposed when in use i.e. the S.W.L. for which the coupling is designed, shall be tested for cracks etc. by magnetic particle inspection. In case any crack is detected either visually or by magnetic particle inspection and any coupling failing in proof load. another lot of equal number shall be tested and in case of any coupling failing in the subsequent test, each coupling from the lot shall be tested.

6.2 The supplier shall provide a certificate of test and examination in the form given a Appendix-I with every consignment of the couplings.

6.3 Any coupling not passing the test shall not be used.

7.0 Record

A record of couplings in use stating the reference number, date of manufacture and date of use shall be maintained. If couplings are procured from more than one source, the name, address and other relevant information, in respect of each shall be recorded in a bound paged book.

8.0 Inspections

8.1 Fortnightly inspection as prescribed in the code of regulation shall be made and report of each examination shall be kept. Any coupling involved in derailment or accident shall be specially inspected at the earliest opportunity and if suspected to have been damaged, it shall not be used unless certified by a competent person superior in rank to the one making the inspection and report of such inspection shall be kept.

9.0 Repair and Rejection

Wear and tear of any component shall not be built up through welding. The components shall be discarded when the maximum loss of cross-section due to wear over a cross-section exceeds 15% of the original cross-sectional area of the portion.

10.0 General Requirements

10.1 Each component of coupling shall have static factor of safety of not less than 7 (seven) in relation to the maximum static load attached to haulage rope.

10.2 Forged components shall avoid sudden change in cross-section thickness/or shape.

10.3 Forging shall be such that the fibres of materials are not transverse to the line of pull.

11.0 Particulars to be supplied at the time of enquiry or order

The following particulars shall be supplied at the time of order.

- (i) Type of coupling.
- (ii) Specification of material.
- (iii) Heat treatment desired.
- (iv) Further tests or chemical analysis, if required.

Note : Couplings shown in drawing Sl. No. 1, 3 & 4 are not recommended for use where sharp curves are to be negotiated.

APPENDIX I

Proforma for the certificate of test and. examination of coupling

Identification Mark	Description	Number tested	S.W.L.
	Particulars of heat treatment to which the Clip has been subjected. Chemical analysis.		

We hereby certify that the clip described above complies in all respects to the design, quality and workmanship and subsequently examined by the competent person.

Signature:

Date:

(Cir. Tech. 1/1986)

9. Annealing of tub coupling chains etc. and their life—Every tub coupling chain and other attachment between tubs and the rope (other than drawbars) shall be annealed once at least in every six months. Where manganese steel coupling chains etc. are in use, the frequency of annealing may be relaxed by DGMS subject to such conditions as he may deem fit to impose.

(Cir. 50/1964)

9A. Life of coupling chains and drawbars—The life of drawbars, coupling chains, and other attachment between the tubs and the rope shall be three years. Where manganese steel coupling chains etc., are used, the life shall be five years.

Every drawbar and coupling chain etc. shall be numbered and the year of manufacture shall be stamped on it.

The date of manufacture of each drawbar, coupling chain etc. the date of annealing and replacement shall be recorded in a bound paged book specially kept for the purpose.

(Cir. 59/1964)

10. Design of drawbar upto 5 tonnes capacity—Investigation into incidents of runaway of tubs due to breakage of the drawbar or its end attachment has revealed that the failure usually occurs owing to one or more of the following reasons :

- (a) the design of the drawbar had inherent weakness;
- (b) the manufacture was defective;
- (c) the material was not of standard quality;
- (d) the drawbar was not maintained in good shape; and
- (e) it was considerably worn or damaged.

Inspections have also revealed that the tub drawbar and its end attachments are not given the required care and attention and their failure results in accidents.

In the light of above the following specifications in respect of tub drawbar and its attachment are laid down. Managements are requested to ensure that the tub drawbars used in mines conform to the said specifications and are maintained in good shape. Appreciably worn or damaged drawbar should not be permitted to be in use. This should be enforced through proper and regular inspection. In addition, after derailment of tub the drawbars of the tub involved should inter alia be carefully checked before the tub is again put into circulation.

Indian Standard specification IS; 4001-1976 for mine tubs should be kept in consideration while designing tubs.

A few designs of tub drawbar and suitable end fittings are given in the sketch annexed. This supersedes the designs approved by Cir. No. 9 of 1975. Any other design may be used with the express permission in writing by the DGMS. In the past, if any other design has been specially permitted by the Director-General of Mines Safety the same should be resubmitted for re-examining the matter, existing drawbars not conforming to the designs shown in the Annexure should be replaced as early as possible, but not later than a period of one year from the date of this circular.

ANNEXURE

1. Material and heat-treatment—(i) Steel for the manufacture of draw bar and its fittings shall be of tested quality.

(ii) The steel used shall not be inferior to carbon steel of designation C-30 of IS : 1875. It can be made from any one of following steels or their equivalent:
Class-4, IS 1875; C—30; C—35 MN 75; C—45; 20Mn₂; HMn₂; HMn₂ Conforming to IS1570.

After manufacture, each component shall be either normalised or normalised and tempered at temperature suitable for the steel. The end fittings can be hardened and tempered, if desired.

2. Design and manufacture—The draw bar shall be manufactured in workshops having adequate facilities for forging, machining and heat treatment. The manufacture shall give evidence of good workmanship and the draw bar shall be free from any visual defect. Holes in the draw bar or its attachment shall be made by drilling and not by punching. Forged draw bar should avoid sudden change of section, thickness, and/or shape or both. In draw bar with eye termination, the eye shape shall be made with the help of suitable mandrill and shall be so made that the line of pull is in line with the axis of the draw bar. The ends of the draw bar shall be such that there is no fouling when tubs are buffed together and there is no locking on curves. In draw bar of lapped design, the lapped portion shall be riveted and side welded on both sides. After riveting the gap between lapped flat faces should not exceed 0.25 mm. After riveting each rivet shall be checked by light hammering and in case of any vibration due to slackness, the rivet shall be cut and redone.

The complete draw bar shall have a minimum static factor of safety of 7 with respect to the rated safe draw bar pull i.e. S.W.L.

3. Identification—The reference number, year of manufacture, material and the heat— treatment shall be legibly punched over a non-wearable part of (he component with suitable abbreviation. Normalised and tempered components shall be marked (M) and hardened and tempered components (OM).

4. Tests—After manufacture and heat-treatment each component shall be non-destructively tested after a proof load of not less than 3 times the rated draw bar pull. It shall be further tested

13. Use of approved type of tub couplings/attachment—In a recent accident due to runaway of empty tubs in haulage roadway, a trammer was killed. The occurrence is reproduced below:

"While a trolley loaded with timber attached with a set of six tubs was being lowered in the haulage plane, the chain of the trolley attached to the empty tubs gave way resulting in runaway of all the tubs. The trammer who was engaged in the haulage roadway was hit by the empty tub and died instantaneously on the spot."

The enquiry into this accident revealed that the coupling attachment being used between the tubs and the trolley was not of approved type as required under provisions of Reg. 89(1) (c) of the CMR 1957. Had an approved type of coupling/ attachment been used between the tub/trolley, this accident could have been prevented and the life saved.

Owners, Agents and Managers of all mines are therefore once again requested to ensure that:

- Only approved type of tub couplings/attachments are used while hauling/ lowering tubs.
- Trolleys with long pipes, timber or other similar material are hauled up or lowered down separately without attaching the same to other tubs/ trolleys in the haulage roadways.

(Cir. Tech. Sapicon 8/1996)

14. Quality of tub couplings—1.0 Enquiries into fatal/serious accidents and incidents connected with haulage for ten years since 1986 have again brought to light the inadequacy of strength of tub couplings. Mechanical failure (i.e. substandard equipment, installation and maintenance) and opening of couplings contributed about 35% of accidents under this category.

The above analysis prompted the need for an in-depth study regarding design, strength of tub coupling, quality, manufacturing process etc. With the above objective in view 14 tub couplings from different subsidiaries of Coal India Ltd., Singareni Coal Company Ltd. and J&K Minerals Ltd. were collected at random, examined and got tested at Central Mining Research Institute, Dhanbad.

2.0 Tests

12 couplings were subjected to the following tests—

- (i) *breaking load*
- (ii) *load at which the coupling started deforming*
- (iii) *hardness*
- (iv) *chemical composition*
- (v) *micro examination*
- (vi) *adequacy of heat treatment*
- (vii) *NOT*

Two couplings from J&K Minerals Ltd. did not conform to the approved design and therefore were not subjected to above tests.

3.0 Results of the 12 tub couplings tested at CMRI

The CMRI report has revealed the following observations—

- (i) Only three couplings had attained the required yield load and factor of safety.
- (ii) The material for most of the couplings did not conform to the approved design.
- (iii) The hardness of couplings in most of them was either very high or low because the heat treatment given was not proper.
- (iv) The dimensions of some couplings also varied from standards.

So it was very clear that 9 out of 12 couplings sent for testing (75%) did not conform to the standards stipulated vide DGMS (Tech.) Circular No. 1 of 1986. Further this approval was given for the type and no specific/particular manufacturer was approved. It was therefore the responsibility of the user industry to assure itself of the proper quality of tub couplings before placing orders and after delivery too by purchasing proper couplings from reliable and reputed manufacturers who had the proper manufacturing facilities.

4.0 Conclusion

It could be inferred from the study that efforts made by the Directorate General of Mines Safety to correct the various irregularities in design, strength, material to be used, heat treatment, quality control both during manufacturing and during procurement through issue of different circulars viz : DGMS Circular No. 4 of 1985 and DGMS (Tech.) Circular No. 1 of 1986 have met with little success. The quality control for tub couplings although is a matter of interest of the management (users) but it has been established that the quality control aspect was not given due priority and importance.

5.0 Recommendation

In view of the fact that rope haulage still remains the primary means of transportation of mineral in the belowground mines, continuance of the above irregularities is a matter of grave concern.

It may also be noted that over the last decade, haulages have remained the second largest contributor to underground fatal accidents and fatalities and it remained the largest contributor to underground serious accidents due to all causes.

In this backdrop, it is imperative to initiate suitable action by all concerned to meet the challenge for improvement in safety and thereby enhance operational performance while reducing the risk

of accidents due to haulages.

Managements are requested to take the following steps/measures for evolving a system of quality assurance scheme in the organisation :

(i) The design of couplings to be used in the mine shall comply with requirements of DGMS (Tech.) Circular No. 1 of 1986.

(ii) 5-10% of couplings selected at random shall be tested to proof load and NDT at any National Test House.

(iii) 1% of the couplings shall be subjected to Break load, and the chemical composition of the material shall be analysed.

(iv) The manufacturers of tub couplings must have adequate manufacturing and testing facilities.

(v) Quality Control Cell shall be set up at company level to ensure purchase and use of quality tub couplings.

(vi) Intensive inspection of all haulage installations shall be done in a phased manner and all sub-standard tub couplings shall be withdrawn from use immediately.

(Cir. Tech. 6/1997)

CMR 90/MMR 99

1. An incident due to failure of brake of a direct haulage—While a set of six tubs was being lowered on a gradient of 1 in 2.5 in a coal mine by a 32 H.P. Pickrose Hauler, the brake of the direct haulage failed and the set ran down uncontrolled creating a potentially dangerous situation. Fortunately, however, there was no casualty.

An enquiry into the incident revealed that the brake failure was primarily due to breakage of a split pin in the top rear hinge pin of the post brake. Whereas regular inspection of vital parts of the machine mechanism, including the brake linkage, would perhaps have shown up the damaged part and thereby avoided the subsequent mishap, it is pertinent to note that the correct recommended procedure for lowering and arresting the load on a gradient is as follows :

"The motor should be running in the direction of 'lower' with the clutch fully engaged. Apply the handbrake gradually at the same time releasing the clutch. Only when the brake has been fully applied is the clutch fully released. That is to say, the prime mover is never detached from the rope load."

Accordingly while lowering a load by any direct haulage, it is desirable to lower or move the haulage rope in the direction with the engine drum in clutched position, and control the speed as necessary by application of brakes. Lowering of load by unclutched drum through the help of brakes only, specially on gradients of 1 in 6 or more, is not safe. At the same time, it is important to ensure that any pin used for location or stop is of standard quality only and of split type.

(Cir. 56/1974)

CMR 91/MMR 99

1. Bent-back wire capps for haulage ropes—Recently some accidents have occurred due to improper capping of haulage ropes. Haulage rope capps are usually of the bent-back wire type. Correct method of making a bent-back wire cappel is given in the Appendix.

It is necessary that a long socket is used. Length of the barrel should not be less than 12 times diameter of the rope.

APPENDIX

Method of making Bent-Back Wire Cappel

The correct way to make a bent-back wire cappel is as follows :

1. Seize or clamp the rope temporarily before cutting off the old cappel or rope end.
2. Thread the socket on the rope and push it along out of the way.
3. Seize the rope tightly with No. 12 to 16 gauge soft iron wire as at RS in Fig. 1. Make this seizing about 1 inch longer than the socket barrel and keep it clear of the rope end by a length ST which should be 1/2 inch less than the length of the barrel.

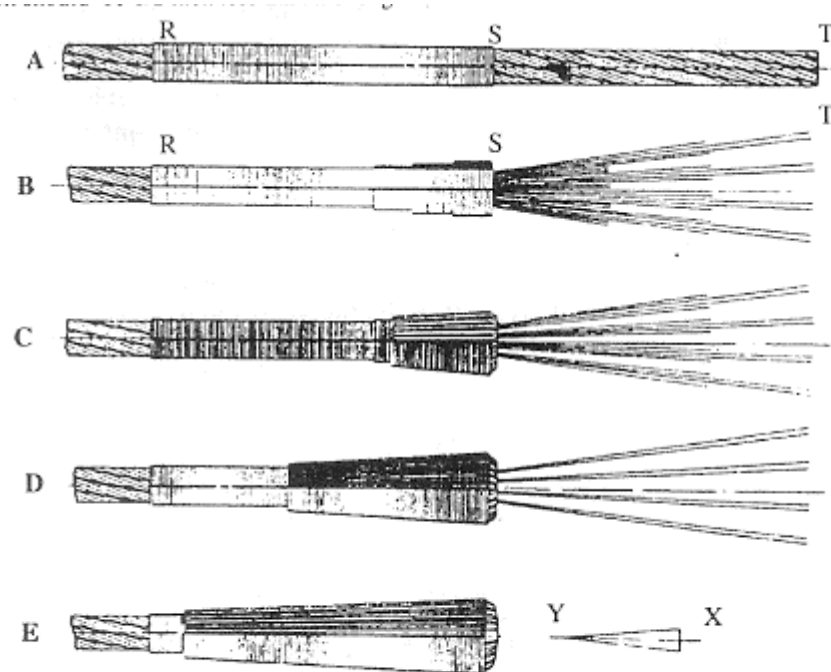


Fig. Stages in forming a cone of bent-back wire cappel.

4. Build up a short cone of the seizing wire at S. This cone (Fig. 2) should be made of two or three layers of wire and should have about the same taper as the inside of the socket.

5. Open out and straighten the wires in the length ST, divide them into three fairly equal groups so that each group is spaced evenly round the rope. Leave one group full length, cut the second group to two-thirds the full length, (as in Fig. 2).

Note—*For small ropes or narrow sockets three layers of bent-back wire ropes may prove awkward to manage or to fit. In that case divide the wires into only two groups. Leave one group full length, cut the other group to half that length and carry on.

6. Bend the shortest wires hard back on to the conical seizing, arrange them evenly around the rope and seize them tightly over their whole length.

7. Bend-back the next short wires in the same way and seize them tightly over their whole length.

8. Bend-back the remaining wires in the same way and seize them tightly over their whole length.

9. Cut off the fibre core where it leaves the end of the cappel and start a hole in the centre of the stump of fibre as a guide for the plug which is to be driven into it.

10. Draw the socket on to the cappel and drive the tapered plug X into the stump of the fibre core at Y, This plug should be wrought iron or mild steel, only 3 to 4 rope diameters in length, conical in shape with its large end slightly bigger than the fibre core and is pointed and not too sharp. It should be driven in true and Hush. Never forget this plug.

11. Put some thick grease into the socket to keep out water.

The aim in making a bent-back wire cappel should be to get a tight, solid core of wires on the end of the rope and to do nothing to prevent the cone from squeezing tighter during service. It is this squeezing of the bent-back wires against the rope which holds the rope in the socket. White metal should never be poured into the socket or it will weld the bent-back wires together and prevent them from squeezing tighter against the rope during service. Bent-back wires or strands should never be sliced into the rope during service. Bent-back wires or strands should never be sliced into the rope because this would cause weakness at the tucks and give an open springly cappel instead of a tight solid one.

(Cir. 37/1964)

2. Indian Standards on wire ropes and wire products—Indian Standards on wire ropes and wire products have been formed and published by the Standards Institution, Manak Bhavan, 9, Bahadur Shah Zafar Marg, Delhi-1.

Managements are requested to ensure that they comply to the National Standards.

A list of National Standards concerning such items is given below :

1. IS: 1866-1961	(Latest revision)	Description
2. IS : 1856-1970	(Latest revision)	Steel wire ropes for winding purpose in mine.
3. IS: 2141-1968	(Latest revision)	Steel wire rope for haulage purpose in mines.
4. IS : 12265-1963	(Latest revision)	Galvanised stay strand.
5. IS : 2266-1970	(Latest revision)	Galvanised steel wire strand for signalling.
6. IS : 2315-1963	(Latest revision)	Steel wire rope for general engineering purposes. Thimbles for wire ropes. Bulldog grips.
7. IS : 2361-1970	(Latest revision)	Steel wire suspension ropes for lifts and hoists.
8. IS : 2365-1963	(Latest revision)	Drop forged sockets for wire ropes for general engineering purposes.
9. IS : 2485-1963	(Latest revision)	Wire rope slings and sling legs.
10. IS : 2762-1974 11.IS : 3121-1965	(Latest revision)	Rigging screws and stretching screws.
11.IS:3121-1965	(Latest revision)	Guide and Rubbing ropes.
12. IS : 3623-1966	(Latest revision)	Locked coil winding ropes.
13. IS : 3626-1966	(Latest revision)	Recommendations for socketing of wire ropes with molten metal.
14. IS : 3937-1967 15. IS: 3973-1967	(Latest revision)	Code of practice for the selection, installation and maintenance of wire ropes.
16. IS : 4521-1968	(Latest revision)	Wire ropes used in oil wells and oil well drilling.
17. IS : 5202-1969	(Latest revision)	Flat hoisting wire ropes used in mines.
18. IS : 5203-1969	(Latest revision)	Flat balancing wire ropes used in mines.
19. IS: 5243-1969 (part-1)	(Latest revision)	Flat splicing of wire ropes
20. IS : 5245-1971	(Latest revision)	Wire rope sling legs with ferrule secured eye terminals.
21. IS : 6594-1972	(Latest revision)	Technical supply conditions for wire ropes

3. Indigenous make haulage ropes— Indigenous haulage ropes have failed while in service within 2 to 3 months of their installation. Whenever there is any such incident (whether or not it results in an injury) a notice of the occurrence should be sent immediately to the Jt. Director of Mines Safety and D.G.M.S. Wherever considered necessary an investigation into the incident would be made by an officer of this office.

(Cir. 2 & 54/1974)

It is requested that sample of the haulage rope, at least 3 metres in length cut off from the broken ends of the rope, should be kept at the mine for examination and tests if necessary, to find out the cause of breakage of the haulage rope.

(Cir. 14/1965)

4. Correct selection of ropes for haulage—It has been observed that wire ropes of various types are used on haulages particularly direct haulages without enough consideration to the type, size, construction and tensile range of wires in the ropes.

It is generally noticed that wire ropes used on inclined roadways are likely to rub on the floor or the sides or on hard objects on the road unless the rope is properly supported throughout its working length. Ropes also get wet over some portion of the track unless, the track is carefully drained.

Rubbing of wires against hard objects tends to develop hardness in the wires leading to a martensitic structure in the steel particularly in wires of high tensile range and results in a faster rate of wear. At this stage the wires develop cracks and fatigue limit is reached very prematurely. The rope then becomes prone to sudden breakage due to heavy jerks.

Wetting of the rope results in rusting and corrosion. Corrosion is accelerated on worn wires and fatigue due to corrosion occurring rapidly. The rope affected by corrosion fatigue is not safe; it becomes prone to breakage at any time even on jerks well within normal limits.

The above therefore, clearly indicates that wire ropes should be properly selected. In this connection you are advised that wire ropes of such construction that would have large diameter outer wires (6-7 construction or so) having tensile range up to 160-175/ kg mm² (max.) Lang's Lay, fibre main core and preformed should be selected. Tensile strength up to 160 kg/ mm² may be even satisfactory. For watery installations, galvanised wire ropes may give better performance.

The factor of safety in haulage ropes for material hauling should not be less than 'eight'.

(Cir. 28/1973)

5. Investigation into breakage of haulage ropes—It has been found that breakage of haulage ropes is becoming frequent and cause for the breakage is not being properly investigated. Instances of breakage of haulage rope are not being reported to this Directorate except when it involves a major or fatal accident.

While the cause of failure of rope reported to this Directorate is investigated, in all other cases of a breakage investigation is not properly made either by the user or the manufacturer. Unless the reasons contributing to the failure—may be due to inferior quality of the rope or due to defects in the installation or maintenance of the rope—are found, deficiency is likely to remain unrectified and improvement is not likely to be made either in the quality of the ropes or in the use of the ropes at the mines.

While the indigenous manufacturer's attention is being drawn towards main-taining quality in the ropes and also to activate their field service, managements are hereby requested to ensure proper use of ropes in the mines. Mainly following should be given due attention :—

1. adequate protection against rubbing of the rope on the track.
2. adequate protection against the rope from getting wet over its length.
3. over loading of the rope.
4. hauling of derailed tubs for re-railing.
5. fouling of the rope along the track against hard objects like iron or stone;and
6. proper splicing of the rope.

The factor of safety of at least 9 should be provided with a new rope notwithstanding installations for man riding where the factor of safety of at least 10 should be provided.

Managements are hereby directed that in future any breakage of haulage rope should be reported to the Joint Director of Mines Safety concerned with a copy to the Director-General of Mines Safety and the Director (Marks). ISI. 5, Chowringhee Approach, Cal-13, furnishing the following details :—

1. name of rope manufacturer :
2. diameter and construction of the rope when installed.
3. diameter of rope (minimum) over the portion snapped.
4. whether the rope is galvanised?
5. date when the rope was put in use.
6. no. of loaded and empty tubs allowed to be hauled and lowered (mention separately).
7. date of failure.
8. type of failure (whether breakage of wire, strands or complete rope).
9. probable reasons for premature failure (stating deficiency in the installation or maintenance, if any).
10. whether the manufacturer was informed—if so, state letter reference.

(Cir. Tech. 15/1975)

CMR 92 / MMR 100

1. Model Conditions for use of Belt Conveyors belowground—No belt conveyor can be used in a mine belowground without the permission in writing of the D.G.M.S. and subject to such conditions as he may specify therein, as provided in Reg. 92(4) of CMR 1957.

In this connection revised Model Conditions governing use of belt conveyors belowground are given in the Appendix for information and guidance. These conditions have been modified in keeping with latest researches and experience in the use of such installations.

It should however be noted that this does not obviate the need for obtaining separate permission in each case, which shall continue to be granted on the merits of each case.

APPENDIX
**Model Conditions Governing the use of Belt Conveyors
 Underground under Reg. 92(4) of CMR 1957.**

General

1. The conveyor belt shall be of fire-resistant type.
2. (a) The installation shall be properly designed, constructed and suited for the duty it is to perform.
 (b) Alloys and metals likely to give incentive sparking shall not be used in the construction of a conveyor installation.
3. Conveyor roads shall be so made and the conveyor so located that the clearances above, below and on both sides of the conveyor are sufficient for persons to carry out installation, proper inspection and maintenance of the belt, structure, rollers, drums and drive, return and tensioning units and for removal of any spillage.
4. Conveyor belt shall not be used—
 (a) when its ends are badly frayed.
 (b) when it is torn, badly worn or has bad joints.
5. Anchoring of return structure shall be adequate and independent of the face or roadway supports.
6. (a) At either end of the conveyor installation, all exposed rotating and moving parts forming part of the drive or return or tensioning units shall be kept substantially fenced or guarded so that no person can get caught by the running belt or any moving part.
 (b) No person shall or shall be permitted to clean or oil any dangerous part whilst the belt is in motion.
7. (a) Along the length of the conveyor, effective means of signalling shall be provided so that distinct signal can be given to the attendant from any point along its length to stop the belt of the conveyor.
 (b) Where conveyor roadway is also used as travelling roadway for persons, signalling arrangements shall be provided on the side of roadway along which persons travel. The travelling passage shall be free from obstruction and it shall be not less than 0.6 wide between the conveyor and one side.
 (c) As far as practicable, pull wire to stop the belt from anywhere along its length shall be introduced for use in emergency.

Precautions against Fire

8. (a) Wood or other inflammable material shall not be used for the support of conveyor structure except for training the belt.
 (b) Within five metres of the drive head only non-inflammable or fire resistant materials shall be used for support, unless otherwise permitted in writing by the DGMS.
 (c) All ventilation doors or screens in conveyor roadways shall be of fire-resistant material unless otherwise permitted in writing by DGMS.
9. (a) No flame lamp shall be kept near the conveyor,
 (b) Where hydraulic fluid coupling is used, fluid shall be of fire-resistant type.
10. Suitable and adequate means of extinguishing fires shall be provided and maintained along the conveyor roads and at the driving unit of every conveyor.

Precautions against Coal Dust

11. At the loading, discharge and transfer points adequate arrangements shall be made to avoid spillage of coal and formation of coal dust.
12. Adequate provisions shall be made for suppression and removal of coal dust from conveyor installation and its roadways. Particular attention shall be paid to places near and around idlers, rollers, drums, discharge and transfer points. Adequate water sprays shall be installed at suitable places on the installation for effective suppression of coal dust.
13. Coal dust on the conveyor structure and in the conveyor roadways shall be regularly cleaned and unless, the coal dust is effectively suppressed with water by an effective system of water sprays, the structure and roadways shall be stone dusted in such manner that the percentage of incombustible matter in any sample of coal dust taken at any place along the conveyor is not less than 75.
14. Adequate precautions shall be taken to prevent overloading of belt and its back slipping.

Operation, Inspection and Examination etc.

15. (a) The conveyor shall not be operated except by a competent person who has attained the age, of 21 years, and has been duly authorised in writing by the manager.
 (b) The operator so authorised shall be well conversant with the controls of the drive, signals and the installation in general.
16. (a) Each conveyor installation shall be regularly inspected once in every 8 hours when in use, for belt slip, fast idlers or rollers, torn belt, frayed ends, non-alignment, heating, rubbing against road or its supports, and any other defect not covered above by a competent person appointed and authorised in writing by the manager for the purpose. Every person so appointed shall at the end of shift record the condition

of the conveyor belt and of the installation mentioning clearly any defect, if noticed, in a book kept for the purpose.

(b) The inspection under clause (a) shall be so made that external parts of the conveyor are examined.

(c) Any competent person, other than the person making inspection as provided in clause (a), noticing any defect in the conveyor installation shall take necessary steps for its rectification and send a report of the same to the senior most official present in the mine.

(d) In the event of any belt slippage, heating of belt or fire, the conveyor shall be immediately stopped by any person noticing such incident, and the belt shall not be restarted unless the cause is satisfactorily remedied and an order in writing is given by the manager to that effect.

(e) Every incident of belt heating, fire or any other serious defect on the installation shall be recorded with its probable cause and it shall be signed by the engineer and countersigned by the manager.

17. Where the inclination of any conveyor gives rise to danger from slipping, devices shall be used to afford adequate protection against such danger.

18. (a) Every conveyor roller shall be maintained in good working condition and shall be taken out of use at predetermined intervals according to the manufacturer's recommendation and the working conditions, and it shall be examined, repaired and if necessary, relubricated before being put into service again.

(b) Sufficient stock of spare rollers and idlers shall be kept at the mine to permit the periodical inspection and replacement stated under clause (a).

(c) If in opinion of the Jt. Director of Mines Safety the interval referred to in Clause (a) is too large and is dangerous he may specify a shorter interval.

19. (a) Erection, maintenance, replacements and repairs of the conveyor shall be under the charge of duly qualified and competent person or engineer appointed in writing by the manager.

(b) The person appointed under clause (a) shall make a close examination of the installation particularly of the drive, the return and tensioning units and of other rollers, idlers, drums etc. once at least in every 24 hours, and keep record of the results thereof in a book for the purpose. The report shall be signed by the engineer and the manager.

20. (a) Electrical parts of the installation shall be maintained in good order.

(b) A competent electrician appointed in writing by the manager shall once at least in every 24 hours examine every electrical part of the installation, and record the result thereof in a book kept for the purpose.

(c) Whenever a conveyor is re erected at a new place, the examination under clauses 10(b) and 20(b) shall be made before the conveyor is put in use.

21. No person shall or shall be allowed to travel or ride on a moving conveyor.

Compliance

22. The Manager and his subordinate staff, including the engineer or competent person concerned shall be responsible for securing effective compliance with aforesaid conditions, and no conveyor shall be used in contravention of these provisions unless exempted in writing by the Director-General of Mines safety.

(Cir 11/1974)

2. Signalling and cross over bridge for conveyor—Recently an accident occurred in a coal mine belowground where a mazdoor attempted to cross a running conveyor by walking on a stowing pipe range slipped and fell between the conveyor and pipe range. He sustained injuries to which he succumbed seven days later. For various works attending the stowing operations going on thereat, persons had to cross and recross the conveyor, but no cross-over bridge was provided for this purpose. Length of the conveyor was 140m but no signalling arrangement was provided. Only by flashing of cap lamp light, a message could be sent to the conveyor attendant nearly 140m away. Though this state of affairs existed for over a month, no effective steps were taken to rectify this defect and ensure safety of workers.

As this accident indicates, such defective practices are fraught with grave dangers and entail loss of human life. It is therefore imperative that for every conveyor exceeding 30m, in length, effective means of transmitting signals from every point on the length of the road to the place at which machinery working conveyor is operated, are provided and maintained as required under Reg. 92(3) of CMR, 1957, Reg. 100(3) of MMR, 1961. Further, at places where persons are required to cross the conveyors, suitable cross-over bridges should be provided to eliminate the risk of any such inadvertent falling on falling on running conveyor. Compliance of the above in respect of conveyor installations shall be ensured.

(Cir. 28/1974)

3. Cleaning of running belt conveyors and provision of guards and fences—A number of fatal accidents take place with belt conveyors in underground mines. On examination of causes of these accidents it is revealed that the accidents mainly took place for the following reasons :—

(1) non provision of suitable guards, fences at the drive head and tail end of belt conveyor.

[contravention of CMR. 184(2) & MMR. 174(2)]

(2) cleaning of belt and conveyor drums when the machinery was in motion.

[contravention of CMR. 184(3) & MMR. 174(3)]

Suitable steps should therefore be taken to prevent recurrence of such accidents.

It is further suggested that persons responsible for care, maintenance and cleaning of belt conveyors are exposed to short term refresher courses at the Vocational Training Centres.

(Cir. Tech. 12/1983)

CMR 96 / MMR 104

1. Accidents in colliery sidings—Every year a number of fatal accidents occur in colliery sidings while wagons are being pushed by wagon loaders. While it is true that depots are visited by the managers as well as some members of supervisory staff such as loading clerks, it is felt that there is more amount of perfunctoriness in their inspections. All accidents in colliery sidings can be averted if the provisions of Reg. 96 of CMR 1957 are fully carried out.

It is, therefore, desirable that managements comply with this regulation. It is also suggested that movement of wagons should be carried out solely under the supervision of a competent person.

(Cir. 2/1963)

2. Accidents in railway sidings during shunting of wagons—A number of accidents have occurred in railway sidings during shunting of wagons when unwary persons employed in or about the siding were runover. The provisions of Reg. 96(3) of CMR 1957 and Reg. 104(3) of MMR 1961, on this subject read as follows :—
"Before wagons are moved, persons likely to be endangered shall be warned by the competent person appointed under sub-regulation (2)".

Enquiries into these accidents have revealed that though warning was given by the competent person in compliance of the above regulation, shunting of wagons was resorted to without ensuring that all persons likely to be endangered had actually moved to a place of safety. The spirit of the law implies that such precautions should be taken in all cases.

To illustrate the point, following example may be of interest :

Loaded wagon was set in motion by two shuntmen after giving the usual warning. This wagon hit another stationary loaded wagon 8m further down, after which both the wagons together rolled down 18m and hit a third wagon on which two female wagons loaders were engaged in levelling loaded coal. One of the two female workers was thrown over-board and was run over by the second wagon.

It may be appreciated that had the shuntmen ensured that the two female workers engaged on top of another wagon further down had got off the wagon, before starting manual pushing of the first wagon, thus complying with the provisions of Reg. 96(3) in spirit, this accident could have been avoided. In this particular case, however, the brake of the wagons was also not being controlled.

Managements are therefore advised to take suitable steps to adopt adequate precautions in railway sidings during shunting of wagons so that shunting is not started unless all persons likely to be endangered have been moved to a safe place.

(Cir.Tech. 2/1984)

DGMS

MINE WORKINGS

CMR98 / MMR 106

1. Advantages of Inclined Holes at hard rock faces—The system of inclined hole drilling is being increasingly adopted in other countries as this has resulted not only in increased efficiency and reduced costs but it also provides for greater safety in quarries. A very useful article in this connection appeared in the Quarry Manager's Journal (Volume 47, Number 4, May 1963). An abstract of the same is reproduced below.

It is recommended that the managements may consider the adoption of inclined-hole drilling in hard rocks in opencast workings.

APPENDIX

Advantage of Inclined Holes in Hard Rock Faces

In an article, Mr. M.A. Cheshire, H.M. Principal Inspector of Quarries, Ministry of Power (U.K.) has discussed the advantages of inclined drilling and reviewed a few of the major defects and limitations of alternative systems of working hard rock.

Against the vertical hole system, which is the most common one currently employed in winning hard rock, he has mentioned the following defects:

- (i) The truly formidable obstacle which a vertical face presents to even the most experienced rockmen.
- (ii) The broken face and overhang conditions (frequently left by back break) which cannot generally be dealt with by rockmen on the face.
- (iii) The large amount of time spent in the hazardous operations of drilling and removing the toes at the foot of a rough and vertical face.

Mr. Cheshire discusses the blasting problems of inclined hole drilling and makes a special mention of the safety aspects of the drilling. He points out that apart from increased efficiency of the new system and the reduced costs, the prime factor of greater safety is also secured. In many respects efficiency and safety are near synonymous terms, though it must be admitted that, on occasions, safety has specifically to be brought. It is not so in this case, because not only does the system of drilling inclined holes automatically eliminate many of the defects of previous system; it also reduces costs. Further the toes of a face are brought much more efficiently with holes that are inclined. It follows that this must largely remove one of the serious weaknesses in the vertical hole system, namely that which frequently requires work to be done in the worst position at a face, namely at the foot. The inclined drilling also greatly reduces the number of secondary shots and eliminates much of the inevitable interruptions of work that such shots entail. The elimination of large boulders in the heap ensures an easier and safer runon of stones to the loading machines. It reduces the need for persons to climb loose heaps in order either to drill the larger boulders or to charge them and connect for firing.

Inclined holes also produce less back-break. In vertical holes this most troublesome feature frequently occurs in heterogenous deposits or where weak sections of rock are present in the immediate vicinity of the column of explosives, such back-breaks can introduce dangerous conditions especially on deep vertical faces. In addition to loose rock which may be left, overhangs occur not infrequently and as is well known, both conditions may be extremely difficult, if not impossible to rectify without resorting to drilling and firing further holes behind the offending area.

It is particularly in the sphere of safety that inclined holes bring the greatest ... advantage, because a face of reasonable height inclined at, say, 25-30°, does not present anything like the hazards that obtain at a vertical face and if unsatisfactory conditions are left after a blast—a possibility with any system using explosives— they can be dealt with easily and safety. The benefits to safety which have been described to establish the case for inclined drilling in deposits to which the system is suited, and the marked improvement achieved at many quarries using this method give reason to believe that its wider adoption is to be expected. It is not the solution ? to all hard rock problems nor is any specific system likely to be put off all current methods; inclined drilling undoubtedly contained fewest inherent weaknesses. (Ref. Quarry Manager's Journal Vol. 47, No. 4, May 1963).

(Cir. 71/1963)

2. Height and width of benches in hard and compact ground—It is recommended that generally the height of a bench in hard and compact ground should not exceed 7.5 metres and the sides of the bench should be sloped at an angle of not more than 60° from the horizontal. The width of the benches should also be not less than the height.

Provided, however, that where there are any practical difficulties in complying with these recommendations, benches in variation of the above mentioned dimensions may be permitted to be made on application subject to such conditions as may be specified in the interest of safety of workpersons on the merits of each case individually. In this connection it may be indicated that no such application would be normally entertained where the benches are worked manually.

(Cir. 42/1965)

3. Conditions for use of heavy machinery/deep hole blasting—Provisions of Regulation 106(2) (b) of the Metalliferous Mines Regulations, 1961 lay down that if in any mine or part thereof it is proposed to work by a system of deep hole blasting and/or with the help of heavy machinery in such a manner as would not permit compliance with the requirements of sub-regulation (1) of the aforesaid regulation, the owner, agent or manager is required to give notice in writing to the D.G.M.S. and the J.D.M.S, Such work can be commenced and carried out only in accordance with the conditions specified by the D.G.M.S,

The conditions subject to which the use of heavy machinery and the adoption of deep-hole technique is permitted by this office have been standardised. A copy of such conditions is given at Appendix for guidance. This may be useful while planning the operations.

(Cir. 36/1972)

APPENDIX

Conditions for adopting a system of deep-hole blasting and/or working opencast mines with the help of heavy machinery for digging, excavation and removal of ore etc. under Reg. 106(2)(b) of MMR 1961

I. GENERAL

1. (1) Except where otherwise provided for in this conditional permission, all provisions of the Metalliferous Mines Regulations, 1961 shall be strictly complied with.

(2) This conditional permission is Subject to amendment or withdrawal at any time.

II. OPENCAST WORKING

Height and Width of Benches

2. (a) The height of the benches in overburden ore body or other rock formation shall not be more than the digging height of the machine used for digging, excavation or removal. Provided that in case of uniformly soft rocks the Regional Inspector may permit the extension of the height upto 3 metres above the digging height of the machine.

(b) The width of any bench shall not be less than

- (i) the width of the widest machine plying on the bench plus two meters,
- or (ii) if dumpers ply on the bench three times the width of the dumper,
- or (iii) the height of the bench, whichever is more.

Provided that the Chief Inspector may, subject to such conditions as he may specify therein, permit the width of any bench to be less than its height.

(c) When persons are employed within 5 m of the working face, adequate precautions shall be taken to ensure their safety by dressing the sides of the bench.

Roads for Trucks and Dumpers etc.

3.1 All roads for trucks, dumpers or other mobile machinery shall be maintained in good condition.

3.2 Where practicable, all roads from the opencast workings shall be arranged to provide one way traffic. Where this is not practicable, no road shall be of a width less than three times the width of the largest vehicle plying on that road unless, definite turnouts and waiting points are designated.

3.3 All corners and bends in roads shall be made in such a way that the operations and drivers of vehicles have clear view for a distance of not less than 30 metres, along the road.

Where it is not possible to ensure a visibility for a distance of 30 metres there shall be provided two roads for the up and down traffic.

3.4 Except with the express permission of Chief Inspector in writing and subject to such conditions as he may specify therein, no road shall have a gradient steeper than 1 in 16 at any place.

Provided that in case of Ramps over small stretches a gradient upto 1 in 10 may be permitted.

3.5 Where any road exists above the level of the surrounding area, it shall be provided with strong parapet walls or embankments not less than 1 metre in height to prevent any vehicle from getting off the road.

Supervision

4. During every production shift the opencast workings shall be placed under the charge of an assistant manager and during maintenance shift the workings shall be placed under the charge of foreman, who shall be responsible to see that all the regulations and the orders made there under are strictly complied with.

Maintenance of Machines

5.1 If the engineer, mechanical foreman or other competent person making an inspection notices any defect in any machinery the said machinery shall not be used until the defect has been remedied.

5.2 Any defect in a machinery reported by its operator shall be promptly attended to.

5.3 Any machine found to be in an unsafe operating condition shall be tagged at the operator's position "OUT OF SERVICE DO NOT USE" and its use shall be prohibited until the unsafe condition has been corrected.

5.4 All repairs to a machine shall be done at a location which will provide a safe place for the persons engaged on repairs.

5.5 Except for testing, trial or adjustment which must necessarily be done while the machine is in motion, every machine shall be shut down and positive means taken to prevent its operation while any repair or manual lubrication is being done.

5.6 Power shall be disconnected when repairs are made to any electric machine.

5.7 Any machinery, equipment or part thereof which is suspended or held apart by use of slings, hoists or jacks shall be substantially blocked or cribbed before men are permitted to work underneath or between such machinery, equipment or part thereof.

Precautions while Drilling

6.1 The position of every deep hole to be drilled shall be distinctly marked by the Mine foreman so as to be readily seen by the drillers.

6.2 No person shall be permitted to remain within a radius of 20 metres or within 60 m on the same bench where charging of holes with explosives is being carried out.

Transport of Explosives

7. Where explosives are transported in bulk for deep hole blasting the following precautions shall be taken:—

(1) Transport of explosives from the magazine to the priming station or the site of blasting shall not be done except in the original wooden or cardboard packing cases. The quantity of explosive transported at one time to the site of blasting shall not exceed the actual quantity required for use in one round of shots. The explosives shall be transported to the site of blasting not more than 90 minutes before the commencement of charging of the holes.

(2) (a) No mechanically propelled vehicle shall be used for the transport of explosives unless it is of a type approved in writing by the Chief Inspector provided that a Jeep or Land Rover may be used for the transport of detonators from magazines to 'priming stations' subject to the following conditions :—

(i) Not more than 200 detonators are transported in a vehicle at a time;

(ii) The detonators are packed suitably in a wooden box;

(iii) The wooden box containing detonators is placed inside an outer metal case of construction approved by the Chief Inspector;

(iv) The outer metal case shall be suitably bolted to the floor of the vehicle or otherwise fixed in a wooden frame so that the container does not move about while the vehicle is in motion; and

(v) No person shall ride on the rear portion of the vehicle.

(b) Every vehicle used for the transport of explosive shall be marked or placarded on both sides and ends with the word "Explosives" in white letters not less than 15 centimetres high on a red background.

(c) Every mechanically propelled vehicle transporting/explosives shall be provided with not less than two fire extinguishers (one of carbon tetrachloride type for petroleum fire and the other of carbondioxide under pressure type for electrical fire) suitably placed for convenient use.

(3) (a) The vehicle used for the transport of explosives shall not be overloaded and in no case shall the explosive cases be piled higher than the sides of its body.

(b) Explosives and detonators shall not be transported in the same vehicle. at the same time.

(4) (a) No person other than the driver and his helper (not below 18 years of age) shall ride on a mechanically propelled vehicle used for the transport of explosives.

(b) A vehicle loaded with explosive shall not be left unattended.

(c) The engine of a vehicle transporting explosives shall be stopped and the brakes set securely before it is unloaded or left standing.

(d) A vehicle transporting explosives shall not be driven at a speed exceeding 25 kilometres per hour.

(e) A vehicle loaded with explosives shall not be taken into garage or repair shop and shall not be parked in a congested place.

(f) A vehicle transporting explosives shall not be refueled except in emergencies and then only when its engine is stopped and other precautions taken to prevent accidents.

(g) No trailer shall be attached to a vehicle transporting explosives.

(5) (a) Every vehicle used for the transport of explosives shall be carefully inspected once in every 24 hours by a competent persons to ensure that:

(i) Fire extinguishers are filled and in place;

(ii) The electric wiring is well-insulated and firmly secured;

(iii) The chassis, engine and body are clean and free from surplus oil and grease;

(iv) The fuel tank and feed lines are not leaking; and

(v) Lights, brakes and steering mechanism are in good working order.

(b) All report of every inspection made under sub-clause (a) shall be signed and dated by competent person making the inspection.

(6) All operations connected with the transport of explosives shall be conducted under the personal supervision of a foreman solely placed in charge of blasting operations at the mine.

(7) The blaster shall personally search every person engaged in the transport and use of explosives and shall satisfy himself that no person so engaged has in his possession any cigarette, 'biri' or other smoking apparatus, or any match or any other apparatus of any kind capable of producing a light, flame or spark.

Precautions during Firing

8.1 (a) Shots shall not be fired except during the hours of day- light or until adequate artificial light is provided. All holes charged on any one day shall be fired on the same day.

(b) As far as practicable the shotfiring shall be carried out either between shifts or during the rest interval,- or at the end of work for the day.

8.2 During the approach and progress of an electric storm the following precautions shall be taken:

(a) no explosive, particularly detonators shall be handled;

(b) if charging operations have been commenced, the work shall be discontinued until the storm has passed;

(c) if the blast is to be fired electrically all exposed wires shall be coiled up and if possible placed in the mouth of the holes, or kept covered by something other than a metal plate;

(d) all wires shall be removed from contact with the steel rails of a haulage track so as to prevent the charge being exploded prematurely by a local strike of the lightning.

Operation of machines

9.1 (a) No person other than the operator or his helper if any or the manager or any person so authorised in writing by the manager shall ride on a shovel (or dragline).

(b) No person shall be permitted to ride in the bucket of a shovel.

(c) No shovel or dragline shall be operated in a position where any part of the machine, suspended loads or lines are brought closer than 3 metres to exposed high voltage lines, unless the current has been cut off and the line de-energised. A notice of this requirement shall be pasted at the operator's position.

(d) Electrical cables, if any, shall be laid in such a manner that they are not endangered either by falling rocks or by a mobile equipment.

9.3 (a) The shovel bucket shall be pulled out of the bank as soon as it is full.

(b) When not in operation the bucket shall be pulled out of the bank as soon as it is full.

(c) When being operated in soft or unstable ground every shovel (and dragline) shall be supported by heavy planks or poles so as to distribute the load of the machine over larger area and to prevent any danger of the shovel (or dragline) over-turning.

(d) When not in use, the shovel or dragline shall be moved to and stood on stable ground. If more than one stripping machine is in use in any area, either on the same bench or on different benches, the machines shall be so spaced that there is no danger of accident from flying or falling objects etc. from one machine to the other.

Duties of Mechanics, Fitters or Engineers

10.1 (a) At the commencement of every shift he shall personally inspect and test every machine and vehicle paying special attention to the following details:

(i) that the brakes and the warning devices are in working order;

(ii) if the vehicle or machine is required to work after day light hours that the lights are in working order.

He shall not permit the vehicle or machine to be taken out for work not shall be drive the vehicle unless he is satisfied that it is mechanically sound and in efficient working order.

(b) The mechanic shall maintain a record of every inspection in a bound paged book kept for the purpose. Every entry in the book shall be signed and dated by the person making the inspection.

Operation of trucks, dumpers and other vehicles

11.1 No person shall be permitted to ride on the running board of a truck or dumper.

11.2 (a) As far as possible loaded trucks or dumper shall not be reversed on gradient.

(b) Sufficient stop blocks shall be provided at every tipping point and these shall be used on every occasion material is dumped from the truck, dumper, or other such vehicle.

(c) Standard traffic rules shall be adopted and followed during movement of all trucks and dumpers. They shall be prominently displayed at the relevant places in the opencast working and truck/dumper roads.

11.3 When not in use every truck or dumper shall be moved to be stood at proper parking places.

11.4 No person shall be permitted to work on the chassis of truck or dumper with the body in a raised position until the truck or dumper body has been securely blocked in position. The mechanical hoist mechanism alone shall not be depended upon to hold the body of the truck or dumper in raised position.

11.5 No unauthorised person shall be permitted to enter or remain in any dumping yard or turning points.

Duties of Machine Operators

12.1 (a) The operator shall not operate the machine when persons are in such proximity as to be endangered.

(b) He shall not swing the bucket of shovel over passing haulage units. While the trucks/dumpers are being loaded he shall swing over the body of the truck/dumper and not over the cab, unless the cab is protected by a substantially strong cover.

12.2 The operator shall not allow any unauthorised person to ride on the machine.

Duties of Truck I Dumper Operators

13.1 (a) He shall not drive too fast, shall avoid distractions, and shall drive defensively. He shall not attempt to overtake another vehicle unless he can see clearly far enough ahead to be sure that he can pass it safely. He shall also sound the audible warning signal before overtaking.

(b) When approaching a stripping equipment the driver of the truck, dumper shall sound the audible warning signal and shall not attempt to pass the stripping equipment until he has received proper audible signal in reply.

(c) Before crossing a road or railway line he shall reduce his speed, look in both directions along the road or line and shall proceed across the road or line only if it is safe to do so.

(d) The driver shall sound the audible warning signal while approaching 'blind' corner or any other point from where persons may walk in front unexpectedly.

(e) The driver shall not operate the truck or dumper in reverse unless he has a clear view of the area behind the vehicle or he has the assistance of a 'spotter' duly authorised in writing for the purpose by the manager. He shall give an audible warning signal before reversing a truck or dumper.

(f) the driver shall be sure of clearance before driving through tunnels, archways, plant structures etc.

13.2 The driver shall see that the vehicle is not overloaded and that the material is not loaded in a truck or dumper so as to project horizontally beyond the sides of its body and that any material projecting beyond the front or rear is indicated by a red flag during day and by red light after day light hours.

13.3 The driver shall not allow any unauthorised persons to ride on the vehicle. He shall also not allow more than the authorised number of persons to ride on the vehicle.

(Cir. 36/1972 & Tech. 17/1977)

3A. Precautions with heavy earth moving machinery— The following procedures and precautionary measures shall be adopted in use of heavy machineries :

(1) At least once in two weeks the brakes of the truck, dumper or any such other vehicle should be tested as indicated below :

(a) Service Brake Test—The brake shall be tested on a specified gradient and speed when the vehicle is fully loaded. The vehicle should stop within a specified distance when the brake is applied. The specified stopping distance shall be obtained from the manufacturer of the vehicle.

(b) Parking Brake Test— The parking brake should be capable to hold the vehicle when it is fully loaded and placed at the maximum gradient of roadway which is permitted for a period of at least ten minutes.

(c) A record of such tests shall be maintained in a bound paged book and shall be signed by the person carrying out the test. These records should be countersigned by the engineer and manager.

(2) Surprise inspection shall be carried out by the engineer/superior official at an interval not exceeding 15 days to ensure that the examination schedule of machineries/equipment are carried out.

(3) While inflating tyres, suitable protective cages shall be used. Tyres shall never be inflated by sitting either in the front or on the top of the same.

(4) While the vehicle is being loaded/unloaded on gradient, the same shall be secured stationary by parking brake and other means such as suitably designed stopper blocks which could be placed below the tyres.

(5) Operation and maintenance of heavy machineries such as shovels, dumpers etc. shall be done strictly in accordance with the operation instructions. The operation instructions and maintenance schedule could be obtained from the manufacturers.

(6) Fire on surface heavy machinery is a serious hazard to life and property. The large size of these machineries magnifies the problem by increasing the potential for fires, obstructing the operator's view of fire hazards and restricting their egress from the machinery. With the increasing size of machinery, the portable extinguishers do not provide adequate protection.

To avoid these problems, automatic fire protection systems shall be provided and maintained in working order for surface heavy machinery such as coal haulers, mine haulage vehicles, ash haulers, dozers, front end loaders, draglines, bucket wheel excavators, blast hole drills, hydraulic and electric shovels etc. It is also necessary that the recommended procedure for testing of such fire protection systems at a given schedule by the manufacturer is also adopted. The automatic fire system consist of one or more containers of fire suppressant (usually a dry chemical) connected by a fixed plumbing network to nozzles directed at specific pre-determined fire hazard areas of the machinery.

Optical, thermal or any other suitable type of sensing device is suitably located to sense the fire and actuate the suppressant to come out through the nozzles already fixed to deal with the fires. An overriding manual system along with fire alarm could also be additionally provided for better effectiveness of the system.

The above procedure and precautionary measures shall also form a part of Circular No. 36 of 1972 i.e. conditions for working opencast mines with the help of heavy machinery under Reg. 106(2) (b) of MMR, 1961.

(Cir. Tech. 3/1981)

4. Dump Workings— Extraction of mineral by reclamation from dump working is a phenomenon common in many mines. Such extraction however is fraught with danger of collapse of loose debris if the reclamation is not done with due care.

The position is analogous to working in opencast benches with loose overburden where the provisions of Reg. 98 of CMR 57/Reg. 106 of MMR 1961 are attracted. Failure to do so had resulted in a few accidents—some of them resulting in loss of life. In a recent accident in an iron-ore mine, while persons were engaged in loading fines dumped earlier, a large mass of fines (approximately 120 cu. metres in volume) slid down and buried one worker. His body was recovered 80 minutes later.

Managements are advised to ensure that in ore dumps precautions are taken similar to those specified for opencast mining in loose soil to avoid danger to the safety of work persons.

(Cir. Tech. 13/1977)

4A. Model Code of Precautions for Truck Transport in Opencast Mines—The most common mode of transport of ore and materials in opencast mines whether big or small is ordinary truck and its use is on the increase. So are unfortunately the accidents due to the use of truck.

An analysis of such accidents by cause shows that majority of them occurred due to failure of brakes or while reversing the truck, and to persons who were riding the trucks unauthorisely or otherwise.

Whatever be the cause of these accidents, it appears advisable that all mines in which trucks are deployed in mining operations ought to take adequate precautionary measures against occurrence of such accidents within their leasehold or area of control. Accordingly, a Model Code of Precautions to be taken for Truck Transport in Opencast Mines is given below. The same shall be enforced either in the form proposed or with such modifications of any of the clause thereof, as may be considered essentially necessary to suit the local conditions and requirements after getting concurrence of the concerned Joint Director of Mines Safety.

Model Code of Precautions for Truck Transport in Opencast Mines

1.0 Roads for Trucks etc.

1.1 All roads for trucks, or other mobile machinery, referred to hereinafter as vehicle, shall be maintained in good condition.

1.2 Where practicable, all roads in and from the opencast workings shall be arranged to provide one way traffic. Where this is not practicable no road shall be of a width less than three times the width of the largest vehicle plying on that road unless, definite turnouts and waiting points are designated.

1.3 All comers and bends in roads shall be made in such a way that the operators and drivers of vehicles have a clear view for a distance of not less than 30 metres, along the road.

Wherever it is not possible to ensure a visibility for a distance of 30 metres, there shall be provided two roads for the up and down traffic.

1.4 Ordinarily, no road shall have a gradient steeper than 1 in 16 at any place.

Provided that in case of Ramps over small stretches a gradient up to 1 in 10 may be permitted.

1.5 Where any road exists above the level of the surrounding area, it shall be provided with strong parapet walls or embankment not less than 1 metre in height to prevent any vehicle from getting off the road.

1.6 Road signs shall be provided at every turning pointing for the guidance of drivers specially at night time,

1.7 At every curve, parapet walls or vertical posts with 'Zebra' lines shall be provided to help the drivers to keep the vehicle on the track specially at night time.

2.0 Maintenance of Vehicles

2.1 (a) The vehicle shall be maintained in good repair, and examined thoroughly once at least in every week by the engineer or other competent person appointed by the manager in writing for the purpose.

(b) The competent person shall maintain a record of every such inspection in a bound pagged book kept for the purpose. Every entry in the book shall be signed and dated by the person making the inspection.

2.2 If the engineer or other competent person making an inspection notices any defect in the vehicle the said vehicle shall not be used until the defect has been remedied.

2.3 Any defect in a vehicle reported by its driver shall be promptly attended to.

2.4 Any vehicle found to be in an unsafe operating condition shall be tagged at the driver's position "OUT OF SERVICE DO NOT USE" and its use shall be prohibited until the unsafe condition has been corrected.

2.5 Every vehicle shall be regularly serviced and over-hauled as per the recommendation of the manufacturer. A written record of each servicing and over-hauling shall be maintained.

2.6 Except for testing, trials or adjustment which must necessarily be done while the vehicle is in motion, every vehicle shall be shut down and positive means taken to prevent its operation while any repair or manual lubrication is being done.

2.7 Any vehicle, equipment or part thereof which is suspended or held apart by use of slings, hoists or jacks shall be substantially blocked or cribbed before men are permitted to work underneath or between such vehicle, equipment or part thereof.

3.0 Daily Examination of Vehicles

3.1 (a) At the commencement of every shift, a mechanic or other competent person specially appointed in writing by the manager for the purpose shall personally inspect and test every vehicle paying special attention to the following details—

(i) that the brakes and the horn or other warning devices are in working order;

(ii) if the vehicle is required to work after day-light hours (i.e. half-an-hour after sunset and half-an-hour before sunrise) that the lights are in working order

The competent person shall not permit the vehicle to be taken out for work nor shall he drive the vehicle unless he is satisfied that it is mechanically sound and in efficient working order.

(b) The competent person shall maintain a record of every inspection in a bound paged book kept for the purpose. Every entry in the book shall be signed and dated by the person making the inspection.

4.0 Operation of Vehicle

4.1 No person shall be permitted to ride on the running board of a vehicle.

4.2 As far as possible, no loaders labourers, shall be allowed to ride trucks, whether loaded or empty. Where this cannot be avoided due to practical considerations, the body of the trucks shall be re-designed to provide separate compartment at the back of the truck in which workers may take a seat.

4.3 (a) As far as possible loaded vehicles shall not be reversed on gradient

(b) Sufficient stop-blocks shall be provided at every tipping point and these shall be used on every occasion material is dumped from the vehicle.

(c) Standard traffic rules shall be adopted and followed during movement of all vehicles. They shall be prominently displayed at the relevant places in the opencast workings and roads.

4.4 When not in use every vehicle shall be moved to and stood on proper parking place.

4.5 No person shall be permitted to work on the chassis of a vehicle with the body in a raised position until after the body has been securely blocked in position. The mechanical hoist mechanism, if any, alone shall not be depended upon to hold the body of the vehicle in raised position.

4.6 No unauthorised person shall be permitted to enter or remain in any dumping yard or turning point.

5.0 Duties of Drivers

5.1 Before commencing work in a shift, the driver shall generally examine the vehicle for its roadworthiness, and in particular check the tyre air pressure, brakes, horn and lights, if he finds any defect which will make the driving unsafe, he shall report the matter to the competent person and get the defect remedied before operating the vehicle.

5.2 The driver shall not drive too fast, shall avoid distractions, and shall drive defensively. He shall not attempt to overtake another vehicle unless he can see clearly far enough ahead to be sure that he can pass it safely. He shall also sound the audible warning signal before overtaking.

5.3 Before crossing a road or railway line, the driver shall reduce his speed, look in both directions along the road or line and shall proceed across the road or line only if it is safe to do so.

5.4 The driver shall sound the audible warning signal while approaching 'blind' corners or any other points from where persons may walk in front unexpectedly.

5.5 The driver shall not operate the vehicle in reverse unless he has a clear view of the area behind the vehicle or he has the assistance of a 'spotter' duly authorised in writing for the purpose by the manager. He shall give an audible warning signal before reversing a vehicle.

5.6 The driver shall make sure of clearances before driving through tunnels, archways, plant structures etc.

5.7 The driver shall not operate a vehicle in fog or mist without taking adequate precautions, as may be specified by the manager.

5.8 The driver shall not operate the vehicle while being in a state of drunkenness, and without due care and attention having regard to/ all circumstances including the nature, condition and use of the road or other place over which the vehicle is being driven and the visibility at the time.

5.9 The driver shall see that the vehicle is not overloaded and that the material is not loaded in a truck, so as to project horizontally beyond the sides of its body and that any material projecting beyond the front or rear is indicated by a red flag during day and red light after day-light hours.

5.10 The driver shall not allow any unauthorised person to ride on the vehicle. He shall also not allow more than the authorised number of persons to ride on the vehicle.

6.0 Duties of Manager

It shall be the duty of the manager—

- (a) to ensure compliance with the aforesaid precautions;
- (b) to determine and specify in respect of every vehicle the maximum load to be hauled, and maximum speed of the vehicle, and cause notices specifying the same to be posted along the road at appropriate places;
- (c) to cause warning notices (drawing attention to any necessary precautions) to be posted along the truck or haulage roads at appropriate places, like level crossing, curves and turning points etc.
- (d) to designate the persons authorised to ride on trucks;
- (e) to give every truck driver directions in writing with respect to loads, speed, persons authorised to ride on trucks, and precautions necessary for safe running;
- (f) to countersign entries in books and records to be maintained in pursuance of these precautions;
- (g) to take such other precautionary measures as may be necessary to ensure safe operation and maintenance of vehicles and for the safety of-work-persons.

7.0 General

These precautions may be amended, modified or relaxed at any time-by or in concurrence with the Joint Director of Mines Safety.

(Cir. 11/1973)

4B. Model code of precautions for dumpers and other vehicles— In many mines dumpers coal haulers, and trucks etc. are used for transportation of coal, minerals and other materials within the mine leasehold areas.

Vide DGMS Circular No. 11 of 1973 "a Model Code of Precautions for Truck Transport in Opencast Mines" had been suggested. It is hereby clarified that the suggestion of the abovementioned Circular will also be applicable to all vehicles used for transport of minerals or materials plying on surface within the mine leasehold area of opencast mines as well as of mines having workings belowground.

Specific attention is also invited to the contents of DGMS (Technical) Circular No. 7 of 1977, regarding precautions while reversing the vehicles.

(Cir. Tech, 4/f979)

4C. Fatal Accidents involving transportation machinery during the years 1980 and 1981—

An analysis of some of the fatal accidents from the point of view of human failure involving transportation machinery, such as Trucks, Dumper, Shovels and Dozers etc. has revealed the following nature of accidents :

- (1) Two persons suffered fatal injuries while travelling on foot-board of a dumper.

- (2) A surface trammer was crushed between a brick wall and a truck, when the truck rolled back during the process of pushing so as to start the same.
- (3) A truck khalasi was killed when a truck in reverse was being placed below the loading bunker.
- (4) A shovel operator was crushed to death in cramped space between the dumpers by one of the wheels.
- (5) A dozer operator, who was in drunken state, lost control and the dozer fell down the haul road thus killing himself.
- (6) A trained dumper operator hit at the back of another dumper which was standing on the active lane of the haul road for cleaning the front wind screen, as a result the trainee operator was killed in his cabin.
- (7) A dumper operator was sleeping by the side of his dumper and was run over by another dumper.
- (8) While seven workers at the end of their shift were travelling on a water lorry, two of them fell from the lorry when the lorry was negotiating a sharp turn. One of them was run over by the rear wheel of the lorry and killed on the spot.
- (9) While a truck was trying to negotiate a steep ramp in a higher gear, the truck could not climb. The driver changed the gear on the steep slope and the truck started moving backwards fast. As soon as the gear was brought to neutral the brakes could not hold the vehicle and it capsized, when the driver was thrown out and the worker in the cabin received serious injuries which proved fatal after 21 hours.

From the causes of the above mentioned accidents it is evident that most of the accidents resulted either due to carelessness or indiscipline. By the very nature of their jobs, dumper drivers, shovel operators, dozer operators, tipping truck drivers etc. have to operate most of the time at their own and they cannot be expected to be under the supervision of officials all the time. Thus the selection of these categories of persons is very important. Due regard should be paid to character, aptitude, amenability to discipline etc. They should be imparted good standard of technical training. Their regular personal contact with officials will go a long way in sustaining moral courage and sense of discipline.

In the past few years, accidents by heavy machineries have been on the sharp increase. It is, therefore, essential to check and minimise this trend. You are required, therefore to arrest this trend and take suitable steps in right direction.

(Cir. Tech. Sapicom. 10/1983)

4D. Precautions while reversing vehicles— Several accidents have occurred in the mines while reversing vehicles. In the code of precautions for Truck transport, attached with Circular No. 11 of 1973, clause 5.5 prescribes that where the view is not clear, the driver should take the assistance of a spotter for operating the vehicle in reverse direction. He is also required to give an audible warning signals before reversing.

It is desirable that a separate horn with a sound different than normal horn of the vehicle should be provided for this purpose. Driver should continue blowing this horn during the process of reversing the vehicle. Such horn should be standardised in a mine so that whenever a horn having a particular sound is given, it would become evident that the vehicle is being reversed. In some countries manufacturers have provided such horns which operate automatically when the vehicle is reversed. Possibility of incorporating such arrangement should be explored.

In addition to a separate horn, flasher lamp at the rear end of the vehicle, in series with the dial light on the control panel, should be provided.

It is requested that necessary action in the matter may be taken so as to eliminate accidents while reversing vehicles.

(Cir. Tech. 7/1977)

5. Accidents due to dumpers, trucks and tractors etc. in opencast mines—

The Sixth Conference on Safety in Mines held at New Delhi on 13th and 14th of January 1986, made the following recommendations for prevention of accidents due to dumpers and trucks and tractors etc. used for transport of minerals in opencast mines:—

- (i) Adequate care should be exercised in selection and training of Operators/Drivers of dumpers and trucks/any other heavy earth moving machinery.
- (ii) Adequate number of dumper operators and drivers of trucks and Heavy Earth Moving Machinery and also pitmen and dump men should be appointed keeping in view factors like absenteeism and leave etc. Work on overtime should be abolished.
- (iii) Effective steps should be taken to prevent riding on dumper and trucks by unauthorised persons. Further adequate arrangements should be made for transport of machinery maintenance staff.
- (iv) Within a period of two years dumpers, trucks and heavy earth moving machinery operating within mine premises should be equipped with audio-visual alarms to facilitate safe reversal.
- (v) Transport and loading operations, including those done by contractors, should be supervised by competent persons. Where contractors are appointed for transport of minerals, examination of vehicles should be done by mine managements. Action should be taken for complying with the above recommendations.

(Cir. Tech. 2/1986)

6. Additional measures to be taken to reduce accidents in opencast mines(as recommended by Seventh Conference on Safety in Mines)—Recent years have witnessed a major upsurge of interest and activity on opencast mines in our country. Unfortunately this upsurge has been associated with increased number of accidents in opencast mines. Analysis of fatal accidents in opencast mines during the years 1981 to 1987 reveals (see Appendix 'A') that majority of the accidents are caused by dumpers driven negligently/unauthorisedly on haul roads and associated roads. The following operations emerge as having high accident potential:—

- (i) movement of vehicles,
- (ii) tipping of dump sites,
- (iii) attending to repair of heavy equipment like dragline, dredgers etc.

An approach paper on the subject of "safety in Open Cast Mining" was considered at the seventh Conference on Safety in Mines held at New Delhi on the 19th and 20th December 1988. The delegates deliberated upon this subject and came to the conclusion that the hazards connected with the above mentioned operations could be tackled by:

- (i) having detailed "traffic rules" governing the movement of all types of vehicles (heavy as well as light) whether belonging to the management or contractors or suppliers etc. operating within mine premises (see Appendix 'C');
- (ii) giving greater emphasis to training and examination of operation of vehicles;
- (iii) having haul roads of prescribed specifications;
- (iv) improving visibility from operator's cabin and by making the operator's cabin such as to provide protection to the operator against hazards from heat, humidity, dust, noise etc.;
- (v) enforcing detailed "code of practice" for tipping on stock piles or dumping of overburden; (see Appendix B); and

(vi) complying with rules framed for preventive maintenance and safe operations during repair/erection of heavy equipment.

The Seventh Conference on Safety in Mines also made a number of recommendations so as to improve status of safety in opencast mines. These are given in Appendix 'B' below. Implementation of these measures would bring down accidents in opencast mines. Managements are advised to act accordingly.

(Cir. Tech. 1/1989)

Appendix A

Analysis of Fatal Accidents in Opencast Mines during the year 1981 to 1987.

I. Percentage of accidents caused by different machines

(a) Dumper/Truck	70.4*
(b) Pay loader	6.2
(c) Tractor	9.0
(d) Dozer	5.2
(e) Shovel/Excavator	2.7
(f) Drill/Crane/Scraper	6.5

II. Percentage of Accidents due to different causes

(a) Negligent driving and unauthorised driving	42.0
(b) Unauthorised travelling on foot-board, body and cabin	21.4
(c) Run-over while crossing haulroad or in cramped space	10.8
(d) Reversal without spotter and non-provision of Audio-visual alarm	10.4
(e) Others	15.4

III. Percentage of accidents at different sites

(a) Haulroad and associated roads	58.6
(b) Quarry operation area and its vicinity	19.6
(c) Workshop/repair shop	9.0
(d) Stock-yard and siding	6.2
(e) Waste-dump	2.4
(f) Others	4.2

Appendix B

Recommendations of the Seventh Conference on Safety in Mines on "Safety in Opencast Mining"

2.0 Safety in Opencast Mining—2.1 (a) Each company should frame suitable 'Code of Traffic Rules' for regulating the movement of Heavy Earth Moving Machinery (commensurate with the capacity/size type of machines used in the mechanised opencast mine) for enforcement in each mine. Such Code of Traffic Rules should be approved by Tripartite Committee.

(b) The Code of Traffic Rules should be deliberated, framed and approved within a period of 6 months. The Code of Traffic Rules should be enforced in each mine within a period of 12 months. (Action: Coal & Metalliferous Mining Cos)

2.2 (a) Each company operating mechanised mines should frame suitable 'Code of Practice' for the prevention of injuries to persons engaged in tipping on stock piles, dumping of overburden at dump yards, at loading points etc. Such 'Code of Practice' should be approved by Tripartite Committee.

(b) The 'Code of Practice' should be deliberated, framed and approved within a period of 6 months. The Code should be enforced in each mine within a period of 12 months.

(Action: Coal & Metalliferous Mining Cos)

2.3 The design and maintenance of haul roads in mechanised opencast mines should be laid down by each company in respect of each mechanised opencast mine. If required, the company may consult/interact with D.G.M.S. in this regard.

(Action: Coal & Metalliferous Mining Cos)

2.4 (a) Each company should ensure that for every mine a scheme is drawn and implemented for proper maintenance, repair, overhaul and erection in respect of heavy earth moving machinery. This scheme should cover places such as repair sheds and workshops. Necessary help, if required, should be obtained from the manufacturers of HEMM. (b) Adequate attention should be given towards proper layout of repair sheds and workshops so as to ensure due protection to work persons deployed at these places from the movement of heavy earth moving machinery therein.

(Action: Coal & Metalliferous Mining Cos)

2.5 This operator's cabin of heavy earth moving machinery should be well designed and substantially built so as to ensure adequate protection to operator against heat, dust, noise etc. and at the same time provide adequate safety to the operator in the event of overturning of heavy earth moving machinery. A seat belt for the safety of the operator should also be provided.

(Action: Coal & Metalliferous Mining Cos)—

2.6 (a) Operator/driver of each HEMM should be selected from amongst persons possessing requisite qualifications. The selection process should comprise of a test of check driving/operating skill, aptitude, health and oral examination of the candidate by a competent selection committee.

(b) All operators of HEMM should undergo regular checks to test their driving/operating skill, knowledge and health once every five years.

(c) Suitable training institute/training centre should be opened in each company Co provide comprehensive training so that only duly qualified and trained operators are always available commensurate with the present and future needs of the mechanised mines.

(Action: Coal & Metalliferous Mining cos)

2.7 A separate format for writing statutory reports by shot-firers/blasters, mining sidrars/mates and overmen/foremen employed at opencast mines should be prepared and circulated early.

(Action: DGMS)

2.8 A format for writing report of inspection of dragline wire ropes should be introduced early.

(Action: DGMS)

2.9 A code of practice shall be drawn up for dealing with fires at different locations in opencast mines including HEMM. Arrangements for fighting fire should be provided on all heavy earth moving machineries. Such arrangements should, if possible, operate automatically on appearance of fire.

(Action: Coal & Metalliferous Mining cos)

2.10 Efficient lighting arrangements not below the standards prescribed in the statute shall be provided and maintained at different locations in opencast mines.

(Action: Coal & Metalliferous Mining Cos)

2.11 Structural stability of HEMM should be examined periodically by an independent team of experts. Such an examination may invariably be made after every major repair of HEMM. '

(Action: Coal & Metalliferous Mining Cos)

Appendix C

Traffic Rules and Procedures

Introduction

The following rules are designed for the safe operation of vehicles in and around the mine. Operators of vehicles shall observe these rules and any other special instructions given by the Mine Manager. The Mine Manager and Officials appointed by him shall ensure that all persons in the mine comply with these Rules.

Rule 1 : Procedures

- (a) A person shall neither drive nor operate vehicle in or about the mine unless authorised to do so for the vehicle or class of vehicles by the Mine Manager.
- (b) A private vehicle shall not be driven within the mine premises unless authorised by the Mine Manager or the official for the time being in-charge of the mine.
- (c) Any driver not regularly working in or about the mine shall request and receive permission to enter the mine premises from Mine Manager or on Official of the mine authorised for the purpose, prior to driving a vehicle within the mine premises, which shall be prominently delineated.

Rule 2 : Speed Limits

- (a) Permanent or temporary speed limits set by the Mine Manager for any area of the mine or any vehicle or class of vehicles shall be adhered to.
- (b) Where visibility or road conditions are poor, a driver shall reduce the speed of his vehicle to the extent necessary to maintain effective control.

Rule 3 : Right of Way

- (a) At inter-sections which are not controlled by traffic signs all drivers should give way to the vehicle on the right, except as stated below:
 - (i) All drivers shall give way to emergency vehicles showing a flashing red light.
 - (ii) Vehicles being used for grading, rolling, watering and repair of roads have right of way over all vehicles except in (1) above. These vehicles will show an amber flashing light.
 - (iii) Light vehicles shall at all times give way to haul trucks and other heavy vehicles.
- (b) The driver of a vehicle having right of way over another vehicle shall not endanger himself or others through insistence on that right if this is likely to cause a collision.

Rule 4 : Parking and Standing

- (a) A driver shall not park or stand his vehicle in a position that will endanger other traffic on the mine premises.
- (b) A driver shall not park or stand a vehicle opposite another vehicle on a haul road.
- (c) A driver shall not park or stand his vehicle within 30 metres of the working area of mobile equipment or where his vehicle cannot be observed.
- (d) A driver shall not park or stand his vehicle within the area of swing of the dragline without first obtaining permission from the operator.
- (e) A driver, before leaving his parked vehicle, shall ensure that the vehicle is secure, that parking brakes have been applied and that all implements have been lowered. If circumstances dictate that a heavy vehicle must be parked on a grade then the wheels should be chocked and the steering turned offcentre.
- (f) A driver of a vehicle shall before moving from a parked position ensure that his path is free of any obstruction and/or personnel.
- (g) A driver of a light vehicle shall observe the following rules while parking his vehicle:
 - stop engine;

- leave vehicle in first or reverse gear;
- apply hand brake;
- not park in front of or behind a heavy vehicle;
- if, for maintenance or operational reasons, it is essential park adjacent to puts off close proximity to a heavy unit or shovel than allowed above, then the driver of the light vehicle shall ensure that the operator of the heavy unit or shovel is fully and clearly aware of his intentions and has his permission to proceed; and
- chock the wheels, if parked facing up or down a slope.

Rule 5 : General

- (a) Vehicle shall not be driven over electric cables, air hoses or water lines unless these are properly protected.
- (b) Seat belts are provided for the operator's personal safety. They are to be worn at all times while the vehicle is operating.
- (c) Passengers shall not be carried on any vehicle unless seated in approved seating or where authorised for training purposes by the Mine Manager.
- (d) A caution sign or hazard lights are to be placed at the front and rear on any vehicle which is being towed or which has broken down and is obstructing roadway.
- (e) Operators and drivers are responsible for cleanliness, oil and water checks, tyres and fuel of machines and for keeping vehicle under their control.
- (f) Operators and drivers are responsible for ensuring that their vehicle is correctly illuminated during hours of darkness.
- (g) Headlights are to be dipped when approaching other traffic or mobile equipment in working areas.
- (h) All earth moving equipment, sound one blast on horn before moving off from parked position.
- (i) No smoking or naked lights are permitted during re-fuelling and the checking of batteries.
- (j) Trucks are to be loaded in such a manner that spillage is minimised. Loads should be centralised to maximise stability. Loads which have an overhang in excess of 1.2 metres shall be clearly marked by a red flag during day and red light at night. All loads shall be made secure for travel.
- (k) The driver shall make sure that the vehicle has adequate clearance, particularly when reversing, parking, passing other vehicles and units or passing stationary and static equipment.

Rule 6 : Overtaking

- (a) The driver of a vehicle may overtake any other vehicle with caution provided that:
 - (i) The speed limit is not exceeded,
 - (ii) There is sufficient visibility of the road ahead,
 - (iii) The vehicles are clear of any road intersection or junction.
- (b) The driver of a heavy vehicle may not overtake another vehicle on an incline unless the overtaken vehicle is travelling at a speed less than 10 km/hour and there is adequate visibility of the road ahead.
- (c) No overtaking is permitted in the vicinity of road dividers.
- (d) While driving behind a haul truck the driver shall ensure that he is visible in the rear view mirror until he pulls out to overtake.

Rules 7 : Signs

- (a) All signs are to be obeyed. If in doubt about the intent or validity of sign, contact an official of the mine, in-charge of the part of the mine, where the sign is displayed.
- (b) Temporary signs shall be removed as soon as possible after need for them ceases to exist.
- (c) Warning signs are to be noted at all times.

8 : Mechanical Condition of Vehicles

(a) The driver of each heavy vehicle in use shall at least daily examine his machine to ensure that it is in safe working order and make a written record of the results of such examination.

(b) The driver of any vehicle shall report to his supervisor any defect in the vehicle as well as damage to the vehicle or injury to himself or passengers, or near miss, arising out of a vehicle incident on the mine.

Rule 9 : Definitions

(a) The following vehicles shall be classified as heavy vehicles:

- Haul trucks
- Scrapers
- ANFO Trucks
- Fuel & Water Trucks
- Wheel Dozers and Loaders
- Buses

(b) The following vehicles shall be classified as light vehicles:

- Jeeps/Land Rovers/Maruti Gypsies
- Station Wagons.

Appendix D

Code of Practice for Prevention of Injuries to Persons Engaged in Tipping on Stockpiles and Dumping of Overburden in Above Ground Mines : Preamble

Injuries to persons engaged in or associated with the operation of tipping on stockpiles or dumping of over-burden in mines are not common. However, when they do occur, the injuries are often serious causing temporary or permanent disability, and sometimes are fatal.

This Code of Practice has been prepared to assist in the prevention of these injuries. The Code describes principles and practices which must be put into effect and strictly observed by management and operators.

For the Code to be fully effective, it is necessary for operating instructions to be prepared and be available for reference and training purposes. The instructions are to be as per requirement at each mine as conditions at mines differ markedly and, over a period of time, at the same mine.

Part 1 : Objectives, Implementation of Code

- 1.1 The objectives are: (i) to prevent accidents and injuries which might occur through the operation of tipping on stockpiles and dumping of overburden.
- (ii) to obtain information on actual and potential hazards and unsafe workings contributing to accidents and injuries.

1.2 This Code recognises that conditions and circumstances which determine operating procedures vary considerably at different mines and over a period of time at any one mine. For the implementation of this Code, it is a requirement that written operating instructions be prepared at each mine and every operator at that mine be issued with a copy of the instructions and undergo a practical test.

Part 2 : Hazards of Stockpiling and Dumping

2.1 The hazards are those associated with the nature of the mined material being stockpiled or dumped, the configuration of stockpile or dump, the mobile equipment, highway delivery vehicles, the immediate and overhead environment, rain soaked stockpiles or dumped materials, and in raw feed stockpiles the hazard of undetonated explosives. The hazards can result in equipment and vehicles going over faces, slipping down wet subsided edges, rolling over, impact with other equipment or person, electrical contact or any combination of these.

2.2 The causes of accidents and injuries can be unstable stockpile and dump surfaces and faces, uneven surfaces, restricted access and egress, equipment and vehicle failure, unsafe working practices and procedures, and contact with power lines.

Part 3 : Responsibilities

3.1 Mine Manager:

The Manager is responsible for implementing matters covered by this Code of Practice. In particular the manager is responsible for, either personally or by the nomination of a competent person, ensuring:

- (i) written operating instructions are prepared, and available for reference and training.
- (ii) operators are trained in the procedures.
- (i) operating instructions are strictly enforced.
- (iv) stockpiles and dumps are properly sited.
- (v) stockpiles and dumps are in a stable condition.
- (vi) the employment or engagement of persons suitably qualified to ensure the requirements are met.

Specifically, the manager or his representative will inspect all stockpiles and dumps once a week and after long periods of continuous rain or after torrential downpours of rain. The manager will ensure that at times of instability during formation of or extraction from the stockpile or dump, there will be strict supervision of the operations.

3.2 Foremen/Supervisors/Delegated Persons:

The foremen/supervisors/delegated persons having operational responsibilities associated with stockpiles and dumps will oversee and apply those aspects of the Code that relate to their responsibility.

3.3 Employees/Operators/Contractors:

Employees/Operators/Contractors at stockpiles are responsible to comply with this Code and the written operating instructions.

They must immediately report unsafe conditions at the stockpile and of mobile equipment and highway delivery vehicles to the mine manager or foreman/supervisor.

Part 4 : Operating Instructions and Training

4.1 At all mines where tipping or dumping is a part of normal operations, there will be prepared operating instructions. These instructions will detail the procedures to be carried out during the operation.

4.2 The manager is responsible for preparing the instructions and ensuring that they are applicable to the current operations.

4.3 The instructions will be displayed on a notice board and be available to all persons at the mine and be used for training and supervision purposes.

4.4 No operator will be engaged in tipping or dumping operations until they have received satisfactory training in the instructions and they have demonstrated, by practical tests, their

competency in tipping and their knowledge of the instructions. It is the manager's responsibility to ensure this on-site training and testing has been performed.

Part 5 : Characteristics of Stockpiles and Dumps

5.1 The characteristics of the types of stockpiles are significant when determining and assessing the hazards and degree of risk. The characteristics of a stockpile are determined by, first the nature of the stockpile or dump in relation to its height and methods of tipping and dumping; second, the nature of the quarried material being stockpiled or dumped and third, the characteristics of the site.

5.2 The five main methods of operations are:

- (i) by moving stacker. This is a conveyor stacker mounted on wheels which moves in a semi-circle. This type of operation has a few hazards, one being to interfere with vehicle/equipment movement, another is walking or driving under stacker.
- (ii) on ground. The use by mobile equipment or by highway delivery. The hazards are not having adequate area for movement of equipment performing the tipping, particularly where there is a nearby quarry face mobile equipment or vehicles coming into impact and uneven surfaces.
- (iii) on stockpiles and dumps up to 6 metres in height. The tipping is on a stockpile. The hazards are roll over, either by unstable surface edges or uneven surfaces.
- (iv) on stockpiles and dumps over 6 metres in height. The hazards are as in 5.2 (iii), however, more serious injuries are likely to occur because of the height of roll over.
- (v) overfaces. The tipping is over a quarry face. The hazard is as in 5.2 (iii); however, the fall is more considerable with the higher possibility of serious injury. A hazard exists for persons working in proximity to the base of the face.

5.3 The nature of the mined material being stockpiled or dumped is divided into three broad categories, namely,

- (i) Generally unstable eg. aggregate, sand. This product does not compact and form a compact surface. Under-cutting of the toe by a front end loader does not result in the formation of an acute angle of the face. The hazards are roll over due to an unstable edge or sides of toe stockpile.
- (ii) Generally stable eg. road pavement material, dust, shale, overburden. The product does compact. Loading from the toe of the stockpile may result in the formation of an acute angle of the face at the edge. The hazard is a roll over from an unstable edge.
- (iii) non putrescible waste. Where this is being dumped, the hazard of rapid subsidence may be present which may cause roll overs.

Part 6 : Siting and Types of Stockpiles and Dumps

6.1 The siting and type of a stockpile or dump is a responsibility of the manager and owner.

6.2 The factors determining the sitting and types are:

- (i) the nature of the mined material;
- (ii) the ground used for the stockpile or dump;
- (iii) the volume of product being used, moved and held;
- (iv) size of area available and required, including allowance for traffic plan;
- (v) other potential hazards i.e. power lines, high winds;
- (vi) environmental considerations.

6.3 Nature of quarried material. Refer Section 5.3.

6.4 Ground conditions. The ground should be selected using the criteria:

- (i) the ground should be firm and provide a stable foundation;

- (ii) the surrounding ground should be firm and stable and sufficient to hold the weight and resist the vibration of operating heavy mobile equipment, particularly if there is a nearby quarry face or water course;
- (iii) water courses, either natural or as a result of a torrential downpour, should not be adjacent to the stockpile or dump;
- (iv) adequate drainage should be provided.

6.5 Volume of product. The through-put of a quarry will have an influence on the siting, type and size of stockpile.

6.6 Area available and required. The area available at a mine will influence the type of stockpile or dump. In some mines it is not possible to perform ground tipping or dumping because of lack of sufficient available area.

The size of the area, irrespective of the type of stockpile, must be sufficient for:

- (i) mobile equipment to operate when loading;
- (ii) safe access of appropriate tipping and other mobile equipment, and highway delivery vehicles;
- (iii) safe access for the extraction from stockpile.

6.7 Other potential hazards. These include overhead power lines and high winds:

- (i) no stockpile or dump shall be formed directly beneath overhead power lines or on top of underground power lines;
- (ii) seven metres minimum horizontal distance shall apply from beneath power lines to top of any stockpile or dump;
- (iii) access to stockpiles or dumps shall not be from beneath overhead power lines;
- (iv) high stockpiles or dumps should not be located where high wind conditions may suddenly occur.

Part 7 : Mobile Equipment and Highway Delivery Vehicles, Operations and Operator Training

7.1 Main function of mobile equipment and highway delivery vehicles is a cause of accidents occurring as a result of activities related to tipping or dumping.

7.2 A check list, prepared by the manager, will be completed prior to start-up of equipment each day.

7.3 Specific items to be observed or installed are:

- (a) *rear vision mirrors of sufficient size to simultaneously view tipping body and the contact between rear wheels and ground shall be fitted to each side of all rear dumps and tipping trucks;*
- (b) dumps and tipping trucks operating between sunset and sunrise shall be fitted with a rear flood light of sufficient illumination capacity to provide clear vision of a distance not less than 10 meters;
- (c) audible or visual reversing alarms.

7.4 Any malfunction of equipment must be immediately notified and if considered unsafe to operate, the equipment will be appropriately tagged "Not to be used" until the malfunction is corrected.

7.5 All operators of mobile equipment must be trained in the operations of the equipment. This training should include the operating instruction at the mine.

Part 8 : Operations using mobile equipment and highway delivery vehicles

8.1 The specific hazards associated with tipping or dumping over the surface of a stockpile, whatever the height, are instability of the edge and surface. The risk is mobile equipment and highway delivery vehicles rolling over the face or on the surface.

8.2 Accidents may also occur by malfunctioning equipment and vehicles, unsafe working practices, or climatic conditions. The latter includes slippery surfaces, high winds when hoist is in raised position and poor visibility because of rain. Visibility may be a factor resulting from a narrow surface of the stockpile or night/dusk working. Tipping at an angle to the tip of the stockpile or dump can cause under-estimation of the distance to the tip.

8.3 Accidents may occur on the access ramp i.e. roll over.

8.4 Forming the stockpile or dump. (i) access ramps :

- (a) access must be sited to avoid possibility of impact with other mobile equipment and vehicles;
- (b) the ramp should be constructed using a front-end loader or tractor to compact the surface;
- (c) the ramp angle should be such that it is compatible for the safe use of the appropriate mobile equipment;
- (d) at edge there shall be constructed a berm.

(ii) initial tipping or dumping:

(a) the first tipplings or dumpings should be at a distance of 3 m from the edge, if using a off-highway dumper. A front-end loader, bulldozer, or other similar mobile equipment pushes the product to the edge;

(b) the lead up to and the edge is compacted, but a berm is formed. This berm is 1 m in width and 0.5 m in height.

8.5 The methods of tipping after the stockpiling or dumping is initially formed will depend on the nature or the mined material. The decision on the method will be determined by the manager.

8.6 The methods are

(i) when the edge and surface is stable,

(a) tipping by off-highway dumper or highway delivery vehicles over the edge. This is dependent on the use of a berm, or

(b) tipping by off-highway dumper or highway delivery vehicle prior to the edge and then be pushed over;

(ii) when the edge and/or surface is unstable Method 8.6 (b) shall be used.

8.7 Non operational areas will be designated by a berm of at least 2 metres in height

8.8 Unstable surfaces or edges will be designated by flags, posts, signs or any other suitable material and will be so located to warn operators not to operate mobile equipment or vehicles on these surfaces.

8.9 Operating practices of tipper operator:

(i) On entering a tipping area, the tipper operator should visually check the general area of the tip especially in their dumping area. All care must be taken regarding the positioning of the truck's rear wheels at the tipping face. A truck should not back up to an area which has not been visually inspected by the operator.

Points to watch for are:

- (a) Spillage
- (b) Soft Spots
- (c) Berm (height)
- (d) Undercutting or Cracking

(ii) When tipping commences in a new area, material should be dumped short of the tipping face and pushed up by a bulldozer to form a berm at the edge of the tip.

(iii) When dumping in an area where no berm is present (for example: the construction of a new haul road where material would be laid down in layers) material must be tipped short of any edge and pushed into position by a bulldozer.

(iv) At the edge of the tip, a safety berm is to be left by the bulldozer operator. This berm shall be formed from the tipped material and have a height equivalent to half the wheel diameter of the trucks dumping. In any event, this berm should not be less than one metre in height.

(v) After positioning his equipment for tipping or dumping, the operator will raise the hoist with the equipment stationary. The hoist must be completely lowered after the operation of tipping or dumping. During these operations the operator will remain in the cabin.

(vi) If at any time the operator considers the operation unsafe, this should be immediately reported to the manager and/or foreman/supervisor.

(vii) Joint special inspections with supervisor shall be made after heavy or prolonged rain.

Part 9: Over mine face tipping and dumping

9.1 The hazards are the same as for tipping or dumping. The risk of serious injury is greater because of the acute angle of the face.

APPENDIX I

Pre-start Check

Prior to starting mobile equipment for daily operations a check will be undertaken. The check will include :

1	C a b i n	Seats and safety belts/harness. Loose tools, equipment and other articles are secured. Remove unnecessary materials/objects.
2	L e v e l s	Check oil, fuel and coolant levels.
3	Pressure	Check tyre pressure.
4	Visibility	Warning devices including turning indications are working. Headlamps work. Windscreens and side windows clean.
5	Controls	Check brakes Check steering Check accelerator/decelerator. Instruments and gauges.
6	Lifting	Check hydraulics Check winches and cables Check elevator and hoists
7	Engine	Check operation
8	Other	Check cutting edges, teeth Wear and damage Vandalism Persons not working under equipment

7. Precautions while working near edges of high benches in opencast mines—Several accidents take place every year in opencast mines when persons working near the edges of benches lose balance or slip and fall to the lower benches. It has been seen that in many of such accidents, the persons involved are engaged in levering out boulders or large rock or ore pieces with the help of crow bars. In some cases death has resulted due to a vertical fall of only about 1.5m on hard ground or on broken strata. Due to the routine nature of job, a sense of complacency develops and the dangers involved in such operations are lost sight of and adequate precautions are not taken.

Such accidents can be averted by the use of proper type of safety belts or safety ropes. It is to impress upon you that whenever persons are engaged near the quarry edges or edge of a bench from which they are likely to fall down, they should invariably be provided with safety ropes or belts. The supervisory officials shall ensure that the same are used.

(Cir. Tech. 12/1982)

8. Transportation of mineral or material by tractor-trailer combinations in opencast mines—In a mechanised opencast mine a fatal accident occurred under the following circumstances: —

"A tractor connected to a two-wheeled-trailer was going down a haul road dipping at 1 in 6 when the brakes failed causing runaway. A miner who was working nearby was hit by the tractor as well as trailer and sustained serious injuries which turned fatal after three hours.

To avoid such accidents the following preventive measures are suggested: —

- (i) No tractor-trailer combination shall be operated on gradient steeper than 1 in 14.
- (ii) Trailers having four or more wheels shall only be deployed in mines. Two-wheeled-trailers, which are in use at present, should be gradually phased out and by the end of the year 1987 no such vehicles shall be in use.
- (iii) Trailers shall be provided with hydraulic brake in addition to hand brake.
- (iv) The coupling between a tractor and its trailer shall be of adequate strength and sound in construction. Such couplings shall have suitable locking arrangements.
- (v) Hand brake be applied when a vehicle is parked. The gear shift lever shall also be engaged in levers while the vehicle is parked on down gradient or on level roads, and in low gear while it is parked on up gradient.
- (vi) While a trailer is being loaded/unloaded it shall held by applying hand brake and also by the use of other means such as suitably designed stopper blocks placed against the tyres, etc.
- (vii) A proper schedule of examination and maintenance of the tractor-trailer combination shall be adopted and record thereof maintained in a bound paged book kept for the purpose. It shall be signed and dated by the person making the examination and countersigned by the Engineer and Manager. A model schedule of examination is enclosed for guidance.

It is hoped that for the well-being of the industry and that of the persons employed therein, every mine utilizing tractor-trailer combination for the transport of mineral and material would pay due attention to the above suggestion.

Checklist for Tractor with Trailer

Object

The specific period has been indicated for the frequency of examinations and test, However, the same can be readjusted based on the actual experience of the Colliery Engineer. The check list should be regarded as a useful guide to assist the examiner in carrying out scheduled

examinations so as to achieve the basic objective of safe and efficient condition of equipment. Results of examination should be recorded in a bound paged book kept for the purpose duly checked and countersigned by colliery officials and should be produced before the inspecting officials.

It is also suggested that the check-list should be painted on a board in English, Hindi and other regional language, as the case may be, and fixed at suitable places so as to facilitate the competent person who is authorised to carry out such examinations.

Every shift

- (a) Without dismantling, to verify that the machine is in efficient and safe working order and is functioning correctly.
- (b) That all fittings, attachments, couplings and components are intact and free from any defect or excessive wear.
- (c) That there are no bolts, studs or rivets loose or missing and that inspection covers securely in position.
- (d) That lubrication has been properly effected and all oil levels are correct and automatic lubricating systems are operating correctly.
- (e) That there is no abnormal noise, vibration or heating particularly at bearings and gearing.
- (f) That there is no leakage of oil, air or water.
- (g) That all guards and fencings are securely in position and adequate.
- (h) Fire fighting appliances are to hand and statutory notices displayed.
- (i) That the machine is reasonably clean and free from accumulation of coal dust or dirt and able to operate freely.

Daily

1. For evidence that daily servicing has been carried out satisfactorily to every shift check list.
2. Engine oil level.
3. Radiator water level.
4. For water, oil and fuel leaks.
5. Engine oil pressure.
6. Battery charging rate and electrolyte level.
7. Tyres for damage and inflation (to manufacturer's recommended pressures).
8. Wheel nuts for tightness.
9. Efficiency of brakes.
10. Efficiency of steering.
11. Test warning devices.
12. Machine performance, cleanliness and any noticeable defects like light, wipers etc.
13. Ensure that all guards and covers are securely in position.

Weekly

1. Clean and re-oil air intake filter.
2. Lubricate all linkages.
3. Oil levels, steering box, gear box, rear axle.
4. Replace all guards and covers securely in position.
5. Check adjustment of brakes and clutch.
6. Fan belt and its tension.

Note : Any other examination to be carried out on the basis of number of hours run as per recommendations of the manufacturer. .

(Cir. Tech. 1/1987)

9. Accidents by consumer's trucks in mine premises—Recently there have been a few accidents caused to and by vehicles of purchasers of ore in mine premises. Such vehicles are being permitted in some cases to move right into the mine workings for loading of the ore from the mine premises. In two such cases, persons have been killed due to movement of vehicles of such consumers. As the two cases under reference indicate, the above practice is fraught with grave danger not only to persons employed in the mine but also to persons operating such vehicles. There is no control of the management on the movement of vehicles of the consumers in the mine workings. Further, the operators of vehicles of consumers not being familiar with the mine workings, create an unsafe condition causing accidents.

In the interest of safety of persons, therefore, it is necessary that no vehicle, other than that of the mine management, be permitted to go inside the mine workings. All transportation of ore on the surface be by vehicles and personnel under the direction, supervision and control of the management only. The sale and the distribution of the mineral should be from a central despatch point if the sale is carried out from the mine itself, and the siting of the central despatch point should be such that it normally does not become a source of danger to persons employed in the mine.

Suitable action should be taken if the procedure adopted is different from that suggested above.

(Cir. Genl. 1/1978)

10. Fatal accidents caused by wheeled trackless transportation machinery in opencast coal mines—Increase in opencast mining activities all over the country has unfortunately been associated with increased number of accidents. A large number of these accidents during the year 1992 were caused by wheeled trackless transportation machinery in opencast coal mines. Some of the findings are given below:—

1. Fatal accidents due to wheeled trackless transportation machinery caused 18% of all fatal accidents in coal mines and it contributes 50% of all fatal accidents in opencast and surface operations.
2. Unauthorised/negligent driving contributed to 26% of the accidents.
3. 33% of the accidents took place while reversing the vehicle.
4. 62% of the accidents took place on haul roads and in quarry operations area.
5. 62% of the accidents occurred after daylight hours and of which 75% happened while reversing.
6. 73% of the victims of truck/tipper accidents were employed by contracts. In order to control the above hazards the following steps should be taken :—

(a) recommendations of Seventh Conference Safety in Mines (1988) regarding 'Safety in Opencast Mines' should be implemented at the earliest (Cir. Tech. I/1989).

(b) Provision of audio-visual reversing alarm of sufficient intensity should be provided on all wheeled trackless transportation machinery (Cir. Tech.7/1977).

(c) Proper illumination is a key to not only better and safe work environment but it contributes to better productivity also. Standards of lighting in all opencast mines should follow guidelines issued to the industry vide (Cir. Legis. 1 of 1976.)

(d) Recommendations of Seventh Conference on Safety regarding employment of contractors' workers should be implemented. Proper training and supervision of contractors' workers should receive priority.

(Cir. Tech. Sapicom. 4/1993)

11. Fatal accidents caused by wheeled trackless transportation machinery in opencast metalliferous mines—Increase in opencast mining activities all over the country has unfortunately been associated with increased number of accidents in opencast mines. A large number of these accidents are caused by wheeled trackless transportation machinery. An analysis of fatal accident during the year 1992 caused by wheeled trackless transportation machinery in opencast metalliferous mines was carried out. Some of the findings are given below:—

1. Fatal accidents due to wheeled trackless transportation machinery caused 26.4% of all fatal accidents in metalliferous mines and it contributed 34.6% of all fatal accidents in opencast and surface operations.

2. Unauthorised/negligent driving contributed to 33% of the accidents.

3. 27.8% of the accidents took place while reversing the vehicles. Out of these in 60% of the cases audiovisual reversing alarms were either not provided or were not functioning.

4. 78% of the accidents took place on haul roads and in quarry operations area.

5. 16.7% of the accidents occurred due to failure of brakes.

6. 56% of the victims were not vocationally trained. In order to control the above hazards and minimise accidents due to wheeled trackless transportation machinery, the following steps should be taken—

(a) Recommendations of Seventh Conference on Safety in Mines (1988) regarding 'Safety in Opencast Mines' should be implemented at the earliest (Cir. Tech.1/1989).

(b) Provision of audio-visual alarm of sufficient intensity on all wheeled trackless transportation machinery must be ensured . (Cir. Tech. 7/1977)

(b) It is disturbing to note that 56% of the victims were not vocationally trained. The need for vocational training is once again reiterated. Moreover, all persons to be employed to drive/operate dumpers/trucks etc. should be trained and their competency should be evaluated by a Board constituted by the mining companies. In case of smaller mines, such arrangements may be made by association of mine operators.

(d) Regular checking of brakes of wheeled trackless transportation machinery will go a long way in eliminating accidents due to failure of brakes. Guidelines in this regard were issued vide Cir. 1 of 1973. Programme for regular checking of brakes as per manufacturer's schedule must be implemented.

(Cir. Tech. Sapicom. 5/1993)

12. Use of Tractor-Trailer combination for transportation of material in opencast mines and on surface—An analysis of fatal accidents during the year 1992 revealed that there has been considerable increase in accidents due to tractor-trailer-combination. The analysis further revealed that these accidents took place due to over speeding and failure of brakes.

Earlier, instructions were issued for prevention of accidents due to tractor-trailer combination vide DGMS (Tech.) Circular No. 1 to 1987. The matter was also discussed in the Eighth Conference on Safety in Mines held in May, 1993. The Conference recommended that "use of tractor-trailer combination on haul roads should be discontinued. Where inevitable, the trailer should have four wheels and separate brake of its own."

Doubts have been expressed regarding availability of such tractor-trailer combination having separate hydraulic brake for the trailer. In this connection M/s. H.M.T. Ltd. have informed that

they have supplied such a tractor-trailer to Neyveli Lignite Corporation and the same is working satisfactorily.

In order to avoid accidents due to tractor-trailer combination, the following steps should be taken—

1. As far as practicable, use of tractor-trailer combination should have four wheels and separate hydraulic brake of its own such that it can be operated by the driver from his seat on the tractor.
2. The tractor operator must not over speed the vehicle and should select proper gear while going down the gradient.
3. While toeing water tanker, drill machine etc. with tractor, precautions mentioned above should be observed. The hauling capacity of the tractor should also be taken into consideration.
4. Unauthorised driving of the tractor and unauthorised riding on the trailer should be strictly prohibited.

(Cir. Tech. 1/1994)

13. Fatal accidents caused by wheeled transportation machinery during the year 1993—

During the last few years fatal accidents have shown an increasing trend in opencast mines. A large number of these accidents are caused by Wheeled transportation machinery. An analysis of the fatal accidents due to wheeled trackless transportation machinery in opencast coal mines during the year 1993 showed that:

- (1) 13.46% of all fatal accident in coal mines were caused by wheeled trackless transportation machinery. This cause contributed to 38.18% of all fatal accidents in opencast and surface operations.
- (2) 62% of the accidents by wheeled trackless transportation machinery were caused by trucks.
- (3) Unauthorized/negligent driving caused 38% of the accidents.
- (4) 43% of the accidents took place on haul roads or quarry operation areas, 28% occurred at other transportation roads and 19% of the accidents were at or near dumper/truck maintenance work-shops. The remaining 10% of the accidents took place in OB dump-yard.
- (5) Reversing of vehicles caused 23% of all the fatal accidents.
- (6) 38% of the accidents occurred beyond daylight hours.
- (7) 47.6% of the victims were contractors' workers.
- (8) In 24% of the cases the victims were not vocationally trained and all of them were employed by contractors.
- (9) 22.7% of the victims were drivers of the vehicles by which the accidents were caused. 27.3% of the victims were helpers/khalasis of the vehicles. In 9% cases supervisors were involved and in rest of the cases other categories of workers became victims. In quite a few cases fatalities occurred while boarding or alighting from running vehicles by khalasis/helpers.

Findings of the analysis reveal that though attention has been drawn time and again regarding the unsafe acts and practices leading to fatalities, similar accidents continue to occur year after year. To control and minimise accidents due to this cause the following steps shall be taken immediately :

- (a) recommendations of Seventh Conference on Safety in Mines (1988) regarding Safety in Opencast Mines and recommendations of the Eighth Conference on Safety in Mines (1993) regarding "Safety in Opencast & Surface Operations" should be implemented without any further delay.
- (b) D.G.M.S. (Tech.) (SAP) Circular No. 4 of 1993 on the same subject should also be followed strictly.
- (c) strict supervision should be exercised to prevent unauthorised and negligent driving and sleeping of persons in the mine.

- (d) the quarry as well as haul roads and dump sites should be well illuminated and survey should be done at regular intervals and a plan should be maintained.

(Cir. Sapicom Tech. 2/1995)

14. Fatal accidents to contractor's employees engaged in transportation work in the mines—Increased demand of minerals/coal has necessitated large amount of mineral/waste handling in the mine. The opencast activities have thus been under immense pressure to boost production and achieve required target. It has generally been observed that waste handling jobs as well as transportation of coal/mineral from mine faces/pits to waste yards/coal dumps are being increasingly carried out by engaging contractual vehicles and workers.

Analysis of accidents due to wheeled trackless vehicles in opencast mines has revealed that:

- Approximately 33% of the accidents take place while reversing vehicles in dump yards/coal benches.
- 60-70% of the victims were either drivers or khalasis of the vehicles deployed by the contractors.
- No basic or specialised training was imparted to the contractual workers before engaging them in the mine.
- In some cases it has been observed that khalasis etc. engaged by the contractors were run over by the vehicles while sleeping in dump yards/ waste yards. Needless to say, special attention need to be paid towards training of contractors' workers and maintenance of vehicles belonging to the contractors. Greater discipline needs to be enforced by local mine management to ensure that only duly qualified, experienced and trained workers are employed by contractors. The work of all such persons should be invariably supervised adequately by mine management.

Attention of owners, agents and managers of all mines is once more drawn to various recommendations and circulars issued earlier and enumerated below for strict compliance :

- (1) recommendations of Seventh Conference on Safety in Mines in respect of 'Safety in opencast mining' to be implemented without further delay. [Ref. DGMS (Tech.) Circular No. 1 of 1989]
- (2) recommendation of Eighth Conference on Safety in Mines in respect of 'Safety in opencast and surface operations' to be implemented without further delay.
- (3) recommendations of DGMS (Tech.) Circular No. 4 of 1993 to be strictly adhered to.

All concerned persons are requested to ensure that the steps enumerated above are implemented forthwith.

(Cir. Tech. Sapicom 9/1996)

15. Danger due to lightning/storm during blasting operation in mines—

Recently, three accidents took place due to premature blasting by lightning when persons were killed/injured/escaped while they were in the process of charging explosives / connecting detonators etc. These accidents occurred as mentioned below :

(1) while nine deep holes and a number of secondary holes were being charged to be connected in series and fired, a lightning discharge due to thunderstorm caused premature firing of the deep holes, killed three persons and inflicted serious bodily injuries to one.

(2) while a Blaster was carrying 100 primed cartridge of explosives with electric detonators in a card-board box on his shoulder, the cartridges exploded suddenly resulting in instant death of the Blaster.

(3) while a Blaster and his helpers were about to take shelter after charging of the holes, suddenly there was a lightning/thunder-storm resulting in premature blast of the holes. Persons escaped unhurt.

Accidents due to above causes continue to occur despite very clear safety precautions laid down while granting permission under Reg. 106 (2) (b) of MMR 1961 and Reg. 98 of CMR 1957 and also Circulars issued by D.G.M.S. recommending additional precautions to prevent such accidents. These precautions in brief are given below :

- (i) shots shall not be fired except during the hours of daylight or until adequate artificial light is provided. All holes charged on any one day shall be fired on the same day as far as practicable.
- (ii) as far as practicable, shotfiring shall be carried out either between shifts or during the rest interval or at the end of work for the day. During the approach and progress of an electric storm, the following precautions shall be taken :
 - (a) neither explosives nor detonators shall be handled;
 - (b) if charging operations have been commenced, the work shall be discontinued until the storm has passed;
 - (c) if the blast is to be fired electrically, all exposed wires shall be coiled up and, if possible, placed in the mouth of the holes or kept covered by something other than a metal plate,
 - (d) all wires shall be removed from contact with the steel rails of a haulage track, so as to prevent the charge being exploded prematurely by a local strike of the lightning;
 - (e) if the firing circuit has been set up before the thunder storm came on, the persons at the site should withdraw at the earliest and the blast should be fired off immediately;
 - (f) all persons shall be withdrawn from the danger zone.

(Cir. Sapicom Tech. 1/1995)

16. Blasting in fire areas—See page 467.

17. Accidents due to dumpers sudden stoppage of engine/failure of braking system—It has been observed during course of enquiry into a recent accident in an opencast coal mine that one 35 tonnes Haul-pack dumper travelling against a gradient of 1 in 10 rolled back and fell down on the lower bench causing fatal injuries to the operator. Enquiry revealed that the engine of the dumper stopped suddenly of its own and due to non/partial functioning of brake and non functioning of the emergency steering system, the operator failed or became rather helpless to control backward movement of the dumper.

In such dumpers the steering system and the power transmission system are hydraulically operated. Due to stoppage of engine, hydraulic pressure comes to zero almost instantaneously, hydraulically operated steering gets locked and the gear system becomes as if kept in NEUTRAL position. Hence the vehicle (when moving against the gradient) starts going back. In such cases, effective parking brake/service brake and secondary braking system having no leakage in the pneumatic system can only save the vehicle from going back. Battery operated emergency steering provided in such dumpers also can be useful for controlling the vehicle if the driver can keep himself cool as he has to manually switch on the emergency/ steering circuit.

It is therefore necessary to maintain parking brake/service brake and secondary braking system and emergency unit in all dumpers in safe working order to avoid such accidents. It is necessary that these systems are more frequently examined and records also of such examinations are maintained.

In this connection I like to draw your attention to DGMS (Tech) Circular 3 of 1981 wherein the importance and methods for testing of parking brake and service brake have been highlighted.

The accidents due to HEMM are on the rise due to increased activities in the opencast mining sector. Hence the above recommendations in consultation with the equipment manufacturers must be strictly complied with.

(Cir. Tech. 3/1999)

18. Accidents due to failure of brake in tippers (tipping trucks)—Tippers (tipping trucks) are being increasingly used for transport of coal/mineral waste material in opencast mines. These tippers are provided with service brakes which operate by air over hydraulic pressure and parking brakes released by air pressure. Such tippers are causing a number of accidents every year due to failure of brakes particularly where a vehicle is plying on gradient.

Inspections made by officers of this Directorate have revealed that parking brakes which could stop the tipper in case of failure of service brakes were found defunct in most of the tippers. Therefore in case of failure of service brakes **on** gradient, the tippers rolled down causing accidents.

Parking brake in general is understood as a brake meant to hold a stationary vehicle in stopped condition. But most of the manufactures now provide parking brakes which can stop a moving vehicle in case of failure of service brakes.

Some of the models of tippers (e.g. TELCO Model 1210 of 1992) are provided with fail safe parking brakes; in some other models of tippers.e.g. Tata 1510 & 1510A, the manufacturer can provide full air brake system on request of purchasers. In case of leakage of air pressure or pressure drop in air system in these models, the brakes are automatically applied on all the four wheels. Ashok Leyland also provides this type of braking system on 'Comet' model tippers.

In order to prevent accidents due to failure of brakes, you are requested to get the tippers regularly checked for the braking system including parking brakes and ensure that the same are maintained in order. Action may also be taken to introduce tippers with full air brake system (and not air over hydraulic oil) in which the tipper stops immediately if the air pressure drops in the brake system.

(Cir. Tech. 9/1999)

19. Provision of propeller shaft guard in dumpers and tippers—While a tipping truck loaded with coal was being driven up a haul road at a gradient of 1 in 16 in an opencast mine, the propeller shaft suddenly broke, thus damaging the service brake. The tipper rolled back for a distance and fell down in 5m deep waterlogged ditch causing fatal injuries to the driver.

There are several cases in which due to a mechanical failure (such as shearing of bolts etc. the rear end of propeller shaft), the shaft would become free to dangle and consequently spin violently over a wide area and thus smash the brake system components (servo chambers, master cylinders as well as pneumatic and hydraulic lines,) which are in the vicinity and this damage would in turn result almost immediately in brake failure.

To prevent possibility of failure in the above situation, BEML has provided a sturdy safety guard for the propeller shaft in BH-36 dumpers. These are simple in design and can be adopted to any type of dumpers easily.

In this connection attention is drawn to the DGMS Tech. Circular 3 of 1999, where in the importance of other safety devices has also been highlighted.

Hence it is recommended that sturdy propeller shaft guard shall be provided in all types of dumpers and tippers irrespective of tonnage/capacity in consultation with equipment manufacturers.

(Cir. Tech. 10/1999)

20. Precaution while reversing vehicles—Accidents due to transportation machinery in opencast mines continue to remain high and several such accidents have occurred while

reversing vehicles. The code of precautions for truck transport in opencast mines attached to DGMS Circular No. 11 of 1973, requires audible warning signals before reversing. Circular No. 7 of 1997 again drew attention of the industry to this hazard, requesting that a separate horn with a sound different from normal horn of the vehicle should be provided for the purpose. The driver should continue blowing this horn during reversing, and the horn should be standardised in a mine so that whenever a horn having a particular sound is given, it would become evident that a vehicle is being reversed. The possibility of incorporating horns which operate automatically when the vehicle is reversed should also be explored.

In some of our mines where such audio visual warning have been provided, it is observed that sometimes the level of sound of horn is so low so as to become ineffective and in other case it is so high that it may even exceed the permissible limits, posing another hazard. High sound level, besides causing hearing impairment and distraction, can even drown sound warning emitted from nearby sources posing additional hazard. It is needless to say the sound generated by the alarm should be such so as not to be shrouded by the sound of the vehicle and the surrounding sources but at the same time should not be high enough to cause hearing impairment and become a source of another hazard.

It is recommended that an audiovisual backup alarm system which adjusts itself to the surrounding noise level maintaining minimum 5 dB (A) above the noise level may be used in trucks and dumpers. Such alarm system have been developed in other countries (i.e. 'ECCO' of USA) and marketed in India. These or similar product may be tried.

(Cir. Tech. 12/1999)

CMR 99

1. Layout of Bord and Pillar workings—1. The common method of developing a coal seam in India has been and still continues to be the Bord and Pillar system of working. The dimensions of pillars and galleries are laid down in the regulations which have been formulated to ensure mainly the stability of workings at various depths.

2. It is very desirable to form panels leaving barriers of coal between adjacent panels with minimum essential entries to each panel. The size of a panel is usually governed by the incubation period of a seam and is sometimes also influenced by the system of mechanisation adopted. The panel system of development has many advantages. Most of the coal seams in India are usually liable to spontaneous heating and therefore, in the event of spontaneous heating or fire in a mine it is possible to control the heating or fire and limit its extent with the isolation of the affected panel only. Development of panel system permits also provision of independent ventilation split for each panel, requires less number of isolation stoppings to be built during depillaring operations, the number of stone dust barriers, explosion proof stoppings to be provided is usually much less; and a panel may be easily kept isolated pending commencement of final operation with a number of attendant advantages as pointed out in this office circular No. 66 of 1964. Thus the panel system of development is not only to be preferred from safety and conservation points of view but it is also likely to prove an economical method of working in the long run.

3. A still better method of working while opening out a seam or a part of a seam is to drive 4 or 5 headings along strike and then dip and rise up to the mine boundary or a predetermined barrier as quickly as possible, and to form panels on the retreat. In this method of working, a system of more or less simultaneous development and depillaring could be conveniently arranged in the same panel or adjacent panels. Such a method of working can be planned to yield the desired output at the initial development stages, and it has the added advantages of concentration of workings, very much reduced chances of spontaneous heating, better roof control, little or no weathering or spalling of pillars, no old panels, requiring inspection or isolation to keep them in safe condition etc.

4.1 Although the above mentioned principles of good development are well recognised, it is found that there continue to be many haphazard and unplanned development. It is high time therefore that old method of ordinary development in which all galleries are interconnected throughout in a honeycombed fashion is stopped and while adopting bord pillar system, the working are developed on panel system only—preferably in the manner indicated in the preceeding paragraph. It is also advisable that a layout plan should be prepared for every scheme of new development of a seam or part of a sam. The layout plan should be sufficiently comprehensive covering the entire area of proposed development or at least the part of the area which is likely to be developed in the course of next 3 years, and take into account the existence of important surface features like railways, roads, building, presence of water-logged workings or fire in the vicinity etc. In preparing the plan of development the manner in which the final operation or depillaring would be carried out, should be kept inclose view to avoid any complications or| wasteful mining later on.

4.2 A copy of the layout plan should be kept at the office of the mine, and a copy may be sent to this office for scrutiny. If desired, the plan may be submitted for approval jointly under all the relevant regulations (e.g. 100, 104, 105, 122). Such a procedure would eliminate the necessity of submitting from time to time a number of separate applications for statutory permission and thus ensure uninterrupted working of mine in so far as compliance with regulations is concerned.

5. Needless to stress, it is important in the interest of proper development of working both from safety and conservation points of view that all future working should be laid out in a planned manner, and when bord and pillar system of work is adopted, the development should be On the lines indicated above.

(Cir. 7/1966)

CMR 100 / MMR107

Proforma for application to extract or reduce pillars under Regulation 100(1)/105(1)/122(1)/126/127 of the Coal Mines Regulations, 1957—In supersession of Circulars issued earlier on the above subject, henceforth all applications for permission to extract or reduce pillars under Reg. 100 of the Coal Mines Regulations, 1957 shall be submitted alongwith the enclosed proforma [Appendix— 10 PR(88)] duly filled in.

APPENDIX—100 PR(88)

PROPORMA FOR APPLICATION TO EXTRACT OR REDUCE PILLARS UNDER REGULATIONS 100(1)/105(1)/122(1)/126/127.

1. Name of Mine:
2. Name of Owner:
3. PARTICULARS ABOUT THE SEAM:
 - 3.1 Name of the seam proposed to be depillared:
 - 3.2 Total thickness of the seam:
 - 3.3 Thickness of the seams/sections) proposed to be depiilared (in a thick seam, indicate also the location of horizon in relation to roof and floor):
 - 3.4 Rate of dip:
4. Plans:
 - (a) Give the plan No. with date
 - (b) Are the plans upto date and accurate? (Please see Reg. 65 regarding checking of Plans)
 - (c) When and by whom the area applied for was surveyed?

5. PARTICULARS ABOUT THE WORKINGS TO BE DEPILLARED Name/No,
and size of panel propose for extraction:

5.1 Maximum and minimum height and width of the workings

5.2 Average height and width of workings

5.3 Maximum & minimum size of pillars centre to centre

5.4 Average size of pillars centre to centre

5.5 In a thick seam, indicate also the location of the horizon in relation to roof and floor and the thickness of coal left in roof and floor.

5.6 Age of workings.

5.7 Nature of roof and floor (upto atleast 5 metres thickness above and below)

5.8 Are the workings dry/damp/naturally wet?

5.9 (a) Maximum and minimum thickness of cover from the surface.

(b) Percentage of sand stone in the cover over the proposed panel.

5.10 STATE

(a) The rate of emission of inflammable gas per tonne of coal raised—

(i) in the district,

(ii) in the seam,

(b) The maximum percentage of inflammable gas detected at any time in the general body of air

(i) in the district,

(ii) in the seam.

5.11 Are there any geological disturbances in or within 180 m of the area proposed to be depillared.

5.12 General condition of workings as actually determined by a recent inspection state in particular

(i) If there are any signs of spalling of coal from pillar sides and/or

(ii) Falls of roof, if any (the nature and extent of such falls should also be clearly indicated)

5.13 Is there any history of fire in the seam in same mine or the adjoining mines. Please give details.

6. Section of the strata from surface showing the overlying and underlying seams, their thickness and the thickness & nature of the parting between them. This strata section shall be drawn at a point either within the panel or close to it [position of bore hole etc. section of which is reproduced shall be clearly indicated on the plan].

7. PROPOSED METHOD OF EXTRACTION.

(a) (i) Conventional depillaring with slicing/stocking method:

(ii) Splitting of pillars as final operation:

(b) With/without hydraulic/dry stowing with sand/other material or by any method like hydraulic mining.

7.1 If in conjunction with stowing, are all preparatory arrangements for stowing ready. If not, what time this will take. Give details & amount of existing void and current rate of stowing/day.

8. Manner of extraction/splitting of pillars to be also illustrated by suitable sketches:

9. Condition of the overlying or underlying seams/sections with respect to the area applied for. Specific details for the area above/below and within 90 m should be given.

9.1 Are the seams free from water? If not give details regarding position of water level (Distance of water from the proposed panel should be given).

9.2 Are the seams extracted/split standing on pillars/virgin? (above the proposed panel and within 90 m thereof)

9.3 If the seams have been extracted or split/state if by caving method or hydraulic stowing or dry stowing.

9.4 Is there any fire in any overlying or underlying seams/Sections or at the surface? If so, please give detailed history about the same and the present condition of the fire. Mention if ventilation of the mine is by exhaust fan(s) or forcing fan(s).

9.5 (a) The rate of emission of inflammable gas per tonne of coal raised.

(b) The percentage of inflammable gas in the general body of air.

10. AIR BLAST

(a) Is the roof easily cavable? What is your past experience?

(b) Is there any danger of air blast? Give details of past experience in this seam either in this mine or any nearby mine.

11. SURFACE FEATURES VIZ. LYING ABOVE AND WITHIN 45 'M OF THE PROPOSED AREA (PLEASE GIVE DETAILS INCLUDING ACTUAL DISTANCE FROM THE PANEL)

(i) Railway;

(ii) public /private road;

(iii) river, nullah or any other water course, tank or reservoir;

(iv) building/dwellings belonging to the owner (state whether kutcha, pucca, single storey, double storey etc.);

(v) buildings/dwellings not belonging to the owner (state whether kutcha, pucca, single storey, double storey etc.);

(vi) H.T. Transmission line (state whether belonging to the owner or any other party);

(vii) aerial ropeway (state whether belonging to the owner or any other party);

(viii) any other structures/features whether or not belonging to owner.

12. HIGHEST FLOOD LEVEL:

Distance of the highest known flood level of any river, nullah etc. from the edge of the panel.

State difference in level between HFL & point on surface over edge of panel (details of HFL/RLS, contours, embankments shall be clearly shown on the plan)

13. DAMAGE TO THE SURFACE STRUCTURES ETC.

Do you apprehend any danger to the surface buildings or structures mentioned in item 11 above or any surface feature/structure beyond 45 m of the panel.

I. Due to the proposed operations: If 'no' give reasons

(a) If you apprehend danger please give details of the proposed measures to prevent danger to the same.

II. Due to the vicinity of a fault or a dyke or other geological disturbances as a result of the proposed operations.

(a) If you apprehend danger, please give details of the proposed measures to prevent danger to the same.

14. SUBSIDENCE RECORDS ETC.

Give particulars of the subsidence experience in panel already extracted in the same seam (Attach also a copy of the subsidence records and plans and sections). Details of nature of intervening strata shall be given.

15. ACQUISITION/FENCING OF SURFACE AREA:

If surface is likely to be affected, has it been acquired for fencing as required under Reg. 112(1) (c)? If not, what alternative arrangement has been made to prevent danger.

16.1 DANGER OF INUNDATION:

(i) Is there any waterlogged/disused working within 60 m of the proposed panel.

(ii) Is there any danger of inundation, as a result of the proposed operation from:

(a) Surface water

(b) Underground workings

(i) In any seam/section lying above or below the area applied for in the same mine or (iii) of the adjoining mines in same seam or any other seam/section, or

(iii) from the seam/section in the same mine.

16.2 What precautionary measures are suggested to prevent the danger of inundation, if any.

17. DANGER FROM FIRE:

Where there is fire either in the overlying or underlying seam/section, or on (the surface (whether in the same mine or adjoining mine) state the proposed protective measures to prevent danger from the same.

18. Details of ventilation:

(a) whether ventilation is exhaust or forcing type

(b) fan capacity and water gauge

(c) quantity of air reaching district.

19. DANGER OF PREMATURE COLLAPSE:

Do you apprehend any premature collapse of the workings either in the same seam/section or in the overlying or underlying seams/sections) as a result of the proposed operations; if so, what are the measures proposed to prevent the same.

20. INCUBATION PERIOD:

20.1 What are crossing and ignition point temperatures of the coal seam to be depillared?

20.2 What is the know-how of expected incubation period of the seam?

20.3 (a) What was the average rate of monthly production from a depillaring district under similar conditions, also state the expected monthly production in the proposed panel.

(b) (i) Percentage of extraction achieved earlier in similar panels (excluding barrier)

(ii) Expected percentage of extraction in the panel.

20.4 What is coal raised/sand stowed ratio by volume?

20.5 What was the average rate of daily sand stowing achieved by volume under similar conditions?

20.6 State the number of pillars in the largest panel/sub-panel and the quantity of coal in standing pillars (proposed for extraction)

21. DIVISION OF THE AREA INTO PANELS AND PROVISION OF ISOLATION

STOPPINGS:

21.1 Has the area applied for depillaring been divided on the plan into suitable panels consistent with the known or expected incubation period of the seam?

21.2 Please state the type (state whether explosions proof or otherwise and give the details of construction) of isolation/preparatory stoppings to be provided for the purpose of sub-regulation (4) of Reg. 100 read with Reg. 118A.

21.3 How long it will take you to complete construction of isolation/preparatory stoppings around the proposed area for depillaring?

22. SYSTEMATIC SUPPORT RULES:

Have you submitted a draft of the systematic support rules to the concerned Director/Dy. Director for approval in accordance with Regulation 108?

23. WORKING WITHIN DISPUTED AREA:

Does the area proposed to be depillared/split lie within or close to the disputed boundary or area or encroached workings with the neighbouring mines. If so, please give details.

Have you left adequate barrier against the mine boundary as per provisions of Reg. 107 (as amended upto date).

24. FOR APPLICATION UNDER REGULATION 105(1):

(a) Where the application has been made under Reg. 105(1), has a copy of the same together with relevant plans been sent in the case of railway administration concerned and in the case of other public works to the authorities, owning works?

25. REFERENCE TO PREVIOUS PERMISSION:

Please state whether any permission for extraction of pillars was granted in the past for any other area of the seam at the mine, if so.

(a) the reference number and date of the permission letter(s)

N.B. Where permission has been granted in more than two areas in the past, reference to only the last two permission letters need be given.

(b) Has the extraction been completed in the said areas (if not give the latest position in respect of the same),

(c) Give details of experience during extraction of such panels mentioned above. Mention about any untoward incidence that might have occurred in those panels.

26. ANY OTHER RELEVANT DETAILS:

Certified that the information given above is correct to the best of my knowledge and belief.

Signature

Designation

Date:

Owner/Agent/Manager

(Cir. Tech. 1/1988)

2. Proforma for application to extract or split or reduce pillars or blocks of minerals under Reg. 107(3)/109(1)/127/128 of MMR 1961—Complete information is not being furnished with the application for sloping. To eliminate avoidable delay in collecting further information required for dealing with the application for sloping, proforma at Appendix MMR-107 shall be filled in and sent with every application for sloping.

APPENDIX

Proforma for application to extract or split or reduce pillars or blocks of minerals under Regulation 107(3)/109(1)/127/128 of the Metalliferous Mines Regulations, 1961.

1. Name of Mine:
2. (a) Name of owner: 2. (b) Mineral worked:
3. Particulars of Ore Body:
 - 3.1 Name of the Ore Body proposed to be sloped;
 - 3.2 Location:
 - 3.3 Thickness of Ore Body
 - 3.3.1 Reef width;
 - 3.3.2 Sloping width
 - 3.4 Size for ore block(s) proposed to be sloped;
 - 3.5 Depth of the vein of ore body;
 - 3.6 Rate of dip;
 - 3.7 Are there any parallel Reefs, if so give details;
 4. Other particulars of the vein of ore body:
- 4.1 Is there any history of occurrence of gas?
- 4.2 Is there any history of fire in the same ore body HI the same mine or in the adjoining mine?
5. Particulars about the workings to be sloped:
 - 5.1 Maximum and minimum height and width of workings
 - 5.2 Nature and type of Hanging wall and Foot wall within 15 metres of Reef.
 - 5.3 General condition of workings.
 - 5.4 Are the workings dry/damp/naturally wet.
 - 5.5 Maximum and Minimum thickness of cover from the surface.
 - 5.6 Are there any geological disturbances within 180 m of the area proposed to be sloped.
 - 5.7 Plan showing 'the area to be sloped and whether it has been signed by surveyor or countersigned by Manager:
 - 5.8 Are main approached roads in country rock or in ore body itself.
6. Section and plan of strata showing the position/condition or overlying and underlying or parallel ore bodies, their thickness and the thickness of the parting between them and the nature overlying rock.
7. Proposed method of extraction viz:
 - (a) by cut and fill or (b) by caving method etc. and/or,
8. Manner of extraction of ore block (to be illustrated by suitable sketches).
9. Condition of the overlying or underlying working with respect to the area applied for:

9.1 Is the area free from water?

9.2 Are other deposits extracted/split/standing on the pillars/virgin?

9.3 If it has been extracted, split, state if by caving method or by cut and fill method, etc.

10. Surface features viz. lying above and within 45 m of the proposed area (please give details):

10.1 Railways:

10.2 Public/Private Road.

10.3 River, Nullah or any other course, tank or Reservoir.

10.4 Building/dwellings not belonging to the owner.(state whether katcha, pucca, single stored, double stored etc.)

10.5 Buildings/dwellings belonging to the owner (state whether kutch/pucca etc.)

10.6 H.T. Transmission line (state whether belonging to the owner or any other party);

10.7 Aerial ropeway (state whether belonging to the owner or any other party);

10.8 Water pipe or gas main (state whether belonging to the owner or any other party)

10.9 Any other structures/features whether or not belonging to owner or any other party.

11. HIGHEST FLOOD LEVEL

Does the area lie below the highest known flood level of any river, nullah etc.

12A. DAMAGE TO THE SURFACE STRUCTURES ETC.

Do you apprehend any danger to the surface buildings or structures mentioned in item 10 above ?

I. Due to the proposed operations:

(a) If you apprehend danger please give details of the proposed measures to prevent danger to the same.

(b) If you do not apprehend any danger please give reasons for the same.

II. Due to the vicinity of Geological disturbances.

If you apprehend danger, please give details of the proposed measures to prevent danger to the same.

12B. SUBSIDENCE RECORDS ETC.

Give particulars of the subsidence experience along with subsidence records if available.

12C. ACQUISITION/FENCING OF SURFACE AREA

If the surface is likely to be affected, has it been acquired for fencing as required under Reg.115(1), If not, what alternative arrangement has been made to prevent danger.

13A. DANGER OF INUNDATION

Is there any danger of inundation as a result of the proposed operation from:

(a) Surface water

(b) Underground workings—

(i) of any workings lying above or below the area applied for in the same mine, or

(ii) of the adjoining mines in same seam or body or any other ore shoot.

13B. What precautionary measures are suggested to prevent the danger of inundation, if any.

14. DANGER FROM FIRE

Where there is fire in the overlying or underlying workings or on the surface. State the proposed protective measures to prevent danger from the same.

15. DANGER OF PREMEATURE COLLAPSE

Do you apprehend any premature collapse of the workings either in the same 01 in the overlying or underlying or parallel ore body/ore shoot, as a result of the proposed operations? If so, what are the measures proposed to prevent the same.

16. DIVISION OF THE AREA INTO PANELS and provision of isolation stoppings. Has the area applied for sloping been divided on the plan into suitable panels.

17. SYSTEMATIC TIMBERING RULES

Have the systematic timbering rules been approved by the Joint Director of Mines Safety in accordance with Reg. 111(2) (a).

18. WORKING WITHIN DISPUTED AREA

Does the area proposed to be sloped lie within or close to the disputed boundary or area or encroached workings with the neighbouring mines? If so, please give details.

19. FOR APPLICATION UNDER REGULATION 100(1):Where the application has been made under Reg. 109(1), has a copy of the same together with relevant plans been sent to the administration concerned and in the case of other public works, to the authorities owning works?

REFERENCE TO PREVIOUS PERMISSION: Please state whether any permission for extraction of blocks/pillars was granted in the past for any other areas. If so,

(a) The reference number and date of the permission letter(s)

(Where permission has been granted in more than two areas, reference to only the last two permissions need be given.

(b) Has extraction been completed in the said area(s).

(If not, give the latest position in respect of the same).

20. Whether all PLANS & SECTIONS submitted have been signed by Surveyor and Countersigned by Manager.

21. ANY OTHER RELEVANT DETAILS

Certified that the information given above and plans submitted are correct to the best of my knowledge or belief.

Signature

Date:

Designation Owner/Agent/Manager

N.B.

1. Separate sheets may be used in case the space in any of the columns is considered insufficient for the information required.
2. The application should be accompanied by an up-to-date plan, in duplicate showing the proposed area for sloping/splitting and all other relevant details required to be shown on an underground plan maintained under Regulation 61.
3. Please send a copy of this proforma together with a plan referred to in item 2 above, directly to the Joint Director of Mines Safety to expedite action.
4. Strike off whatever is not applicable.

(Cir. 52/1974)

3. Application for depillaring to cover large areas—Applications for depillaring should cover areas sufficiently large to last for a period of at least 3 years. The applications should be

submitted at least 3 months in advance of the proposed date of commencement of depillaring operations to enable DGMS to deal with them in time. The proposed panels for depillaring should be clearly indicated on the plan keeping in mind the incubation period of the seam.

(Cir. 19/1960)

4. Applications for depillaring: Positive draw to be considered—(1) Particulars regarding surface features and the highest flood level are to be given in applications for depillaring. These particulars generally pertain to the surface area lying over the area proposed to be depillared. However, there may be positive draw upto 45 degrees from the horizontal in some cases, e.g.

(a) when working near faults and dykes,

(b) when depillaring under a goaved out seam.

In case(a), surface projection lines shall be shown on the plans accompanying the application for depillaring.

In case (b), details of the surface features lying within a zone extending to a distance equal to the depth from the surface of the area to be depillared should also be given. If the area to be depillared lies in the vicinity of the highest known flood level of a river, the extent of HFL should be shown on the plans within this zone also.

(2) *Numbering of plans and reference in application*—Under Reg. 100 of the CMR 1957 every application for extraction or reduction of pillars is to be accompanied by two copies of an up-to-date plan showing the area. Cases have arisen where there has been some confusion about the sanctioned area of depillaring. In order to overcome these difficulties, it had been advised in circular No. 19 of 1960 to number the plans accompanying applications for depillaring. This recommendation should be followed up rigidly as it is proposed to mention the reference number of the plan in every letter granting permission for depillaring so as to link up for reference the specific area for which the permission is issued. For the sake of cross check, the reference number of the plan should be given in the application for depillaring also.

(Cir. 79/1966, Cir. 19/1960 & 29/1962 superseded)

5. Preparation of plans accompanying applications for depillaring etc.—It has been observed that the plans accompanying applications for depillaring operations etc. submitted to this office are mostly ferro print copies which are generally difficult to read due to poor quality of reproduction. This usually delays disposal of the applications. It is therefore advisable that proper legible plans showing only the relevant particulars concerning the application should be submitted to this office. Where a part plan would do, complete plans (which are often large) should not be submitted.

(Cir. 16/1966)

6. Strata Control Plan—While working in a seam or section over already worked seam or section, it is sometimes noticed that the roof becomes suddenly bad in certain patches. This is usually the case when the line of extraction comes over some pillars or stocks that were left unextracted in the bottom seam or section. These zones are subject to high concentrations of stresses and therefore the roof condition in the top seam/section is likely to become difficult and extra support and care is needed to control the strata while working at such places.

It is desirable that composite plans of the workings should be prepared showing all pillars/stocks of coal that may have been left unextracted in the bottom seam/section. While approaching such zones, extra precautions should be taken for proper roof control both during development and during extraction of pillars in the top seam/section.

(Cir. 40/1966)

7. Isolation/Preparatory stoppings around depillaring areas—Since the provision of the isolation/preparatory stoppings is an essential precaution against danger from fire, it is proposed that, when a proposal for depillaring is approved in principle by this office, a letter would at first

be issued to the management concerned intimating that the work of building the isolation/preparatory stoppings may be started and the JDMS may be informed as soon as the work is completed. The letter granting permission for depillaring (subject to such other conditions as may be considered necessary) would be issued by DGMS only after the stoppings have been provided to the satisfaction of the JDMS.

8. Standard of Construction of Isolation Stoppings to seal off goaved out depillaring areas or a Fire or spontaneous heating—1.0 Coal Mines Regulations 100(4) and 118A(1) (a) read with the proviso to Reg. 18A(4) require, inter alia that, unless exempted in writing and except where solid stowing is practised, no depillaring shall be commenced unless isolation/preparatory stoppings or firedams have been provided around the area to be extracted.

1.1 Even in seams where extraction is carried out in conjunction with stowing, there have been instances of goaf fire. In exercise of the powers under the proviso of Regulation 118A(4) therefore, provision of isolation/preparatory stoppings is also often required where extraction is practised with solid stowing. However, in such cases, stoppings may be provided to enclose relatively larger panel(s).

1.2 The purpose of provision of these isolation/preparatory stoppings around every panel or sub-panel is that the area could be sealed off expeditiously in emergency i.e. upon appearance of any sign of heating or after completion of extraction therein so that breathing of air into goaf and consequent heating is prevented. Incidentally, to prevent the passage of air into the goaf from surface, subsidence cracks formed as a result of the depillaring operations should also be filled-up with incombustible material and the filling material well-rammed and kept topped-up as often as necessary.

2.1 Stoppings are also required to be constructed under Regulations 119 & 122 to effectively seal off areas where heating is detected or fire exists.

2.2 Similarly, as required under Reg. 118A(1) as well as to better utilise the available ventilation air in the mine and to obviate the constant efforts needed to deal with coal dust problems, stoppings are built to isolate the disused workings in certain cases.

3.0 The selection of site and the design, standard and manner of construction of isolation/preparatory stoppings under Regs. 100(4)/118A as also the stoppings to be built under Regs. 119 & 122 to isolate or control a fire or spontaneous heating belowground or to seal off/sectionalise disused workings shall be as follows:

3.1 Selection of site

The site of stoppings should, as far as practicable, be free from cracks, slips and other disturbances and should be so selected that:

(i) the stoppings do not get affected by any extension of falls in goaf or by crushing/spalling of the corners/sides of coal pillars containing the stoppings. For this purpose, the stoppings may be sited at least 3 m away from pillar corner on the inbye side;

(ii) sufficient space is still available on the outbye side to enable stoppings to be:

(a) re-inforced, if they fail to contain the fire, if any; or

(b) converted into explosion-proof stoppings subsequently, still leaving about 3 m distance between the second stopping and the pillar corner on the outbye side.

3.2 Design of construction

3.2.1 All stoppings shall unless otherwise provided for here under be of bricks in lime/cement mortar.

3.2.2 Minimum thickness of stoppings shall be as follows:

Gassiness of seam	Minimum thickness of stopping in case of extraction		REMARKS
	by caving method	with slowing (of all voids and galleries upto the stoppings)	
III degree	Two stoppings each 1 m. 1 m thick and 4.5 m apart, with the intervening space packed solid with incombustible material	1m	I. an area, only partly extracted and slowed is sealed-off prematurely due to healing or
I and II degree	1 m to be reinforced as in case of III degree, if inflammable gas behind the stoppings exceed 2%	0.5m	otherwise, the stoppings shall be re-inforced as in case of extn. by caving method. In gassy seams of I degree, stoppings may also be built of RCC provided the thickness is not less than 0.3 m.

3.2.3 Minimum depth of 'locking' of both brick and RCC stoppings into roof, floor and sides should be as follows:

Brick in cement/lime mortar RCC.

—in coal	one metre	50 cms
—in shale roof/floor	30 cms	30 cms
—in sandstone roof/floor	15 cms	15 cms

3.2.4 To enable the areas to be sealed-off expeditiously in case of emergency, every preparatory slopping shall be filled, on its inbye side, with a suitable steel door or provided with an emergency door seal as per DGMS Circular No. 19 of 1967. Sufficient stock of bricks and other material shall also be kept readily available in the vicinity on the outbye of the stoppings.

3.2.5 The exposed face of the stoppings as well as the roof, floor and sides of the gallery on outbye side, for a distance of at least 1 m there from, shall be plastered with sufficient thickness of lime or cement to prevent leakages.

3.2.6 Where water is likely to accumulate behind any stopping there shall be provided in the stopping 'water seal' viz. a suitable pipe or other device to drain away the water without permitting any leakage of air or gas.

3.2.7 In a few strategically located stoppings, including at least one on rise side, air-sampling pipes, 25 mm or 50 mm in dia filled with suitable sluice valve/cap should be provided, for ascertaining, once at least in every 30 days, the atmospheric conditions behind the stoppings. The sampling pipes should be extended upto a distance of at least 3 m inbye of the stoppings. Some of the sampling pipes should be placed within 30 cm of the roof.

3.2.8 While sealing off disused workings in gassy seams of Second or Third degree, large diameter pipes (say 45 cm) with suitable valves/flanges may be provided in some of the isolation stoppings both on the intake and return sides to enable 'bleeding off the sealed off areas as and when required. Also, in order to render later entry into the area more convenient, it would be advisable for a door to be installed at the inbye end of one of the stoppings each on the return and intake sides before the rest of the thickness is built in with masonry.

3.2.9 The stoppings should be kept properly white-washed to enable fine cracks to be detected, and serially numbered. The approach roads upto the stoppings including the stoppings built around the goaved out areas of panel(s) not yet fully extracted and sealed off, shall be kept well-supported, properly ventilated and clear of obstruction to enable weekly inspections thereof to be carried out in a proper manner. The records of inspections should be maintained isolation stopping wise.

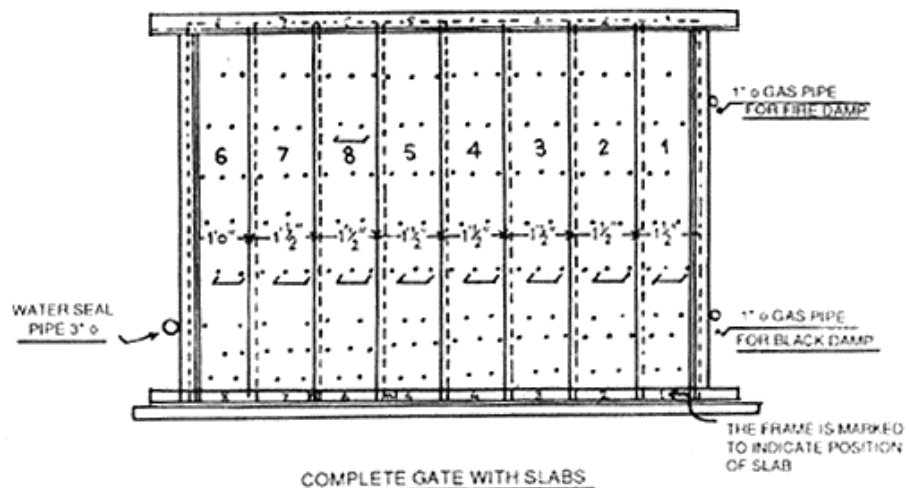
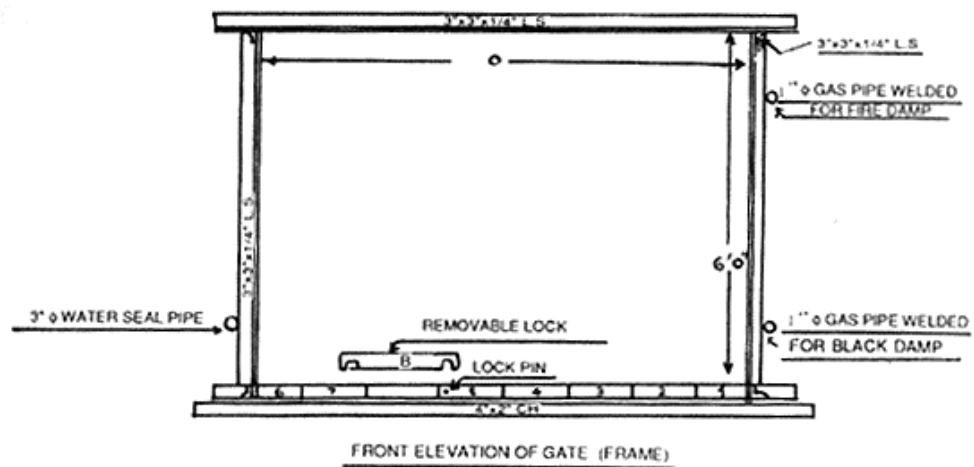
4.0 The pillars containing isolation stoppings should not be extracted or reduced.

5.0 This supersedes DGMS Circular No. 49 and 55 of 1962, 37 of 1963, 17, 25 and 30 of 1964, 23 of 1965 and 1 of 1968.

(Cir. Tech. 3/1988)

9. Emergency door seals in preparatory stoppings—It has been recommended that every preparatory stopping around a depillaring area should be fitted with steel door which can be shut off immediately in the event of symptoms of spontaneous heating or outbreak of fire.

An effective manner of quickly isolating an area is by providing an emergency door seal consisting of reinforced cement slabs, which can be readily pushed home within a steel frame work- previously built in a preparatory stopping. The constructional details of one such type of seal, which has been successfully



EMERGENCY DOOR SEAL

The door consists of a fabricated steel frame of 3"x3"x1/4" angle steel and a number of r.c. slabs sliding within the steel frame work. The sides of slabs are grooved for making bounded joints in order to eliminate leakage of air. The r.c. slabs are 6' 4 1/2" high x 1' 1" wide x 1 1/2" thick with 1" wide grooves for overlapping. When pushed home the slabs over-lap the frame 1 1/2" on the sides and top, and 3" at the bottom. The gap between the front and back angle irons of the frame is 1 3/4" which allows the slabs to fit in snugly.

The reinforcement of the slabs consists of 3/8" m.s. rods placed longitudinally three inch apart with similar rods placed transversely 9" apart. All these rods are welded to each other in position thus giving desired rigidity. A hand rod is welded in position to the reinforcement of each slab for easy handling of the slabs. The last slab is provided with the two hand rods for convenience of operation for ready identification.

All the slabs are numbered serially in the order in which they are to be pushed home. Eight slabs are required in a door of this size.

Materials Required—Materials required for making one door are as follows:

A. Frame:

- (i) 3"x3"x1/4" angle Iron for frame-4 pcs each 6'3" long, 25'-0".
- (ii) 3"x3"x1/4" angle Iron for bracing-4 pcs 9'6" each long, 38'-0"
- (iv) 3"x3"x1/2" angles corners 8 pcs each 3" 2'-0"
- (v) 2"x4"x1/4" channel iron for bottom-1 pc 10'-0" 75'-0"

B. Slabs:

- (i) Reinforcement of 3/8" rods 9x42' for each slabs-378 ft.
- (ii) Cement—Two bags.
- (iii) Sand—Two bags.
- (iv) Stone chips or ash cinders four bags (1/8"x1/2")

Cost:

1. Cost of materials:

For iron materials—Total 186 kg @ Rs. 800/- per tonne = Rs.150.00

For other materials—" " " " " " = Rs. 24.00

2. Labour Cost

Framework—Rs. 25/- L.S.

Slabs @ Rs. 6/- each Rs. 54/-

Total Rs. 79.00

Grand Total Rs. 253.00

Time required for emergency sealing—At each preparatory door site a ready made mixture of cement and sand in a bag and sufficient quantity of water in a tank are kept readily available for eliminating delay in sealing. It takes about 4 minutes in pushing home all the door slabs in position and another 3 to 5 minutes for applying the cement plaster in all joints to make an absolutely air light seal. Thus the sealing operation is completed in less than 10 minutes, the whole job being done by one person.

Strengthening of the seal—Once the sealing of the door is completed, further strengthening can be done at the earliest opportunity by erecting brick-work on the outside of the door. For this purpose outer sides of the slabs as well as the plaster of the preparatory stopping are made rough

by checked lines for good bonding. 3/8" rods projecting out of the slabs may also be welded on to the reinforcement rods for better bonding.

Sampling pipes etc.—Two sampling pipes, one for black damp and the other for fire damp, and one water seal pipe are welded to the steel frame of the door thus ensuring that these important items are not forgotten at the lime of actual emergency.

A removable lock is also provided at the bottom member of the frame for locking the last slab as shown in the sketch. The last slab may or may not be locked depending on the nature of atmosphere inside the seal. The last slab may be kept unlocked for providing an easy outlet in case of an explosion inside the seal in which case the last slab may act as a 'relief valve'. A duplicate slab is provided for replacing the damaged slab in such an event.

a suitably designed rack is provided near the site of the preparatory stopping for orderly storage of the numbered slabs, a mixture of sand and cement in plastic bags, water, and implements for completing the seal.

(Cir. 19/1967)

10. Design of Sand Bunkers—Some fatal accidents in sand stowing bunkers have occurred in the past while persons were engaged inside bunkers for releasing stuck up sand. If a bunker is well designed normally there should be no need for a person to go inside it to dislodge sand. But in the case of some old sand bunkers sometimes need may arise to dislodge stuck up sand or lead sand. This should be achieved not by sending a man inside the bunker but by directing a jet of water or by operating a rake from outside the bunker. Where however, it is imperative to send a man inside the bunker, it is recommended that the operation should be conducted under competent supervision and that adequate precautions such as the use of a strong steel rope anchored on surface to provide the persons with necessary hand hold, use of a safety belt etc. are taken. It may also be advisable to fix 'U' brackets at convenient places inside the bunker to serve as steps for persons to go inside a bunker.

At one mine when a workman was partly buried in sand in a sand bunker and there was risk of sand drowning him completely if disturbed, a large diameter pipe (1 metre) was lowered around him and sand from within the pipe removed. Finally the man was saved and brought to surface.

It is understood that sand bunkers of different types, sizes and shapes in use in our many mines call for a different set of precautions in each case. Therefore, the stowing installation at mines should be carefully studied and in the light of foregoing remarks the procedure to deal with dangerous situation laid down.

(Cir. 13/1968)

11. Details of depillaring, local and main roof falls, ground movement

observations and subsidence plans—If ground movement observations are carried out in a scientific manner, following every depillaring operation, and the observation data are kept properly maintained, much valuable information such as amount of subsidence, angle of draw, rate of subsidence, etc. can be made available for planning future operations under similar ground conditions and similar operational parameters. At every mine, where depillaring operations are being conducted, regular subsidence and other connected observations should therefore be taken and records maintained in the following manner :—

Name of seam.....

Distinctive No. of panel :

1.0 Operational parameters :

1.1 Dimensions of the panel : Area..... sqm.
 Average length.....m. Average width.....m

1.2 Manner of extraction-
 (Caving/stowing)

Thickness of	Single Section	Double Section	
		Top	Bottom
—Seam			
—Extraction			
Parting finally left between the two seams or sections -		Thickness	Nature

DGMS

1.4 Average depth of workings.....m

1.5 Panel Width/Depth Ratio

1.6 Percentage of sandstone in roof.....

(ignore bands intercalated with shale)

1.7 Dip of seam :

1.8 Status of overlying/underlying seams

Seam(s)	Thickness of parting with-	Age of working in-	Condition of workings	
			On pillars*	Extraction by caving/stowing**

* indicate the dimensions of the workings.

** indicate the extent of unextracted pillars/barriers left if any.

1.9 Description of geological disturbances, if any (fault, sill, dyke, prominent slips/cleats, etc.) "

1.10 Percentage of extraction;

(a) Coal left "in-situ"—on floor area basis,

(i) during development—

(ii) during depillaring—

(Give dimensions of ribs/chowkidar/stooks left unextracted— average of at least 10 pillars)

(b) Coal lost:

(against fault/dyke, in panel barriers etc.)

(c) Coal left in roof floor/parting—

Overall percentage of extraction in the panel.

2.0 Information regarding local, main fails, etc.

Event	Dates	Average thickness of fall	Extent of extn. At the time of fall			Remarks -air blast -effect of geological disturbance, stooks/ribs left.
			Area	Length	Width	

1. Commencement of extraction, in the panel.

2. First (local) fall.

3. First main fall.

4. Periodic falls

5. Completion of extn.

6. Sealing off the panel.

3.0 Subsidence Surveys, Plans & Sections

3.1 The lines of observation or test lines for subsidence surveys should be carefully laid out. Whenever possible, the test lines may be laid out in the direction of and at right angles to the line of extraction. The levelling stations should be fixed not more than 6 m apart near the panel barriers and 15/30m apart elsewhere. The stations should be of permanent nature so that they are available for observations even after the completion of depillaring operations.

3.2 The lines of observation should extend beyond the panel upto a distance equal to the depth of the seam/The levelling should, however, commence from stable bench marks situated well outside the above zone.

3.3 The interval of time between the successive observations would vary depending upon various factors but such observations may be taken, at least once a month when the depillaring operations are in progress and also up to at least one year after the depillaring operations have been completed in the area and at lesser frequencies thereafter. This is to see if any further

subsidence is taking place and to ensure that the observation stations will be available for recording movements caused by any future workings.

3.4 Whenever practicable, spot levels should also be taken at the floor of overlying workings and at the roof of workings; underlying within 12m if any; these observations may cover the panel and at least a 30m fringe all-round.

3.5 Separate subsidence plans and sections may be maintained showing, inter alia :

- (a) observation points in the test lines;
- (b) depillared area and/or the area under extraction;
- (c) geological disturbance(s) if any;
- (d) extent of extraction (and dates) at the time of (i) first (local) fall (ii) first main fall;
- (e) extent of surface subsidence;
(where the overlying seam(s) have been depillared, the line of subsidence for the different seams should be shown in different colours.)
- (f) method of extraction;
- (g) a section of the strata overlying the seam under extraction indicating;
- (i) thickness and nature of overlying strata;
- (ii) condition of overlying and underlying seam if any; (whether they are depillared, virgin, etc.)
- (h) amount of subsidence from time to time;
- (i) angle of draw; and
- (j) the point at which maximum tensile and compressive strains were observed (indicate values thereof).

Subsidence plans may be prepared on the same scale at which the statutory plans are maintained. Sections showing total subsidence may be plotted to an exaggerated scale with the surface profile and relative position of the seam(s) and workings plotted to a natural scale.

4.0 Submission of copies of the records of ground movement observations, subsidence plans & sections:

One set of the records of ground movement observations together with copies of relevant subsidence plan(s) and section(s) shall be submitted to this office, soon after completion of depillaring operations.

5.0 This supersedes Circular 12 of 1962, 9 of 1963, 65 of 1975 and (Tech.) 1 of 1978, on the above subject.

(Cir. Tech. 4/1988)

12. Manner of extraction of pillars—The following conditions are usually incorporated in the depillaring permission letters while specifying the manner of extraction of pillars which are extracted in caving system—

- (i) Each pillar shall be split into two equal parts by driving a central split gallery, not exceeding 3.6 metres in width.
- (ii) Each half of a pillar shall then be extracted by driving slices, not exceeding 4.5 metres in width, so however that the area or roof exposure at any one working place shall not exceed 60 sq. m. at any time.
- (iii) While driving slices, a rib of coal, not less than 1.8 m in thickness shall, be left against the adjacent goaf. This rib may, however, be reduced judiciously on retreat.
- (iv) Not more than one slice shall be driven in a pillar at a time, and the extraction of a half of a pillar shall not be commenced until extraction of the adjoining inbye half of the pillar has been completed.

As would be seen, a coal rib of 1.8 m in thickness is recommended to be left against the goaf in each slice which is to be judiciously reduced on the retreat consistent with safety. It is considered desirable that similar precautions should be taken while establishing a connection of a split gallery which is to join into a goaf. Some fatal accidents have occurred recently when this precaution was not taken. Thickness of rib to be left in the split may perhaps be same as that required to be left in slices. As in the case of ribs left in slices, the same could be reduced judiciously in the split galleries also after setting strong breaker line of cog(s) and/or other means of artificial support adjacent to it.

(Cir. Tech. 14/1975)

13. Precautions against dangers from air blast—Under Reg. 100(5) of CMR 1957, managements are required to conduct depillaring operations by caving method in such a way as to leave as small an area of uncollapsed roof in goaf, as possible. Nevertheless, occasions might sometimes arise when roof in goaf remains uncollapsed over a large area. In order to minimise dangers from air-blast due to sudden collapse of such overhanging roof in goaf, it is requested that the following precautions may be taken :—

1.0 Isolations/Preparatory Stoppings

1.1 Initially, 1.5m x 1.5 m openings shall be left in sufficient number of isolation stoppings. The openings shall, unless required to be kept open, be covered with fire-resistant plastic sheeting of a type approved by DGMS, to serve a 'safety valve' in the event of an air blast. The openings shall be subsequently closed with brick in lime/cement mortar in vicinity of the area when fall of overhanging roof in goaf has taken place and danger due to air blast no longer exists.

1.2 Doors meant for closing the preparatory stoppings in emergency shall be taken off their hinges and kept laid flat on the ground in the vicinity.

2.0 Shelters

2.1 At suitable sites, shelters shall be provided where workmen may take refuge whenever an air-blast is apprehended. Every such shelter shall be located away from the probable path of air blast.

2.2 The shelters and the approaches thereto shall be kept free of any obstruction. Only cross-bars or roof bolts shall be used for support of roof at the shelters; vertical props and cogs shall be avoided.

3.0 Warning System

3.1 *Use of whistles:* The district Overman and Mining Sirdar shall be provided with whistles, and whenever any danger from air-blast is apprehended, they shall repeatedly blow the whistle to warn persons in the district and the vicinity.

3.2 *Use of convergence recorders :* In appropriate cases, such as areas prone to air-blast, adequate number (at least 15) of convergence recorders may be installed in the vicinity of the pillars under extraction. The amount of convergence may be measured once every shift and the daily rates of convergence computed and compared to obtain indication of impending roof-fall.

4.0 Withdrawal of persons

4.1 Obligation of work persons :

4.1.1 On hearing the sound of the whistle, all persons in the district and its vicinity shall take refuge in shelters provided for the purpose.

4.1.2. If a person is caught in the air-blast, he shall immediately lie flat on the ground, preferably in a gallery not in the direct path of blast.

4.2 Duty of Overman and Mining Sirdar : He shall, in addition to giving warnings, see that all persons employed in the district and those present in the probable paths of air blast take refuge in the shelters.

5.0 Additional measures

Such additional measures as may be considered necessary by the Manager shall also be taken.

6.0 Mock Drills etc.

6.1 Manager shall ensure that:

(a) only supervisory officials experienced in extraction by the caving method are deployed in the district, and

PARTICULARS OF STOWING ETC.

[See Reg. 100(6) of CMR 1957 read with D.G.M.S. Circular No. Legis. 1/1975]

Name of Mine Monthly Return for the month of 19

Name of Owner

Sl. No.	Name of District	Material stowed (sand or other materials)	Quantity of stowing done (in tonnes)	Quantity of coal raised (in tonnes)	Ratio of stowing done coal raised	Arrear in stowing if any (in tonnes)		Action taken to make up the arrears, if any	Remarks
						Name of panel	Quantity		

INSTRUCTIONS

The return should be submitted to the joint Director of Mines Safety and Director General of Mines Safety on the 10th day of every month.

Signature

Designation : Owner/Agent/Manager

Date :

(b) all concerned persons including the supervisory officials have been made fully conversant with these precautionary measures.

6.2 Regular mock-drills shall also be held so that every person in the district and its vicinity remains alert to perform his duty during an impending air-blast.

7.0 General

The manager shall hand over copies of this Schedule to all the supervisory officials concerned and shall also post copies thereof at conspicuous places in the mine.

(Cir. Tech. 2/1988)

14. Monthly return of quantity of coal raised and sand stowed, etc.—

Inviting your attention to Reg. 100(6) of Coal Mines Regulations, 1957, it is requested that in addition to the monthly information to be furnished to the concerned Joint Director in respect of quantity of coal raised and quantity of sand or other material stowed in every district in which voids formed as a result of extraction area stowed, particulars regarding arrears in stowing, if any, should also be included in the statement, panel wise.

For the sake of uniformity, the aforesaid information may kindly be furnished every month in the enclosed proforma, with copies to D.G.M.S. This may be accorded due priority.

(Cir. legis. 1/1975)

15. Precautions against fire-spontaneous heating—Attention is drawn to DGMS Circular No. 3 (Tech.) of 1975 regarding determination of crossing point and ignition point temperatures of coal seams for assessing their proneness to heating.

The Ministry of Coal through its SSRS's Standing Sub-Committee entrusted a S&T project to CMRS to prepare report on "Coal Classification and Fire Risk". In the report it has been concluded that in about 70% of cases assessment of proneness of coal seams to spontaneous heating could be made to a reasonable degree of accuracy

by studying the crossing point temperature and moisture content of coal seams; a coal seam with crossing point temperature more than 160°C and moisture content less than 2 percent is poorly susceptible with crossing point temperature between 140°-160°C and with moisture content between (2-5) percent is moderately susceptible; and with crossing point temperature between (120°-140°C) and with moisture content more than 5 percent is highly susceptible.

Managements are therefore advised to get the moisture content of coal seams also determined in a standard laboratory as per the procedure laid down in the Annexure. This information shall henceforth accompany the proforma for permission under Regulations 100 & 100A of Coal Mines Regulations, 1957. As regards determination of crossing point temperature the method laid down in the Annexure may be followed.

ANNEXURE

Standard Procedure for determination of Moisture Content & Crossing Point.

1. Determination of Moisture Content;

Moisture percentage of coal shall be determined in air oven with 60% relative humidity.

2. Determination of Crossing Point:

- (i) Amount of coal required—20 gms with size—72 to + 200 B.S. mesh.
- (ii) Rate of heating of bath 1°C per minute in air/glycerine media.
- (iii) Rate of oxygen flow—80ml per minute.
- (iv) Size and shape of reactor tube—20 cm x 2 cm ID with double walled spiralling around the reactor, (8 spirals), in the bath of oxygen intake for attaining the temperature of the bath.
- (v) Sampling of coal—Fresh R.O.M. lump coal of about 3 kg shall be collected and placed under water. During preparation of sample outer part of the lump should be scraped off before preparation of testing sample. Sample thus prepared should be used for experimental purposes within 24 hrs.

It is desirable that the sample collected should represent entire section of the seam to be depillared in one stage. Therefore it should be a channel sample of section of the seam or part thereof to be extracted in caving system etc. as the case may be. When the thickness of seam is such that it is to be extracted in different sections or slices, separate channel samples should be collected for each such section or slice and the Crossing Point and moisture content thereof reported separately.

(Cir. Tech. 3/1994)

CMR 100A

Prevention of accidents in mechanised longwall coal mine—In the recent past two fatal accidents occurred in longwall powered support workings of a coal mine. The causes of the accidents are given below.

1. While a crew of five piece rated mazdoors were engaged in inserting one front leg of a shield support in the salvage gallery, the other front leg holding the canopy suddenly closed causing the canopy to collapse inflicting serious bodily injuries to two of them. One mazdoor succumbed to his injuries.

2. While a cableman cum lockout switch operator, standing between the spill plate of the Armoured Face Conveyor and the front legs of the hydraulic chock, was attempting to operate a lockout switch to stop the APC after a roof fall, a piece of roof shale measuring about 1.45 m x 0.45 m x 0.45 m thick fell down from a height of 1.7 m on the AFC and hit him inflicting serious bodily injury to which he succumbed one hour later.

properly to the leg, the staple pin required to be put for locking the hose in place was either not fully inserted or broke while being inserted. The supervisor overseeing the operation was held responsible for the accident.

In the second case, it was found that the Code of Practice was not followed by the mining sirdar and the deceased. The overman in-charge also did not ensure compliance of the code of practice.

In both cases, it came to light that established systems for doing a particular job at the longwall face were not followed and supervision was slack.

In highly mechanised operations strict compliance to statute and systems cannot be over emphasised. It is necessary to frame relevant Codes of Practices for various operations and follow them strictly. The necessity of on-going training plan for all workers get highlighted by such tragic losses of life.

In view of the above, I once again draw your attention to the aspects mentioned above and advise, that:

- (i) Strict supervision be ensured at all places in a mechanised operation.
- (ii) Proper codes of practices be framed for all operations in longwall mines and their implementation ensured, and
- (iii) Only properly trained workers are deployed at longwall and other mechanised face operations.

(Cir. Tech. 4/1999)

CMR 102 / MMR 107

1. Supports in mechanised mines—It is the general experience that as mechanisation increases, chances of multiple accidents also increase. Although the total manpower required for the same output is less, there is greater concentration of men at a few places. Considering this matter, the safety in Mines Conference (1958-59) considered that more attention should be paid to the support of strata in mechanised mines. For this purpose it is necessary to have a proper organisation for erecting supports.

(Cir. 15/1959)

2. Use of steel supports and proper maintenance of supports—Fatal accidents due to 'Falls of roof and sides' continue to constitute the largest percentage of total accidents in mines. Nearly half of the total fatalities in mines are due to this single cause, which is also responsible for about 1/9th of the total serious injuries.

In most of our mines, timber supports are used at present. The accident rate in the collieries belonging to one of the major private coal concerns in Raniganj Coalfield, where steel supports have been introduced, has come down remarkably to less than half and even less in some cases.

Serious thought should be given by all collieries for introducing steel supports to reduce accidents. The type of steel supports to be used would of course depend upon the local condition,

but in most of the cases ordinary type of rigid/steel cum timber/friction steel supports should serve the purpose. In a few special cases Hydraulic yielding type of steel supports may be necessary.

Maintenance of supports— Cogs and crossbars set in mines generally remain loose, and therefore do not serve the purpose of providing effective roof support; what is still worse, they give a false sense of security. It is therefore necessary that steps are taken to keep the timber supports tight at all times, and in order to ensure this it may be necessary to appoint separate gangs of timber men who should be mainly entrusted with the job of proper maintenance of supports already set in the workings.

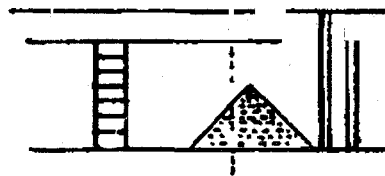
(Cir. 29/1964)

3. Support of partially stowed areas—A few fatal accidents from falls of roof occur every year to persons entering partially stowed galleries either for removing stowing pipes or for erecting or repairing stowing barricades. Investigations into such accidents have revealed that no arrangements were made at the site of accidents to support the roof. Perhaps, it is a general practice to withdraw supports from the places where sand is to be filled. But even in these areas wherever persons have to work, pass or remain for any length of time, adequate supports for their safety need to be left or erected till the voids are fully stowed.

(Cir. 30/1971)

4. Accidents while taking coal from roof— It is a common experience that when coal is brought down from roof, supports, if any, are generally withdrawn first. The ledge inbye of the working places sometimes goes without supports. On the other hand, the ledge is progressively rendered weaker. It is also inevitable that part of the coal brought down from roof goes beneath the lip of the ledge.

Many accidents occur by fall of the ledge on workers while they go beneath it to collect coal. Such accidents may be avoided if the part of the coal lying directly beneath the ledge is left to be loaded during the next operation. It will thus be necessary to leave some coal unloaded at the end of the shift to be loaded by the workers of the next shift.



The principle of this precaution is illustrated in the sketch. It is expected that if this simple practice is introduced in collaboration with the supervising staff and the loaders; there may be a considerable reduction in the accidents by falls of roof.

(Cir. 59/1973)

5. Accidents due to Falls of Roof : Danger from ledges in roof coal or stone— Quite a few fatal accidents occur every year due to falls of roof off ledges in coal or stone. Whereas it is no doubt desirable to avoid formation of ledges, it may not be a practicable proposition in certain cases specially when the roof is to be heightened during the depillaring

operations in a thick seam, or when the immediate roof is weak, and it is to be dressed at some places like the junctions of development galleries. In all such cases, it is necessary to keep the lips of the ledges adequately supported by artificial means e.g. either by a set of 2/3 cross bars duly kept lagged and/or by props etc. in a depillaring area. In development workings, a system of roof bolts could also be tried with suitable precautions. What is however important in every such case is that whatever form of artificial support is set, it must be erected immediately that is, soon after formation of the ledge, and kept tight at all times; for which purpose a separate maintenance gang may be appointed, if necessary.

When the ledge is of a thickness more than say one metre some form of additional protection may also become necessary to prevent danger from any overhanging side of the lip which cannot be safely or conveniently dressed down. In such a situation, either a special form of artificial support may be designed or the timber or steel support extended beyond the ledge so as to provide an overhead protection against any loose pieces of coal or rock inadvertently falling over work persons. This type of structure is usually being provided in the depillaring districts of some mines where extraction of thick seams is done in caving system, and it has proved to be a fairly satisfactory device.

Managements are requested to take suitable action in the matter of avoiding accidents to fall of roof off ledges, as and when required.

(Cir. Genl. 5/1975)

6. Immediate support of slip or other planes of weakness—While enquiring into accidents due to falls of roof it has been revealed that planes of weakness like slips etc. though visible and known to the supervisory staff are not timely supported. While setting permanent supports suddenly roof comes down involving timber men in such accidents.

It is prudent and desirable that soon after a slip or other plane of weakness is exposed, the place shall be temporarily supported which shall be replaced by permanent supports at the earliest to minimise accidents of this nature.

(Cir. Tech. 5/1977)

7. Support of freshly exposed roof—Many accidents occur, both in development and depillaring areas, due to fall of roof, while loaders are engaged to load blasted coal.

In depillaring areas, the first row of supports at slices generally consists of only props. These are usually knocked down by blasting and cannot be re-erected, on account of inaccessibility, till the blasted coal is lifted. The loaders have, therefore, to work under completely unsupported, freshly exposed roof and are thus exposed to an avoidable risk. This can perhaps be avoided if the first row of supports contains at least one strategically placed cog so as to suffer minimum damage due to blasting. The cog will no doubt be disturbed and some coggings sleepers thrown off but the cog can be expeditiously re-erected, with due precautions, on the few coggings sleepers left at bottom on solid floor, thus providing much needed support for the loaders. Even a few cantilever supports can be provided over the cog so as to provide a protective canopy, if necessary. This has been tried out in a colliery with promising results.

In development areas, where nature of immediate roof necessitates supports, freshly exposed roof, after blasting, may be supported by means of cantilever supports sliding over crossbars, before employment of loaders.

It is suggested that, these simple practices may be introduced in all mines on a trial basis.

(Cir. Tech. 9/1977)

8. Reporting of every major roof fall—The single biggest cause of fatalities in coal mines continues to be fall of roof and sides, which accounts for more than half the total number of fatalities in underground coal mines. There has been no appreciable change in this position over the years. It is, however, expected that with the implementation of the recommendations of Fifth Conference on Safety in Mines (December 1980) to the effect that no worker shall be permitted to work under unsupported roof that has been freshly exposed, a substantial reduction in the fatal accidents due to this major cause group will be achieved.

2.1 Occasionally, there are incidents of fall of roof and sides in mines which fortunately do not cause injury to any person, but provide a definite and useful indication of the behaviour-pattern of the roof under specific geo-mining conditions. It is, therefore, important that every major fall of roof should be carefully investigated. This could be done by the Safety Officer of the mine as well as Internal Safety Organisation and a report made.

2.2 For an overall assessment of the situation, it is desirable that this office should also be kept informed about occurrence of every major fall of roof or side as already advised vide DGMS Circular No. 63 of 1973. While doing so all relevant particulars like dimensions of fall, depth of cover, nature of immediate roof, age of working etc. should be furnished within 24 hours of the occurrence alongwith a plan and section showing the site of occurrence and section of strata. Precautionary measures taken or proposed to be taken to deal with the situation and to prevent such occurrence in future should also be intimated.

(Cir. Tech. 7/1983)

9. Accidents in coal mines due to ground movement— This Directorate brings out every year an annual report on the administration of Mines Act in all mines in the country. The report for the year 1985 was released in the month of Nov. 1986. You may like to obtain a copy of the same to look at the national picture about safety and health of persons employed in mines. One chapter in the said report deals with accidents in coal mines. Some of the salient features of the analysis presented in this chapter regarding accidents due to falls of roof and sides are presented below for your attention.

2.0 Death rate per thousand persons employed in our coal mines dropped from 0.91 in the year 1951 to 0.65 in 1961; to 0.60 in 1971; to 0.36 in year 1981 but since then it has remained almost stagnant.

2.1 Cause-wise analysis of fatal accidents shows that ground movement continues to be the major killer. During the year 1985, ground movement was responsible for 43.8% of the fatal accidents. A break-up of fatal and serious accidents due to this cause during the year 1985 is given below—

Cause	Fatal Accidents			Serious accidents	
	Number	Persons killed	Persons seriously injured	Number	Persons seriously injured
1. Fall of roof	56	74	19	68	81
2. Fall of sides					

(a) belowground	16	23	6	80	82
(b) opencast	5	5	1	5	6
Total	21	28	7	85	88
3. Other (Bumps)	1	1	—	2	2
Total	78	103	26	155	171

2.2 An analysis of fatal accidents due to falls of roof revealed that:

(a) All the accidents took place in Bord and Pillar workings or drivages.

(b) Nearly 34% of the accidents took place in development workings; 35% in depillaring districts and 13% outside the working districts. The corresponding figures for the year 1984 were 41, 49 and 10 respectively.

(c) Of the accidents which occurred within the working districts (both development and depillaring), nearly 63% took place at and within 10 metres of the working faces. The corresponding figure for the year 1984 was 67%. If we consider only development districts, then 44% of the accidents in such districts took place at and within 10 metres of the faces.

(d) In 39% of the accidents, there were falls at junctions as compared with 36% in 1984.

(e) In 57% cases falls of roof occurred due to inadequacy of supports as compared with 60% during the year 1984.

(f) In 55% of the accidents height from which the roof fell was between 1.6 and 3 metres; in 38% cases more than 3 metres and in 7% cases upto 1.5 metres. Corresponding figures for the year 1984 were 64%, 26% and 10% respectively.

2.3 From the above analysis one would conclude that 57% of the accidents due to falls of roof can be controlled if due care is taken to erect supports according to S.S. Rules. And, since checking for, dressing and securing roof upto a height of 3 metres do not present any serious problem, a sizeable chunk of accidents due to this cause group could be prevented if these aspects are taken care of.

2.4 The Sixth National Conference on Safety in Mines held at New Delhi in January 1986 had deliberated upon the subject and had recommended that mine managements should prepare and enforce "Support Plan" for each mine. Even after a lapse of a year, there has not been much progress in the matter. An immediate action is called for to strictly comply with this recommendation in order to make a break-through in reduction of accidents due to falls of roof.

3.0 Out of sixteen fatal accidents in underground workings due to falls of sides, ten took place in depillaring districts, three in development districts, one near the junction of gate roadway and a longwall face, one in disused workings and one in a tramming roadway. In fourteen cases (i.e. in about 87% of the fatal accidents due to falls of sides belowground) the sides were not properly dressed or supported.

3.1 In depillaring districts spalling of sides is a common phenomenon and a constant watch by supervisory officials to assess the condition of sides is required. Overmen and sirdars should, therefore, frequently inspect the places where work persons are engaged and such officials should not be burdened with any work which requires their absence from the district under their charge.

4.0 It is hoped that serious and concerted efforts will be made by all concerned to make and keep secure the roof and sides of all working places and travelling roadways in our mines.

(Cir. Tech. Sapicom. 4/1987)

10. Fatal accidents by fall of roof in u.g. coal mines— Fall of roof is still the preponderant cause of fatalities in belowground coal mines, inspite of considerable advances made in the area of roof-support, accidents due to fall of roof keep on posing serious threat to the life and safety of persons working belowground. In order to gain meaningful insight into the incidents of fatal accidents caused by fall of roof in Indian coal mines during the year 1993, an exercise was undertaken in this Directorate. Some of the findings are given below:

- (i) In the year 1993, there were 47 fatal accidents killing 54 persons due to fall of roof in underground coal mines.
- (ii) Roof fall accounted for 30.13% of all fatal accidents in coal mines and it contributed 46.53% of all fatal accidents in belowground operations.
- (iii) 55% of the fatal accidents due to fall of roof were in depillaring districts and 38% took place in development areas.
- (iv) 34% of the accidents took place within one hour of blasting and 10.6% of the accidents occurred within 2 hours of blasting. In development districts 55.5% of the accidents occurred within one hour of blasting.
- (v) In all 61.7% of the cases took place within 10m effaces. In case of accidents due to roof fall in development districts, 77.8% of the cases occurred within 10m of the faces and in depillaring districts the same figure was 58%.
- (vi) As far as the types of roof which fell causing fatal accidents are concerned, all types of roof were found involved as would be seen from the following figures :

<u>Types of strata that fell</u>	<u>% of accidents</u>
Sandstone	34
Coal	31.9
Shale	23.4
Others	10.7

- (vii) In 62% of the cases conventional timber support was used. In 8% of the cases, roof bolts were in use but these were either inadequate or not correctly installed.
- (viii) It was also revealed that in 34% of the cases supports provided were inadequate, in 21.3% of the cases the supports got dislodged after blasting and in 19% cases supports were not provided at all.

Findings of the analysis reveal that though attention has been drawn time and again towards unsafe acts and practices leading to fatalities, similar accidents continue to occur year after year. To control and minimise accidents due to fall of roof in underground coal mines, the following steps shall be taken immediately :

(a) Recommendations of the Eighth Conference on Safety in Mines regarding prevention of accidents in coal mines due to fall of roof should be implemented strictly without further delay. [See D.G.M.S, (Tech.) Circular No. 2 of 1993].

(b) D.G.M.S. (Tech.) (Sapicom) Circular No. 3 of 1993 elaborates guidelines for preparation of Support Plan. The recommendations made in the circular, if implemented, will go a long way in curbing roof-fall accidents.

(c) Some of the accidents took place following dislodgment of supports, improper installation of roof-bolts etc. These reiterate the need for proper use of support material & adequate strength and proper installation of the same. In case of roof bolts, proper type of grout should be used so that the roof bolt developed an anchorage of atleast 3 tonnes within 30 minutes of grouting. Adequate infrastructure facilities should be provided to test atleast 10% of the roof bolts installed and to impart training and retraining of support personnel based on the roof-bolting records. Attention is drawn towards D.G.M.S. (Tech.) (Sapicom) Circular No. 6 of 1994 in this regard.

(d) A number of accidents occurred inside gloves or at places where the workmen had no business to be present. These accidents also revealed that fencings wherever required were not erected as per requirements of statute. Strict vigil on correct erection and maintenance of fences should be maintained so that these types of failures are avoided in future.

(Cir. Sapicom Tech. 3/1995)

11. Accidents due to fall of roof in coal mines : Causes and prevention—Accidents due to movement of strata has been, and is, the major concern of mining engineers as withdrawal of natural support is a logical sequel to the process of mineral exploitation in underground. Over the years, compiled statistics of accidents in Indian coal mines identified the major cause of mine accidents as 'fall of roof'.

In 1980, the fifth conference on safety in mines reviewed some of the developments in support technology and emphasised the need for further work in this direction. The sixth conference on safety in mines (1986) made some pioneering recommendations as regards to 'Accidents due to fall of roof & sides' and suggested some basic changes in the process of formulation of support plan, which were duly followed up by seventh conference on safety in mines (1988). The eighth conference on safety in mines (1993) made some vital recommendations regarding the use of Rock Mass Rating in formulating support design and adoption of roof bolting as a method of support.

The Coal Mines Regulations were amended in 1990, to provide statutory backing to the recommendations of the sixth conference on safety in mines. As per the amended provisions of Reg. 108 of CMR' 1957, the manager of every mine is required to frame and enforce systematic support rules for supporting, amongst others, the roof within 10m of working faces with due regard to the physico-mechanical properties of strata, local geological conditions, system of work, mechanization and past experience. Regulations 109 and 110 of CMR' 1957 were also amended to take care, inter-alia, of different types of steel supports being introduced to replace traditional timber supports. In this connection, Technical Circulars [D.G.M.S. (Tech.) (Sapicom) Circular, No. 3 of 1993, Circular No. 6 of 1994 and Circular No. 3 of 1995] were issued concerning the methodology of support design, use of roof bolts in coal mines and fatal accidents to underground coal mines respectively.

1.0 ACCIDENTS DUE TO STRATA MOVEMENT-REVIEW

Statistics of accidents due to movement of strata has been sending warning signals to all concerned for quite some time. In coal mines, as many as 10 recorded disasters (about 20% of the total) involving 140 deaths were caused by the movement of strata. The trend analysis of accidents in last ten years points to the fact that 'fall of roof continues to be the predominant cause of fatal accidents in underground coal mines.

A critical analysis of different aspects of roof fall accidents spanning a period of four years (1992-95) has revealed many interesting details relating to the event:

- A Substantial percentage of accidents (34% to 43%) occurred involving 'coal' roof.
- Thickness of fall in 70% to 85% cases was less than 0.5m.
- Roof bolting was not practised generally, even in coal roof (only about 13% coal roof was supported by bolting).

A sample analysis of accidents for the period from 1992 to 1995, where roof bolting were used as primary means of support, revealed that:

- Support by roof bolting was either inadequate or got dislodged/was not provided at all.
- In most of the cases, accidents were caused due to 'system failure'.

2.0 SUPPORT APPRAISAL IN BORD AND PILLAR WORKINGS IN COAL MINES

With the advent of modern coal mining techniques associated with increased mechanisation or solid blasting, it has become imperative to adopt 'Roof bolting' as a primary means of support in place of traditional timber supports which act as a hindrance for achieving higher productivity, apart from economic and socio-ecological considerations. The fusion of this state-of-art support technique vis-a-vis methodology of mining in underground coal mines started only a decade back and the process of assimilation is still not complete as yet.

2.1 In this back-drop, an accident took place in a coal mine in 1990 (where cable bolts were used as an exclusive means of support in a development area) killing four persons. This accident jolted all concerned associated with the introduction of this new system of support. The observations at the site of accident revealed that:

- Support was not provided in a systematic manner.
- Support density was not adequate.
- Holes drilled for installation of cable bolts were 1.0m deep.
- Cable bolts were not grouted for the full column in cement and sand mixture.
- No anchorage tests were carried out to ascertain the efficacy of installed cable/rope bolts.
- No study on strata movement monitoring was conducted.

2.2. In the light of this unfortunate occurrence, it was thought appropriate to carry out an appraisal of support system where roof bolts were in use as principal means of support, encompassing a broad spectrum of geo-mining conditions and an array of work systems, to identify the grey areas required to be atoned. In 1991, a study was undertaken in coal mines to look into the details of (a) formulation of support system and (b) strata and support behaviour monitoring. The finding of the study covering 15 mines of 5 different coal companies was summarised as follows:

- (a) Roof bolting was applied in most of the mines without assessing the support requirement on the basis of RMR, leading to under designing or over designing of support system.
- (b) Monitoring of support performance did not receive the attention. In all the cases, the percentage testing of bolts for their anchorage capacity was far below the required 10%, recommended by the expert committee.
- (c) Records of such limited number of testing carried out were not even maintained in proper manner.

(d) The monitoring of strata behaviour was literally non-existent.

To sum up, it could be inferred from the study that the progress of absorption of 'Roof Bolting systems designed on the basis of RMR' in Indian underground environment was poor and incomplete largely due to lack of a comprehensive approach. This gross deficiency may have serious consequences from the point of view of safety.

Efforts were made to correct the various imbalances but without much success.

2.3 In 1996, a roof fall accident took place in the development district of a coal mine killing four persons and seriously injuring five. In this district roof bolting was used as primary means of support. An investigation was conducted to ascertain the efficacy of support system in the development district of the mine where accident took place. The investigations revealed that:

(i) Assessment of installed support system— Support of roof in the galleries and at the junction (accident site) was grossly deficient. Only about 25% and 15% support was provided at galleries and junctions respectively.

(ii) Support accessories— 15mm dia. roof bolts rods were used in place of 20-22mm diameter M.S./Tor-steel rods. The hole diameter was 20-22mm larger than the bolt diameter whereas the said value should be between 8-12mm. This larger annular space in the hole may cause increase in grout consumption and 'Sheath effect' i.e. poor mixing of the grout constituent resulting in 'poor' anchorage.

(iii) Cement Capsules—The infrastructure provided for the manufacture of the cement capsule was not adequate, there was no mechanism to monitor the quality control aspects of the (a) ingredients/chemicals used in the capsules, and (b) prepared cement capsules. It was revealed that :

- The mixing operation was not generally supervised by skilled/ experienced person.
- Identification number(s) was/were not given to prepared cement capsules.
- No record whatsoever detailing the composition of the manufactured cement capsules was maintained.

(iv) Installation of roof bolts— The roof bolts were not installed in a systematic manner. The spacing between the holes in a row and the distance between rows were not maintained. Moreover, the holes were drilled in different directions with widely varied angle of inclination. Bearing plates were also not provided in the roof bolts.

As far as systematic installation of roof bolts was concerned, the enquiry revealed a distinct lack of understanding on the part of management (local mine operators) and supervisors. The level of awareness amongst them about the provisions of DGMS Circulars, concerning use of roof bolts in coal mines was dismal. Proper training was also not given by the management to the officers/supervisors, before and during the introduction of roof support by bolting, in the mine. The details of installation of roof bolts were not entered in the daily report book maintained by the supervisors of the shift concerned and no effort was made on the part of management to introduce a system of recording and monitoring, in this regard.

2.4 Assessment of roof bolting system—As a part of the study, laboratory and field tests Were carried out whose findings are summarised below :

At the accident site (junction of 6th D/R & 8th level), the results of testing point to the fact that although the bolts had a setting time of more than 72 hours, the anchorage capacity varied widely

between 0 tonne and 5.4 tonnes. Further field tests conducted in the development district of the mine revealed that :

No anchorage developed after 2 hours setting (old seized capsules) with 15mm diameter roof bolts.

Anchorage developed after 2 hours, 8 hours & more than 24 hours setting (new cement capsules) with 22mm diameter roof bolts, were of the order of 1.0 T, 2.5 T and 6.0 T only.

Apart from the above, collected samples of cement capsules and roof bolts (15mm dia) were sent to an approved Rock Mechanics Laboratory for ascertaining their efficacy as support material. The results of the said tests revealed that the anchorage developed after 2 hours & 8 hours setting was of the order of 0.0 T & 0.25 T, respectively.

2.5 Monitoring of roof bolts—Only one anchorage testing machine was available for testing of installed bolts in three different district of three different pits which was totally inadequate to meet the standards of testing as envisaged in DGMS (Tech) (Sapicom) Circular No. 3 of 1993. About 2.5% installed bolts could be tested for ascertaining their anchorage capacity and a maximum 5 tonnes load was applied during testing. The records of such tests were not maintained in proper format resulting in loss of much valuable information required for carrying out an analysis on the performance of the support system and adoption of corrective measures, if needed. Proper training was also not imparted to the officers/supervisors, incharge of testing operations, on systematic monitoring of roof bolts.

2.6 Strata behaviour monitoring—No study was conducted by the management to monitor the behaviour of roof rock supported by bolts, as envisaged in D.G.M.S. (Tech.) (Sapicom) Circular No. 3 of 1993.

3.0 RECOMMENDATIONS

A review of roof bolting practices has revealed that although bolting was used as primary means of support in some selected coal mines, proper attention was not given to design, installation and monitoring procedure of roof bolts, thereby jeopardising the safety of work persons. Keeping in view the guidelines contained in DGMS (Tech.) (Sapicom) Circular No. 3 of 1993. Circular No. 6 of 1994 and Circular No. 3 of 1995 read with Reg. 108 & 109 CMR' 1957 the following steps may be taken to effect qualitative improvement in the existing scenario :

3.1 Systems approach— An integrated systems approach to develop the support design and implement it in the mine in the form of an action plan (annexure-I) for coal mines, is suggested.

3.2 Design of roof bolting system—The assessment of support requirement should be done on the basis of Geo-mechanics classification approach, as recommended vide D.G.M.S. (Tech.) (Sapicom) Circular No. 3 of 1993, for particular geo-mining condition. Whenever changes are proposed in roadway dimensions or methods of working, or where geo-technical conditions change, further design verification by fresh RMR studies needs to be carried out to assess the continued validity of the design.

3.3 Support materials—The following materials should only be used.

3.3.1 Roof Bolts

Materials: Tor-steel/M.S. (IS : 1786-1985/IS : 226-1975/IS : 1570

Rod length: 1.5m

Rod diameter : 20-22mm (ribbed bar)

Length of the thread : 125-150mm

3.3.2 Bearing plate (IS : 226-1975)

Material: MS

Size: 150mm sq. or equivalent

Thickness: 6mm

3.3.3 Nut (IS: 1363, Part-3, 1984)

Shape: Hexagonal

Height: 20mm

3.3.4 Cement capsules

Length: Not exceeding 400mm

Diameter: 30-32mm

Type: Quick setting (the grout should provide a minimum anchorage of 3T after 30 minutes, and 5T after two hours of setting.)

3.3.5 General requirements

(a) Roof Bolts shall be commercially straight, sound and free from harmful surface defects.

(b) Threads in the bolts shall preferably be rolled so that the strength of the bolt is not reduced.

(c) The threads on bolts and nuts shall conform to tolerance class of 8g and 7H respectively (IS; 4218-1967).

(d) Nut shall be compatible with bolt.

(e) Threads of the bolts shall be kept lubricated and suitably protected.

(f) Bolts/capsules shall be marked with the following information at visible places:

(i) Manufacturer's name

(ii) Dia. of the bolt/capsule

(iii) Length of the bolt/capsule

(g) Packing

(i) Bolts shall be packed in cleaned condition

(ii) The cement capsules shall be packed suitably with batch no., month of manufacture etc., so that they are not damaged during transit.

(h) Quality control: Strict quality control shall be exercised during manufacture of the cement capsules/roof bolts. The manufacture of cement capsules/roof bolts should be batch tested before packing and dispatch.

3.4 Installation of roof bolts— Roof bolts should be installed, as soon as the roof has been exposed, incorporating following steps, under the direct supervision of an Under Manager/Overman.

3.4.1 Drilling of holes— As per design, the holes should be drilled to the correct diameter and length, with a suitable drill. The hole diameter, should not be more than 8 mm to 12 mm larger than the bolt diameter, for full column cement grouted bolts. Due care should be taken to maintain the verticality/inclination of the holes.

3.4.2 Grouting of roof bolts— Where fast and slow bonding materials are used together (i.e. in case of pre-tensioned grouted bolts) it should be ensured that fast capsules are inserted first. All operations shall be carried out under supported roof (temporary support).

The following steps in sequential order shall be taken to install the roof bolts :

- (a) Soak the cement capsules (quick setting type) in water and allow it to absorb water until the bubbling ceases.
- (b) Remove the capsules from water and insert into the bore hole. Push the capsule to end of the bore hole.
- (c) Tamper firmly with a stemming rod until the required number of cement capsules have been inserted.
- (d) Insert the rock bolt into the hole and push it home.
- (e) If necessary push the rock bolt to the-bottom of the hole with suitable mechanical means.
- (f) Fit a bearing plate and a nut. Tensioning should be provided only after the prescribed setting time has elapsed.

3.5 Monitoring of support performance— At least 10% of installed roof bolts should be invariably subjected to anchorage testing (at random) under the direct supervision of Under Manager and the results of such tests should be maintained in the prescribed format (Annexure-II). The minimum anchorage strength of the bolts should not be less than that of value, which has been considered for design of support system. The following points should be kept in view, while conducting testing.

3.5.1 Testing should be always carried out under a properly supported roof, with a suitably designed anchorage testing equipment.

3.5.2 The roof bolt load should be increased smoothly and gradually. About 9% bolts should be tested upto the designed capacity and rest 1% may be subjected to destructive testing. The tested bolts should be identified with tags bearing the record of load applied on them.

3.5.3 The anchorage testing equipment should be subjected to regular maintenance and calibration.

3.6 Monitoring of strata behaviour—Measurement of roof-floor convergence should be an essential part of monitoring strata behaviour scheme. A suitable approach may be used for estimating the critical value of the convergence vis-a-vis gallery size and Rock Mass Rating, in a particular ge-mining condition.

3.7 Supervision—Roof bolting operations in the mine may require the service of a group of dedicated technically qualified personnel headed by an Asstt. Manager/Strata officer.

(Cir. Tech. 3/1996)

CMR 105/MMR 109

- 1. Public Works**— In pursuance of Reg. 105 of the Coal Mines Regulation, 1957, the Central Govt. has directed that the works, specified in column I of the Schedule below shall be public works for the purpose of the said Regulation and that a copy of the application for permission in relation to these works required to be submitted to DGMS under sub-regulation (1) of the said Regulation shall also be sent to the authority specified against the respective works in column 2 of the schedule.

SCHEDULE

1	2

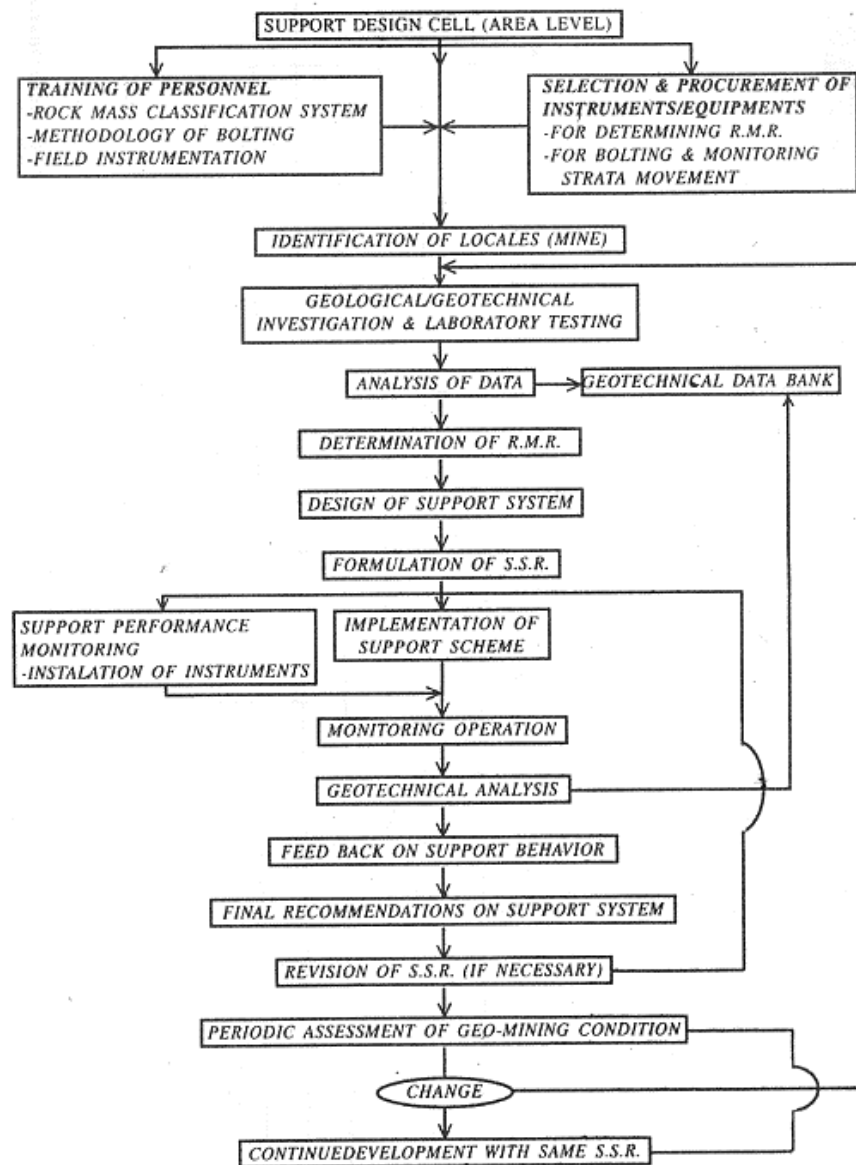
(a) Aerial ropeways	The public authority owning the Aerial Ropeway.
(b) High-tension transmission lines	The public authority owning the transmission lines.
(c) Water and gas 'mains' above 60 cm. dia.	The public authority owning the water or gas 'main'.

Govt. of India-Ministry of Labour-Order No. S.O.FM-1(94)58 dt. 11th Dec. 1958.

2. Inspection of workings beneath important surface features—In order to keep a check on the condition of workings (both present and disused) beneath and within the statutorily restricted areas for

DGMS

ANNEXURE-1



SUGGESTED SYSTEMS APPROACH TO DEVELOPMENT SUPPORT DESIGN IN COAL MINES

ANNEXURE-II

ANCHORAGE TESTING DATA SHEET

COLLIERY/MINE : COLLIERY/MINE ID : EXPERIMENT
SECTION : SEAM : CONDUCTED BY :

Location	Date & time of testing	Bolt ID	Bolt No.	Bolt length & (dia)	Dimension of bearing plate		Date & time of installation	Grouting		Physical condition of bolt	Load applied (tonne)	Displacement (mm)	Remarks*
					Area (mm ²)	Width (mm)		Type	No. of capsules				

* State whether failed/not failed

Manager Asst. Manager/Strata Control Officer Name & Signature of Undermanager

- (a) rivers and jores etc.
(b) roads and railways,
(c) dwellings and other structures.

- (1) It is considered advisable that a regular inspection of such workings should be made once at least in every month by a person holding an overman's certificate or a manager's certificate and written record of such inspections should also be maintained, and duly countersigned by the manager.
- (2) Such workings should be inspected once atleast in every 3 months by the manager personally. Protective measures, as and when necessary, should be taken to keep the workings in a satisfactory condition.
- (3) All the approach roads to such workings should be kept adequately supported.
- (4) To facilitate inspections, each pillar of such workings should be marked all round on the sides, at a convenient height, by a white band in lime wash having width not less than 15 cm.

(Cir. 1/1960)

3. Inspection of disused workings—Statutory inspections of disused workings (which have not been sealed off) are to be made by the supervisory staff—overmen and sirdars—to check for the presence of gas and coal dust etc., so as to see that such workings are also properly ventilated, treated with inert dust, adequately supported and are generally kept in a safe condition. Checks made by the officers of this department, however, show that these workings are not always maintained in the desired condition. This may be due to the reason that the supervisory staff charged with carrying out the inspection either do not properly make inspections or take inadequate steps to remove the dangers and deficiencies observed by them.

It therefore seems desirable that, in addition to the statutory inspections by the supervisory staff, the manager or his assistant manager should personally inspect the disused workings once at least in a month, and take necessary measures to ensure that these workings are also maintained free from dangers of falls of roof and sides, inflammable and noxious gases, coal dust etc. Check inspections shall be made by the manager himself or by an assistant manager holding a manager's certificate and results thereof and recorded in the diary maintained under Reg. 41(1) (b) of the Coal Mines Regulations, 1957.

4. Maintenance of approach roads beneath important surface features—

A question has arisen as to how long approach roadways to workings beneath important surface features are to be maintained and whether they have to be maintained after the mine starts depillaring,

As long as the mine workings on the outbye side of the workings in the restricted areas are not depillared, at least two such approach roadways should as far as possible, be maintained in good condition. As however such approach roadways lock up considerable quantities of coal, the maintenance of these roads cannot in the larger national interest of coal conservation, be justified after the depillaring operations in workings public these restricted areas are started. Before the approach roadways are cut off, however the owner, agent or manager shall ensure that the restricted workings under the surface features are in stable condition or have been stabilized, where necessary; and should give the JDMS concerned atleast 30 day's notice of the intention to cut off the approach roadways.

(Cir. 8/1962)

5. Review of old permissions granted under Regulation 105 of Coal Mines Regulations, 1957/Land Acquisition Mines Act 1885, prior to 31.12.1970—It is observed that mining operations have not commenced in case of some mines in spite of the fact that they were given permission for development/depillaring beneath railway acquired land long ago. Since the conditions as compared to those prevailing at the time of granting the permission in the past might have changed by now, such permissions need review from this Directorate.

It is therefore advised that in all cases where permission for development/depillaring under the railway acquired land was granted under Regulation 105 of the Coal Mines Regulations, 1957/Land Acquisition (Mines) Act, 1885, prior to 31st December, 1970 but no mining operation had since been done, commencement of mining operation now on the basis of old permission shall not be undertaken unless a fresh application is made by the colliery concerned and the permission is reviewed by the Directorate.

(Cir.Tech. 2/1979)

6. Applications for permission under Regs. 105 and 126(2)—In many cases a number of separate applications from the same colliery are received in this office for permission to work under:

- (a) railways, roads, buildings, etc. (Reg. 105), or
- (b) rivers, tanks etc. [Reg. 126(2)],

As such applications are received separately and at different times, they necessitate a number of separate visits by Inspecting Officers to the mine. Such repetition of work could be avoided if the management of every mine, after a full consideration of the matter as relating to the whole mine, submits together all applications in respect of working different seams under different surface features.

(Cir. 40/1960)

CMR 107

1. Neighbouring mine to be informed when approaching within 60 m of boundary—Provisions of Reg. 59(40) (a) (ii) of the Coal Mines Regulations, 1957 lay down that the plans kept under clause (b) of sub-regulation 1 of the aforesaid regulation shall show the workings of all adjacent mines as are situated within 60 metres (measured on any plane) of the boundary claimed by the owner of the adjacent mine. This regulation casts the responsibility of showing the extent of the workings of the neighbouring mines on the Owner, Agent or Manager of the Mines, who is expected to enquire the position from the neighbouring mines.

It has been observed that in a large number of mines the provisions of this clause are not being complied with because the owners of the neighbouring mines do not intimate the fact of the working of their mine having approached within 60 metres of the claimed boundary.

All concerned are advised that whenever the workings of mine approach within a distance of 60 metres of the settled boundary or in case of disputed boundary within 60 metres of the boundary claimed by the owner of the adjacent mine, an intimation about this fact shall be sent to the Owner, Agent or Manager of the neighbouring mine as well as to the Director and Joint Director incharge of the Zone/Region.

(Cir. 4/1971)

2. Re-adjustment of boundaries: Applicability of Reg. 107—After the nationalisation of coal mines, general re-organisation of mines has been taken up and in that process smaller mines have been/are being amalgamated to form bigger units. Since all the mines in a area/coalfield now belong to one 'owner' namely, one or the other public sector undertakings, strictly speaking the provisions of Reg. 107 of the Coal Mines Regulation, 1957 are not attracted in amalgamation of small mines belonging to the same owner. All the same, such re-adjustment of boundaries with a complete and thorough study could be a possible source of danger and requires proper scrutiny sometimes along with the old plans and mine records in DGMS Office.

It is therefore, desirable that re-adjustment of boundaries should be done after the matter has been studied in details over correct plans of the mines concerned and in consultation with the concerned Joint Director/Director incharge of the Region and Zone respectively.

Prior approval of the DGMS should also be obtained under Reg. 107; whenever it is intended to cross boundaries and/or 15 metre statutory barrier between two adjacent mines under the control of different managers after the amalgamation etc.

(Cir. 62/1973)

CMR 108 / MMR 112

1. Roof stitching by old haulage ropes and roof bolting-Reg. 108 of CMR 1957 and Reg. 112(2) of MMR 1961—Roof stitching with old haulage ropes and roof bolting have been tried, at some of the mines with conventional supports. Although the efficacy of the above methods has not been fully proved, still this Directorate is prepared to permit field trials of the above methods in such development workings where systematic limbering/supports are required, on the following conditions:

- (a) The mine management intending to adopt the above methods of supports must have a proper organisation for supervision and carrying out the work and keeping detailed records of operations. They must also have reliable and tested equipment and instruments for carrying out the anchorage test, sag test and torque test. It is understood that properly tested roof bolts are available indigenously.
- (b) The management having the proper organisation and equipment mentioned above may submit detailed proposal to me Joint Director of Mines Safety of the Region giving the grounds for adopting the methods together with a preliminary report of scientific investigations so that approval for the new methods may be considered.
- (c) No application will be considered till the mine concerned has proper organisation and instruments etc.
- (d) Such supports will be of temporary nature and should in principle be adopted for such developments.
- (e) It must be understood that the additional conventional supports will be necessary in grounds disturbed by faults, slips geological disturbances and other places, where their use will be deemed necessary.

(Cir. 19/1974)

- 2. Use of (i) Slot and wedge, (ii) Expansion and (iii) Perfo type roof-bolts manufactured by M/s Nanda Miller Co.**—M/s Nanda Miller Co. 10, Phears Lane, Calcutta, are manufacturing the above mentioned type of roof bolts having the following specifications:—

Type of bolt	Road Dia	Yield load	Breaking load
1. Slot and wedge IS 226: 1969	25mm.	12.110Kg.	21,510 Kg. per bolt
2. Expansion bolt as per IS 226: 1969	20mm.	8,300 Kg.	13,450 Kg.
3. Perfo bolt IS 1786:1969	26mm.	13,600 Kg.	15,850 Kg.

These bolts have been duly tested and found satisfactory by the Central Mining Research Station, Dhanbad as also in actual use in several mines. As such vide this Directorate's letter No. 16(24) 74-Gcnl/1137 dated 10/7/74 the manufacturer, M/s Nanda Miller Co. Calcutta were informed that there was no objection to the use of the aforesaid roof-bolts in the mines on the

condition that suitability of any particular type of bolt will be ascertained by specific investigations and studies to be conducted in the actual strata requiring support. Such investigation/study shall be made by the Central Mining Research Station, Dhanbad or any other Institution or Laboratory approved by this Directorate.

It may be recalled that vide DGMS Circular No. 19 of 1974, systematic support of development workings by means of roof-bolting has been permitted by this Directorate under certain conditions.

It is hereby advised that where roof-bolting is conducted as a means of systematic support in accordance with the aforesaid circular, it would be desirable to use the above mentioned tested roof-bolts.

(Cir. Tech. 8/1975)

3. Guidelines for preparation of Support Plan—Accidents due to fall of roof and side continue to be major problem in coal mines. An analysis of accidents due to fall of roof and sides during a three year period indicated that

- a large number of accidents (about 45%) took place in freshly exposed roof areas;
- the thickness of the fall was less than 50 cm in 80% of the cases;
- falls occurred in all types of roof.

Sixth conference on Safety in Mines recommended inter alia the formulation of Support Plan for each mine taking into account the local geological conditions, physico-mechanical properties of the strata, method of work, mechanization, past experience etc. To help enable the mining industry in drawing up the support plans properly and scientifically, the Director-General of Mines Safety had constituted an Expert Group in 1983 under the chairmanship of Shri K. Paul, the then Dy. Director-General of Mines Safety. The committee had submitted its report in 1989 which was sent to all chief executives of coal companies. Extracts from the report and the recommendations are being brought to the notice of all for implementation.

Recommendations:

A. Geomechanics Classification:

Engineering classification approach being the only accepted way of qualitative and semi-quantitative assessment of the roof conditions, this method should be adopted in all the mines. The geomechanical classification developed by CMRS-ISM is applicable to Indian ground conditions. Any support plan should first indicate the class of roof and the rock mass rating obtained from this approach,

B. Support Systems:

In general extended use of roof bolting as a method of support would have to become an integral part of future mining system. This can not only be installed early to support the green roof but also as an active support has a distinctive edge vis-a-vis passive supports currently in use in coal mines. Full column grouted bolts using quick-setting cement capsules appear ideal for most of the conditions prevailing in Indian mines. The recommendations, for the support system, both for bolting and alternative support-system in different geomining situations, are given in Table 1 & 2. The support plan should be based on these guidelines. In mining under shallow cover, however extra care and caution needs to be exercised for application of roof bolting. While timber supports as per the Systematic Support Rules will continue to be used in conventional depillaring panels, the split galleries could be supported with roof bolts or rope dowels. Pit props and steel props should also find application in depillaring panels as replacement of timber props. Light duty hydraulic props should be useful in depillaring areas where the extraction height is less than 3.5 m. For greater height of extraction steel square chocks with wooden sleepers can be used. In mechanised depillaring panels using LHDs and SDLs, the original and split galleries should be supported

with roof bolts. The slices may also be supported with roof bolts and channels/w- straps, if necessary, except in such roofs where the potential of airblast exists.

In thick coal seams, if extraction is proposed using multiple slices in ascending order, use of cable bolts should be undertaken while working the bottom slice.

Span of galleries plays a very important part in the stability of the roof. In the case of bad roofs, it is recommended that, apart from supporting the roof, the span should be minimised and formation of four way junctions avoided, where feasible.

Table-1

Recommended support system for freshly exposed roof
(Upto 10 m from the face)

	Roof description (class)	Bolting systems	Conventional supports
1	Very poor roof (class V)		The system of support indicated in Table 2 should be erected closely following the face.
2	Poor Roof (class VI)	(a) Point anchored (mechanical or grouted with quick setting resin) bolts for immediate tension, to be fully grouted soon afterwards. W- straps here necessary (b) Full column grouted bolts with quick setting grout.	Cross—bars on steel chocks or hydraulic props with minimum 5 Tonne setting load.
3	Fair Roof (class III)	(a) Combination bolts as at (a) above. (b) Full column grouted bolts with quick setting grout. (c) Recoverable bolts.	(a) Light duty hydraulic props. (b) Steel props (c) Triangular chocks at junctions. (d) Safari supports.
4	Good Roof class II)	(a) Recoverable bolts. (b) Full column grouted bolts.	(a) Steel props (b) Safari Supports.
5	Very good roof (class I)	No support except for roof bolting in disturbed areas.	

Table-2

Recommended support system for other development working

1	Roof description (class)	Bolting systems	Conventional supports
	Very poor roof (class v)		(a) Yielding steel arch under highest stress conditions. (b) Rigid steel archs on moderate stress condition
2	Poor roof (class vi)	(a) Full column grouted bolts using quick setting grout supplement with steel channel /w-strap, for flaky roof wire mesh in addition (b) For temporary roadways roof stitching alongwith roof bolts and w-straps.	(a) Rigid steel arch for roof with structural disturbances. Steel beam (200 mm * 100 mm) (b) set on brick wall for permanent road ways. (c) Steel bars set into pillars or on steel propes.
3	Fair roof (class III)	(a) Full column grouted bolts using quick setting grout. (b) For temporary roadways roof stitching supplemented by roof bolting in distributed areas.	(a) Steel bars set into pillars or on steel propes for permanent roadways (b) Steel props for temporary roadways. Can also be used in permanent roadways.
4	Good roof (class II)	(a) Full column grouted bolts for permanent roadways (b) Roof stitching with additional spot bolting in disturbed areas in permanent roadways	Steel props for permanent roadways.
5	Very good roof (class I)	No support except for roof bolting in distributed areas.	

N. B. — 1. Grouted bolts also imply the use of cement capsules.

2. 'Quick setting' implies the development of an anchorage capacity of at least 10 KN in 30 minutes and about 50 KN in 2 hours.

3. Vertical supports should be set with minimum 5 Tonne setting load to prevent dislodgement due to blasting.
4. Very poor & 'poor' roof should be supported as soon as it has been exposed.

Until such time these recommendations are implemented and some experience gained, roof bolting should not be the sole means of support in roadways which are more than 5 m in width. In seams liable to spalling from sides, bolting with or without side straps and stitching the sides should be the prime means of roof control.

C. Specifications for Bolting systems

All components of the roof bolt assembly should comply with the BIS specifications, wherever available.

Generally speaking, the length of the bolt should be at least one-third of the width of the roadway. However, the length should normally be not less than 1.5 m. For restricted height coupled bolts would have to be used.

A 20-22 mm diameter bolt (ribbed bar) will meet the requirement in most cases.

The bolting density for the three types of roof, where bolting has been recommended, will be as given below:

- (i) Poor : 1.2 to 1.5 bolts/sq.m.
- (ii) Fair: 1 bolt/sq.m.
- (iii) Good: 0.7 bolt/sq.m.

At junctions, the density should be increased by 25%.

The bearing plates should be not less than 5 cm. sq. or equivalent area.

The bolt angle should generally be normal to the bedding plane in rectangular roadways. The rib side bolts may in certain cases be inclined outwards.

D. Requirements for Drilling of Holes

To be effective the drilling of roof holes for bolting has to be mechanised using hydraulic or compressed air operated drilling machines.

In case of high strength abrasive roof rocks, such as massive sand stone, high torque compressed air operated drill machines should be used.

While wet drilling of the holes in stone is mandatory, for bolting this is additionally required to clear all the dust and ensure maximum bond strength between the strata and the bond materials. This is equally applicable in the case of coal.

E. Monitoring of support performance

With conventional free-standing supports, there are clear indications when they carry excessive load. Roof bolts, however, give no visual indication of load increase and therefore no indication of how close either the individual bolt or the system is to ultimate failure. Failure of bolted roof can be more rapid and more extensive and with less warning than the failures experienced with conventional supports.

Systematic monitoring of roof bolted systems will, therefore, be seen to be essential, to assess the stability of the system and provide feedback which will allow future designs to be fine tuned. Monitoring can be divided into broad categories, namely,

(a) Measurement of bolt performance—This is ascertained by anchorage capacity test (pull testing conducted on about 10% of the bolts installed. A minimum of 5 Tonnes anchorage strength should be achieved.

(b) Measurement of strata behaviour—Stability of the roadway should be monitored using sag indicators, sag boll load cells, convergence recorders etc. For this purpose there should be a systematic plan of establishing monitoring stations both in active areas and in the permanent roadways outbye. Borehole extensometer for measuring strata dilation at different points along the roof may also be used where appropriate.

It is desirable that a combination of monitoring techniques be used in order to provide meaningful result and differentiate between difficult loading condition.

F. Training needs

Roof bolting is a new concept to the workforce. It is, therefore, extremely important to make the workforce aware of the principles of bolting, the objectives and above all to give them confidence in the new system of roof support. For these reasons, both surface and underground training sessions are to be carried out.

G. Implementation Strategy

There should be a skilled roof bolting task force at the area level to check/guide installation work and monitor performance. To oversee the area level work, there should be a group of specialists at the corporate level.

Appendix—I

Different rock mass classification systems were discussed and it was felt that CMRS—ISM classification would be useful.

The five parameters in this classification and their importance rating are:

	Parameter		Range of Values				
1.	Layer thickness	(cm)	<2.5	2.5-7.5	7.5-20	20-50	50
		rating	0-5	6-12	13-20	21-26	27-30
2.	Structural features	(index)	>14	11-14	7-11	4-7	0-4
		rating	0-4	5-10	11-16	17-21	22-25
3	Weatherability	%	<60	60-85	85-97	97-99	>99
		rating	0-3	4-8	9-13	14-17	19-20
4.	Strength of the rock	(kg./Sq. cm.)	<100	100-300	300-600	600-900	>900
		Rating	0-2	3-6	7-10	11-	14-

						13	15
5	Ground water seepage rate	(ml/min)	>2000	200-2000	20-200	0-20	dry
		Rating	0-1	2-4	5-7	8-9	10

The five parameter values for the classification should be determined individually for all the rock types in the roof, upto a height of atleast 2 m.

1. Layer thickness

Spacing between the bedding planes or planes of discontinuities should be measured using borehole siratascope in a 2.0 m long drill hole made in the roof. Alternatively, all bedding planes or fissile (weak) planes withing the roof strata can be measured in any roof exposure like a roof fall area, shaft section or cross measure drift. Core drilling should be attempted wherever feasible, and the core log can be used to evaluate ROD and layer thickness. Average of five values should be taken and layer thickness should be expressed in cm.

2; Structural features

Random geological mapping should be carried out, and all the geological features (discontinuities, like joints, faults and slips and sedimentary features like cross bedding, sandstone channels) should be carefully recorded. The relative orientation, spacing and degree of abundance for all these features should be noted. Their influence on gallery stability should be assessed, and the structural index for each feature should be determined from table below:

<i>Indices for parameter structural features</i>			
1.	Presence of Major faults net displacement >10 m displacement 2-10 m displacement <2m		15 8 5
2.	Presence of minor faults/slips spacing : 5 m Orientation unfavourable Orientation not favourable spacing : >5 m Orientation unfavourable Orientation not favourable		10 5 7 3
	Occurrence of joints and cleats	Orientation unfavourable	Orientation not unfavourable
	(a) Minimum spacing 30 cm Single set two sets more than two sets (b) Minimum spacing >30 cm Single set two sets more than two sets	6 7 8 5 6 6	4 6 8 2 4 6

4	Sedimentary features		
	lateral thickness variations	3	
	sandstone channels	6	
	kettle bottoms	4	
	plant impressions	3	
	ball coal	4	
<i>Index for structural features = sum of indices for individual features</i>			

3. Weatherability

ISRM standard slake durability test should be conducted on fresh samples of roof rock collected from the mine to determine the susceptibility of rocks to weathering failure on contact with water or the atmospheric moisture. For this test, weigh exactly any ten irregular pieces of the sample (the total weight should be between 450 and 500 g.); place them in the test drum immersed in water, and rotate it for 10 minutes at 20 rpm; drain the material retained in the drum and weigh it again. Weight percentage of material remaining after the test is "the first cycle slake durability index. Mean of three such first cycle values should be taken. Core may be broken to obtain the samples.

4 Rock strength

Point load test is the standard index test for measuring the strength of rocks in the field. Irregular samples having a ratio of 2: 1 for longer axis to shorter axis can be used for the test. The sample is kept between the pointed platens and the load is applied gently but steadily. The load at failure (in kg.) divided by the square of the distance between the platens (in cm) gives the point load index (I). The mean of the highest five values out of at least 10 sample tests should be taken. The compressive strength of the rocks can be obtained from the irregular lump. Find load index for Indian coal measure rocks by the relation—

$$Co = 14 \times I \text{ (in kg/cm}^2\text{)}$$

5. Groundwater

A 2 m long vertical hole should be drilled in the immediate roof, and the water seeping through the hole after half an hour should be collected in a measuring cylinder. The average of three values from three different holes should be taken and expressed in ml. per minute.

The ratings for the five parameters are given in Table 10. Rock Mass Rating (RMR) is the sum of the five parameter ratings. If there are more than one rock type, then the combined RMR is obtained as :

$$\text{Combined RMR} = \frac{\sum (\text{RMR of each bed} \times \text{bed thickness})}{\sum (\text{thickness of each bed})}$$

The RMR so obtained may be adjusted, if necessary, to account for some special situations in the mine like great depth. Figure below shows the flow chart for deriving the rock mass rating while Table II gives the value of adjustment factors.

Procedure flow chart for deriving RMR

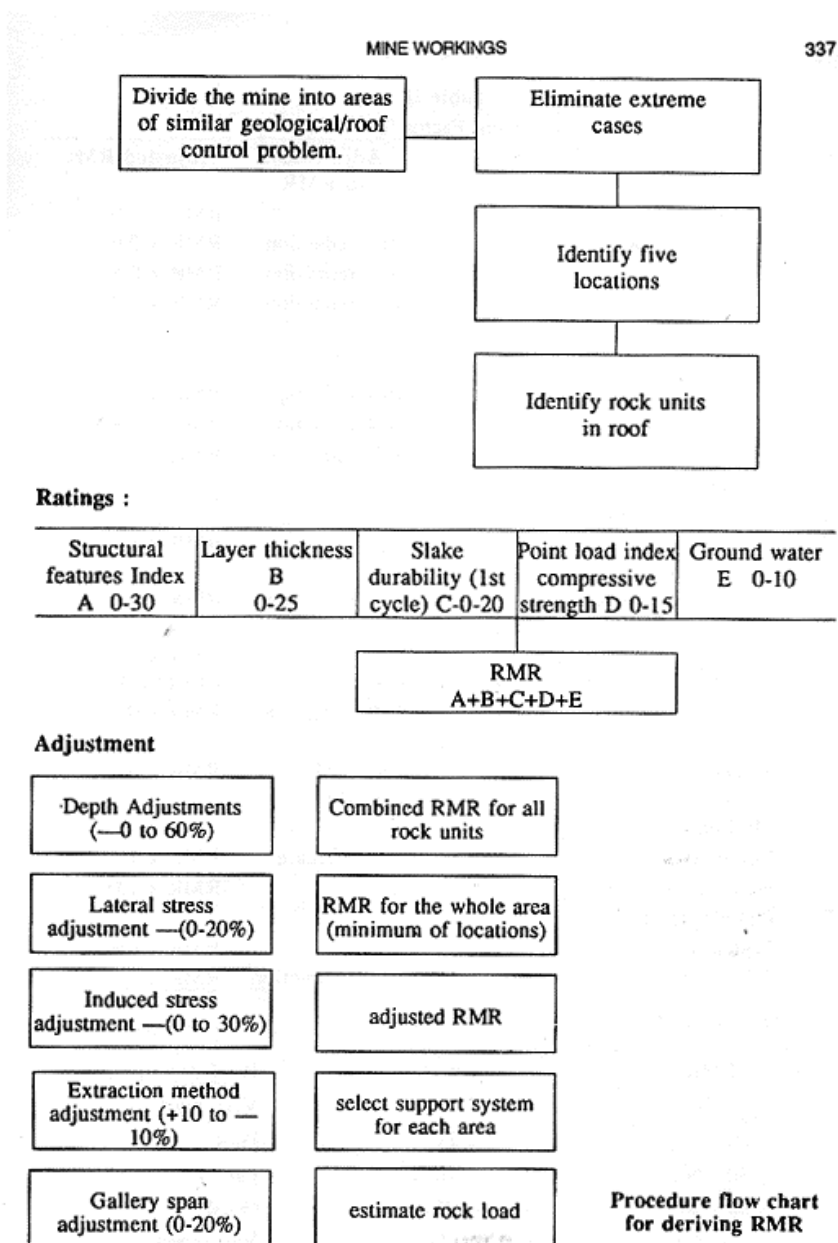


Table II
Adjustment Factor for RMR

1. Depth	Adjustment to RMR	Adjusted RMR
Less than 250 m	nil	RMR x 1.0
250 — 400 m	10% reduction	RMR x 0.9
400 — 600 m	20% reduction	RMR x 0.8

more than 600 m 30% reduction RMR x 0.7

2. Lateral stresses

Assumed stress amount

Small	10% reduction	RMR x 0.9
Moderate	20% reduction	RMR x 0.8
High	30% reduction	RMR x 0.7

3. Induced stresses

stress situation :

No adjacent workings in the nil RMRx 1
same seam

Extraction areas within 10% reduction RMR x 0.9
20-40 m in the same seam

Extraction areas within 10- upto 30% seam reduction RMRx (0.7 to 0.8)
20 m in the same

Working above with 10-20 10% reduction RMR x 0.7
m parting

Working above with 3-10 upto 30% reduction RMR x 0.7
m parting

4. Method of excavation

Continuous miner	10% increase	RMRx 1.1
Undercut and blasting	nil	RMR x 1.0

5. Gallery span

Less than 4.5 m	nil	RMR x 0.8
4.5 — 6.0 m	10-20 reduction	RMR x 0.8

On final RMR the roof is classified as—

RMR	Roof class	Roof description
0—20	V	Very poor
20-40	IV	Poor
40—60	III	Fair
60—80	II	Good
80—100	I	Very good

An empirical relation obtained between RMR and rock loads is:

Likely rock load in tonnes/m²span in m x mean rock density x (1.7—0.037 RMR + 0.0002 RMR²)

Example for Application of the Classification

Immediate roof of seam is 0.6 to 0.7 m thick layered silty sandstone. The roof is uneven, and has innumerable plant impressions. Two sets of joints are mapped, the prominent one having a trend 35°—215°, and the other at right angles to it. The former set is an open joint set (aperture 2mm) and is more or less parallel to the dip rise galleries, the galleries are 3.6 m.

Point load index of the silty sandstone is 22.65 (irregular lump test) or compressive strength is 317 kg/cm². Dry density of the rock is 2.215 t/m³.

	Parameter	Value	Rating
1.	Layer thickness	6cm	11
2.	Structural index (two joint sets)	6	17
3.	Weatherability (1 cycle slaking index)	89.7%	10
4.	Rock strength	317 kg/cm ²	7
5.	Groundwater seepage	—dry—	10
			RMR 55

The roof is classified as class III 'Fair Roof '

Expected rock load = rock density x gallery width

$$\times (1.7 - 0.037 \text{ RMR} + 0.0002 \times \text{RMR}^2)$$

$$3 = 2.215 \times 3.6 \times (1.7 - 0.037 \times 55 + 0.0002 \times 55 \times 55)$$

$$= 2.15 \text{ sq.m}$$

If roof bolting is to be effected, then the bolts need to be installed correctly. To ensure correct installation the following basic installation factors need to be adhered to: —

- (a) to prevent bed separation and dilation the bolts should be installed as soon as the roof has been exposed,
- (b) the bolt holes should be drilled to the correct diameter and depth. While drilling, the bolting pattern should be adhered to as closely as possible.
- (c) Where fast and slow bonding materials are used together, it should be ensured that the fast capsules are inserted first.
- (c) The manufacturer's recommendation regarding mixing procedure (including time) and setting time should be closely followed. No tensioning should be provided before the prescribed setting time has been allowed.
- (d) It should be ensured that the specified drilling equipment is used correctly.

(Cir. Tech. Sapicom 3/1993 & 6/1993)

4. Fatal accidents caused by fall of roof in underground coal mines—

Strata control is a major problem affecting safety and productivity in underground mining. Experience of the past clearly brings out that roof fall is the preponderant cause of fatalities in belowground coal mines. An exercise was undertaken in this Directorate to analyse the fatal accidents caused by fall of roof in underground coal mines during the year 1992. These were 47 accidents due to fall of roof involving 66 fatalities. Some of the findings are given below :

- (i) Fall of roof accounted for 29% of all fatal accidents in coal mines and it contributed 46% of all fatal accidents in belowground operations.
- (ii) 36% of the fatal accidents caused by fall of roof were in development districts and 55% took place in depillaring districts.
- (iii) Out of the fatal accidents in depillaring districts 27% occurred within or near goaf.
- (iv) 72% of the accidents were within 10m of faces. Out of all fatal accidents due to roof fall in development districts, 70.6% were within 10m of the face; similar figure for depillaring was 84.6%.
- (v) In all 32% of accidents occurred within 2 hours of blasting and 25% within one hour. In development districts 58.8% of the accidents occurred within 1 hour of blasting.
- (vi) All types of roof strata were involved in the falls causing accidents as would be seen from the following figures:

<u>Type of strata that fell</u>	<u>Percentage of accident</u>
Sandstone	29.8
Coal	27.6
Shale	19.1

- (vi) In 76.6% of the cases timber support was in use. Among other, 6.3% of the accidents took place during withdrawal of supports. Excluding withdrawal etc. in 87.5% of the cases support was either not provided at the site of accident or was inadequate or dislodged.

It was disturbing to note an upsurge in fatal accidents due to roof fall in comparison to the previous years. Some of the causes which were earlier resulting in fatal accidents due to falls of roof and which has been almost eliminated are coming to the fore again, viz. allowing work within goaf, improper support withdrawal procedure, improper goaf edge fencing supports etc. indicating system failure. Managements are therefore advised to take the following steps, amongst others to prevent such accidents:

- (a) Recommendations of the Eighth Conference on Safety in Mines regarding prevention of accidents in coal mines due to fall of roof should be implemented early.
(See DGMS (Tech.) Circular No. 2 of 1993).
- (c) Recommendations made wide DGMS (Tech.) Sapicom Circular No.3 of 1993 should also be implemented.
- (d) At least one row of props should be erected inbye of the goaf-edge chocks where roof is hard and compact.
- (e) Manager's standing orders for withdrawal of supports as required under the provisions of Reg. 110 should be strictly followed.

(Cir. Tech. (Sapicom) 4/1994)

5. Monitoring of performance of roof bolts in coal mines— To control accidents due to fall of roof the 8th Conference on Safety in Mines has recommended use of roof bolts as a method of support in coal mines.

Some mines have already started using grouted roof bolts. You may no doubt be aware that the bolts if not properly installed, would give the workers a false sense of security and this may lead to falls larger than those occurring with conventional support causing greater

damage. In this connection your attention is invited to the recommendation regarding monitoring the performance of the bolts by anchorage testing and other means.

In one case, where rope stitching was being done as a method of support, 4 ropes came out from one side followed by the fall of roof leading to a fatal accident. The enquiry revealed that depth of holes drilled for rope stitching was only 0.8 to 1.0m, Apparently proper grouting had not been done because the 20 cm. thick fall could easily have been supported by properly installed rope stitches.

Recent study by the S&T wing of this Directorate has revealed that in about 35 percent of the bolts tested, the anchorage was less than 2 tonnes. Many of the bolts failed at no load, in many cases threads slipped. In many cases no testing could be done as rope dowels had been used without any provision for anchorage testing.

Immediate steps need therefore be taken to ensure that proper type of material is used along with proper type of cement capsules, which set within 1/2 hour giving a load of at least 3 tonnes and intensive training should be given to workers and supervisory officials for proper installation of and monitoring of roof bolting system.

In every mine where roof bolting is practised suitable anchorage testing devices should be provided and kept maintained. At least 10 percent of the bolts installed should be subjected to anchorage testing on a systematic basis as already recommended and records of the anchorage testing done should be properly maintained and countersigned by the manager regularly.

Appropriate remedial measures shall be taken if the results of anchorage testing are not found satisfactory.

[Cir. Tech. (Sapicom) 6/1994]

6. Support of freshly exposed roof and sides in belowground coal mines— Roof and side fall accidents continue to be the major cause of fatality in underground coal mines inspite of our best efforts. Analysis has revealed that—

- 38.76% of total fatal accidents and 39.46% of total fatalities are caused by fall of roof and sides only.
- 60.30% of belowground fatal accidents and 57.43% of belowground fatalities occur due to fall of roof and sides only.

Most of these fatal accidents had occurred in Bord and Pillar method of extraction both during development as well as during depillaring operations. Analysis further revealed that—

- 58.50% of roof and side fall accidents and 58.40% of fatalities due to fall of roof and sides occurred within 10m of development and depillaring faces i.e. in Freshly Exposed Roof area.

Although Coal Mines Regulations provide for support of such Freshly Exposed Roof and Sides as per the Systematic Support Rules framed for the purpose, it has been observed during the course of enquiries into such accidents that—

- either the supports were not provided or were inadequate;
- the supports were not designed in accordance with the geotechnical requirements specific to such workings, and
- the type of support was not commensurate with the type of ground to be supported.

Recommendations

In view of the situation described above it is recommended that—

1. Full column grouted roof bolts may preferably be used as support in Freshly Exposed Roof area in development workings.
2. The design and pattern of roof bolting shall be based on RMR and in consultation with the technical experts from a recognised Scientific and Technical institution in association with this Directorate.
3. Quality and Efficiency of roof bolts shall be monitored regularly as recommended in Circular (Tech.) 1/1996.
4. All other Circulars issued earlier in this respect shall be strictly implemented so' as to ensure safe and secured ground conditions for improved safety standards in the mine.

[Cir. (Tech./Sapicom) 2/1997]

CMR109 & 110

1. Re-setting of supports— On a number of occasions, the supports already set in a mine are to be replaced. This is usually done when the old timber supports show signs of decay and are under weight, or after a fall of roof or sides has taken place resulting in displacement and or breakage of the supports. Every year a number of fatal accidents occur usually involving the timber gangs and sometimes even the supervisory staff. All such accidents could have been averted if only elementary precautions had been taken in the withdrawal of the supports previously set, and by exercising due care while clearing the roof fall and in properly securing the place. In this connection, your attention is invited to the following provisions of the regulations which stipulate the precautions that should always be taken during such operations.

"Reg. 109(8) (b) (Setting of supports)— In every place wherein a fall of roof or sides involving the displacement or breakage of supports has occurred, no work of clearing the fall or any part thereof shall be undertaken until the newly exposed roof or side in the vicinity of the fall or part thereof has been examined and made safe if necessary by temporary supports."

"Reg. 110—Withdrawal of supports : Whenever props, bars or cogs set as supports are to be withdrawn, a safety proper withdrawer or other suitable contrivance shall be used."

Furthermore, in this regard it is the statutory duty of the mining sirdar to be "present throughout whenever any work of clearing falls of ground and setting of supports therein is being carried out" [See Reg. 44(6) (b)].

Suitable steps shall therefore be taken to enforce strictly the aforesaid statutory provisions of the regulations, and in particular ensure that timber gangs always use safety prop withdrawer while withdrawing any support, they secure the place with temporary supports before a roof or side fall is cleared and permanently supported.

(Cir. 50/1966)

2. Replacing old supports; clearing falls of ground— erection of temporary supports— In this office Circular No. 50 of 1966 issued to Owners, Agents and Managers of underground coal mines attention was drawn to the fact that every year a number of precious lives are lost while undertaking operations of replacing old timber supports, clearing roof and sides falls, dressing roof/sides etc. It was pointed out that strict compliance with the provisions of Reg. 109(6) and 110 of the Coal Mines Regulations, 1957, would go a long way in preventing such accidents. As an additional safeguard, it was recommended that before attempting to clear falls of roof and side or removing old and damaged supports, temporary supports should be erected to afford protection to people engaged in the site operations.

It is painful to observe that accidents due to above cause continue to take place with alarming frequency. Unless, therefore, a concerted effort is made to meet the challenge squarely, no tangible improvement can be expected.

In connection with replacement of broken or decayed supports erected in a roadway, the point to be remembered is that because roof or side at the particular place was weak or unsafe, it was decided to support it in the first instance. With the passage of time and the consequent

damage/breakage of supports the hazard potential at the said place is likely to have increased. In such a situation, it would be folly to deploy persons at the place, even for the purpose of dressing roof or side, without first erecting temporary supports. If only this elementary precaution is taken and the work persons (dressers, support-gang, supervisory staff) take care to work or made to work only beneath supported roof, albeit temporarily, accidents due to this cause can be eliminated.

Special pains should be taken to bring home to all concerned, the above precautions with the ultimate objective of eliminating such accidents from our mines.

(Cir. Tech. 5/1982)

3. Withdrawal of supports—While withdrawing cress-bars set in gallery a timber mistry lost his life recently in a fatal accident when he was struck by a piece of stone that was being supported by the offending cross- bar. An enquiry into the accident revealed that the timber mistry had not used a safety props withdrawer or other suitable contrivance as required under Regulation 110 of the Coal Mines Regulations 1957.

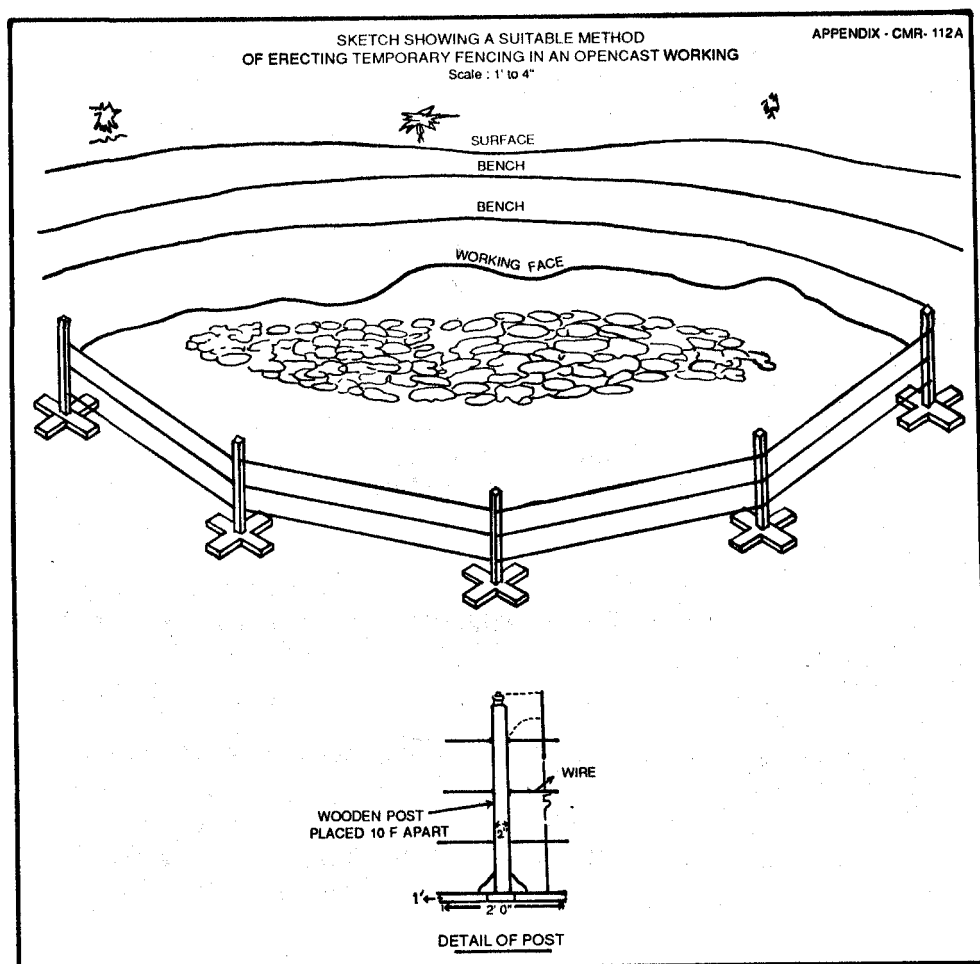
The cross-bar was fixed in notches "Duggis" into the pillar sides. To withdraw the cross-bar the timber mistry (the deceased) first took out the laggings over the cross-bars and then knocked out the wedges from the holes (notches) in the pillar sides. He then proceeded to pull out the cross-bar from the holes. Two of his helpers held the cross-bar on their shoulders at the two ends respectively, while he himself supported it on his shoulder in its middle part. While they were thus ready to move the bar on their shoulders, a piece of stone measuring 120 cm x 90 cm x 15 cm thick fell from the portion of the roof under which the timber mistry was standing, inflicting serious injuries to him to which he succumbed on the spot.

In view of above, it is considered desirable that instead of setting bars in "Duggis" in coal sides of a pillar, the bars should be supported on props to make a stable set. This is also likely to prove an economical method as it is a time-consuming process to make real "Duggis". If such a practice is adopted, withdrawal of bars and props can too be conveniently handled, when required- with the help of a safety prop withdrawer. The bar is recovered without being sawn off in Duggis.

(Cir. Tech. 17/1975)

CMR 112 / MMR 115

Fencing around working quarries—A suitable method of fencing the moving front of a quarry is shown in the sketch.



CMR 113 / MMR 116

1. Statutory inspection on rest days—Vide this Directorate's Circular No. 7 of 1960 it has been recommended, interalia, that in order to ensure that spontaneous heating was detected in its early stages, each depillaring district should be inspected on every idle day by a person holding an overman's certificate. No such inspections are being done at present on rest days in the development districts.

It has been found that after a rest day or a holiday or a temporary discontinuance of the workings due to any reasons workers are allowed to enter the workings places before the sirdar/overman has made his statutory inspection of the working places in accordance with provisions of Regulation 113 and/or Regulation 143 of the Coal Mines Regulations, 1957. This is a serious matter as it has been the cause of a number of accidents including ignitions/explosions which have occurred in some mines in the recent past.

It is therefore considered advisable that there should be a continuity of statutory inspections of the working and temporarily discontinued places both in development and depillaring districts throughout the week, and for this purpose a competent person should be deputed on every shift of the rest day or a holiday etc. to make inspection. A record of these inspections should be kept as for the other week-day inspections.

(Cir. 70/1967)

2. Sirdar's report to be descriptive—The report of the sirdar has to include, interalia, details referred to in clause (b) of CMR 113(3) i.e. the condition (of every part of the mine or the district assigned to the sirdar in which persons have to work or pass through during the shift,

and all roadways and working places where work is temporarily stopped) as regards ventilation, sanitation, the presence of gases, the state of the roof and the sides and generally so far as the safety of the persons is concerned. It is apparent from above that to satisfy these requirements the sirdar should write a descriptive report about his inspection and not merely fill up a form. The report should be a detailed one and should give all the particulars specified. He should be encouraged to write the report himself in the script he is able to write.

(Cir. 4/1958)

3. Format of daily report of Mining Sirdar/Mining Mate for mechanised opencast mines—AS per recommendation 2.7 of the Seventh Conference on Safety in Mines, formats of daily reports of Mining Sirdar (Reg. 113 of CMR 1957) and Mining Mate (Reg. 116 of MMR 1961) have been devised. The same are given below.

(Cir. Genl. 3/1990)

Daily report of inspection by Mining Mate incharge of Opencast Working of a mine under Regulation 116 of the Metalliferous Mines Regulations, 1961

Name of Mine.....Name of Owner.....

Date.....Shift and Shift hours.....

Taken over charge from.....at.....(time) on.....(date) at.....(place)

Rest Interval.....to.....

Number of persons under my charge—

A.

(a)	Name/numbers of quarries & other work places under my charge and inspected	Benches in O.B.		manual /mecha nised	Benches in ore		Manual Mecha nised
		Height	Width		Height	Width	

(i)

(ii)

(b) Measurement pillars in case of manual mines

(2) Overhangs/undercuts-

(3) Loose stones/material/trees within 3 metres of edges

(4) Fool-paths for travelling and carrying loads

(5) Fencing of top of quarry & disused parts/abandoned quarries-

(6) Fencing along footpaths/benches (where required)

(7) Use of helmets and boots—

(8) Use of safety belts—

(9) Condition of dumps—

B. (1) First Aid Kit, First Aid Station

(2) Rest Shelter

(3) Drinking Water

C. Dangers observed and action taken:

D. Details of any accidents during the shift.

First Aid given by.....

E. (1) Details of areas fenced off under my direction

(2) Safety instructions given.....

F. Any other remarks.....

G. Details of inspection period—

	Began	Ended
First inspection		
Second inspection		
Third inspection		

<i>Descriptive Report</i>

I, the undersigned hereby certify that I have written the above report after making thorough inspection.

Handed over charge to.....at.....(time).....on (date) at.....(place)

Date.....Time.....

Signature
Mining Mate
Name of Mining Mate

For cases in which the person, who made the report is unable to write, left thumb LTI thumb impression of Shri.....

Signature Mining Mate

Daily report of inspection by Mining Sirdar incharge of Opencast Working of a mine under Regulation 113 of CMR 1957

Name of Mine.....Name of Owner.....

Date.....Shift and Shift hours.....

Taken over charge from.....at.....(time) on.....(date) at.....(place)

Rest Interval.....to.....

Number of persons under my charge—

A.

(a)	Name/numbers of quarries & other work places under my charge and inspected	Bench(es) in O.B.		manual /mecha nised	Bench(es) in ore		Manual Mecha nised
		Height	Width		Height	Width	

(i)

(ii)

- (b) Measurement pillars in case of manual mines
 (2) Overhangs/undercuts-
 (3) Loose stones/material/trees within 3 metres of edges
 (4) Foot-paths for travelling and carrying loads
 (5) Fencing of top of quarry & disused parts/abandoned quarries—
 (6) Fencing along footpaths/benches (where required)
 (7) Use of helmets and boots—
 (8) Use of safely belts—
 (9) Condition of dumps—
 B. (1) First Aid Kit, First Aid Station
 (2) Rest Shelter
 (3) Drinking Water
 C. Dangers observed and action taken:
 D. Details of any accidents during the shift.
 First Aid given by.....
 E. (1) Details of areas fenced off under my direction
 (2) Safety instructions given.....
 F. Any other remarks.....
 G. Details of inspection period—

	Began	Ended
First inspection		
Second inspection		
Third inspection		

Descriptive Report

I, the undersigned hereby certify that I have written the above report after making thorough inspection.

Handed over charge to.....at.....(time).....on (date) at.....(place)

Date.....Time.....

Signature
Mining Sirdar
Name of Mining Sirdar

For cases in which the person, who made the report is unable to write, left thumb LTI thumb impression of Shri.....

Signature Mining Sirdar
(Cir. Tech. 3/1990)

4. Statutory Report of Mining Mate—It has been seen that the daily report forms currently used by Mining Mate under Reg. 47 & 116(3) (d) of MMR 1961 leave much to be desired. The information furnished by the subordinate supervisory staff is usually of routine and casual nature; as such it does not serve the desired purpose of the statutory reports.

In order to improve the quality and utility of such reports, revised forms of daily report of Mining Mate has been prepared keeping in view the statutory duties prescribed for and/or normally expected of them. The same is given below. It may be got printed and supplied for use to the said officials as early as possible.

(Cir. Genl. 3/1985)

MATE'S REPORT OF DAILY EXAMINATION OF MINE

[Regulation 47 & 116(3) (d) of MMR 1961]

I, the undersigned being a person duly appointed and authorised for the purpose as required by Regulation 116 hereby declare that I have carefully examined the workings of the parts of the mine named below and have to record as under: —

Name of Mine.....

Name of section Examined.....

1. Date of Examination

	Shift	
Began		Ended

(a) First Inspection

(b) Second Inspection

(c) Third Inspection

2. Number of persons Working under my charge

Any deficiencies noted in respect of					Whether any symptoms of fire noticed
1	2	3	4	5	
Ventilation	Support of Strata (Roof & sides)	Drinking water	Fencings	Sanitation	

3. Places examined:

(a) Working Places:

- 1.
- 2.
- 3.
- 4.

(b) Ladderways/Rodways in which persons have to pass during shift:

- 1.
- 2.
- 3.
- 4.

4. Special safety instructions given:

(Give particulars of instructions and names of persons to whom given)

5. Any person ordered out of the mine for working at a place other than that assigned to him:

6. Safety materials etc.:— Deficiency, if any

- (i) Timber
- (ii) Bunions, when height of working place is more than 3 m.
- (iii) Ladder —do—
- (iv) Other safety materials.

7. Travelled along second egress from surface (not ordinarily used for travelling) and made myself thoroughly acquainted with the same on:

8. Dangerous places observed during shift (Give details) Any danger reported by anyone (Give details of danger, and name of person reporting)

9. Dangerous operation carried out under my personal supervision (Give nature & place of danger):

10. Any abnormal seepage of water observed at a working place. (Give details)

11. Conference with successor (Give details of information conveyed and to whom):

12. Any other remarks:

Date.....Time.....Signature.....

Descriptive Report

For cases in which the person making the examination is unable to write, who made the above report (Regulation 197)

Left Thumb mark of

I, the undersigned hereby certify that I have written the above report in the presence of and at the dictation of... and have read over to him in his language. He attached his left thumb mark in my presence.

5. Appointment of Sirdars in mines worked by sub-contractors etc— Even where the work is carried on through contractors and sub- contractors etc. it is the responsibility of the management to appoint the competent persons for making inspections etc.

Use of flame safety lamps fitted with relighters—While testing for gas with ordinary flame safety lamp the lowered flame usually gets extinguished when the wick is being adjusted. The mining sirdars, overman etc. who are provided with such type of lamp in gassy mines to carry out statutory tests for inflammable gas are, therefore, generally reluctant to make percentage tests with lowered flame.

In order to encourage the supervisory staff to test for gas it is advisable that the statutory inspections are carried out with flame safety lamps which are fitted with a suitable relighting mechanism.

1. Use of Lineman's Safety Belt—That a safety belt should be used whenever electricians or other competent persons are required to work at the top of an overhead line pole is a recognised good practice which should not normally need a reminder. However, it appears that there are still some lapses about this usual precaution as was recently seen when an accident occurred in a mine in which an electrician fell from the top of an overhead pole and received fatal injuries. This mishap could have been easily avoided if only the electrician had been provided with and used a lineman's safety belt (made to IS: 3521- 1965 Specifications for Lineman's Safety Belt and Strap).

It is advised that immediate action should be taken to ensure that this simple protective equipment is used by the electrician etc. when working/on overhead lines.

2. Need for testing of roof and sides by workers—It has been observed that there occur a few accidents due to fall of roof or sides, which could have been avoided had the work-persons employed there taken the rudimentary precaution of testing their working place. Apart from the statutory obligation of making the working places safe resting on the part of supervisory staff like overman and sirdar, it is also in the interest of the workers and their duty to test for themselves the conditions of their working places at regular intervals as enjoined under the provisions of Reg. 115(2) of the Coal Mines Regulations, 1957.

This responsibility on the part of individual workers or gangs of workers does not appear to receive adequate recognition and there is an undesirable tendency to leave it all to the overman and sirdar.

This aspect should be impressed upon in your safety vocational training classes etc. to ensure that individual workers also bestow sufficient attention in respect of securing their working places safe.

DGMS 291

3. Accident to shotfirers: need for careful checking of roof and sides— A number of fatal and serious accidents have recently occurred involving shotfirers, their helpers etc. They were involved in accidents due to fall of roof/sides in the course of connecting detonator leads to the shotfiring cable in between two rounds of blasting.

In such cases, apparently the provisions of Reg. 176 of the Coal Mines Regulations, 1957 are not applicable, for the shotfirer had not allowed any body else to enter the face after completion of earlier round of firing. It is, however, clear that the condition of roof and sides deteriorates due to blasting as well as dislodgement of the supports already set by the shotfiring operation. Thus when the shotfirer enters the place for a subsequent round, he exposes himself to danger unless he checks and makes the roof and sides secure before attempting to attach the detonator leads to the shotfiring cable in between the two rounds of blasting.

Under Reg. 115(2) of the CMR 1957 every person is required to examine carefully his working place before commencing work and at intervals during the shift. This provision is perhaps not strictly applicable to the aforesaid situation, but there can be no two opinions about the need for careful checking of roof and sides by the shotfirer while coming to the working faces in between two rounds of shots. It is, therefore, recommended that the importance of periodical checking of working faces by the shotfirer in between two rounds of blasting should be impressed upon all persons working as shotfirers. Vocational training centres should also pay special attention to this aspect while taking special classes for shotfirer trainees etc.

(Cir. Gen. 4/1975)

4. Providing footsteps on floor of all wet and slippery sloping roadways— There has been a large number of accidents due to non-use of protective footwear in underground mines, even though use of such footwear on duty is obligatory under provisions of Reg. 191 of CMR 1957 (and corresponding Reg. 182 of MMR 1961). Quite often the workers, specially loaders, are reluctant to use the protective footwear at work even though they had been supplied the same by the management. An indepth study of the causes of these accidents has revealed that workers are reluctant to use footwear on sloping, wet and/or slippery floor for fear of slipping.

Reg. 115(5) (b) of CMR 1957 (and corresponding Reg. 118(5) (b) of MMR 1961) stipulates provision of proper level steps where the gradient of roadways exceeds 15 degrees. In view of the observations made in the foregoing para, it is considered desirable that proper steps be provided also in wet and/or slippery roadways, irrespective of the gradient of such roadways, so that workers can conveniently use protective footwear even under such adverse conditions.

Managements are therefore, advised to take necessary action to provide proper footsteps on floors of all sloping wet and/or slippery roadways as well. which are frequented by work-persons.

(Cir. Tech. 9/1983)

5. Footpaths in opencast mines— There have been instances when persons walking/travelling in open-cast workings have met with accidents due to slipping, failure of safety rope etc. While analysing such accidents, it is revealed that, by and large, suitable roads or foot paths for travelling are not provided in the open-cast workings. Reg. 88 of CMR '57 and Reg. 96 of MMR '61 prescribe the type of travelling road to be provided for persons to travel to and from there working places in an underground mine. Reg. 115(5) of CMR 57 and Reg. 118(5) of MMR '61 prescribe dimensions of roads or foot paths along which loads are carried by human agency. Necessary action to suitably amend the regulation in the matter is being taken. In the mean-time managements are advised to provide and maintain foot paths (travelling roads) in opencast workings for safe travel of working persons to and from their working places (benches) according to the specifications given below—

- (a) Breadth shall not be less than 1m;
- (b) At every place where the inclination exceeds 15° from the horizontal, level steps shall be provided such that the vertical height of every step does not exceed 0.18 m and the distance from the edge to the back is not less than 0.35 m or where inclination exceeds 30°, suitable ladders may be provided;
- (c) Where inclination exceeds 45 degrees from the horizontal, be provided, in addition to steps or ladders, with hand rails or ropes to ensure safe travel; and
- (d) Where the inclination exceeds 60 degrees from the horizontal, be provided, in addition to the steps or ladders and hand rails or ropes, with suitable platforms at intervals not exceeding 10 metres measured along the slope.

(Cir. Tech. 3/1976)

6. Accidents due to defective design of ore chutes—Accidents in belowground non-coal mines due to defect in the ore chute design and connected operations therewith have been noticed during the course of accident enquiries and subsequent analysis of accidents. The analysis has revealed that proper safety measures and effective design features had not been incorporated to prevent the dangers from the following—

- (a) Sudden run down/rolling of muck from the stope or ore pocket into empty ore chutes,
- (b) Improper design of the covering lips of the ore chutes to prevent any openings being left therein,
- (c) Operator's safety in case of sudden run down/rolling of muck. In view of the above, it is recommended that :
 - a buffer stock (muck) shall always be left over the chute to work as cushion and to guard against sudden run/roll down of debris;
 - manual operation of ore chute/pocket with the help of wooden planks as covering of the opening shall be eliminated and replaced with mechanically (pneumatic or hydraulic) operated chutes.
 - Safety of the chute operator or the persons passing underneath shall be ensured by providing suitable operators cabin or refuse chamber.

(Cir. Tech. Sapicom 3/1997)

7. Identification for newly recruited inexperienced mine workers—A

person newly recruited for employment in a mine does not possess any knowledge of mining activities and is therefore, exposed to dangers and hazards in the same. According to Reg. 115(9) of the Coal Mines Regulations, 1957, and Reg. 118(10) of the Metalliferous Mines Regulations, 1961 an inexperienced person shall not be allowed to work alone without presence/ guidance of an experienced worker so as to ensure the safety of new worker.

- It is necessary that every new person is given initial training as per the Mines Vocational Training Rules, 1966 to develop necessary and requisite skill and safety awareness in him. The new worker should be aware of the various dangers involved in different types of operations. No inexperienced worker should be allowed to work in any particular job unless he has been trained thoroughly in safe work procedure related to that job.
- In view of the above, every newly recruited mine worker shall be issued a coloured helmet of a distinct colour, one different from those worn by experienced mine workers. He shall wear this distinctively coloured helmet all the time while at work in or around a mine for atleast one year

from the date of initial employment. The coloured helmet should bear luminous markings/strips for ready identification while at work in the dark.

- By introducing the system, newly recruited mine workers can be easily and readily identified by these distinctively coloured helmets (preferably written N.E.W.—newly employed worker).

Competent persons and mine officials shall help to develop/inculcate safety consciousness and safety awareness in them from the very beginning of their employment. Mine officials shall take care of, watch and guide the new workers to discharge their duties safely.

Managements are requested to take appropriate action in the matter at the earliest and ensure that all newly recruited mine workers are issued with distinctively coloured helmets and to ensure that they wear them at all times.

[Cir. (Tech.) 9/1997]

DGMS

PRECAUTIONS AGAINST DANGERS FROM FIRE, DUST, GAS AND WATER

CMR 116

1. Classification of seams: general body of air—The word ‘general body’ of air includes the general atmosphere in roof cavities and at roof level. That is to say that, a seam will fall into Second Degree if the percentage of inflammable gas anywhere in the working, excepting in (i) the part of workings which are sealed off and (ii) borehole, exceeds 0.1.

As a corollary, classification of seams will not be normally done on the basis of percentage of CH₄ in a sealed off area, but if any air sample from a sealed off area shows 2% or more CH₄, the isolation stoppings around the area should be strengthened suitably to make them explosion proof.

(Cir. 39 & 39A/1967)

2. Classification of coal seams according to degree of gassiness and procedure for gas surveys—All coal seams are now treated as gassy and they are classified into three degrees of gassiness as defined in Reg. 2(12A) of the Coal Mines Regulations, 1957.

2.0 A seam once classified as Degree I, Degree II or III may be reclassified into higher or lower degree of gassiness depending upon the percentage of inflammable gas in the general body of air and/or the rate of emission of such gas in cubic metres per tonnes of coal raised. For this purpose, sub-regulation (5) of Reg. 116 of the CMR 1957 requires the mine managements to examine, once at least in thirty days, the rate of emission of inflammable gas in cubic metre per tonne of coal raised as also the percentage of inflammable gas in the general body of air.

3.0 As regards determination of rate of emission of inflammable gas in cubic metre per tonne of coal raised, the standard procedure to be adopted is given in Appendix I to this circular.

4.0 Even though in Degree I gassy seams the rate of emission of gas is usually almost negligible, it is advisable to keep a close watch on the gas behaviour pattern of such seams, and for this purpose it is recommended that the procedure given in Appendix II for collection of additional data regarding gassiness should be strictly followed.

5.0 It is further advised that results of every bore hole gas survey in a degree I gassy mine should be promptly conveyed to the JDMS concerned. Incidentally, the results of every examination made in pursuance of sub-regulation (5) of regulation 116 are to be recorded in a bound paged book kept for the purpose as provided therein.

6.0 This supercedes DGMS Circular Nos. 3 of 1969 and 21 of 1970.

APPENDIX I

DETERMINATION OF RATE OF EMISSION OF INFLAMMABLE GAS PER TONNE OF COAL FOR THE PURPOSE OF CLASSIFICATION OF GASSY SEAMS

1. Place and Time of Collection of air samples

(a) The air samples shall be collected at the following points:

(i) at the outbye end of the return airway of every ventilating district;
and

(ii) at the outbye end of main return.

(b) The samples shall be collected during coal getting operations when the emission of gas is likely to be the maximum taking into account the method of extraction,

2. Method of collection of air samples

Air samples shall be collected over the entire cross sectional area of the return airway moving the sampling bottle more or less in the same manner as an anemometer is moved during an air measurement. The air samples may be collected dry, or by water displacement when they are going to be analysed within 72 hours.

3. Analysis of air samples

Two air samples shall be analysed for inflammable gas as early as possible, but definitely within 4 days of collecting them.

4. Air measurements

The quantity of air passing through the return airways shall be measured at about the same time when an air sample is collected therein. Each air measurement shall be taken for a time of at least 2 minutes.

5. Calculation for determination of rate of emission of gas

G	The make of inflammable gas in cubic metres per min	$\frac{\text{= Quantity of air in cubic metres per min * Percentage of inflammable}}{100}$
	The rate of emission of inflammable gas in cubic metres per tonne of coal produced	$\frac{G \times 60 \times 24}{\text{Output of coal in tonnes during the day}}$

The rate of emission of gas shall be calculated in the above manner separately for each ventilation district and also for the entire mine as obtained from the main return. For fixing the degree of gassiness of a seam the maximum value of the above readings shall be considered.

APPENDIX II GAS SURVEY IN FIRST DEGREE GASSY SEAMS

1. General

Determination for presence of inflammable gas shall be made in General Body of Air and in Boreholes. Detection of Inflammable gas in borehole provides a valuable guideline as to how a seam is potentially behaving in respect of gassiness and therefore due importance to gas survey in boreholes should be given.

2. Procedure

(a) *General Body of Air*—Sample of air shall be taken from the following vulnerable points:

- (i) Cavities
- (ii) Blind headings both in working and disused areas.
- (iii) Places in the vicinity of faults, dykes and other geological disturbances.

(b) *Boreholes*—

(i) For the purpose of gas survey, boreholes shall be drilled at number of active development faces or in the pillar sides adjacent to same, so however that at least one set of boreholes shall be put in a block of coal measuring 45 m x 45 m A set of boreholes at such a working face shall consist of 2 or more number of rising boreholes (one metre apart in vertical plane) so positioned as to intersect almost the whole of the working section of the seam. When thickness of seam is more than the working height, additional borehole(s) shall be drilled in the roof and/or floor coal, as the case may be.

(ii) Air samples shall be taken from inside the boreholes put in as mentioned above specially drilled for the purpose. These boreholes shall be drilled by electric drills at least 1.5 m long and slightly rising. They shall be kept effectively plugged for not less than 60 minutes before collecting samples. The air sample from the back of such boreholes shall be collected by inserting a copper/brass tube and sucking the sample by water displacement in a 100 c.c. glass tube provided with two-way stop cocks at its ends.

(iii) Air samples shall again be collected from the same borehole after keeping them plugged for 7 days.

3. Periodicity

(a) Initially, in every seam as soon as it is opened or reopened.

(b) While approaching within 30 metres of a fault plane, dyke or other geological disturbances.

(c) Determination in general body of air shall be made at least once in thirty days. Borehole sample shall be collected at suitable intervals to be fixed by the manager, but not less than once in a quarter.

4. Recording and intimation of results etc.

(a) Results of borehole gas survey shall be recorded in bound paged book.

(b) Whenever any inflammable gas is found either in a borehole or general body of air a copy of the entries made in the above-said register shall be promptly sent to the concerned Joint Director.

(c) A separate plan of workings shall be maintained showing the position of the boreholes, last date of gas survey, and other relevant information including points where 2% or more inflammable gas has been found in a borehole.

(Cir. Tech. 6/1976)

CMR 116

Fire risk from compressed air—In order to minimise the risk of fire associated with the use of compressed air, the following precautions are suggested:

1. Leakage in pipe joints particularly the type that produces 'Squeal' leads to fire. As far as practicable plane-flanged joints should not be used in the pipe range. Only non-inflammable packing materials should be used at the joints.
2. Sealing of holes in pipes by packing should not be done. Only clamps of robust construction in conjunction with non-inflammable material should be used.
3. A compressed air pipe range should not be kept hurried.
4. A punctured hose should not be used.

(Cir. 17/1960)

CMR 117

1. Prompt detection of surface fires—It has been seen that in some cases the fire had broken out on the surface long before it was detected by the officials of the mine with the result that the operations to control the fire became more difficult. Small fires which could have been dealt with quickly had developed into big fires requiring considerable time and effort.

Under Reg. 117(6) of the CMR 1957 a competent person (Sirdar or Overman) is required to inspect once at least in every 7 days the top of all entrances to a mine, all opencast workings and any ground broken by extraction of coal in order to ascertain whether the precautions against surface fire had been taken and for detection of any fire that may have broken out or any indications thereof. It appears that such inspections are either not being done regularly or they are not enough. It is therefore recommended that in addition to the weekly inspections by the junior supervisory staff, the manager and other senior officials should also make surface inspections at least once every month.

Danger of fire from soft coke making—The practice of making soft coke in quarries or over broken ground is particularly fraught with danger and should be strictly prohibited.

(Cir 32/1964)

2. Occurrence of fire in quarry debris—There have been a number of cases of fire occurring in quarry debris either due to spontaneous heating or due to preparation of soft coke or deposition of heated material or hot ashes etc. over the quarry debris. There have also been instances of such fires travelling underground through the entrances to underground workings from the quarry. Needless to say once the fire goes underground it becomes very difficult to control it; there is usually huge loss of coal and considerable expense is involved in dealing with the fire.

To reduce the chances of occurrence of fires in quarries, Reg. 117 of CMR 1957 lays down certain precautions to be taken, but these precautions are apparently not enough for preventing a fire, should it occur in a quarry, from going into the underground workings started from the quarry. It is therefore recommended that in addition to the usual precautions, a zone of at least 15 metres from the entrances to underground workings and the coal face in the quarry should be kept clean of all quarry debris, wild or herbaceous plants and any other carbonaceous material. This zone should be maintained scrupulously clean right up to the bed of the quarry.

(Cir. 56/1964)

CMR 118

1. Brattice cloth and brake linings etc. to be fire resistant—It is necessary that brattice cloth, brake linings and sheave packings of haulage engines and winches should be fire resistant.

(Cir. 1/1940, 8/1960 & 25/1970)

2. Danger of fire underground from illicit distillation of liquor—The practice of illicit distillation of liquor in the underground workings of a mine is likely to start fires underground. Particular attention to this aspect should therefore be paid during inspection of old workings. In case of workings which are not inspected regularly, the entrances from the surface should be permanently closed across whole width in such a manner as to prevent unauthorised persons entering into the workings. The entrances should be inspected at regular intervals.

Any person found to be carrying on such distillation should be immediately reported to the nearest Excise Officer. If such person is an employee of the colliery suitable departmental action should be taken against him.

(Cir. 4/1956)

3. Degassing of isolated old workings—It had been recommended that old underground workings in mines should be kept isolated so as to prevent the danger of spontaneous heating, to better utilise the available air and to obviate the constant efforts required to deal with the coal dust problem. It was also recommended that air sampling pipes should be provided for all sealed off areas (whether in Degree I, II and III gassy mines) to keep a check on the atmospheric conditions behind the isolation stoppings and that in order to prevent building up of pressure of gas behind the sealed off areas it may be necessary to make arrangements for bleeding of gas from such sealed off areas.

It has since been observed that in a number of such cases, particularly in Degree II and III gassy seams, these sealed off areas soon become reservoirs of gas thereby introducing a new hazard. It has therefore been decided that whenever the percentage of inflammable gas inside the sealed off area exceeds 2% either explosion proof stoppings should be provided around it or the area should be degassed as far as practicable. To enable this to be done conveniently it is advisable that while an area is being sealed off, large diameter pipes (say 45 cm dia) with suitable valves/flanges are provided in some of the suitably located isolation stoppings both on the intake and return sides in order to facilitate degassing over the weak ends.

Also in order to render later entry into the district more convenient it would be advisable for steel frame and a door to be installed at the inbye end of one of the intake side stoppings before the rest of the thickness is built with masonry.

(Cir. 46/1969) Note—See circulars under Reg. 146 & 100.

4. Precautions regarding use of flame or electric welding or repairing apparatus in mines working seams of First Degree of gassiness—Of late there have been some incidents of fire occurring in shafts where welding apparatus had been used in repairing jobs. Sometimes ago an explosion had occurred in a shaft when the sparks from a welding apparatus which was being used at the pit top fell down the shaft of gassy mine of Second and Third degree. Recently an incident occurred at another mine where a new headgear was being installed and holes were being drilled in the headgear with gas cutting equipment. Hot particles of the cut material fell on the wooden platform that had been placed at the decking level to cover the shaft, and also at the second platform that had been provided at the ground level of the shaft. Both the platforms caught fire and were completely burnt out. Fortunately the workers were withdrawn from underground well in time and there was no further untoward happening.

These incidents illustrate the need for extreme care that should be exercised whenever any gas or electric welding apparatus has to be used on the headgear or in a shaft. In all such cases, the following precautions should be taken: —

(1) Before cutting or welding operations commence, and whilst such operations are in progress, a responsible person (who is a qualified engineer or holds a manager's certificate duly authorised by the manager in writing), shall be placed in charge of the entire work. He shall patrol in or about any structure or building close to the cutting or welding operation &, where risk of fire may arise consequent upon such work.

(2) All inflammable material of a portable nature shall be removed from the site of operations and grease, fat and coal dust shall be cleared away.

(3) Suitable protection shall be provided immediately under the work place. Such a protection shall be made from non-inflammable materials so that sparks or particles flying out during welding or flame Cutting operations do not pass down the shaft. Provided that wooden platforms may be used as protective shield only then they are protected by sheet metal covered with wet sand, and the protection shall be so arranged-that it does not get damaged or burnt by the falling particles.

(4) All inflammable material remaining in the vicinity shall be thoroughly wetted with water or completely covered with sand or stone dust.

(5) As far as practicable, unless the shaft is naturally wet it shall be wetted with water before the work is started and after it is finished.

(6) At least two foam fire extinguishers shall be provided and held in readiness for immediate use, if necessary. Where cutting or welding takes place in close proximity to any electrical apparatus the latter shall be securely screened and sufficient number of CO₂ extinguishers shall be kept readily available.

(7) As soon as cutting or welding operations are completed, the responsible official (appointed by the manager as mentioned under sub-paragraph (1) above) shall examine the place, and unless he can satisfy himself that the place is safe, further inspections shall be made from time to time during next four hours and if necessary thereafter, until the responsible official has satisfied himself that the place is safe and has so reported to the manager. The parts of the shaft where such special inspections should be made shall include shaft bottom and all insets below where the cutting or welding operations have taken place. During these inspections all fire precautions including those mentioned in the foregoing sub-paragraphs shall be kept in commission.

(8) Only the minimum number of persons shall be allowed to remain underground when any cutting or welding operation is in progress in any shaft or headgear and the persons withdrawn from the mine before commencement of such operations shall not be re-admitted into the mine except with prior permission of the manager.

(9) A written record of every occasion when the cutting or welding apparatus was used in the shaft or headgear, the circumstances when it was used, the results of examination-for fire, and the name and designation of the person who supervised the operation, shall be maintained in a bound paged book.

(10) The aforesaid precautions are given here for general guidance of the manager and all other concerned. In case of mines working seams of Second and Third Degree of Gassiness a flame or electric welding or repairing apparatus should not be used in headgear unless prior permission in writing has been obtained from the concerned JDMS and subject to such additional precautions as he may specify.

Note—In case any such apparatus is used in shaft, the provisions of Reg. 118(2) shall be complied with.

(Cir. 55/1966)

5. Preparatory stoppings for development district—There have been some occurrences of fire in development districts of mines. These fires were caused from use of explosives. There was also a case of fire in which a part of a coal pillar between main intake and main return had caught fire due to spontaneous heating along a fault plane crevice traversing the pillar.

To ensure that the whole mine has not to be sealed off because of fire in a development district it is considered advisable that besides the arrangements for fire fighting that are required to be provided under the regulations read with this office Circular No. 2 of 1960, it would be desirable to construct preparatory stoppings in the entires to one or more development districts depending upon local conditions. Sufficient building materials like bricks and other suitable materials should be kept readily available in the vicinity. Doors should also be provided which are normally kept open but can immediately close the opening of preparatory stopping as a first step for cutting off air to the district(s) affected by fire if it is decided to control the fire by isolation of the district(s).

(Cir. 62/1964)

6. Sectionalisation of u.g. workings—Despite advice contained in Circular 62 of 1964, not much progress appears to have been made in constructing preparatory stoppings (with doors) so that in the event of a fire only the affected district is isolated quickly and the whole mine has not to be sealed off at the entrances.

Recently there were two instances when the mines had to be sealed off at the entrances due to lack of proper fire-fighting and isolation arrangements underground. In both the cases one in Raniganj coalfield and the other in Madhya Pradesh millions of tons of coal have been locked up apart from rendering a large number of

persons unemployed. In one mine alone machinery worth Rs. 34 lakhs (approximate) could not be retrieved before sealing off and nearly 2500 workers were laid off. While in this case fire had apparently occurred in workings which had huge stacks of fallen coal, fire had got out of hand in the other case in a crushed zone near a fault plane.

Immediate steps shall therefore be taken in all underground mines, if not already done, so as to sectionalise the workings into different districts for the purposes of quick isolation in the event of a spontaneous heating or fire in any part of the mine. It is hoped that stern measures to enforce this important precaution, which is necessary both in the interest of safety and conservation as well as for the welfare of workers, shall not have to be taken by this Directorate.

(Cir. 5/1972)

7. Danger of spontaneous heating—Many times districts/areas are sealed off after development. Openings are sometimes made in these isolation stoppings later on for removing/inserting pipes, cables, rails etc.

Instances have come to light where these breaches/openings in the stoppings were not expeditiously closed off and spontaneous heating/fires have occurred particularly where falls of coal had taken place in the area. To guard against such dangers the following actions should be taken—

(1) Before breaching/breaking any stopping enclosing a district/area, sufficient building materials shall be provided nearby.

(2) Necessary organisation shall be geared up for quickly removing/ inserting pipes, cables, rails etc, and the work carried out expeditiously once opening(s) is (are) made in the stoppings. The opening shall be re-built immediately after work of removal/insertion of pipes, cables, rails etc. is over.

(Cir. Tech. 4/1981)

9. Use of fire-resistant hydraulic fluids in machinery u.g. —

Investigations into a few incidents of open fire in mines resulting from burning of hydraulic fluids have revealed that the temperature of the hydraulic fluid used in the equipment reaches its flash point due to pressure and friction when safety devices provided on the equipment such as fusible plug, release valves etc., are tampered with or not maintained properly. Such fire can be of serious consequences specially in coal mines. Therefore, besides use of suitable fire-resistant fluids in the equipment, the protective devices provided on the equipment should be properly maintained in safe working condition.

Recently I.S. specification IS: 7895-1975 has been published for fire-resistant hydraulic fluids and these are indigenously available.

In view of the above, it is of prime importance to use in machinery underground only fire-resistant hydraulic fluid manufactured as per I.S. specification and having obtained I.S. certification mark.

(Cir. 10/1977)

10. Blasting in fire areas— see page 468.

CMR118A

1. Fire in solid coal pillar: distance between main intake and return airways— Ventilating pressures in Indian mines are generally on the low side. Even then there are instances of outbreak of fire in solid coal pillars in some seams, which abound in prominent cleavage planes. Recently in one of the mines a fire broke out in a coal pillar situated between main intake and main return. The pillar was triangular in shape and 7m thick at the place where the fire originated. The original seat of fire was found to be 3.15m within the coal pillar and the fire had gradually travelled up to the main intake airway through a prominent cleavage plane.

Though such occurrence is not common but in view of the fact that more mechanical ventilators of higher capacity and pressure are likely to be installed in near future it is advisable for the industry to consider such a possibility and take precautionary measures. It is suggested that in coal seams which abound in natural prominent cleavage planes or geological disturbances, intake and return roadways shall be as far away (say at least 2 pillar length) from each other as practicable. Where due to operational difficulty intake and return roadways have to be maintained adjacent to each other, pillars between them shall be of adequately larger dimension than provided in the statute.

(Cir. 17/1965)

2. Isolation stoppings around extracted portions of stowing districts—

During last two years, there have been several cases of fire due to spontaneous heating in stowing mines as well. In most cases the areas enclosed for depillaring by preparatory/isolation stoppings were large and as depillaring operations progressed, the inspection and maintenance of isolation stoppings around extracted portions were found to have been neglected. Strictly speaking the provisions of Reg. 118(A) (3) (c) of the CMR 1957 requiring inspection of isolation stoppings are at present applicable only for those areas which have been fully extracted and isolated.

However, pending amendment of these provisions, in future, you are advised to observe the provisions of the Reg. 118(A) (3) (c) for regular inspection and maintenance of isolation stoppings built against extracted portions of districts in which depillaring is in progress.

(CirTech. 12/1977)

3. Danger from coal stacks underground— In some mines stacks of coal and shale are still being left underground in blind galleries or in roadways branching-off travelling/haulage roadways, and sometimes also in discontinued workings which are not sealed off, without taking any precautionary measures as given in Circular No. 7 of 1960.

Every such stack of coal/shale is potential source of spontaneous heating and fire under favourable conditions. Therefore no such stacks should be left underground anywhere, and all accessible places should be scrupulously kept clean and adequately stonedusted.

Where however, it is not practicable to remove the fallen coal, the matter should be brought to the attention of JDMS and the method of dealing with the situation may be decided in consultation with him. Recent experience has shown that sealing of fallen coal by slushing or blanketting sand is not always successful.

(Cir. 2/1967)

4. Danger from carbonaceous packing of track belowground— In one of the coal mines there was an outbreak of fire on the haulage road, which had been graded by using coal as packing material. The heating occurred in about 6 ft thick coal debris overlain by about 4 ft thick sand stone debris dumped on the haulage road for maintaining a suitable gradient. This incident has painfully demonstrated fully the danger of utilisation of coal or other carbonaceous material as packing material. Within four months of the laying of the haulage road coal debris caught fire bringing the entire work in the mine to a stand still and endangering the safety of the work persons. This incident is being brought to the notice of all concerned in order to eliminate such occurrences in future.

(Cir. 65/1970)

5. Precautions against underground fire— Recently a mine had to be sealed off at the outlets after an outbreak of fire in a depillaring district of the mine. The incident focussed attention to the following points which are being brought to your attention for information and guidance—

(1) Gob stink was detected by Mining Sirdar at the end of night shift of a rest day. It appeared that the district had not been properly inspected during whole of the rest day and thus the stink had remained undetected for a long period. Necessity for inspection of all depillaring districts on rest days by an Overman as already advised in Circular 7 of 1960 needs no further emphasis.

(2) No doors had been provided in the two preparatory stoppings. It is essential that doors of suitable design should be fitted in all preparatory stoppings constructed in the mine so that part of the workings affected by heating or fire can be isolated expeditiously and the whole mine has not to be sealed off at the outlets as happened in this case. In this context attention is invited to this office Circular No. 25 of 1964 in which provision of doors in preparatory stoppings had been recommended.

(3) The surface fan should be provided with a reversing arrangement. In the incident mentioned above no such arrangement was provided with the result that no attempt could be made to save the situation by reversing the current.

(Cir. 2/1965)

6. Crossing point and ignition point of coal seam to be depillared—

Vide Circular 53 of 1974, you had been inter-alia, requested to furnish information about crossing and ignition points of the seam to be depillared in the proforma to be filled in while submitting an application for depillaring. For the sake of uniformity and rational comparison it is necessary to standardise the method of collection of samples for this purpose.

CMRS have indicated that they would need about 3 Kg of freshly mined coal sample for Crossing Point Temperature and Ignition Point determinations. The sample should be sent in an air-tight container, preferably immersed in water.

For obvious reasons, it is desirable that the sample collected should represent entire section of the seam to be depillared in one stage. Therefore it should be a channel sample of section of the seam or part thereof to be extracted in caving system etc. as the case may be. When the thickness of seam is such that it is to be extracted in different sections or slices, separate channel samples should be collected for each such section or slice and the Crossing/ Ignition Points thereof reported separately.

(Cir. Tech. 3/1975)

7. Recalibration of direct reading CO-detectors— You may be aware that direct reading Carbon Monoxide (CO) detectors are now used in some coalmines. Whereas these instruments are convenient to use, they require careful handling and regular maintenance and periodic testing for accuracy and calibration; otherwise incorrect and misleading results may be obtained.

It is therefore recommended that direct reading co-detectors should be got re-calibrated by the manufacturers/suppliers of the instrument or by the authorised agent(s) of supplier concerned or at an approved laboratory at an interval not exceeding 4 months.

(Cir. Tech 1/1992)

8. Prevention of spontaneous heating by use of Bitumen based Fire Retardant Sealant— It has been observed that even during the last five years since 1991, 24 to 62 percent of dangerous occurrences were reported to be due to spontaneous heating of coal and in 4 to 14 percent cases of dangerous occurrences old fires reactivated and broke out due to various causes mainly due to leakage of air into sealed off/isolated areas. The enquiries made by the Directorate had revealed that not only proper monitoring of the environmental condition was not being done but also isolation stoppings and surface cracks/ fissures were not being checked and attended to at the proper time and action taken for minimising leakage of air. It has therefore continued to remain as an important problem of safety of workers and mines.

Due to seriousness of the problems Research Institutes have carried out experiments with two types of base material for development of cost effective suitable coating sealants— (i) Lime Based Coating and (ii) Bitumen Emulsion Based Coating. They have come to the conclusion that a Cationic Bitumen Emulsion based coating material would be suitable for coal. As recommended the coating material should have following characteristics:

- (1) Should be leak proof and have sealing property when tested as per IS-4355/77.
- (2) Free from toxic exhaust when heated for 3 hrs at 150°C.
- (3) Should be fire resistant.
- (4) Should pass through adherence and washability tests.

Later on, Field trials were carried out by the management (different subsidiaries of C.I.L.) both in underground and opencast mines under guidance of CMRI and CMPDEL.

‘COAL SHIELD’ Fire Retardant Sealant manufactured by PVR INSHIELD BITUMINOUS PVT. LTD., P.O. Dishergarh W.B., possesses the above characteristics. This sealant had passed different tests at CMRI Dhanbad (a copy enclosed) and was used in such trials with positive results.

It is therefore recommended that 'Coal Shield' Fire Retardant Bitumen based sealant may be used under all circumstances e.g. underground sealed off area, surface cracks at shallow cover, pillar fire, ventilation appliances and opencast coal benches, to minimise leakage of air and thereby to reduce incidence of dangerous occurrences due to spontaneous heating and fire.

I would be pleased to get a feed back on the action taken in the matter along with recommendation, if any, for improvement of the situation further.

(Cir. Tech. S&T 7/1996)

ANNEXURE 'A'

Test Report

Testing of sample for sealant— Emulsion brand name 'Coal Shield'.

Material Supplied by— M/s PVR INSHIELD BITUMINOUS
PRIVATE LIMITED Hatinal, Vill. Boldi,
P.O. Dishergarh-713 333

Ref. No. Coal Shield— CMRS/41, dated 20.4.93

Test Result of 'COAL SHIELD'

A. Leakage Test: The emulsion after due stirring painted over a brattice cloth and air dried for 72 hours and then tested as per IS: 4355/77.

Pressure in (mm)	Leakage ($\text{m}^3/\text{m}^2/\text{min}$)
10	0
20	0
30	0
40	0
60	0
70	Leakage but not appreciable

B. Toxicity Test : The emulsion was heated at 150°C for 3 hrs and the exhaust gas was analysed for CO. Results: No CO was detected in Graham Lawrence apparatus.

C. Fire Retardancy Test : The emulsion was coated on FRP piece dried for 72 hours and tested as per IS-355/77.
The flame was observed after contact time of 70 sees. The flame extinguished on withdrawal of source of flame.

D. Non-Wash ability Test : A weighed emulsion coated brattice cloth was kept in water for 48 hrs and then dried and weighed. The weight loss was negligible.

Remarks : (1) Compatibility with brattice cloth, wood and coal (Excellent)
(2) Fire retardant quality (Excellent)
(3) Adhesion (Excellent)

Tested by: S.K. Sen

Checked by: A.K. Acharya

CMR116

Precautions during sealing off a fire— The following additional precautions should be observed when sealing off a fire belowground—

(1) Before construction of a stopping is begun an adequate stone-dust barrier should, if practicable, be erected in the part of the roadways between the seat of the fire and that of the stopping proposed to be sealed, and this part should be thickly strewn with in-combustible dust.

(2) The preliminary stopping should be strong and of a thickness proportional to the cross section of the roadway. It should be built very quickly of material affording greatest practicable protection against explosion.

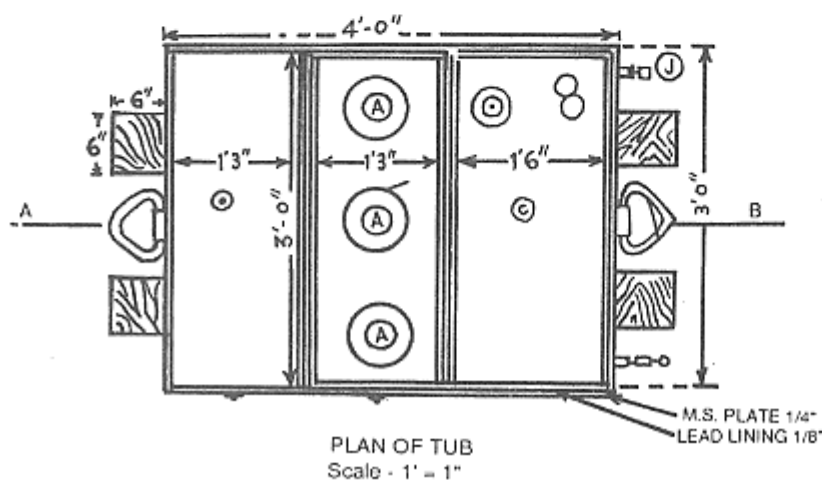
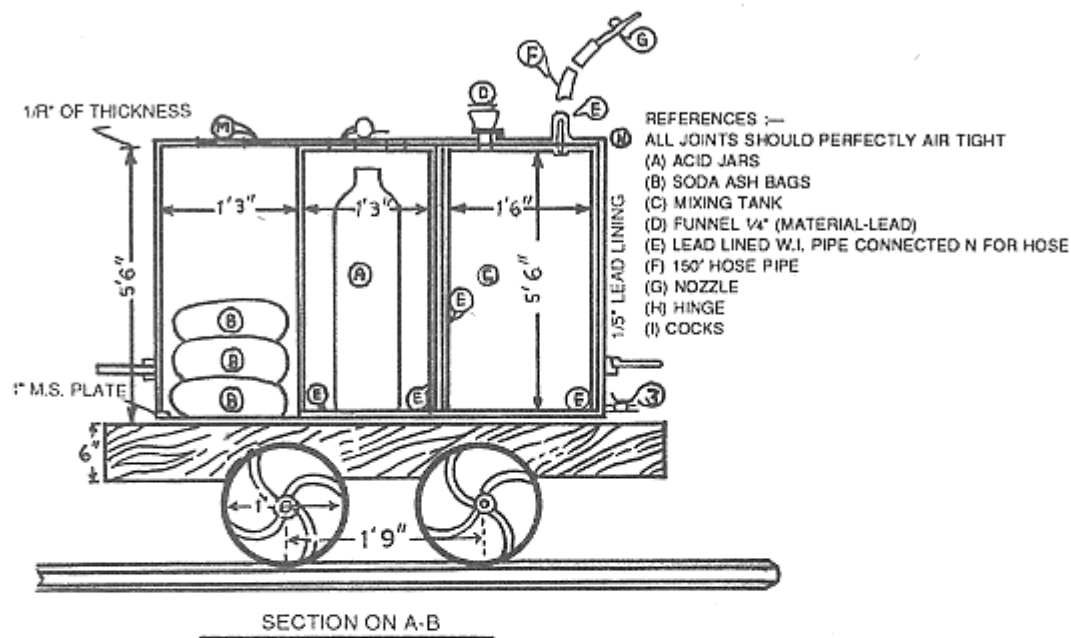
(Cir. 5/1960)

CMR 120

I Equipment for fire-fighting—Fires, specially in coal mines, are best controlled in initial stages. All mines in which a fire is likely to occur should have

PORTABLE FIRE EXTINGUISHER
FROM 30 CUBFT TUB-2' GUAGE
Scale - 1' = 1"

APPENDIX - CMR - 120A



some sort of portable fire extinguisher of adequate size ready at the mine for use in any place during initial stage of fire.

The sketch reproduced at Appendix below shows how a 36 cft. tub can be improvised to make a fire extinguisher. The chemicals can be mixed and those connected after the assembly have been taken to the site of the fire. The chemicals used may be the simplest acid and soda ash; and when used in suitable

proportions, can effectively throw inert gases on a fire situated as far as 500 feet from the extinguisher. (DGMS Inst. dt. 3.3.54)

2. Provision of fire extinguishers belowground—Portable fire extinguishers of Minimax 'Frowave' type (fully sealed model) or of other similar type should be provided at every entrance to a mine at every landing and shaft bottom in use on pumping and other machinery in shaft lodgements; at intake entrances to engine houses and sub-station; on the intake sides of gate-end switch-gear and at approximately 10 yds. on the intake side of conveyor transfer and loading points; on or near portable machines or motors and on the intake side of semiportable or fixed machines or motors and wherever timber, canvas, grease, oil or other inflammable material is stored.

For the purpose of use upon electrical fires, carbon-dioxide gas or other dry powder appliances should be used at places where electrical equipment and gear are installed.

(Cir. 21/1960)

3. Fire extinguishers for use belowground—The following fire extinguishers are suitable for use belowground:

1. CO₂ fire extinguishers.
2. Foam type fire extinguishers.

(DGMS Instruction dt. 3.6.1958)

4. Fire-fighting Equipment and Organisation—(1) Whenever in a mine fire-fighting equipment is provided:

- (a) water piping (including joints) should
 - (i) as far as practicable, be of metallic construction throughout; and
 - (ii) be so connected that the water cannot be cut off by a fire.
- (b) Hose connections should be standardised throughout the mine.

(2) In every mine where fire extinguishers are provided a sufficient number of persons, specially machine operators and khalasis, should be trained in the use of these fire extinguishers.

(3) In order to prevent accidents due to fires, it is also necessary that a proper organisation for fighting fire should exist at every mine. For this purpose, fire stations should be established at surface and also on every main haulage roadway belowground at suitable places in the intake air current near a main shaft. Adequate fire-fighting equipment should be kept in every such fire station.

(4) A sufficient number of plans showing the fire-fighting equipment maintained at the mine, and giving such other information as may be useful for the purpose of fighting fires should be prepared, and up-to-date copies of these plans should be kept available at suitable places both on the surface and belowground.

(5) Adequate number of persons should be trained in fire-fighting. Such persons should be familiar with the position of all fire-fighting equipments provided in the mine in general and near their places of work in particular.

(6) The manager of every mine should also draw up Standing Orders laying down the procedure to be adopted for giving warnings of fires, for withdrawal of personnel from the mine and for the conduct of fire-fighting operations. The Standing Orders should be sent to DGMS for his approval.

(Cir. 2/1960)

5. Model Standing Orders in the event of a Fire—Model standing orders are given below. If they need any modification to suit local conditions, the same may be amended with prior approval of this Directorate.

Model Standing Orders for Immediate Action to be taken on Occurrence of Underground Fire

A. Giving of Warning

Duty of a person—1. Any person who notices a fire in a mine shall take immediate steps to extinguish it using whatever material or appliances are available at or near the site. Where more than one person is present, one or them shall proceed for getting further assistance and to give warning.

2. Any person who notices a fire in a mine, which is too extensive to be tackled by him or when he fails to control the fire by taking action as described in clause I above, shall proceed to give warning.

3. Any person who notices the appearance, in any part of the mine of smoke or other signs indicating that a fire or heating has or may have broken out, shall take action to give warning.

4. The person detecting the fire shall take steps to give warning by the fastest means to the nearest available Mining Sirdar, Overman, or any other mine official. When the person detecting the fire is employed near the pit bottom, he shall give warning to any official present nearby and in the absence to an official or to the onsetter.

Duty of Mine Official—5. The Mining Sirdar, Overman or other mining official and the onsetter to whom warning of fire is given shall send warning by fastest possible means to:

- (a) other parts of the mine, so that persons may be withdrawn therefrom;
- (b) surface and in particular, to the Manager;
- (c) senior official if he in the underground working at the time.

6. Where available, telephones shall be used to convey warning to different parts of the mine and to the surface.

7. Where a telephone is not available, or if it is out of order, fire signal consisting of 10 raps on the haulage signal shall be transmitted from the inbye workings to haulage engine driver. The driver receiving such a signal shall transmit the warning by the fastest means to the pit bottom.

8. When the warning can neither be transmitted by a telephone nor through haulage signalling arrangement, warnings shall be sent by special messenger(s). A warning sent by means of haulage signal shall be confirmed through a messenger.

Duty of Onsetter—9. The Onsetter on getting information of a fire underground shall inform Banksman at the surface by a telephone, if available. Where there is no telephone or if it is out of order, he shall give 10 raps on the shaft signals and confirm the fire warning through a special messenger.

Duty of Banksman—10. The Banksman, on getting information about fire from underground shall arrange to give warning to the following persons in the order below without leaving his place of duty:

- (a) Manager or in his absence, the principal official present at the surface;
- (b) Attendance clerk;
- (c) The persons responsible for sounding colliery whistle, where one is so appointed;
- (d) Engineer.

Duty of Attendance Clerk etc.—11. On receiving information about the underground fire, the Attendance Clerk or the person in charge of sounding colliery siren or whistle shall give a siren or whistle of ten blasts. In the absence of a colliery siren or whistle, the Attendance Clerk shall take steps to warn the members of colliery fire-fighting and rescue teams.

Duty of Fire-Fighting and Rescue Personnel—12. On hearing the fire signal or on being informed through any other means, the colliery fire-fighting and rescue teams shall immediately collect at: (specify place)

Duty of Manager—13. On getting information about a fire or heating at the mine, the manager or in his absence, the principal official present at the mine, shall either himself inform or take suitable action to inform the Agent and other senior officers of the Company, the Rescue Station, and the Directorate-General of Mines Safety.

B. Withdrawal of Persons

Duty of Mining Sirdar & Overman—14. (a) On the appearance in any part of the mine of a fire or of smoke or other signs indicating that a fire or spontaneous heating has broken out, or on getting information about fire in any other part of the mine, the Mining Sirdars and Overman shall withdraw from the mine all persons under their control except those persons whose presence in the mine is considered necessary for dealing with the fire or heating.

(b) The persons shall be withdrawn via intake roadways and downcast shaft or intake incline as the case may be, whether these routes are ordinarily used as travelling roads, or not.

Duty of other Mine Officials— 15. The mine officials superior to mining sirdars and overman shall exercise general supervision over the withdrawal of persons from underground workings.

C. Admittance of Persons

Restriction on Employment of persons Underground—16. No person other than those permitted by the Manager, or in his absence, by the principal official present at the mine, shall be allowed to remain in or to enter the mine for the purpose of dealing with the fire.

Explanation: Every such authorisation shall, as far as possible be in writing.

Duty of Attendance Clerk—17. The Attendance Clerk shall record in his register the entry to and the exit from the mine of every authorised person.

Duty of Banksman etc.—18. The Banksman, or any other person specially deputed for the purpose, shall not allow any unauthorised person to go underground.

D. Conduct of Fire-Fighting Operations—19. All work of dealing with or sealing off a fire or heating underground shall be conducted in accordance with Regulation 119 of the Coal Mines Regulations, 1957 and other relevant statutory provisions, and any recommendations made in this regard by the Director-General of Mines Safety through Circulars issued from time to time.

20. Fires which cannot be dealt with immediately and all spontaneous heating, shall be dealt with by fire fighting and rescue teams specially detailed for the job, and in accordance with instructions issued by the Manager, or, in his absence, by the principal mining official present at the mine.

E. Resumption of Work—12. **Normal work shall not be resumed underground except with** prior permission of the Manager.

F. Enforcement of the Order—22. A copy of orders shall be posted at the mine office, Attendance Room and at every Pit Top and Pit Bottom. It shall be the duty of all mine officials and other concerned persons to make themselves thoroughly familiar with their duties in case of a fire in workings belowground. Rehearsal shall also be held for this purpose once at least in a quarter.

(Cir. 59/1967)

6. Marking of escape routes—At times an eventuality may arise in an emergency when some miners might have to walk out of the mine workings unattended or unescorted by mine officials. It, therefore, appears necessary that escape routes from different sections or parts of the mine, where persons are engaged on work, should be prominently designated by suitable markings which are clearly visible underground. This simple measure is also recommended for implementation in addition to the usual mock-rehearsals once at least in a quarter (as outlined in circular 59/1967).

(Cir. 10/1973)

7. Examination of fire extinguishers under Reg. 120(3)—This examination includes check whether (i) fire extinguishers are in working order, (ii) sufficient spare refills are available in stock, (iii) fire extinguishers clearly indicate the due date for replacement of the refill, in accordance with recommendation of the manufacturer. Supply of fire extinguishers has to be 'sufficient'.

(DGMS Instruction)

CM 121 / MMR 122

- 1. Use of sparrows for detecting Carbon Monoxide**—Ordinary sparrows are not suitable for carbon monoxide tests. There have been occasions to compare the susceptibility of sparrows with those of "MUNIA" during the work carried out in fire areas by the Rescue Stations. In an atmosphere containing carbon monoxide to the extent of 1 to 2 per cent the sparrows did not exhibit any signs of distress until they were dead; whereas "MUNIAS" exhibited progressively signs of distress as indicated below:

C0-0.15%

Type of bird used 'Munia'

Exposure	Symptom

3	minutes	:	Lost its liveliness and remained comparatively quiet.
5	minutes	:	Started gasping by opening beak.
10	minutes	:	Swayed and fluttered from its perch.
15	minutes	:	Lay at the bottom of the cage with wings out stretched but was not dead.

After this stage of 15 minute exposure, the bird was revived with oxygen. It took 30 minutes to revive the bird. The test was made in Halden's cage.

Chickens of one week age are also good indicators, but they usually take a little more time to exhibit signs of distress. Ordinary sparrows should not be used for the detection of carbon monoxide in mines. Chickens of one week age can however be used for this purpose.

Immediate signs of distress are not likely to be observed on birds when exposed to only 0.1% of carbon monoxide; they are visible only when the concentration is more than 0.3%. One bird was lost in this concentration within two minutes' time and could not be revived.

(DGMS Instruction dt. 24.9.54)

2. Other means of detecting Carbon Monoxide gas—A list of approved apparatus for detecting CO gas is given below:

Name of apparatus	Name of Manufacturer	Agents in India
"P.S." Carbon Monoxide Detector (Patented)	M/s. Siebe, German and Co. Ltd., "Neptune" Works Davies Road, Tolworth, England	M/s. Burn & Co Agencies Dept. P-10, Mission Row Extension, Calcutta.
M.S.A. Colorimetric Tester	M/s. Mine Safety Appliances Co., 201, North Braddock Avenue, Pittsburg 8PA.	M/s. Voltas Ltd., 8, Netaji Subhas Road, Calcutta.

(Cir. 18/1958)

3. Approval of Carbon Monoxide detector tubes—Carbon Monoxide Detector Tubes and Co-detector (Aspirator) manufactured by M/s. J.D. Chemicals, Barwa Road, Dhanbad have been approved under Reg. 121 of CMR 1957 and Reg.122 of MMR 1961 for detection of carbon monoxide in mines.

(Cir. Approval 1/1993)

TX11 Carbon Monoxide detector (range 0-300 ppm)	Manufactured by M/s. Oldham France, S.A. and supplied by M/s. Macneill & Magor Ltd., P.O. Box No. 1, P.O. Dhansar - 828 106	(Cir. Appr. 14/1992)

4. Recalibration of direct reading CO detectors—Direct reading Carbon Monoxide (CO) detectors are now being used in some coal mines. Whereas these instruments are convenient to use, they require careful handling and regular maintenance which include periodic testing for accuracy and calibration otherwise incorrect and misleading results may be obtained. The detectors may be got recalibrated by the manufacturers/suppliers of the instrument or by the authorised agent(s) of supplier concerned or at an approved laboratory at an interval not exceeding four months.

(Cir. Tech. 1/1992)

5. Detection of lower percentage of Carbon Monoxide—Normally carbon monoxide detector tubes are capable of detecting upto 10 ppm. of carbon monoxide is 5 squeezes with the aspirator supplied with MSA CO detector. The tubes as they are, however, are -not suitable for estimation of tower concentration of gas. The yellow reacting gel is moisture sensitive and the guard gell is not sufficient to remove the moisture of large volumes.

Central Mining Research Station have developed a suitable device consisting of various graphs which can be fitted to the existing MSA CO detector tubes for determination of carbon monoxide in samples containing up to 0.0002% of CO. This device would be useful in detection of minor traces of CO in mine atmosphere and could help in detection of fire.

For full particulars reference may be made to the article published in September 1971 issue of the Journal of Mines, Metals and Fuel or reference may be made to Central Mining Research Station, Dhanbad.

(Cir. 43/1971)

CMR 122

1. Preventing entry of water into fire areas—It is highly advisable that the surface over a fire area is inspected daily to see that any considerable quantity of water does not find its way into the fire area and thereby feed the fire.

(DGMS Instruction dt. 30.7.1935)

2. Work in mines where there is a fire—Normal work cannot be permitted unless a seam or part of the mine where there is a fire or in which there is believed to be a 'fire has been effectively sealed or dammed off belowground and as far as practicable also on the surface, from any working part of the mine. The area sealed or dammed off should include all goaves or broken strata connected with the fire, whether in the same seam or another seam.

(Cir. 3/1956)

3. Taking samples from behind fire stoppings—Samples for ascertaining atmospheric conditions behind stoppings built to seal off heatings etc. are often collected indiscriminately without regard to barometric conditions. Such samples would reflect the true state of affairs only if they are taken during periods of low barometric pressures, such as between the hours of 12 noon and 2 P.M.

It is also important for comparison purposes that, as far as practicable, the sample from a particular stopping should be collected on every occasion at the same time.

(Cir. 15/1961)

4. Recording of temperature of atmosphere behind sealed off fire area—

A number of DGMS Circulars have been issued on the subject of isolation stoppings and air sampling of sealed off fire areas (Circular No. 15 of 1961, 17 and 30 of 1964, 1 of 1968, 46 of 1969 etc.).

To keep a watch on the activity inside a sealed off fire area, it is considered desirable that in addition to regular air sampling and analysis as already advised a record of temperature readings should also be kept.

While collecting an air sample, the temperature of the air issuing out of the sampling pipe should also be taken after about a minute or so to make a correct assessment of air temperature in the sealed off area. The ambient temperature outside the stoppings as well as the atmospheric temperature on the surface should also be simultaneously recorded for comparison.

These temperature records should be maintained along with the air analysis records duly signed by the competent person (Ventilation Officer or Safety Officer) making the observations and countersigned by the Manager.

(Cir. Tech. 5/1976)

CMR 123

1. Precautions against air-borne dust—DGMS (Technical) Circular No. 16 of 1975 gave tentative standards for air borne dust. In this circular it was recommended that the average concentration of respirable dust in mine atmosphere during each shift to which each miner is exposed at any working point or place shall not exceed 3 mg/m where the free silica in air borne dust is 5% or less. Where the dust contains more than 5% quartz or free silica, the limiting value was required to be determined by the following formula: —

$$\begin{array}{lcl} \text{Permissible concentration} & & 15 \\ \text{of air-borne dust} & = & \frac{\quad}{\% \text{ respirable quartz or free silica}} \quad \text{mg/m}^3 \end{array}$$

2.0 Recent dust surveys by R & D wing of DGMS revealed that concentration of air-borne dust at working places in mechanised mines, whether opencast or belowground, and near crushers was; higher than the limits prescribed above. Following are a few examples:

DGMS

Type of mine		Place	Concentration of air-borne dust (mg/m ³)	Remarks
Opencast	(i)	Haul road	6.11	
	(ii)	Near shovel	9.12	
	(iii)	Near drill machine	5.88	
	(iv)	Near rock breaker	10.37	
	(v)	Shovel operator's cabin	7.29	with personal dust sampler
	(vi)	Dozer operator's seat	8.50	-do-
	(vii)	3 metres away from shovel	16.21	
Coal Belowground	(i)	(a) Return side of Scraper	9.86 to 22.37	Dry face
	(ii)	(a) Face of Scraper section	24.40 to 31.34	Dry face
		(b)-do-	1.25 to 2.51	Wet face
	(iii)	Coal face while drilling	15.42	Dry face
	(iv)	Coal face of scraper section	4.16 to 7.6	Water spraying done
	(v)	Near transfer point	2.22	-do-
	(vi)	Coal face after blasting	1.36	-do-
	(vii)	road header face	8.02	-do-
Stone Opencast	(viii)	Road header face near operator	8.12 to 11.47	-do-
	(i)	Near drilling site	7.76	With personal dust sampler
	(ii)	Near crusher	11.64 to 20.29	-do-
Copper Belowground	(iii)	Near crusher	19.13	
	(i)	Face during mucking (manual)	0.55	
	(ii)	Drilling (with personal dust sampler)	1.0 to 6.5	
	(iii)	Face during rock breaking operation (with personal dust sampler)	1.78	
	(iv)	Loading point	3.30	
	(v)	Return of loading point	2.46	

3.0 Health hazards associated with respirable dust are well known. Measures like water spraying, water sprinkling on haul roads use of wetting agents wet drilling and cutting, use of dust extractors overlap auxiliary ventilations should be adopted to keep the level of air-borne dust at work site within stipulated limits.

Dust surveys at strategic points with gravimetric dust samplers should be carried out regularly to monitor dust concentrations. Where dust cannot be sufficiently suppressed to stipulated limits, every person exposed to such dust shall be provided with a suitable respirator.

(Cir. Tech. 5/1987)

2. Guidelines for conducting air-borne dust surveys—The Sixth Conference on Safety in Mines under its recommendation No. 2.4.4 assigned the task of laying down guidelines for conducting air-borne dust surveys for different types of dust, specifying class of workings and periodicity of conducting such surveys for the sake of uniformity and comparison to an Expert Group consisting of a member each from DGMS, mines management, research establishment, BGML, CMPDIL and a workers' representative. Such a Group was constituted on receipt of nominations from the organisations mentioned above. The report of the Group has since been received and the guidelines for conducting air-borne dust surveys, as per the report are given in the appendix.

The group did not recommend the maximum permissible values for different types of dust in different class of workings as the terms of reference to the Group did not include such a task.

The Research & Development Wing of DGMS is implementing a programme to lay down the maximum permissible values for different types of dusts in different class of workings as part of a project under UNDP. A separate circular on the subject would follow after the work has been completed.

APPENDIX

GUIDELINES FOR CONDUCTING AIR-BORNE DUST SURVEYS.

1.0 Instrument

Considering that the British Medical Research Council (BMRC) cut-off curve having a 50% cut off at 5 micron and an upper cut-off at 7.1 micron represents in a better way the pneumoconiosis risk from mine-dust, the group felt that this curve, which was also approved by the Johannesburg Conference on Pneumoconiosis (1969) may be accepted as standard curve for any sampling instrument to be used in Indian Mines. American Conference of Governmental Industrial Hygienists (ACGIH) curve gives a 50% cut-off at 3 micron and an upper cut-off at 9 micron. The results obtained by sampler based on ACGIH curve do not agree with the results obtained by instruments based on BMRC curve. Results obtained by personal sampler operating at 2 L/Min should be multiplied by a factor of 1.38 to obtain the equivalent MRE concentration

However, personal dust sampler giving the same cut-off characteristic curve as that of BMRC might be a better instrument in assessing the exposure of any category of workers irrespective of their position of work and/or movement.

In case of asbestos dust sampling, the group felt that the method recommended by the National Institute of Occupational Health & BSI should be adopted.

The method consists of collection- of samples by the personal asbestos dust sampler and counting the fibres under pimecontrast microscope. The membrane-filter used for collection of

dust is rendered transparent by treating with acetone vapour on glass slides which is read under microscope with magnification of 450 times.

A countable fibre is defined as any object having maximum diameter less 3 μm and a maximum length greater than 5 μm and a length: diameter ratio 3:1. The result is expressed in particles per c.c.

In view of the above, the instruments to be used for air-borne dust survey in mine are:

- (i) NCB/MRE dust sampler type 113A or its approved equivalent.
- (ii) Personal-samplers of an approved type.
- (iii) Personal asbestos dust sampler of an approved type.
- (iv) Any other dust-sampler approved by DGMS.

As mentioned earlier, it is to be kept in mind that whereas a personal, sampler gives the assessment of the dust dose of an individual during a shift, a fixed type sampler viz., MRE 113A, gives mainly an assessment of work place environment.

1.1 In some metal mines where there are relatively low concentrations of highly siliceous dust, difficulty has been experienced in weighing the samples collected in single shift by portable instruments such as the MRE 113A or personal samplers or any approved equivalent. This should not be an insuperable obstacle. Experiments in several countries indicate that it should be possible to measure the quartz on a membrane filter of suitable type directly by x-ray diffraction or infra-red absorption, without weighing. The instrument would be calibrated against standard samples. Another possibility would be to sample for more than one shift which would give a sample of even greater statistical value. Static instruments could be provided with a time-switch, so as to operate over the required period each day.

1.2 Maintenance and calibration of the instruments

The instruments should be properly maintained and systematically calibrated as per the manufacturers' instructions.

1.3 Laboratories for evaluation of the samples

The laboratories for evaluation of the samples drawn and determination of its quartz content should be properly equipped.

1.4 Samplers

Adequately trained persons should be appointed for conducting air-borne dust surveys in mines.

7.5 General sampling procedures

1.5.1 Sampling with MRE or its equivalent should be carried out with the air inlet to the instrument facing the ventilation current and the instrument horizontal. The instrument shall be positioned at about breathing level away from the sides of the roadway. The position chosen shall be such that the safety of the instrument is ensured and that the instrument does not interfere with the work being carried out at that place.

1.5.2 Sampling position

- (i) Personal sampler shall be attached to the worker.
- (iii) Fixed type sampler, such as MRE 113A or its approved equivalent should be placed as follows:
 - (a) in case of manual operation, the sampler should be positioned adjacent to the worker(s) at a distance of not more than 1 m from them, and should be placed on the return side of the point of dust generation.
 - (b) in case of mechanised operation, the sampler should be placed adjacent to the operator within 1 m. inbye of his normal working positions and on the return side of the point of dust generation. In no case shall the device be installed behind the operator.

1.5.3 Places to be sampled

Any place where people are at work in a mine during a shift has to be sampled with the frequency and duration as enumerated in these guidelines. The following places also should be sampled.

1.5.3.1 Intake airway/Bord & pillar workings

Samples should be taken in the intake airway of a working district within 30 m outbye of the first working face.

1.5.3.2 Return airway/Bord & pillar workings

Samples at the return side of the working faces are to be taken at a distance of not more than 30.0 metres from the last working face.

1.5.3.3 Longwall workings

In case of Longwall workings, samples should be taken at the following positions at the return airway:

- (i) 30 m outbye of the face in the intake airway,
- (ii) 10 m from the intake end at the face,
- (iii) 13 m inbye from the return end of the face,
- (iv) at the centre of the face, and
- (v) 30 m outbye of the face in the return airway.

1.5.3.4 Opencast workings

Samples should be taken at the working places near the persons. Direction of air current should be kept in mind while sampling such that the instrument is actually placed on the return side of the point of dust generation. In opencast workings; sampling by personal samplers is considered more reliable than sampling by fixed point samplers.

1.6 Duration of sample

A working place should be sampled continuously during the whole of the working shift from the time men reach the working places, sampling should be done continuously for a shift so as to get a representative sample. In case of personal sampler, the sampler shall be attached to the person from the time he enters the mine to the time he leaves the mine.

1.7 Frequency of sampling

Every place as mentioned above shall be sampled once in every month. If the respirable dust concentration exceeds the T.L.V. prescribed for the type of dust, then the face shall be sampled again for 5 times in the next 7 successive shifts and continue till the concentration comes within T.L.V. Once the respirable dust content falls to TLV or below, the monthly schedule shall be followed.

1.8 Quartz content

The quartz content of each sample of air-borne dust shall be ascertained.

1.9 Defective samples

In any case, if the laboratory where the samples are analysed is of the opinion that due to some reason a particular sample is not representative of the mine atmosphere where the sample is taken, that sample should be disregarded and a fresh sample should be taken.

2.0 Recording of results

(a) Record of the respirable dust content and the quartz content of the samples in respect of any place where samples have been taken shall be kept in a bound paged book.

(b) A plan in a suitable scale should be maintained showing clearly all the places where sampling for air-borne dust has been conducted. The air-borne dust content, quartz content and the date of last sampling should also be indicated on the plan.

(Cir, Tech. 5/1988)

3. Approval of Casella Gravimetric Dust Sampler type 113A—See under Reg. 181(3)

(Cir. Approval 1/1990)

4. Adequate arrangements for water spraying—It had been recommended vide DGMS Circular 2 oT 1959 that suitable arrangements should be made for treating the coal dust with water within 90 metres of the working faces underground.

In a number of mines whereas water pipe lines have been laid in working districts either adequate water pressure is not available at the faces or the water pipe line is not connected to a continuous source of water supply, so the arrangement is not adequate.

It is recommended that at all mines:

- (i) the water, pressure available at the working place should not be ordinarily less than 75 lbs per square inch, and
- (ii) the water pipe line should be connected to a rise side water reservoir having sufficient capacity to meet the requirements for suppression of coal dust in the workings for one week or more or the pipe line should be connected to a water reservoir of the surface, or any other approved arrangement should be made which would ensure a continuous source of water supply at pressure.

The practice of connecting water pipe line (meant for supplying water) to suppress coal dust to a delivery pipe line of a dip side pump or a main pump cannot be generally considered a permanent arrangement for wetting the coal dust with water because in the event of failure of the pump there may not be enough water in the delivery range.

(Cir. 60/1964)

5. Approval of laboratory for determination of quartz content—The Central Fuel Research Institute Laboratory P.O. FRI (PIN 828 108), Distt. Dhanbad, has been approved for determination of quartz content in air-borne dust samples under Reg. 123(3) (d) of the Coal Mines Regulations 1957 and Reg. 124(3) (d) of the Metalliferous Mines Regulations, 1961.

(Cir. Appr. 2/1993)

6. Automatic operation of water sprays on machines—It is desirable that, so far as possible, automatic turning on and off devices should be fitted on such machines which would ensure that the cutting operation cannot start until the water spray/jet is put on.

(Cir. 26/1966)

7. Treatment of coal dust in old workings—Several old workings still contain dry and fine coal dust which has not been suitably treated. The presence of untreated coal dust in any part of the mine is to be viewed with concern as it might defeat the very purpose of treating coal dust at the working place. As most of the workings are situated far way from working places, the deposition of coal dust in these workings cannot be excessive. Therefore, after such workings have been once cleaned of all coal dust and adequately treated with stone dust very little attention will be required to keep the workings in a satisfactory state.

(Cir. 38/1960)

8. Approved wetting agent for coal dust in mines—(A) 'Calsolene Oil'

HSI manufactured by M/s. Imperial Chemical Industries (India) Pvt. Ltd. 18, Strand Road, Post Box 334, Calcutta.

The following characteristics of the wetting agent may be noted for guidance: —

1. Optimum concentration for 'Calsolene Oil' in wetting dust of low moisture as well as high moisture coals of Jharia and Raniganj field—0.16% by volume in aqueous solution.

2. Maximum amount for low moisture Jharia Coal dust* wettable per 1000 litres of 0.16% aqueous solution of Calsolene Oil = 242 Kg* i.e. 151.25 Kg dust per litre of the Calsolene Oil supplied.

Note: *Particles that pass through No. 90 B.S. sieves and retain on No. 100 B.S. sieves;

**This is the maximum possible value and it does not in any way reflect the actually attainable wettability in practice.

(Cir. 31/1966)

(B) 'Shell non-ionic detergent P-470C'. The following characteristics of the wetting agent may be noted for guidance:

1. Optimum concentration for shell P-47-C detergent in wetting dust of low moisture as well as high moisture coals of Jharia and Raniganj field: 0.20% by volume in aqueous solution.

2. Maximum amount of low moisture Jharia coal dusts* wettable per 1000 litres of 0.20% aqueous solution of detergent = 240** Kg. i.e., 120 Kg dust per litre of detergent supplied.

(Cir. 62/1966)

(C) Coalset and Coalset x 5 manufactured by M/s. Daiichi Karduria Pvt. Ltd., Liberty Building, New Marine Lines, Bombay-1, (Selling Agents: M/s Chika Ltd., 36, Ganesh Chandra Avenue, Calcutta-13).

A copy of the CMRS Test Report giving properties of the two wetting agents is given in the Annexure for your guidance. It may be pointed out that the efficacy of the wetting agent, which has been expressed as the amount of dust in kg per thousand litres of the optimum solution of the detergent, is the maximum possible one and does not in any way reflect the actually attainable wettability in practice.

TEST REPORT

Coalset

Coalset x 5

Quality	Transient frothing, faint but not disagreeable smell in dilute solution, disagreeable smell in dilute solution, easily mixable with water, clear syrupy liquid.	Transient frothing, faint but not disagreeable smell in dilute solution, disagreeable smell in dilute solution, easily mixable with water, clear syrupy liquid.
Spreading Quality	Fast spreading efficient wetting agent for dust. Particularly recommended for wetting for operation where mechanical/air stirring is used along with. 1. optimum concentration for 'Coalset' in wetting coal dust is 0.20% by volume in aqueous solution. 2. Maximum amount of low moisture coal dust* wettable per 1090 litres of 0.20% aqueous solution of coalset= 263 kg.	Slow spreading but efficient wetting agent for dust. Recommended for wetting operations where mechanical/air stirring is used along with. Optimum concentration for 'Coal set x 5' in wetting coal dust is 16% by volume in aqueous solution. Maximum amount of low moisture coal dusts wettable per 1000 litres of 0.16% aqueous solution of coalset x 5 = 1069 kg.

*In the test carried out the dusts mean all particles that pass through No. 72 B.S. sieves.

(Cir. 34/1967)

9. Suppression of air-borne dust by Mist Sprayer— According to the test report from Central Mining Research Station the (MISTER) manufactured by Mine Machinery & Spares, Saraidhela, Dhanbad, the sprayer has been found satisfactory for suppression of air-borne dust in mine.

(Cir. 68/1970)

10. Dispersability of incombustible dust used in coal mines—The quality of incombustible dust has not hitherto been prescribed. It is recommended that the dust shall be of such fineness that of the dry dust which passes through a 60 mesh sieve, not less than 50% by weight and not more than 75% by weight shall pass through a 240 mesh sieve.

As required, the dust shall also be such that it is readily dispersable into the air and, when in use in places where it is not directly wetted by water from the strata, does not cake but is dispersed into the air when blown upon with the mouth or by a suitable appliance.

(Cir. Tech. 2/1980)

11. Precautions against danger of coal dust explosion while extracting pillars by opencast method—Attention is invited to DGMS (Technical) Cir. No. 11 of 1979 in which it was stipulated that LOX shall not be used for blasting in overburden within 15m of the underground workings in the coal seams immediately below or in the vicinity.

The above subject matter has been re-examined in consultation with the Director, CMRS and the Director ISM, and it is now suggested that to prevent danger of blown through into underground workings as a result of deep-hole drilling and blasting in overburden, the following precautions should be taken :

(1) No shothole shall be drilled in overburden above underground galleries.

(2) A parting of atleast 3m between the bottom of a shothole and the coal seam shall be left intact.

The above precautions have to be observed not only with LOX but with all other types of explosives used in opencast mines.

Following the recent explosion of coal dust while extracting pillars by opencast method, it is necessary to regulate the use of explosives in opencast mines so as to prevent a recurrence of the incident. The precautions to be taken in this connection are at present under discussion with the CMPDIL. However, meanwhile it is advised that precautions listed in the Appendix below should be taken.

APPENDIX

PRECAUTIONS AGAINST DANGER OF COAL DUST EXPLOSION WHILE EXTRACTING PILLARS BY OPENCAST METHOD

1. *Survey, cleaning and dusting*—Where the u.g. workings are accessible, the same shall be surveyed and cleaned of coal dust and thickly stonedusted before commencement of extraction of pillars.

2. *Withdrawal*— All persons shall be withdrawn from u.g. in the same working seam or any other seam or section -connected therewith before commencement of blasting operations in the quarry, and no workpersons shall be re-admitted into the said u.g. workings unless and until the same have been inspected by a competent person duly authorised for the purpose and found free from any noxious gases and or signs of fire etc.

OR

The underground workings to be quarried shall be isolated by explosion-proof stoppings or by any other approved manner from any active working area either in the same seam or different seam or section as the case may be, so as to prevent transference of danger to the said active working area.

3. *Location of holes*— The spacing of holes in the bench lying immediately above the coal seam (referred to hereinafter as last OB bench) shall be so adjusted that the holes do not lie immediately above the galleries as far as possible in order to ensure that the blastholes do not directly fire into the u.g. workings.

4. *Safe parting*— The depth of holes in the last OB bench shall be such

as to leave atleast 3.0 metres thickness of OB above the coal seam, and to ensure compliance with this requirement, a pilot hole shall be put for each round of blasting to determine the total thickness of OB over the coal seam.

5. *Filling sand in holes*—Where there is any doubt particularly where there are cracks and crevices, the bottom 2 metre length of the hole shall be filled with sand.

6. *Delay detonators not to be used*—Unless otherwise permitted by DGMS in writing and subject to such conditions as may be imposed, no delay action detonators shall be used in coal, and the manner of extraction of pillars shall be by drilling and blasting holes in coal pillars only from top downwards.

7. *Workings developed in more than one section*— Where more than one section of the seam had been developed on pillars, the shotholes shall not be drilled to within 3 metres of a lower section, and care shall be taken that, as far as possible, the blastholes do not directly fire into any underground gallery.

8. *Use of water ampoules/moist sand*— All holes in the last OB bench and/or in coal shall be charged with water ampoules or with moist sand of atleast 0.6m in length at the bottom of the hole.

9. *Shelter*—No person including shotfirer shall take shelter within 100 metres of the quarry openings, and such shelter shall be of an approved design.

10. *Administrative control*—The opencast workings and underground set of workings shall be under the administrative and technical direction and control of the same Manager and/or Agent.

(Cir. Tech. 3/1980)

12. Precautions against danger of coal dust explosion while extracting pillars by opencast method—Vide DGMS (Tech.) Circular No. 3 of 1980 certain 'precautions were recommended to guard against danger of coal dust explosion while extracting pillars by opencast method. Recently there had been another incident of coal dust explosion in an opencast mine in Jharia coalfield when deep hole blasting was done resulting in shooting out of flames of explosion from different openings and raising clouds of coal dust high up into the air. The explosion was followed by fire underground and in the opencast debris. Fortunately no person was involved.

2.0 According to one of the precautions recommended, the underground workings where accessible should be cleaned of all coal dust and thickly stone dusted before commencement of extraction of pillars. Most of the workings, however, are usually inaccessible, and a question arose whether such workings could be treated with stone dust ahead of the quarry face with stone dust fed through surface boreholes and dispersed by compressed air available on site with the drilling equipment. Field trials were carried out by the R & D wing of this Directorate at two mines and the results have been encouraging. Based on the findings, the following procedure is recommended for treating the inaccessible workings underground with stone dust:

(1) Ahead of the bottom bench in overburden holes should be drilled 18 metres apart in grid-pattern from top bench in overburden or surface to the underground galleries. The distance between the 1st row of holes and quarry face should be 6 metres or less.

(2) After holing through of the galleries in coal the drill rod should be withdrawn and at least 2 tonnes of stone dust fed through the borehole.

(3) The drill rod should then be lowered through the borehole again so that it is well in the heap of stone dust dropped on the floor of the underground galleries.

(4) Compressed air should then be blown at the rate of not less than 20 cu. m per minute under pressure of at least 3.5 kg cm² for a minimum 45 minutes. This time can be proportionately reduced if compressed air at higher pressure is available.

(5) The steps (2), (3) and (4) shall be repeated with 2 tonnes or more of stone dust dropped in each hole.

(6) If perimeter of galleries exceeds 14 m the quantity of stone dust dispersed should be proportionately increased by repeating the whole process a second time.

(7) For greater effectiveness the holes should be drilled in the junctions of the galleries as far as practicable.

(8) For better dispersability, it is desirable to use pure limestone dust or dolomite dust with least possibly silica content. The stone dust should preferably be water-proofed in humid and wet conditions.

Note: None of the holes put down for stone dusting the underground workings are to be utilised for any other purpose, except for determining the thickness of overburden etc. and other monitoring purposes.

3.1 With the above stated procedue the sample results showed that the percentage of incombustibles rose from 30-40% to 80-90% in the galleries between any two holes spaced 18m apart. However, where the galleries were not in direct line of the boreholes, the increase was

only upto 50-60%, but the position could be greatly improved when air pressure is higher (say 7 kg per sq. cm.) and additional quantity of stone dust is used.

3.2 It should be possible to improve the efficiency of the operation by fabricating special equipment or device which would enable the stone dust to be airborne near about the mouth of the borehole instead of dumping the stone dust at the bottom of the hole and then attempting to disperse it with compressed air as outlined in the procedure given above. The recommended method is, however, very simple and can be adopted immediately without much difficulty or sophistication.

4.0 This should be incorporated as an additional precaution to be taken along with those given in the Appendix to DGMS (Tech) Circular No. 3 of 1980 while extracting developed pillars by opencast method.

(Cir. Tech. 4/1983)

13. Suppression of mine dust by using ionizers 'Pulver Bond' and *Dust Bond'—1.0

Introduction

Most mining operations produce dust which, when airborne becomes a serious hazard to the health of workers and equipment/machines. Besides, coal dust which is inflammable may also lead to disastrous explosion. In recent times with introduction of mechanisation both in opencast and underground mines, it has become a bigger danger than ever before since operations of machines usually throw up much more dust as compared to hand operations. Dust of any kind of sufficiently fine quality when inhaled in large quantities may lead to development of respiratory diseases such as pneumoconiosis and silicosis etc. Sizeable amounts of dust are also produced and are rendered air borne in and around haul roads in opencast mines during material transportation by dumpers, conveyors etc.

Pine dust rendered air borne remains in the atmosphere for a considerable length of time positively polluting the environment. The best method of preventing roadway dust getting air borne is to consolidate it by wetting the dust with water sprays, but water sprays alone do not produce good wetting of all deposited dust and large quantities of water may be needed frequently for producing effective results due to propensity of water to evaporate in hot and dry conditions. Wetting Agent, if added, would increase the ability of water to consolidate and hold together the smaller dust particles.

This Directorate vide Cir. No. 31 and 62 of 1966, and Cir. No. 40 of 1967 had advised the industry to use Wetting Agents for effective suppression of dust. These wetting agents were either syrupy liquid or non-ionic detergents and did not form ionized emulsion and thus were not very effective for consolidation of loose dust in order to ultimately prevent it from being airborne.

Due to limited availability of Wetting Agents alongwith the absence of methodology of correct treatment, dosages etc., and non-availability of sufficient water, the industry had not responded to the advice and standard of dust suppression remains unsatisfactory.

To overcome the above difficulties, the Research Institutes have carried out experiments with Ionized Emulsion for development of cost effective suitable Dust-Settling-Ionizer for effective dust suppression/dust consolidation including airborne dust for both opencast and underground mines.

2.0 Principle of Operation

A dilution of an Ionized Emulsion with positive and negative charged ions when sprayed in/on dusty atmosphere, binds the small charged particles together to large particles suspended in air and brings them down to settle on surface and remain there for a long time. The dust suppression material is thus able to encrust surface dust and reduce the concentration of airborne dust.

3.0 Methodology of Application

About 10 to 20 numbers applications would be required in a cyclic manner for efficient dust suppression. Each application is required to be done in two weeks followed by daily watering. The requirement of water would gradually decrease over the period of time.

4.0 Properties

The Dust Settling Ionizer should have the following characteristics '.

- (1) Flash point of Ionizer should be more than 175°C;
- (2) It should be non-toxic and hygroscopic in nature, and
- (3) It should be effective to conglomerate fine dust including airborne dust.

Field Trials of Dust Settling Ionizer have been carried out by the managements of some Coal Companies in the opencast mines under the guidance of CMRI. "Pulver Bond" and "Dust Bond" two Dust Settling Ionizers manufactured by M/s PVR Inshield Bituminous Pvt. Ltd., P.O. Dishergarh, Distt. Burdwan, W. Bengal and M/s Calcutta Mining Sealants Pvt. Ltd., P.O. Dishergarh, Distt. Burdwan, W. Bengal respectively possess the above characteristics and have been used for dust suppression in opencast mines. Pulver Bonds passed different tests carried out by Indian School of Mines, Dhanbad and Dust Bond also passed same type of tests carried out by CMRI, Dhanbad.

It is therefore recommended that a Dust Settling Ionizer may be used under all circumstances for dust suppression including airborne dust in opencast mines to start with.

We would be pleased to get a feedback on action taken in the matter alongwith recommendations, if any, for improvement of the situation further in our mechanised opencast mines.

(Cir. Tech. 8/1997)

14. Suppression of coal dust underground by using Dust Settling Ionizer— In DGMS (Tech.) Circular No. 8 of 1997 the need and results from experiments with a dust settling ionizer were elaborated. Field trials for the above were carried out both in opencast as well as underground mines. Results of the trials were found to be encouraging. This method of suppressing dust could be used affectively in underground coal mines also provided the methodology of application as described in the circular mentioned above is followed and the ionizer possesses the prescribed properties.

It is, therefore, recommended that the dust settling ionizers may be used for dust suppression in underground coal mines.

As mentioned in the circular referred above, recently two such dust settling ionizers have been introduced by M/s PVR Inshield Bituminous Pvt. Ltd. and M/s Calcutta Mining Sealants Pvt. Ltd. with trade names of 'Pulver Bond' and 'Dust Bond' respectively.

(Cir. Tech. 10/1997)

CMR123A

Appointment of Dust Incharge, Sampling Incharge and Ventilation Officers—Following additional personnel are required to be appointed at all mines by virtue of two recent amendments to coal Mines Regulations, 1957 vide GSR No. 568 dated 7th April, 1971 and GSR No. 631 dated 23rd April, 1971—

- (a) Dust Incharge
- (b) Sampling Incharge
- (c) Ventilation Officer

Unless the monthly output of a mine is less than 5000 tonnes, separate person should be appointed to discharge the duties of a Dust Incharge or Sampling Incharge and no additional

work can be entrusted to either of them except with prior permission of the concerned Joint Director of Mines Safety. Ventilation officers are now required to be appointed for seams of first degree of gassiness as well, apart from those for the seams of second and third degrees of gassiness.

Qualifications for the above officials have been laid down in the regulations. Except for mines producing over 15,000 tonnes of coal per month, persons holding only degree in mining engineering or diploma in mining engineering from an institution approved by the Central Government can be appointed to the above posts in the industry.

Despite there being a number of vacancies of Sampling Incharges, Dust Incharges and Ventilation Officers in mines, a large number of graduates of mining engineering are still unemployed. It is only fair and proper that the mining industry should play its part in providing suitable jobs to the mining graduates which are open to them under the statute, and remove any sense of frustration amongst them on this score. It is hoped that the mining industry will extend all co-operation in this respect in full measure and assist this Directorate in enforcing the statutory requirements without any pressure, so as to reduce the hardship to unemployed graduates in the national interest, as far as possible.

(Cir. 49/1971)

CMR 123 C

1. Type and manner of construction and maintenance of stone dust barriers in gassy seams of Second and Third degree—In pursuance of sub-regulation (2) of Regulation 123C of the Coal Mines Regulations, 1957 the type of stone dust barriers to be provided and the manner in which such barriers shall be maintained in every gassy seams of Second or Third degree have been specified vide Government Notification No. GSR 472 dated 6.11.1974 published in the Gazette of India dated 12.4.1975 part- II, Section 3(i). The schedule is reproduced below.

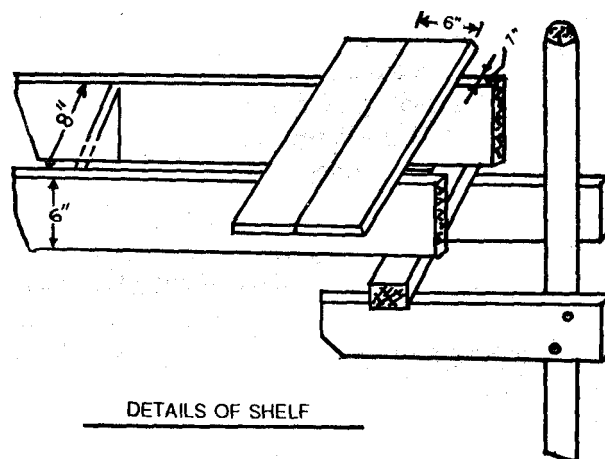
SCHEDULE

STONE DUST BARRIERS FOR GASSY SEAMS OF SECOND AND THIRD DEGREE

1. General

1.1 Stone dust barriers shall be placed in the full path of the explosion and the shelves shall be so arranged that their collapse in the event of an explosion is not impeded.

1.2 Barriers shall be sited as low as convenient within the upper third of the roadway; and no part of any shelf and no stonedust on it shall be less than 10 cms from the roof or sides of the roadway or any roadway support.



In addition, the shelves shall be constructed and installed that, in the event of an explosion, they fly without obstruction along the roadway.

2. Design of Barriers

2.1 The stone dust shall rest on boards which run longitudinally in the roadway and whose length equals the width of the shelves. These boards shall rest on a rigid frame, the two members of which shall be atleast 15 cms in depth and rest on their edges on two fixed rigid brackets.

2.2 Neither the boards nor the frame shall be fastened either to each other or to fixed brackets.

2.3 Primary or first or light barriers which are intended to be installed nearest to the possible point of ignition, when installed, shall consist of lightly loaded shelves (see below) not more than 35 cms in width.

2.4 The distance between two shelves of a light barrier shall be not less than 0.9 m and not more than 2.0 m.

2.5 The shelves of a light barrier shall be loaded with not more than 30 kg of dust per metre of shelf length and the total quantity of stone dust in the barrier shall be not less than 110 kg. of stone dust per sq. metre cross-section.

2.6 Secondary or heavy type of barriers (see below) intended for use further outbye shall consist of one third of its shelves loaded and spaced (see below) as in case of primary barriers.

2.7 The loading for a heavy barrier shall be 390 kg. per sq. metre of the cross section. The shelves shall not exceed 50 cms in width and their loading shall not exceed 60 kg per metre of shelf length.

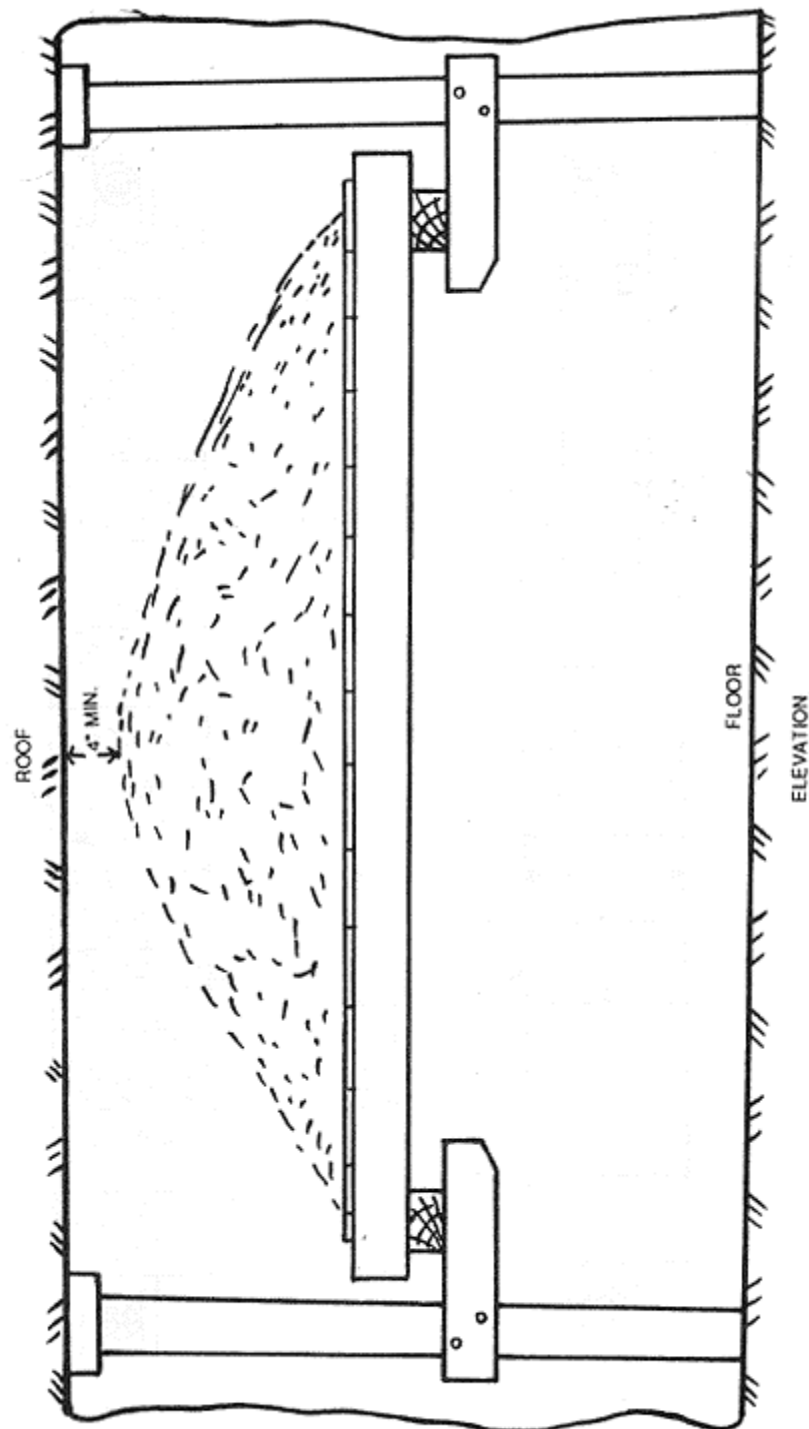
2.8 The distance between heavily loaded shelves or between a heavily loaded shelf and a light loaded shelf shall not be less than 1.25 m and not more than 2.7 m.

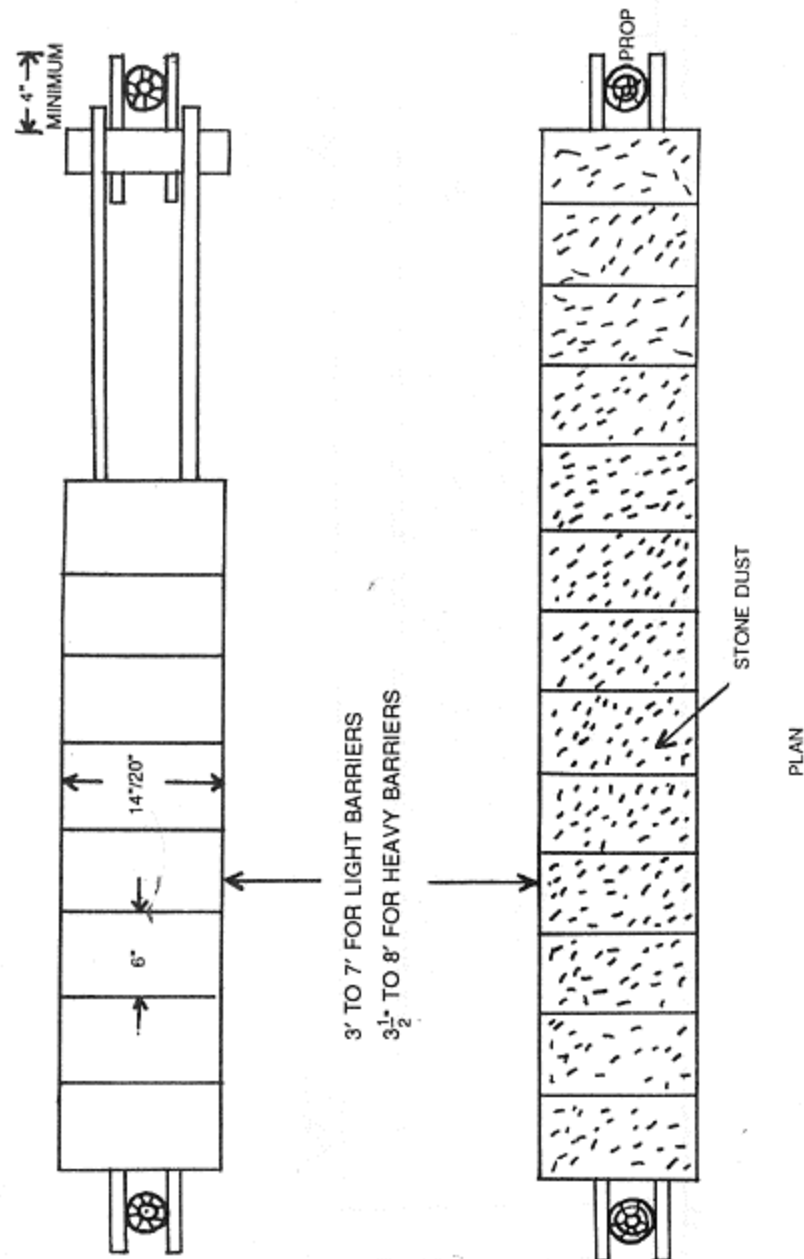
2.9 The lightly loaded shelves shall be adjacent to each other and placed at the inbye end of the barrier.

2.10 Where circumstances require intermediate barriers, such barriers shall be loaded with 195 kg of dust per square metre of roadway, half the dust being placed on lightly loaded shelves and half on heavily loaded shelves. The lightly loaded shelves being arranged at the inbye end, as in the case of heavy barriers.

2.11 When calculating the quantity of stone dust in a barrier, cross sectional area shall mean the average cross sectional area determined by an off set survey of the roadway where the barrier is installed. The amount of stone dust in the lightly loaded shelves in a heavy barrier shall be calculated proportionately on the basis of average length of the shelf as determined from the offset survey plan.

2.12 For maximum dispersability the dust shall be piled loose on the shelves. The dust shall also be of a type that will not cake in use; in damp or wet condition water-proofed stone dust shall be used.





2.13 When a roadway has to be enlarged to provide sufficient height to accommodate a barrier, the ripping shall extend over a distance on each side of the barrier equal to at least 20 times the difference between the height of the top of the stone dust on the barrier and the height of the unripped roadway.

2.14 When siting a barrier, the distance as specified shall be measured from the shelf nearest to the face.

3. Bord and Pillar Workings

3.1 The workings in the mine shall be divided into sections so that an explosion occurring in one section may not spread to another.

The barriers may be sited in relation to group of adjacent headings.

3.2 In bord and pillar workings, only a heavy type barrier may be provided at a suitable site in relation to the groups of headings in a district intended to be served by the barrier. Such a barrier shall be provided at a distance of not less than 135 metres from the nearest working face and not more than 365 metres from the farthest face.

3.3 Heavy barriers shall be provided in all the entries to the district. When in any entry a stopping is to be provided instead of a dust barrier, such stopping shall be explosion proof. If any dispute arises whether a stopping is explosion proof, it shall be referred to the Chief Inspector for decision so, however, that such stopping shall be of strong construction with brick in cement and not less than 1.8 metres in thickness and located at a position corresponding the inbye ends of the barriers. The gallery outbye of such stoppings shall be kept clean of coal dust, heavily stone-dusted and adequately ventilated.

3.4 The barrier including the explosion proof stoppings, if any, shall be provided at fresh site as the faces advance, in order to comply with the conditions mentioned under para 3.2 above.

3.5 The sites of stone dust barriers shall be predetermined at the time of planning the mine and the pillars at such sites shall be of adequate size such that the shelves of the barriers are included in about one pillar length. Where the shelves of a stone dust barrier extend through a junction of galleries, either the cross galleries shall be blocked off by stoppings and such galleries kept adequately treated with stonedust and ventilated, or the shelves extended into the cross galleries for a length on either side which is not less than the length of barrier extending over the junction and outbye of it.

3.6 When it is impracticable to site a barrier within the upper limit of 365 metres, the matter may be referred to the Chief Inspector.

3.7 When a new district is being developed a barrier or barriers shall be sited in the adjacent transport road within the distance mentioned under para 3.2 to give protection in relation to the group of newly started headings.

4. Single Heading in Coal

4.0 When a single heading is driven from an existing main roadway, a barrier of heavy type shall be sited in the main road at a distance specified under para 3.2 measured from the face of the heading.

5. Longwall Workings

5.1 A barrier of light type shall be installed in all longwall gate conveyor roads within the range of 45-110 metres from the nearest point of the face.

5.2 A second barrier of heavy type shall be installed in longwall gate conveyor roads at a distance of 180-320 metres from the face.

5.3 When a conveyor gate is being developed and the road is too short to accommodate barriers, light and a heavy barrier shall be sited on the trunk conveyor road outbye of the transfer point at the respective distances mentioned under para 5.1 and 5.2.

5.4 Where the trunk conveyor road passes inbye of the transfer point to other districts, two more such barriers shall be provided in the corresponding positions, inbye of the transfer point.

5.5 For a newly developed face which does not have a separate ventilating split, a pair of barriers shall be sited on the trunk road at the distance specified above.

5.6 Where a number of longwall faces are being developed from a relatively short length of trunk road, protection shall be provided to prevent an explosion occurring at any face spreading to other parts of the mine and also as far as practicable, so as to prevent an explosion from

spreading to an adjacent face. Where practicable, this protection shall be provided by a system of light and heavy barriers.

6. Shaft Insets

6.1 Where more than one seams are worked from the same shafts, heavy type of barriers shall be sited in the roads adjacent to the shaft landings in each seam at a distance of 90 m to 150 m from the landing. These barriers shall, as far as possible, be so arranged that they are in the middle of a straight stretch, at least 180 m in length.

7. Barriers in thin Seam

7.1 In thin seam where the roof condition does not allow heightening of roadways to accommodate barrier shelves in the manner specified under paragraph 1.1 and 1.2, stonedust barriers may be provided in the following manner:

(a) in the travelling roads and airways other than haulage roads, the stone dust barrier shelves may be provided of shorter length, leaving a clear space of at least 10 cms on one side, and up to 90 cms on the other side for passage of men, provided that the length of the shelves shall not be less than 180 cms. Suitable type of fencing shall be provided between the travelling passage and the part of the roadway containing barrier shelves.

(b) In the haulage and tramming roads, the stonedust barrier shelves may be provided on either side of the track leaving a clear space of at least 10 cms from the side of tub and shelf. Provided that length of the shelf shall not be less than 90 cms and where the roadway cannot be safely widened to accommodate such shelves, the shelves may be located on the side of the track.

(c) the total quantity of stone dust in the stone dust barrier shall be at least 1-1/2 times of that required in normal cases, the rate of loading of shelves remaining the same.

(d) The part of the roadway containing the stone dust barrier shall be kept clean of coal dust and thickly treated with stone dust on roof floor and sides including cogs and other supports.

8. Maintenance

8.1 For proper discharge of his statutory duties, the Ventilation Officer shall ensure proper construction and maintenance of the barriers in the following manner:

(a) He shall examine the stone dust barriers once at least in every week. As a part of this examination dispersability of the dust shall be tested by taking some dust in hand and blowing on it. If this shows that the dust has tended to cake or consolidate the dust in the barrier shall be removed and replaced by fresh dust.

(b) He shall arrange for repair of any damage to the shelves or other parts of the barrier.

(c) He shall supervise the erection of new barriers as required.

(d) He shall write a report on such inspections and on any action taken or required. The report shall be countersigned by the manager. In the book maintained for such reports, there shall also be recorded all data concerning position, quantity of stone dust, cross-section of the road in which the dust barrier is situated, date of inspection and renewal of stone dust and any other relevant particulars.

(e) If at any time, the Ventilation Officer is not in a position to rectify any defect, or damage to a barrier, he shall report the matter to the Manager who shall take immediate action to put the barrier in proper order.

8.2 If any defect in the stone dust barrier is not possible to be removed forthwith, shotfiring shall be stopped in the district or districts concerned, pending remedy of the defect as early as possible.

8.3 The barriers, as required, shall be removed at necessary intervals to ensure that they are maintained constantly within the recommended range of distance from the face.

9. Check Boards

9.1 A board shall be provided near each barrier on which the following information shall be recorded:

- (a) Cross-section of the roadway.
- (b) Total dust loading of the barrier.
- (c) Number and loading of shelves.
- (d) Date of last removal of stone dust.
- (e) Reference number of the barrier.
- (f) Date of last inspection by the Ventilation Officer.
- (g) Signature of the Ventilation Officer.

9.2 The following particulars in respect of stone dust barrier shall be shown on the rescue and stone dusting plans:

- (a) Position, type of barriers, and date of their construction.
- (b) Projection for next position of the barriers and the likely date of their installation.

These plans shall be brought up-to-date not less than once in three months and copies of the stone dusting plan shall be provided to the officials and competent persons responsible for examining and maintaining the barriers.

(Cir. Legis. 6/1975)

2. Water proofing of dust for stone dust barriers—For maximum dispersability dust should be of a type that will not cake in use, and in damp or wet conditions water-proofed dust must be used.

Necessary steps should be taken to ensure that the limestone dust is made water-proof wherever required. In this connection it may be pointed out that waterproofing of limestone dust with a fatty acid like stearic acid results in a distinct decrease in its efficacy as an explosion suppressant due to the inflammability of the fatty acid. In general about 30% more water-proofed dust per unit mass of coal dust is required for equal efficacy to untreated stone dust. On the other hand if a compound which is known to be good flame and explosion inhibitor is incorporated with the water-proofing agent, its effect might more than compensate for the decrease in efficacy due to the water-proofing agent.

(Cir. 2/1966)

CMR 123/MMR 124

1. Approval of dust respirators—Dust respirators manufactured as per BIS specification (IS-9473-1980) and approved by this Directorate shall be considered suitable for use in mines under Reg. 123(4) of the CMR 1957 and Reg. 124(4) of the MMR 1961.

(Cir. Gen. 1/1991, 1/1994 & 1/1995)

2. Manganese poisoning—In November 1958 Government of India appointed a committee of medical officers to investigate into the causation, extent, diagnosis and treatment of different varieties of manganese poisoning and to advise preventive measures for the same. Following recommendations are amongst those made by the committee :

1. Dry drilling must be stopped at all costs and wet drilling introduced compulsorily both underground and at surface. In general dust control methods are strongly recommended wherever a hazard exists.

2. In underground mining practices, the following ventilation standards are tentatively recommended :

- (a) Maximum permissible concentration of 6 mg of manganese dust per cubic metre of air.
- (b) A minimum air velocity of 50 ft. per minute at the work faces and dead ends at points not more than 5 ft. away from the worker.
- (c) As a check, periodic dust, and ventilation surveys of the underground environment should be done.

3. All management personnel in the manganese mining should be conversant with the occupational risks in the industry.

4. All manganese mines should have suitably qualified medical officers— whole-time or part-time. Periodical medical examination of all mines should be done and adequate records maintained.

As soon as early diagnostic symptoms and signs are recognised, the worker should be withdrawn from his duty environment to a suitable surface job and the proper authority notified.

There is no specific remedy for the disease and the affected patients should be rehabilitated in new occupations suitable to their physical conditions.

(Cir. 25/1961)

3. Precautions against dust in manganese mines—Apart from wet drilling which must be done. Dr. Donald Hunter, consultant who had visited some of the manganese mines in India in 1963 has made the following other recommendations which should be complied with :

1. In mines which are in semi-desert areas with an exceedingly low rainfall and there is scarcity of water, the water should be brought to mining sites and stored for use in drilling. To save water, wet drilling may be done with a detergent (say 1% sulphonated oils which are cheap and simple to use) added to the water. (During the drilling operation, the detergent will produce foam that will trap dust and help in saving considerable quantities of water).

2, All eating and drinking must be forbidden at work amongst mining personnel; instead washing facilities should be provided and food kept in places away from any possibility of contamination by ore dust.

(Cir. 73/1964)

CMR 126

1. Mining operations at shallow depth of cover—Under Reg. 126 of the Coal Mines Regulations, 1957 before making any workings beneath and within 15 metres of any river, canal, lake, tank, surface reservoir etc. permission in writing has to be obtained from the Director General of Mines Safety. This gives an opportunity for the strata between the proposed workings and the water-body to be examined carefully, and if necessary, precautions taken to guard against danger of inrush of water or other liquid matter. In area where the cover consists mainly of alluvium and/or sand particularly in the vicinity of rivers/jores, and where the workings have to be made at a shallow depth of cover, even though the provisions of Regulation 126 are not applicable, such a move is likely to disclose the presence, if any, of soft ground, including running sand, above the coal seam, against which suitable precautions can be taken in time to avert any untoward incident. Managements conducting or intending to undertake mining operations at shallow depth of cover in suspect areas should give effect to the above precaution and to keep the Joint Director of Mines Safety, incharge of the mine, informed of their findings.

(Cir. 23/1969)

2. Resurvey of jores, nallas etc.—It has been found that in several cases the course of jores, nallas and other courses has shifted to considerable extent over the past few years from the course shown in the mine plan. To assess the danger of inundation in mines from such shifting, it is necessary that every water course is re-surveyed and correlated with the workings belowground. Whenever any large discrepancy from the known data is noticed, it should be

intimated to the JDMS concerned. The report should be accompanied by necessary plans accompanying the change.

If the re-survey indicates that any new danger has arisen, this should also be clearly indicated in the intimation aforesaid.

(Cir. 44/1959)

3. Precautions against danger of inundation from surface water—Reg. 126(1) (a) of CMR 1957 provides that where any mine or part thereof is so situated that there is any danger of inrush of surface water into the mine or part, adequate protection against such inrush shall be provided and maintained.

In the discharge of above responsibility you must have identified the possible sources of danger and laid down remedial measures. As rainy season is fast approaching, now is the time to make a careful re-appraisal of the situation.

Enquiries into accident caused by sudden inrush of surface water have revealed that in several cases even the obvious precautions were not observed. It is thus not enough to lay down remedial measures only, what is more important is to evolve a system which does not fail at the critical moment. It is, therefore, recommended that the following steps may also be taken to improve such systems generally: —

(i) A careful assessment of the danger of inundation from surface water should be made before the on-set of rainy season and adequate precautions against such danger should be clearly laid down and implemented.

(ii) Effectiveness of precautions against danger of accumulation of rain water, weakening/breach in embankments, obstructions in normal drainage system should be checked regularly and also by surprise inspections.

(iii) Fixation of danger mark of water level, effectiveness of the signaling and communication system should receive particular attention.

(iv) Standing Orders for withdrawal of persons from the mine in case of apprehended danger should be framed and enforced. All concerned should be made familiar with the Standing Orders. Mock rehearsals should be held for this purpose' once at least in every month during the rainy season.

(v) During heavy rains, the manager or senior most mine official present in the mine, should go round the surface area of the mine to check vulnerable points and effectiveness of the safety measures. In case of any doubt, he should withdraw persons to safety from threatened workings.

(vi) The Area Safety Officers should maintain close liaison with the mine officials particularly during heavy rains to ensure strict observance of the precautions.

(vii) Specific precautions to be observed in a mine should be prominently displayed in the office of the Manager and also at such other places as may be deemed necessary.

(viii) It should be borne in mind that situation changes swiftly due to heavy rainfall and the necessity of constant vigilance in such circumstances cannot be over emphasised.

(Cir. Tech. 2/1978)

CMR 127 / MMR 128

1. Barrier with earlier workings—At present when an area is being developed, the managements are required to keep a solid barrier of 10 metres thickness against earlier workings whether developed or sloped. The reason for the stipulation is that the plans of the old workings

are either not available or not reliable. Nevertheless, it is a wasteful process because mica locked in these barriers is permanently lost.

If managements are interested in reducing the thickness or in completely doing away with the barriers, they may come forward with concrete proposals specifying the manner of proving ground and protecting the workings or slopes from dangers. In each case, decision will be taken after examining the merit to the proposal.

(Cir. 61/1970)

2. Drivage towards waterlogged dip galleries—The regulation 127(5) of CMR 1957 also applied to normal drivages towards waterlogged dip galleries and should be strictly followed in all such cases.

(Cir. 1/1957)

3. Precautions while approaching waterlogged dip galleries—Recently three lives were lost in a coal mine when a level heading approaching an adjacent waterlogged dip gallery in the same seam, got connected to it and three miners working on the dip side were drowned.

During enquiry there were two startling revelations. Firstly the provisions of Reg. 127(5) of the CMR 1957 were not complied with although in DGMS Circular No. 1 of 1957 it had already been made clear that provisions of Reg. 127(5) also apply to normal drivages towards waterlogged dip galleries and should be strictly followed in all such cases.

Secondly the offending gallery was accessible. It was, therefore, possible to dewater it directly by installing pumps/siphons and thereafter an inspection of the workings would have revealed whether the danger was removed or not. Instead an attempt was made to dewater the dip gallery by putting two bore holes, which failed to tap the water satisfactorily but led mine officials to believe that the gallery was free from water. An inspection was not made.

In the case of thick seams, there is the added danger of the old and present workings being in different horizons.

It is, therefore, once again advised to strictly comply with the provisions of Reg. 127(5) in similar situations. Where the water-logged workings are accessible, it is desirable that these are dewatered directly by installing pumps/siphons and thereafter the workings should be carefully inspected to ensure that the danger does not exist.

(Cir.. Tech. 1/1979)

4. Mining near water bodies—In coal mines, mining near abandoned or discontinued waterlogged workings is hazardous. In the past many accidents have occurred when the active workings got connected to waterlogged workings. An obvious remedial measure in such cases would be to safely drain out the water body, provided it does not engender any other hazard.

It is requested that suitable action should be taken in all such cases. Henceforth in every application made under Reg. 127(3) of CMR 1957, it should be clearly stated whether the question of draining the water body was considered. In case the workings are not to be drained, the reasons may be given.

(Cir. Tech. 1/1982)

5. Minimum length of advance boreholes—There appears to be some misunderstanding about the words 'constantly maintained' in the regulations. The intention is that the length of a borehole should not at any time be less 3 metres. This means that at a machine cut face where the depth of the cut is say 1.5 metres, the length of the borehole before giving a cut should be not less than 4.5 metres. Such a length would ensure that even after giving the cut and blasting of the face the length of the borehole remaining in the face is not less than 3 metres. Before the next machine cut, the length of the 3 metres long borehole should be extended by 1.5 metres or more making it at least 4.5 metres to provide for the subsequent reduction in length of the borehole by about 1.5 metres with the next machine cut and blasting at the face. For pick mining faces, the length of the

initial borehole would of course depend upon the rate of advance. If the rate of advance is say 0.5 metre in a shift, the length of the borehole to start with should be at least 3.5 metres. At the beginning of each shift, the borehole should be advanced by 0.5 metre or more to ensure that the length of the hole will not be less than 3 metres at any time during the shift.

(Cir Tech. 1/1964)

6. Plugging of boreholes—It is well known that prospecting boreholes put in a property, and which later get connected with underground workings can be a source of danger specially if they intersect a water-bearing strata or during or after a particularly heavy rainy season. It is, therefore, desirable that while planning lying out of workings in a seam, care should be taken to ensure that the boreholes do not get connected with underground galleries but are sited over solid pillars of coal. However, if some boreholes do get connected inadvertently, the same should be kept plugged with cement grout. When a borehole is intended to be used for any purpose and it is intentionally connected with the underground workings, it should be suitably cased and the annular space between the borehole and the casing pipe filled up with cement grout effectively.

(Cir Tech. 1/1973)

7. Recommendations of Mahabir Court of Inquiry—As is well known a fatal accident due to inundation took place in the underground workings of Mahabir Colliery of the Eastern Coalfields Ltd. on November 13, 1989, killing six persons. Sixty five persons were also trapped and were rescued after almost seventy five hours.

The court of Inquiry appointed to inquire into the causes of and the circumstances attending the accident made, inter alia, the following recommendations for similar accidents in future: —

- (i) development of awareness among workers and the first line supervisors of the need for identifying hazards through intensified programmes or education and training;
- (ii) activating the institution of Safety Committee, and Workmen's Inspector so that they become relevant to the safety needs of underground coal mining;
- (iii) inculcation in the minds of workers and officials in underground coal mines the need for compliance with the provisions of the safety laws and regulations;
- (iv) provision of infrastructure (wherever required) for drilling advance boreholes to detect the presence of waterlogged workings.

Managements are requested to implement these recommendations in their mines.

(Cir. Tech. 2/1993)

8. Recommendations of Chasnalla Court of Inquiry—See chapter 'General'.

(Cir. Gen. 1/1979)

9. Recommendations of Gaslitand Court of Inquiry—See chapter 'General'.

(Cir. (Tech.) 1/2001,2/2001)

CMR 129

1. Particulars of water dams—The depth to which the dams are locked into the roof, floor and sides are important dimensions. Similarly, the materials used in construction of a dam are also important details to be shown on plans.,

(DGMS Instruction dt. 12.8.1959)

2. Supervision during construction of water dams—During the constructiol of water dams belowground the foundations are not properly cut and the construction work is not up to the standard. As a result, either the work has to be repeated or the dam becomes a potent source of danger. Considering this fact the Safety in Mini Conference (1958-59) recommended that the construction of dams should be place under the personal supervision of either an Assistant

Manager or a graduate mining or civil engineering. Whenever a water dam is constructed in a mine, the recommendation should be complied with.

(Cir. 24/19)

3. Control valves in water dams—It has been seen that a number of mines provide short length of pipe with a wheel valve at the outbye end in the water dams to keep the dammed-off area free from water. In a number of cases it has been found that only rejected length of pipes are used for this purpose with the result that in course of time the pipes corrode and crack so that the drainage of water cannot be stopped or regulated when required.

It is therefore recommended that when it is thought necessary to provide control valves, only non-corrosive types of pipes should be fitted in the water dams.

(Cir. 68/1967)

4. Construction of retaining walls to hold water in mine workings—Sometimes retaining walls are built in workings belowground to store water at low head for various purposes like stage sump, water for spraying purpose or cooling in air compressor etc. Such retaining walls are generally built with an opening at roof level so that head of water is limited to gallery height, but quite often the quantity of water so stored is fairly large.

Unless the retaining walls are built strongly and locked properly into the containing gallery sides and floor, any disturbance in the storage area like sudden fall of roof etc. may cause their damage or even failure. In such an eventuality sudden inrush of water is likely which may spell danger to workpersons employed in the neighbourhood or in dip headings at a lower reduced level than that of the storage area.

To obviate any such chance of mishap, it has been decided to treat the retaining walls built for the purpose of storing water as water dams and as such the same shall only be constructed in strict compliance with requirements of Reg. 129 of CMR 1957 and corresponding Reg. 130 of MMR 1961.

As regards retaining walls which are already being used for above purpose you are advised to submit details of construction thereof to the respective JDMS and obtain necessary approval for their continued use as water dams, unless the same are no longer meant to hold water at any head.

This may be given top priority for safety in mines.

(Cir. Tech. 7/1976)

VENTILATION

CMR 130 / MMR 131

1. Ventilation in Sinking Shafts—At all sinking shafts deeper than 30 metres, there should be some mechanical means of ventilation.

(DGMS Instruction dated 20.11.1937)

For shafts up to 60 metres deep, however, it may be enough if suitable means to clear the fumes are provided by means of compressed air.

(DGMS Instruction dated 5.10.1959)

2. Advance Scrutiny of Mine Projects—In its report on Standards of Mines Ventilation, the Technical Committee on Mines Safety Standards has recommended inter alia that "there is great need for advance planning of all mine projects with a view to ensuring that the ventilation aspects receive due consideration from the very initial stages". The relevant extract from the Report is reproduced at Appendix below.

Action is being initiated by the Central Government to amend the Mines Act to provide for the setting up a Mine Development Board for advance scrutiny of all mine projects from the safety viewpoint. Even before such a board is set up, however, it will be in the interest of mine managements themselves to send a copy of all new project reports to the office of DGMS for such scrutiny—particularly from the ventilation point of view. Existing mines should also draw up their plans for development and extension of workings at least three years in advance and submit copies of the same to the office of DGMS for scrutiny. This would also enable the managements to give thought to obtaining timely permission for working under restricted area or in respect of their depillaring programmes as advised in DGMS Circular No. 19 of 1960.

APPENDIX

STANDARDS OF MINE VENTILATION

(Extract From Report of Technical Committee on Mines Safety)

39.1 There is also great need for advance planning of all mine projects with a view to ensuring that the ventilation aspect receives due consideration from the very initial stages.

In this connection it may be pertinent to recall the following comments made in 1959 in respect of ventilation planning in British mines by the Bryan Committee:

"Whatever the particular problems presented by individual collieries may be, the important general requirement is that there should be a plan and that the colliery ventilation system should not be merely the result of expedients progressively adopted as the workings advance."

The capacity of the fan and the ventilation lay out should be selected having regard to the highest duty they will be required to perform, and the colliery officials should be fully conversant with the overall development plan for the ventilation of the colliery, both as a whole and specially as it affects the particular part of the pit for which they may be responsible. In our view there is considerable advantage to be gained by including ventilation amongst the items covered by the general development plan for a colliery and which cannot be altered subsequently in any major respect without derangement of other plans"

"It is important that the efficiency of ventilating systems and all their equipment is kept under close review to ensure that they are actually achieving what they are intended to achieve and to effect any alterations necessary in the light of changing circumstances."

39.2 Till about 30 years ago, ventilation in Indian mines was not a major problem except in the ultra-deep mines of Kolar. As the workings became deeper and generally more gassy, however, difficulties arose in this respect. The average depth of the mine workings in this country is steadily increasing and in general the firedamp emission per tonne of coal mined is also increasing. In order to avoid ventilation difficulties arising later on, therefore, the necessity of planning the ventilation system well ahead has become more evident and, indeed, must now be accepted as a merely good mining practice.

The greater depth of mining also gives rise to higher strata temperatures with resulting higher air temperatures in the working places, which again calls for advance ventilation planning and possibly, in due course, for some form of air conditioning, much as is already being practised in the Kolar gold mines.

39.3 The average daily output of Indian mines is also increasing, and still larger outputs are being planned, necessitating the provision of larger volumes of circulating air and of higher fan water gauges. It now becomes essential to look many years ahead when considering the installation of main fans for these mines, whether existing or projected, in order to ensure that the fan will meet the full ventilation requirements of the colliery for as far ahead as can be reasonably foreseen. Furthermore, the ventilation requirement may change appreciably during the successive stages of development of the mines—all of which must be considered when preparing the fan specification if the fan is to operate with a reasonable degree of efficiency throughout all the stages of development and workings'.

39.4 Though the safety aspect of ventilation is generally well appreciated, the economic aspect has not received the same attention and indeed, sometime it appears almost to have been totally forgotten. The main fan is rarely visited by the senior officials; and large volumes of leaking air serving no useful purpose, may be heard but cannot be seen. The main fan operates 60 minutes per hour, 24 hours per day and 365 days per year. The cost of providing the ventilation system and the constant provision of adequate quantities of air may be quite high at large mines today and even at 5% drop in ventilation efficacy can mean a loss of thousands of rupees at the end of the year.

Thus, in a mine in which 1,50,000 ft./min. of air is circulating at 1 inch water gauge, the cost of power alone comes to over Rs. 28,500 per year assuming a mechanical efficiency of 90%, a fan efficiency of 60% and an industrial rate of 10 paise per unit of electricity. If this fan efficiency could be increased to 70% the cost of power would come down by Rs. 3,700 per year. In addition, of course, there are costs of depreciation and maintenance as well as labour costs.

To ensure that the ventilation system is the most economical possible, it should not be allowed to develop haphazardly, but must be properly planned having in mind the future development of the mine, the layout of the workings, and the method of working to be adopted. As no mine ever develops precisely as planned, the ventilation system must be reasonably flexible and must be amended as occasion arises.

40.1 The Committee understands that provision is being made in the Mines Act for the setting up of a Mine Development Board for scrutiny of all mine project plans. The Committee feels that the proposal brooks no delay if only to ensure that adequate attention is paid to the Ventilation aspect of the mine at its planning stage.

(Cir. 16/1964)

3. Notice to be sent when the percentage of methane in any return air exceeds 0.75 per cent—When the percentage of inflammable gas in any return air exceeds 0.75%, it shows that the ventilation arrangements are not adequate.

When this happens, it is advisable that the matter should be brought to the attention of the Directorate. It is therefore requested that, if any determination shows the percentage of inflammable gas to exceed 0.75 in any return airway, a notice should be sent to the JDMS forthwith giving, inter alia, the following particulars.

- (i) Name of seam.
- (ii) Name of ventilating district.
- (iii) Percentage of CH₄
- (iv) Quantity of air in return airway.
- (v) Number of persons employed in the ventilating district.
- (vi) Precautionary measures being taken.

(Cir. 5/1966)

4. Ventilation surveys of large mines—In its report on Standard of Mine Ventilation the Technical Committee on Mines Safety standards has recorded that the field investigations carried out on its behalf have "brought out the desirability of complete ventilation surveys being carried out at all large mines. Adequate facilities for such survey work are available at the Central Mining Research Station." This observation of the Technical Committee is a very important one and is being notified to all concerned for information and necessary action.

(Cir. 8/1964)

5. Maximum wet-bulb temperature at faces as recommended by Technical Committee on Fatigue of Mine Workers—In hot and humid mines there is likelihood of strain with the existing level and pattern of workload at even lower temperature than indicated in the regulations. But short of such extreme suffering i.e. heat collapse, strain of various degrees was observed which was mostly, if not exclusively, due to heat-stress.

In this connection attention is invited to Reg. 130(3) (IV) of Coal Mines Regulations 1957 and Reg. 131 of Metalliferous Mines Regulation 1961 for strict compliance.

The Technical Committee on Fatigue of Mine workers is of the opinion that wherever the humidity is higher, the safe limit of environmental temperature shall be brought down to 30.0°C wet bulb temperature to reduce substantially the strain.

Managements are advised to submit a specific time bound programme to achieve a wet bulb temperature of 30°C or less within a year. It is contemplated to incorporate the above recommendation in the regulations at future date.

Wherever such conditions exist in underground non-coal mines, similar action as above is suggested for compliance.

It is requested that suitable steps should be taken to reduce, by all appropriate means, the exposure of workers underground to the safe limit of environmental temperature not exceeding 30°C wet.

(Cir. Tech. 3/1978)

6. An incident of ignition of inflammable gas—An incident of an ignition of inflammable gas that occurred in a development district of a mine in which there had been no previous history of occurrence of inflammable gas. An enquiry into the incident revealed that while a miner was cutting coal in a heading, his pick struck against pyritic stone band. The sparks produced as the result of this friction were sufficient to cause an ignition of a layer of gas that had accumulated at the face having come through cracks from the overlying strata. The depth of this working was only about 45 metres (150 ft.) from the surface. Fortunately there were no fatalities. Coal dust did not take part as the workings were naturally wet.

This incident, however, once again focussed the importance of providing good ventilation at the face to dilute and render harmless any dangerous accumulations of inflammable gas in any mine.

(Cir. 75/1966)

7. Ventilation survey and investigation reports to be sent to the Directorate—The role of adequate ventilation of belowground workings in improving working conditions having been realised by several managements, it is a welcome trend to find them sincerely worried about attaining the prescribed ventilation standards in their mines. The multiplicity of seams being

worked in our mines, over large geographical areas from numerous openings has made the task of reaching the goal difficult. Before a feasible solution can be prescribed for a particular mine it is essential to know the present and future requirements of the mine characteristic and other details which can be ascertained by experts with the help of appropriate instruments. Some managements hire the services of Scientists from the Research Station for this purpose. If a copy of the report prepared by these Scientists is forwarded by the managements to this Directorate, it would enable the officers of the Directorate to render all possible assistance to the managements in solving their problems. It is, therefore, requested that whenever the services of the Research Station are utilised for conducting ventilation surveys or investigating into certain problems, a copy of their findings may be furnished to this Directorate.

(Cir. 26/1970)

8. Adequacy of ventilation while using explosives in underground metalliferous mines—During trials conducted for assessment of fume characteristics of new explosive formulations both from I.D.L. and I.E.L. for use in underground metalliferous mines, it has been observed that unless ventilation is of high standard, carbon monoxide and/or nitrous fumes formed by blasting of practically all types of explosives above the threshold/ceiling limits internationally accepted for these noxious gases are met with for some time after the blast and thus injurious to the health of the workpersons in the vicinity.

In view of this it is advised that while using any explosive, be it NG-based, AN based or slurry, in underground metalliferous mines the following precautions regarding ventilation should be observed: —

(1) Adequate arrangements should be made to circulate such quantity of air upto the site of blasting as to ensure, after every round of blast, dilution of carbon monoxide and oxides of nitrogen in the blasting fumes to less than 50 parts per million and 5 parts per million respectively within a period of 5 minutes.

(2) For drivages more than 50 m long a suitable auxiliary ventilator should be provided to ensure at least 150 m³/min ventilation air current within 4.5 m of these faces.

In addition, in view of the difficulty of sampling and analysing for CO and nitrous fumes as well as paucity of suitable detector tubes for these gases no person should be allowed to re-enter the place where blasting has been carried out unless the fumes are cleared and unless a period of atleast 15 minutes has elapsed from the time of blasting.

(Cir. 30/1973)

CMR 131

1. Air-lock design—Attention is invited to Reg. 131(5) of CMR 1957 according to which "At every shaft or incline ordinarily used for lowering or raising of persons or materials where a mechanical ventilator is installed, there shall be provided a properly constructed airlock"

At a number of mines the type of air lock provided consists of only a simple covering at the top of a shaft which is lifted up by the upcoming cage. In this design, heavy leakage of air as much as 20 to 30% of the quantity of air circulated by mechanical ventilator takes place when the cage is resting at the pit top. Such a design of the air lock therefore cannot be considered as suitable.

The suitable air-lock designs are—

- (1) Standard type of air lock at the top of a shaft enclosing part of the pit top.
- (2) Guillotine type of doors which are provided in a vertical steel box fitted within the headgear.
- (3) German type box which forms an air lock inside the shaft.

Types (1) and (2) are well known. A sketch of the German type box is enclosed.

Special attention is invited to the German type box. As would be seen, it would not be difficult for most of the mines having simple coverings at shaft tops to change over to this type of air lock. If the airlock is properly constructed, it has been found that the leakage through the box when the cage is resting at the pit top does not exceed 3 to 5% of the total quantity of air being circulated by the fan and the leakage is practically negligible when both the cages are below the pit top.

It is advisable that wherever simple covering at the upcast shaft is provided, the same should be replaced by one of the three types as recommended above.

(Cir. 82/1966)

2. Arrangements for reversal of ventilation—Regulation 131(2) of Coal Mines Regulations 1957, requires inter alia, that every mechanical ventilator (other than an auxiliary fan) shall be so designed, installed and maintained that the current of air can be reversed when necessary. In the case of a Sirrocco Fan installation, this can be done by re-arranging the set of doors in the ventilator housing. In other cases, reversal of air current can be achieved by changing the angle of the ventilator blades whenever such a facility exists. Failing this, the direction of rotation of the fan has to be reversed either by reversing the drive belt/ropes or by reversing the direction of rotation of the motor itself.

Incidentally, most of the mechanical ventilators in use are electrically driven and have rigid blades. The reversing of air current in such cases can be easily achieved by reversing the rotation of the electric motor. However, it has been brought to my notice that 'reversers' have generally not been incorporated in many

It may be emphasised here that when the fan pressure is reversed ventilation doors unless fitted with catches, may blow open thereby causing short circuiting of air. And unless these catches are in use at all times, they may well be inaccessible or overlooked when an emergency arises. Therefore in order to secure effective compliance with Reg. 131(2) of CMR 1957, it is necessary to have such arrangements, fitting or equipment which would give the required service in emergencies. The arrangements for the purpose at mines should be reviewed to satisfy that reversal of air flow can be effected at the farthest working place of the mine in the shortest possible time.

(Cir.32/1971)

3. Standby ventilator for emergencies—Recently in one of the mines where the seam is highly gassy, due to the breakdown of the main mechanical ventilator even the pumping operations at the shaft bottom in the intake airway had to be severely curtailed due to non-availability of a ventilator of adequate capacity. This indicates the necessity of providing an alternative ventilator in such cases so that essential work can be carried on at the mine in the event of the stoppage of the main mechanical ventilator due to breakdown etc.

In all such seams a standby ventilator should be provided for use in such emergencies. Scheme in this regard may be submitted to the Director of Mines Safety of the zone by 31.10.1972 and this direction should be complied within six months of the issue of this circular.

(Cir.42/1972)

CMR 132

1. Precautions against danger of fire from Mechanical Ventilators installed belowground—in the year 1959, one of the bearings of a main mechanical ventilator installed belowground before the coming into force of CMR, became hot, resulting in the drive belt catching fire. Before the fire could be detected, the electric winding of the drive motors got burnt and the timber used in the vicinity of fan also caught fire as also the coal in the pillar sides. All persons working underground had to be withdrawn to the surface and the services of the Rescue Station had to be requisitioned before the fire could be put out.

This case brings out the advisability of siting the main mechanical ventilators on the surface even though a mine may be a non-gassy one. Managements of all mines having main ventilator installations belowground have been advised to explore the possibility of shifting the mechanical ventilator to the surface.

Wherever mechanical ventilators are installed below ground, it is also necessary that the coal sides for a distance of 10 metres in all directions be properly walled in by masonry.

(Cir. 6/1959)

CMR 133

Air Measurements—In most mines, air measurement readings as recorded are not correct due to the fact that—

(a) Anemometers used have not been calibrated for a long time and are, therefore, giving very misleading figures.

(b) Air measurement stations are badly sited and are not maintained in a streamlined condition.

It is important for proper control of ventilation at mines that air measurements taken are correct, Adequate facilities are available at the Central Mining Research Station, Dhanbad for calibrating anemometers.

(Cir. 46/1963)

CMR 134

1. Written permission for stoppage of main mechanical ventilator—While inquiring into the causes and circumstances attending the accident due to gas explosion at Noonidih-Jitpur Colliery that occurred on Sunday the 18th March, 1973, the Court of Enquiry came to the conclusion that the cause of explosion was primarily due to prolonged stoppage of the main surface ventilation fan on the fateful day for 3 hours in the first shift and again continuously for six hours in the second shift. As a result, accumulation of gas occurred in the working of No. 14 seam, which was categorised as a seam of Degree III gassiness. In due course an explosive gas mixture was formed in the underground working. The accumulation of gas that occurred was ignited by electric sparks from a drill panel unit located in the top gate on the return side of a longwall face. Investigations confirmed that work on the drill panel unit was being done without ensuring that power supply was isolated on the return side. The arrangements to isolate power at the drill panel had been rendered ineffective due to the absence of a mechanical isolator in the drill panel, which was missing.

Apart from the clear contraventions of Indian Electricity Rules as mentioned above, the investigation also brought out certain shortcomings in the provisions of regulations in respect of stoppages of mechanical ventilators, as well as the Standing Orders framed under Reg. 134(1) of Coal Mines Regulations, 1957. The observations of the Court of Enquiry in this regard are reproduced below:

"While the current regulations require that the specific permission of the manager should be obtained before the main fan is stopped, it does not, however, require that this permission should be given in writing. I recommend that the fan should not be stopped apart of course from stoppages due to power failure or other circumstances beyond the control of the management, except on the written authority of the manager or a person authorised by him. Such authority should, in every case, indicate also the period for which the fan is to be stopped. Even when the fan stops for reasons outside the control of the management the fact of stoppage should be recorded in the fan register and initialed by the Manager or the person authorised by him in token of his having been informed."

"It would thereupon be entirely the responsibility of the manager or the officer authorised by him to take such action to withdraw men from underground as he is required to do so under the Standing Orders. It will also be his responsibility to decide if the power should be disconnected. If so, to what extent, after providing for essential services to be maintained."

The provisions of the regulation referred to by the Court are incorporated in Reg. 133(2) of CMR 1957 which reads as follows:

"The installation and maintenance of every mechanical ventilator shall be supervised and controlled by a competent person appointed for the purpose and except in an emergency, no person shall start, stop, remove or in any way alter, repair or interfere with any such ventilator except by or on the authority of the manager or other official authorised in this behalf. Particulars of every such stoppage or alteration, together with the duration thereof, shall be recorded in a bound paged book kept for the purpose."

It is proposed to amend the said regulation, in due course, to require that written permission of the manager should be obtained for stoppage of the main fan. In the meanwhile, it is recommended that departmental action should be taken by every manager straightaway to require this to be done by all concerned at this mine including the engineering personnel.

As for the specific responsibility for withdrawal of persons and disconnection of power supply from underground, suitable provisions can be incorporated under the Standing Orders itself as framed under Regulation 134 to make the position clearer.

All managers were advised to submit their modified Standing Orders for their respective mines so as to fix a clear line of responsibility for withdrawal of persons and disconnection of power supply etc. from underground workings, as mentioned above within 30 days of the receipt of this Circular to the concerned Joint Directors.

(Cir. 53/1973)

2. Model Standing Orders in the event of stoppage of main mechanical ventilator—Model Standing Orders in the event of stoppage of the main mechanical ventilator are reproduced in the Appendix for gassy mines.

APPENDIX

MODEL STANDING ORDERS IN THE EVENT OF STOPPAGE OF THE MAIN MECHANICAL VENTILATOR

(Under Reg. 134 of CMR, 1957)

Fan Attendant

1. (a) The fan attendant shall not stop the main mechanical ventilator except on the written authority of the manager or a person authorised by him in this behalf. Such written authority shall, in every case, indicate the period for which the fan is to be stopped, and the fan attendant shall strictly comply with the instructions.

(b) In the event of stoppage of the main mechanical ventilator either authorisedly, or due to power failure, or for any other reason whatsoever under circumstances outside the control of the management, the fan attendant shall immediately open the main doors of the ventilator installation, where such doors are provided.

(c) He shall then immediately notify the attendance clerk on duty of the stoppage, clearly indicating the reasons and circumstances thereof and get the particulars of every such stoppage and duration thereof recorded in the bound paged book maintained under Regulation 133(2) by the attendance clerk; and the fan attendant shall also sign every entry.

The book shall be kept under charge of the fan attendant.

Attendance Clerk

2. (a) On being notified as aforesaid the attendance clerk shall immediately send information of the stoppage—

(i) to the onsetter or any other person in-charge of the pit bottom (who shall arrange immediately to inform every undermanager, assistant manager and overman and other member of supervisory staff present below ground); and in mines which are worked by inclines, wholly or partly to every undermanager, assistant manager and overman and other members of supervisory staff present below ground.

(ii) to the manager (or in his absence, to the senior official present on the surface of the mine) and to the engineer authorised by manager for this purpose.

(b) The attendance clerk shall note down the exact time and other particulars of every stoppage of ventilator in the Book provided for the purpose under Regulation 133(2) and get the entries initialed also by the manager, engineer or person(s) authorised in writing by manager in this behalf as token of their having been informed of the stoppage of the fan.

Immediate precautions (Cutting off electricity and withdrawal of persons)

3. (a) The engineer, or a person authorised in writing by the manager in this behalf, shall arrange to have the electric current cut off from all apparatus belowground excluding auxiliary fans (if installed belowground), except from such apparatus as is situated in a main intake airway or at a distance greater than 270 m from nearest working place.

(b) The undermanager, assistant manager, overman or other members of supervisory staff on being informed of the stoppage of main mechanical ventilator or otherwise coming to know of such stoppage shall arrange to withdraw all persons present belowground from the working place to the nearest main intake airway at least 270 m away from the nearest working face, to the downcast shaft bottom, or in case this is worked wholly or partly by incline, to the surface.

Short Stoppage

4. (a) If the ventilator is restarted and works satisfactorily within a period of one hour after its stoppage, the attendance clerk on duty shall immediately send information thereof to all persons concerned mentioned in article 2(a) above. All working places in the mine shall then be examined by an overman or other competent person(s) in the manner laid down in Regulation 113 and if they are found to be free from inflammable and noxious gases and in safe condition, persons may be allowed to proceed from the place to which they had been withdrawn to their respective working places. Information about resumption of working shall be reported by senior official present belowground to the manager in writing expeditiously.

Provided that where auxiliary fans are installed, the overman or other competent person shall arrange for starting of such fans (if the atmosphere at the site of such installations is free from inflammable gas) before allowing persons to the working places ventilated by the fans.

Long Stoppage

5. (a) If the ventilator has not been restarted within a period of one hour from time of its stoppage, all persons shall be withdrawn from the workings below ground.

So, however, that officials and persons engaged in supervisory duties, pump attendants and persons employed on essential urgent repairing work may be permitted by the manager (or in his absence, by the senior official of the mine) to remain belowground if he is satisfied that the places where these persons are to work or to pass are adequately ventilated during the stoppage of the ventilator and gives an order in writing to the effect.

(b) When the ventilator has been restarted after a period of more than one hour from the time of its stoppage, all working places in the mine shall be examined by an overman or other competent person(s) in the manner laid down in Regulation 113.

Order for general resumption of the work shall be given by the manager (or in his absence the senior official of the mine) in writing only on the receipt of a report that the ventilator including booster and auxiliary fans (if any) are working satisfactorily, and that all working places are in safe condition. All such orders of resumption of work shall be recorded in the book maintained under Regulation 133(2). The manager shall also write or cause to be written in this book the cause of stoppage of the ventilator and the time when the ventilator restarted its normal working, the time when the electric power was cut off and restored, and particulars of the withdrawal of persons and resumption of normal work.

Planned Stoppage

6. (a) When the stoppage of a mechanical ventilator is pre-planned, no person shall be allowed to proceed underground without written authority of the manager (or in his absence by the senior official of the mine present at the surface).

(b) The manager (or in his absence the senior official) shall inform in writing all concerned officials (as well as the fan attendant and the attendance clerk) about the planned stoppage, period for which the fan is to be stopped, and, the precautionary measures to be taken by each of them during the stoppage.

Resumption of Work and Restoration of Electric Power

7. (a) The competent person(s) making the inspection under article 4 and 5(b) above shall immediately record the result thereof in the book kept under Regulation 114(3).

(b) The electric current shall not be switched on until, as a result of such examination, the workings have been found to be free from inflammable gas within the meaning of Regulation 130(2).

Enforcement of the Orders

8. (a) A copy of these Orders shall be posted in the fan house, office of the mine, attendance room and at every pit top and pit bottom, and in the case of mines worked by inclines wholly or partly, at every landing on the haulage planes. It shall be the personal duty of the manager to make all officials and persons concerned thoroughly conversant with their duties in case of a stoppage of the main mechanical ventilator.

(b) The manager shall authorise an official in writing to discharge his responsibilities under these Standing Orders when he is absent from the mine. The official so authorised shall make himself constantly available at the mine during such period.

Means of Communication

(c) The manager shall ensure that adequate means of communication are provided between all necessary points so that the information about stoppage of mechanical ventilator is sent to all concerned promptly by the persons who are so charged with this responsibility under these Standing Orders.

Stoppage of one fan out of two parallel running fans

(d) The above procedure shall also apply when only one fan out of two parallel running fans is stopped due to any reason. Work in the mine shall be resumed only on written authority of the manager and on such conditions as he shall specify in every case, after ventilation of the mine has been re-established.

(Cir.537J.973)

CMR 136

1. Brake lining and brattice cloth—Ordinary brattice cloth or any inflammable material used for ventilating purposes, underground mine is a potential danger.

(Cir. 1/1940 & 25/1970)

2. Specifications for Ventilation Stoppings—The following standards are recommended for construction of Ventilation Stoppings.

Thickness and Construction—1. (a) The minimum thickness of a ventilation stopping should in no case be less than 38 centimetres.

(b) The stoppings should be pucca, built in lime or cement mortar.
Prevention of leakage—2. The stoppings should be plastered on the outside with sufficient thickness of lime or cement plaster to prevent leakage of air.

(Cir. 17/1964)

3. Minimising leakage of air through stoppings etc.—C.M.R.S., Dhanbad, has developed a sealant to minimise leakage of air through stoppings and pillars. The product is based on Sodium Silicate and Limestone mixtures with additives to improve adhesive property. The sealant consists of two components, one being solid and the other in liquid form. The two are mixed before use and applied on a surface by brush.

The product which is currently being manufactured by Mine Allied Products, 8 Govind Nagar, Rajendra Path, Dhanbad, was used in a few coal mines and reportedly, it was found to be useful in reducing leakage of air through ventilation and isolation stoppings and also through coal pillars. The results were, however, not satisfactory when the sealant was applied on rough surfaces on unplastered stoppings and coal pillars.

This is for your information.

(Cir. Tech. 3/1984)

CMR 136 A

Maximum Air Velocities—The current regulations specify only maximum velocities of air at or near working faces but the maximum velocities in shafts, main roadways, etc. have not yet been stipulated. In designing a mine, however, it is necessary to know the maximum limits which should not be exceeded taking into consideration factors like dust hazard, fire hazard, human

discomfort etc. as also on economic considerations (cost of excavation versus high pressure/power costs etc.) so as to determine optimum dimensions of shafts and roadways.

2.0 Based on our experience in this country as well as standards adopted by other countries like U.K., Poland and USSR, the following standards with regard to maximum air velocities are recommended for different location as indicated below:

Locality	Maximum Velocity (m/sec)
Ventilation shafts not provided with winding equipment, fan drifts	15 m/sec
Ventilation shafts where man-winding is not carried out, or hoisting, shafts only	12 m/sec
Shafts used for man-winding or man-hoisting shafts and haulage roads (other than Conveyor roads)	8 m/sec
Other roadways	6 m/sec
Conveyor roads, loading points and transfer points	4 m/sec
Working faces in developing or depillaring/stopping areas including longwall faces	4 m/sec

3.0 These are the upper maximum limits of air velocities. There can of course be no objection to providing lower velocities (in fact, in some situations this may be inescapable or even desirable) so long as the same do not fall below the minimum statutory limits specified for a location or point.

(Cir. 42/1974)

CMR 137

Use of auxiliary fans underground—Reg. 137 of CMR 1957 lays down certain precautions with regard to installation, location and working of auxiliary fans. In many cases, it has been found that the fans are not properly located with the result that there is recirculation of air.

With a view to prevent re-circulation of air which could lead to a dangerous situation in a mine, it is recommended that the following rules should be observed in all mines where auxiliary fans are installed:—

- (1) To prevent re-circulation of air, the quantity of air taken by an auxiliary fan shall not exceed one half of the quantity in the current from which the air passing through the fan is drawn; provided that this rule shall not apply where the inlet and outlet ends of the duct are separated by doors or seals.
- (2) All auxiliary fan installations, which draw air from an intake airway and feed it into a return airway, shall be examined once at least in every week by the Ventilation Officer to check that the quantity of air passing in the intake airway on the inlet side of the fan or fans (if more than one fan is drawing air from the same airway) is sufficient for the proper ventilation of the inbye workings when the fan/fans is/are running.
- (3) Before any auxiliary fan is installed the quantity of air flowing in the airway at the point, where it is proposed to install it, shall be measured. The fan shall not be installed unless the measurement shows that there would be a sufficient quantity of air, (a) to avoid the possibility of re-circulation, (b) for the proper ventilation of the inbye district when the fan is running.
- (4) (i) If it is necessary to regulate an auxiliary fan, it shall be done in such a way as to prevent unauthorised or inadvertent alteration.

(ii) Fans delivering air through flexible ducting shall not be regulated by constricting the ducting.
 (iii) Fans with rigid ducting shall not be regulated by placing loose obstructions such as bricks or stones in the ducting.

(5) No person other than an official of the mine, ventilation officer or a person authorised by the manager to do so shall regulate the quantity of air passing through or delivered by any auxiliary fan.

(Cir. 82/1963)

CMR 141

1. Precautions against gas during dewatering of disused workings—Attention is drawn to an accident in a mica mine in which three workmen were seriously injured due to ignition of inflammable gas in a drive. Firedamp or marsh gas can be formed by the decomposition of timber or vegetable matter. Accumulations of such gas can thus be encountered in blind headings in mines which are being dewatered after being abandoned for sometime.

(Cir. 18/1961)

2. Use of flame safety lamps in statutory inspections in First Degree Gassy Mines—Reg. 141(2) (a) of the Coal Mines Regulations, 1957 requires that the first inspection of a mine or part which is re-opened after a discontinuance of mining operations for a period exceeding seven days and of any part of the mine after being dewatered should be made by a competent person with an approved flame safety lamp and during such inspection no additional lamp or light other than an approved electric torch or lamp should be used.

Again Reg. 124(2) of CMR 1957 requires that in a non-gassy mine if any workings have approached within 30 metres of a known dyke, fault or other geological disturbances the competent person appointed to make inspections under Reg. 113 should during the course of his inspection test for the presence of inflammable gas with an approved flame safety lamp.

There are some other occasions also like inspection following the occurrence of fire or inspections of fire stoppings when it is necessary to make the statutory inspection with only a flame safety lamp.

It should be appreciated that in order to comply with the aforesaid requirements of the regulations the sirdars appointed in first degree gassy mines should also be competent to test for the presence of inflammable gas and therefore they should hold a gas testing certificate granted under the CMR 1957.

It is possible that the presence of a dyke or fault may not be known in advance, and since in most of the mines some of the faces are likely to remain discontinued due to practical difficulties for periods of 7 days or more, it is advisable that in all the underground first degree gassy mines also the statutory inspections of both active and discontinued faces should be made with flame safety lamp to avoid any mishap due to chance of occurrence of inflammable gas in such mine.

Therefore necessary action to encourage your sirdars to obtain a gas testing certificate as early as possible shall be taken. For this purpose arrangements should be made to train them at the mine so as to enable them to pass the gas testing examination. In the meantime, tests for inflammable gas at the active faces should be made once at least in every 24 hours by an overman or an assistant manager. Tests for the presence of inflammable gas should also be made during the weekly inspections of unused workings carried out under Reg. 143 by the overman appointed by manager for the purpose. A written record of the results of such tests should be maintained.

(Cir. 3/1966)

CMR 142

1. Barometric Pressure—In order to find out if there is any abnormal change in the barometric pressure which would affect the rate of emission of noxious gases underground from sealed off areas etc. it is advisable that each mine should provide a barometer. The readings of the barometer should be recorded by a competent person, and any unusual change in the barometric pressure should be reported by such person to the manager for suitable action including withdrawal of persons from the mine or part of a mine as may be considered necessary in the interest of safety of workers.

Barometers shall be provided at least at every first class mine in which depillaring is done and/or which has sealed off workings underground.

(Cir. 84/1966)

2. Accidents due to inhalation of nitrous fumes—The effect of inhalation of nitrous fumes on workers employed belowground does not appear to have received adequate attention nor the dangers associated duly recognised. Instances have come to light recently where some belowground workers who were so affected died shortly after. In all such cases, death was apparently taken to be due to broncho-pneumonia whereas in actual fact, it was due to Broncho spasm due to inhalation of noxious fumes. Had the patients been treated for the latter viz. noxious fumes by provision of oxygen etc., it is likely that their lives could have been saved. It is also to be recognised that the effect of inhalation of nitrous fumes on different individuals may be different, depending upon the concentration of the noxious fumes in the general body of air, degree of exposure and the constitution of the individual. Thus, in some cases death may follow the same day, or in some extreme cases, even a week later. It is because of this time-lag and similarity of symptoms that such deaths are being recorded as natural deaths instead of recognising them as occupational hazards.

An extract on this topic from ILO publication Occupational Health & Safety is reproduced below in this connection for information:

"There is some doubt concerning the toxic actions of nitric oxide, but it is certain that nitrogen dioxide, with its associated dinitrogen tetroxide, is a powerful lung irritant and it is probable that the hazard from 'nitrous fumes' is due mainly to this component. Exposure to high concentrations in the region of 100-500 ppm may lead to sudden death from bronchospasm and respiratory failure. A more typical death arises from delayed pulmonary oedema, the initial signs on exposure being no more than moderate irritation of the eyes and respiratory tract. A third type of death may ensue several weeks after exposure and may be associated with inflammatory changes termed broncholithis fibrosa obliterans and thought to be due to an auto-immune response or with bronchitis, pneumonia or other lung infections."

In drawing the above to your notice, I am to request you to bring the same to the attention of all concerned, more particularly to the Mine/Hospital Doctors to the above occupational hazard and of the dire necessity of treating such patients more for inhalation of noxious fumes rather than for bronchitis.

(Cir. Tech. 7/1981)

CMR 145

1. Dust and gas analysis laboratories at mines—As per regulations samples of coal dust are to be collected from the u.g. workings in coal mines and analysed for the percentage of incombustible matter. Regular samples are also to be collected from the mine air to keep a check on the percentage of inflammable gas in the mine atmosphere.

To be of practical use, the coal dust and mine air samples should be analysed within the period of ten days and four days respectively.

At present most of the coal mines send their samples for analysis either to Government laboratories or some private laboratory. Of course, a few mine managements have their own arrangements in this regard. It has been seen that, generally speaking, the analysis results from

the outside laboratories are received at the mine very late and therefore the position is not satisfactory. Apart from the question of delays in getting the analysis results well in time, it is desirable even otherwise that the mine managements should have their own laboratories as far as possible.

(Cir. 87/1966)

2. Repair and Service of Riken Gas Indicator Types 17 and 18—Mines Service Corporation, Safety House, Ushagram, Asansol are the sole selling Agents in India of Riken Keiki Fine Instruments Co. Ltd., the manufacturer of Riken Gas Indicator Type 17 and 18 which are approved for use in mines vide DGMS Circular No. 42 of 1962. Recently the service engineer of Mines Service Corporation has returned from Japan after extensive training in repair and maintenance of these instruments and the manufacturers have authorised Mines Service Corporation to undertake necessary repairs and maintenance of such instruments. Managements may like to make use of this facility.

(Cir. 15/1969)

3. Calibration of Methanometers—It is recommended that all methanometers approved for use in mines are calibrated at an interval of 12 months so that their accuracy is maintained. Calibration of the instruments could be carried out by the following:

- (1) Central Mining Research Station—Methanometers of all makes.
- (2) Mines Service Corporation-Methanometers of Riken Type.

(Cir. 11/1971)

4. Sampling of mine air—The following methods are recommended for the collection of samples of mine air:—

(a) *Samples collected/or determination of CH₄ or for complete analysis*—The samples should be collected in 4 oz flat medicine bottles with ground glass stoppers. The stopper may be lightly vaselined. A suitable rubber band should be used to keep the stopper in position. Samples should not be collected by displacement of water but by aspiration of air.

Before taking a sample, care should be taken to see that the bottle is dry and clean. A rubber tube (which should be fairly loose in the neck of the bottle) should be lowered up to the bottom of the bottle. The person taking the sample should suck air and then discharge it on the return side of the sampling bottle. This operation should be repeated at least four times to ensure that all air in the bottle is displaced by mine air. The stopper should then be put in position and held there with a suitable rubber band.

(b) *Samples collected for determination of Oxides of Nitrogen*—8 oz flat medicine bottles with ground glass stoppers should be used. As the Oxides of Nitrogen are noxious, the sample should be taken by means of a suitable air pump. A football pump is quite suitable for the purpose.

(c) *Samples collected for determination of Carbon Monoxide*—As samples of mine air are likely to contain very low percentage of CO, it is preferable to use 2 litre size Winchester bottles for taking such samples. If bottles of such large size are not available, quart size bottle may be used but then results are likely to be erratic.

(Cir. 39/1959)

5. Supply of air samples to the Central Mining Research Station—A few air samples received in the Central Mining Research Station, though explosives in nature had not been marked explosive. This is likely to cause serious accident resulting in injury to persons working in the laboratory. Also some air samples were received by the station in wet and dirty bottles.

It is, therefore, advised that all samples of mine air likely to be explosive in nature should be clearly marked so and they should be sent to the Central Mining Research Station in clean bottles properly sealed.

(Cir. 8/1963)

6. Apparatus approved for making determinations of percentage of inflammable gas—The apparatus approved by Reg. 145(1) (a) for determination of percentage of inflammable gas in mines and the conditions of approval are given in the Appendix.

These apparatus should be checked at frequent intervals by taking samples of air simultaneously at the points fixed in the mine by the manager (and the JDMS) for such determinations. The air samples should be collected along with the instrumental observations at the intervals specified below:

Sl. No.	Interval of determinations laid down under Reg. 145(1) (c)	Interval at which air samples should be taken along with instrumental observations
1.	One month	Three months
2.	One week	One month
3.	Daily	One week

APPENDIX
APPARATUS FOR MAKING DETERMINATIONS OF PERCENTAGE
CH₄
(as on 31.12.74)

	Make	Type	Conditions attached to the approval
1.	Riken Gas indicator Japanese make	18	The accuracy of the instrument shall be periodically checked against the air samples taken at the same time and analysed at the Central Mining Research Station on the Haldane apparatus
2	MSA Methanometer	W.8	-
3	Mucluckie Methanometer	M	-
4	Ringrose Methanometer	IV	-
5	Ringrose Methanometer	-	-
6	Riken Gas Indicator Japanese make	17	The apparatus shall be supplied in a locked metal case to prevent access to the electrical circuit, including the battery and bulb.
7	Riken Jaberg	17/ 100	--

	Gas Indicator		
8	Zeiss Fire Damp Interferometer	ZGG Carl	Instructions for the operation and maintenance of the instruments and also its limitations shall be inscribed on the casing of each instrument.
	MSA General Purpose Methanometer	1	-
	Portable Methanometer 'PM'	Manufactured by Oldham France & marketed by M/s Macneill & Magor Ltd., Post Box No. 1, P.O. Dhansar 826 106, Distt. Dhanbad	(Cir.Appr. 11/1991)

(Cir. 42/1962, 58/1970 & 70/1974, Appr. 11/1991)

7. Determination of percentage of inflammable gas in bord and pillar workings—

According to Reg. 145 of CMR 1957 determination of percentage of inflammable gas in the general body of the air is to be made once atleast in every 7 days. Where, however, the determination made during the 30 days immediately preceding has shown the percentage of inflammable gas to be below 0.6%, it is sufficient to make such determinations once in every 30 days for so long as the gas content does not exceed that percentage.

In mines working by Bord and Pillar system, a sudden increase in the make of gas may create dangerous condition in individual faces, and this may go undetected for a period of even one month i.e. the period between the two consecutive samples.

In order that risk from this source is minimised, it is advisable if in every mine of Second and Third degree of gassiness being developed by Bord and Pillar system, determination of the percentage of inflammable gas in the general body of every district return is made at intervals not exceeding 7 days.

CMR 146

1. Precautions against accumulations of inflammable gas in blind headings—it has been observed that inflammable gas may accumulate at the blind ends of the workings. Although efforts are made to keep the faces ventilated by conducting the air along the same by sheets etc, it has been found in a number of cases, that the arrangements for coursing of air had not been properly maintained. As any accumulation of gas in a mine is dangerous, it is recommended that, as far as possible, no blind ends should be left in the discontinued workings of a Second and Third degree gassy mine. The blind ends should normally be connected and the air current circulated around the working to prevent accumulations of inflammable gas.

(Cir. 48/1959)

2. Ventilation of headings in Bord and Pillar workings—For proper ventilation and work in the headings, it is recommended that:

(1) *Where the air is conducted by means of brattices*—

- (i) corrugated iron sheet screen fitted with self-closing doors are provided near the entrances to the last inbye ventilating connections that is the beginning of the outbye ends of the brattices put in to course the air into each face, or,
- (ii) wherever possible, the system of work is so organised that the loaders are not required to cross the brattice partitions, and

(iii) no gaps are left in the brattices near the roof and the floor.

(2) Instead of driving a large number of galleries simultaneously in a district, only a few essential levels with interconnecting galleries are driven at a time and the headings are ventilated by an auxiliary fan with due regard to the provisions of the regulations. The air current to each face could then be easily conducted by suitable tubes with T-connections from the main ventilation tube.

(Cir. 45/1962)

3. Precautions against roof layering of gas—Attention is drawn to the phenomenon of 'roof layering' in the workings and the dangers arising therefrom. In a recent case, it was revealed that nearly 38% gas had accumulated at the roof level at a working face but its concentration was only 1% one foot below the roof. A layer of gas is also known to travel along the roof against an air current for appreciable distance away from its source.

It is, therefore, necessary that test for gas should be made as near the roof as possible, and, for this purpose, flame safety lamps fitted with top air feed arrangement should be used while testing for gas. In addition, air samples should be frequently collected at the roof level of the working faces and analysed for the presence of CH₄. Whenever a concentration of gas is found near the roof, necessary steps should be taken to remove it and no blasting should be done at the face, till the gas had been cleared.

(Cir. 48/1959)

4. Behaviour of the Flame Safety Lamp in Layers of Methane—Recent researches on the behaviour of flame safety lamp in layers of methane carried out in U.K. indicate that although the flame safety lamp is a reliable indicator of firedamp when it is immersed in a uniform or almost uniform mixture of firedamp and air such as is commonly found in the general body of the mine air, it is not so certain a guide to the presence of big concentration of firedamp in thin layers near the roof.

The following may be the probable explanation of the failure of the lamp to react in the expected way:

"The hot gases, including the products of combustion, rising from the lamp, reduce the quantity of methane in the space around the lamp: this effect will not be so great when the layer of methane is moving along the roof of the roadway. When the movements of air and methane are slow, convection current rises around and close to the lamp and supplies air containing relatively little methane from the base of the lamp to the top and middle feeds. Part, possibly the major part, of gases entering the lamp, leak, through or around the middle feed. With poor ventilation, the gases entering the lamp at the middle feed will be drawn from the base of the lamp but, even with good ventilation, the response of the flame will be determined in part by the concentration of methane at the level of the middle feed i.e. about 6" below the roof."

It is, therefore, obvious that even a top feed flame safety lamp may not be suitable for detecting thin layers of gas within about 3 inches from the roof. However, to enable the methane layers to be detected more easily with flame safety lamp. Mr. F.H. Baker, Safety Engineer for the Durham

Division, National Coal Board, has devised a modification to the flame safety lamp so that by using a probe which is a metallic tube, methane in a layer can be drawn down and fed into the lamp by means of an aspirator. The use of the probe also enables high places in roadways to be tested safely and removed the need to use ladders or staging to reach up into the roof. In this way, an underground official is encouraged to make frequent tests without the risk of the ladder slipping or the staging collapsing.

It is, therefore, recommended that flame safety lamp fitted with a probe by which gas samples can be drawn from roof level into the lamp may be used for checking layers of methane gas in gassy mine.

(Cir. 66/1963)

5. Danger of layering of inflammable gas near the roof—During a recent inspection of a gassy mine, the following accumulations of inflammable gas were obtained in the roadways: —

		at roof level	3" below roof	6" below roof	9" below roof
1.	A dip face	10%			1%
2.	Another dip face	10%			1 ½%
3.	A third dip face	10%	8%	0.5%	
4.	A level gallery	3-10%			½%
5.	Another level gallery	10%	8%	3%	2 ½%

The readings above are typical of conditions occurring in a gassy mine where the ventilation current is not turbulent.

In its report on Mine Ventilation Standards, the Technical Committee on Mining Safety Standards has also observed that "velocity of air current is a very important factor in the removal of methane layering".

The need for having a turbulent flow of air in working areas should always be kept in mind while planning and executing measures to deal with the danger of inflammable gas in mines.

(Cir. 7/1964)

6. Precautions against danger of outbursts of gas—The Court of Enquiry appointed of inquire into the causes of and circumstances attending the explosion at Chinakuri Colliery made a recommendation that in gassy mines, especially where the seam appears to have less than its normal thickness, boreholes shall be put down periodically to explore whether there is an approaching seam or whether there is excessive liberation of gas. This is a sound precaution which can help in the prevention of outbursts of gas and taking timely precaution against the danger of outburst of inflammable gas.

1. In order to detect the possible presence of a splinter or contiguous seam in close proximity of a seam being worked, boreholes (not less than 35 metres deep) shall be made in the roof and floor at intervals not exceeding 90 metres).

2. Where a second seam has been found to exist within 3 metres of a working seam, boreholes of sufficient depth to reach this other seam. shall be made in the roof or floor, as the case may be

(i) if the thickness of the parting exceeds 1.5 metres, at intervals of not more than 15 metres;

(ii) if the thickness of the parting is less than 1.5 metres, at intervals of not more than 3 metres.

A report in writing of the occurrence of this second seam in close proximity shall be sent to JDMS.

3. (a) The size of boreholes may be about 10 cm in floor and about 4 cm in roof. Where a splinter or other seam has been detected in the neighbourhood of the working seam and where there is a make of gas in the borehole, the borehole shall be widened to one metre and filled with sand or other similar packing material.

(b) Whenever an unusual make of gas is detected at borehole in the floor or roof as aforesaid all further work in that area shall be stopped until the make of gas has ceased. A report of every such stoppage shall be sent to JDMS within 24 hours.

4. Where the presence of a splinter or other seam has been detected in the neighbourhood of the working seam advance boreholes shall be drilled in coal in the leading gallery (or galleries) to a depth of not less than 3 metres in order to give information regarding the presence of dykes or faults. The drilling of these advance boreholes may be discontinued when this other seam joins the main seam or the thickness of parting exceeds 3 metres.

(Cir. 3/1959)

7. Precautions against inflammable gas and coal dust—It is possible that inflammable gas may be found in a gassy seam of first degree in certain situations or circumstances. One source of gas in such seams is in the vicinity of faults and dykes and the regulations already provide for precautions to be taken while working within 30 metres of these and other geological disturbances. Other places where inflammable gas may occur are the parts of mine which have remained discontinued for a period of more than 7 days or which are being or have been dewatered. The regulations, therefore, require tests for gas to be made at all such places.

The managements working such seams have been advised by this office to carry out regular gas surveys to find out well in time if the seams being worked at their mines had become of second or third degree of gassiness. A number of other precautions have also been recommended from time to time to avoid any danger from inflammable gas in these mines.

This is just to remind you about the various precautions that should be taken to prevent any danger from inflammable gas and dry and fine coal dust in first degree gassy mines. These precautions are summarised below and a reference to the circular issued on the subject or the relevant regulation is given in bracket.

- (a) All statutory inspections should be done only with locked flame safety lamp (Circular No. 3 of 1966).
- (b) Only approved electric lamps should be used underground (Notification No. 3193G dated 25.1.62 reproduced in Circular No. 11 of 1962).
- (c) The workings of the mine should be ventilated by surface mechanical ventilator if they extend to a distance of 60 metres or more in any direction from the entrance to the mine (Circular No. 17 of 1966).
- (d) The workings should be kept clear of coal dust and adequately treated with limestone or gypsum dust; (Regulation 123) and,
 - (i) water pipe line should be laid in the working districts to wet the coal dust at and within 90 metres of the working places (Circular No. 41 of 1965).
 - (ii) wet cutting arrangements should be provided on every coal cutting machine in use (Circular No. 37 of 1965).
- (e) Unless otherwise exempted, only permitted explosives should be used in firing of shots underground (Regulation 172).
- (f) No contrabands should be allowed underground.
- (g) Gas surveys should be carried out regularly, (Circular No. 52 of 1962 read with No. 72 of 1965).

(Cir. 29/

8. Precautions against explosion hazard in mines—The Coal Mines Regulations, 1957 are fairly comprehensive in spelling out precautions to be taken against the explosion hazard in Indian mines. The regulations have been amended from time to time to keep abreast with the advances made in knowledge about the phenomenon of gas and coal dust explosion as well as the practical aspects of observing the precautionary measures as revealed by experience and/or arising out of the recommendations made by Courts of Inquiries set up to enquire into the causes of and circumstances attending the explosions that have occurred in India and abroad. There can, however, be no end to our efforts in improving upon the measures to fight this greatest of hazards in the coal mines, which though fortunately not so frequent, usually takes a very heavy toll of the life whenever it occurs.

2.0 The following additional precautions are recommended for degree HI gassy seams in order to minimise danger from inflammable gas in such mines: —

(i) The workings should be laid out on longwall system in preference to Bord and Pillar method of working;

(ii) No explosive other than P5 Type of permitted explosives should be used;

(iii) Continuous methane recorders should be installed at vulnerable points along with an automatic alarming system, even if this requires importing the equipment;

(iv) (a) All main ventilation fans, including booster fans installed belowground, should be provided with independent source of supply or an alternate source of supply like provision of diesel generating sets (on the surface);

(b) When more than one auxiliary fans are installed in a ventilation district, either the fans should be provided with a sequence control or fan attendants should be appointed to ensure that a fan is started or restarted only when it is safe to do so;

(v) Methane drainage system should be installed when the percentage of inflammable gas in general body of air is high so that it would be unsafe to use electricity within 270 metres of working faces. Alternatively, use of only com-compressed air operated machinery may be considered.

3.0 Following other additional precautions against inflammable gas should also be taken in all gassy mines (some of these precautions have been previously recommended by separate circulars)—

(1) Only fire-resistant hydraulic fluids shall be used in the machinery deployed belowground.

(2) In wet conditions, stone dust used as a precaution against coal dust, shall be suitably rendered water proof.

(3) Advance ventilation planning shall be done to meet the requirements of a mine throughout its working life.

(4) Formation of roof cavities shall be avoided, and where this is unavoidable, the same shall either be kept filled up effectively or ventilated adequately.

(5) Suitable precautions shall be taken to prevent layering of gas.

(6) In the use of auxiliary fans—

(i) Independent power supply shall be maintained to the fan;

(ii) electric power to face machinery shall not be restored unless the auxiliary fan is running;

(iii) After stoppage of main mechanical ventilator or a booster fan, supply of electric power to an auxiliary fan shall not be resumed unless the main mechanical ventilator and the booster fan have been restarted.

(7) Effective steps shall be taken to prevent generation of frictional sparks, and accumulation of gas in undercuts.

(8) Alloys and metals likely to give incentive frictional sparks shall not normally be used belowground.

4.0 It must be appreciated, however, that the law cannot embrace each and every eventuality. The circumstances in mining can be so varied and complex that constant vigilance on the part of all concerned—workers and officials alike—is very essential to eradicate the menace of explosions.

There is, no doubt that the explosion hazard can be very much minimised if adequate precautions are taken by all concerned even within the ambit of the current regulations and known safe practices based on general knowledge and experience. The causes of explosions as have occurred so far are well known and no new technical cause has been revealed to us in the recent years. What is required is full awareness of the known hazards, and strict compliance with the statutory requirements and recommendations of DGMS from time to time. Dissemination of the knowledge and experience amongst both the officials and workman through regular training courses will go a very long way in reducing the hazard. It is vitally important that the explosion hazard in a mine should be constantly reviewed to take timely precautionary measures well in time; that is the best insurance against risk of explosion in the mine.

(Cir. 8/1974)

9. Prevention of explosions in coal mines: Approved types of equipment and maintenance of safety features—A study of explosions/ ignitions that occurred in coal mines during the last 20 years has revealed that the source of ignition originated from the electrical equipment. The different courts of inquiry set up after the occurrences highlighted over and again the importance of a programme of inspections at regular intervals to ensure installation and proper maintenance of approved type of equipment and maintenance of essential safety features (viz. intrinsic safety/F.L.P.) in good order.

Inspections of mines made by officers of the Directorate during the last few months have revealed that *approved types of equipment* are not being used always in underground mines and the standard of *maintenance of safety features* in the electrical equipment is not very satisfactory.

Owners, Agents and Managers of coal mines are requested to organise a special drive in their underground mines to identify any contravention in respect of safety features in electrical equipment being used and take suitable remedial measures. Proper systems for inspection of all electrical equipment and schedules for maintenance are also required to be formulated and enforced.

(Cir. Tech. 4/1995)

10. Use of light metals/alloys in shafts & workings belowground—As most light metals and alloys give out incandive sparks when struck with stone or metal, it is desirable to avoid their use in any fittings/equipment in shafts other than downcast shafts and at any place belowground in gassy coal mines.

Where a fitting/equipment, as aforesaid, is already being used in a gassy coal mine, the matter should be brought to the notice of the DGMS.

(Cir. 3/1960)

11. Use of electrical equipment in Degree II and Degree III gassy coal mines having Aluminium or Magnesium alloy casing—There is no objection to the use of aluminium body

drills in Degree II gassy coal mines in this country for a further period of 3 years i.e. upto the 31st August, 1977, provided the following conditions are duly complied with:

1. The ventilation of working places strictly conforms to the ventilation standards.
2. No such drill is used in development headings within 30 metres of a known fault plane or other geological disturbance.
3. This permission will be valid only for a period of 3 years i.e. up to 31st August, 1977.
4. This permission is, however, subject to revision or revoke if so considered necessary in the interest of safety.

(Letter No. 2/1033-37/EHQ. dt. 23.8.1974)

12. Provision of isolation stoppings around disused workings—

- (1) Disused workings are not kept secured and free from gas, coal dust etc. all the time.
- (2) Such workings require certain quantity of air to keep them free from gas and fit for inspection.
- (3) There are practical difficulties in connecting the blind ends in conducting a current of air up to the face by means of brattice.
- (4) Chambers of gas may be created if disused workings are isolated.
- (5) In certain seams where there are large falls of roof coal there may be dangers of spontaneous heating and fire if the area is not sealed off.
- (6) Isolating an area is not a costly affair.
- (7) Isolation will result in considerable saving in the amount of ventilation, stone dust, personnel etc.
- (8) Isolation will cause less deterioration of old workings.

It is therefore, recommended that old workings may be kept sealed off by stoppings in the beginning, but careful watch should be kept on the atmospheric condition in the sealed off area by taking regular air samples in the manner specified in Circular No. 30 of 1964. Subsequently, when the air samples show that -the percentage of inflammable gas has increased to 2% or more behind the rise-most stopping, the ring of single isolation stoppings should then be strengthened suitably to make them explosion proof in accordance with the specifications of such stoppings given in Circular No. 7 of 1964.

In this connection, it is desirable that in constructing the first row of stoppings care should be taken to see that it is not sited too far inbye of the ventilation current, and that when the second set of the stoppings has to be constructed outbye later on, the distance of the second stopping from the corner of the pillar containing the explosion proof stopping does not become more than 3 metres.

This is with a view to assist the air current ventilating the face of the stopping without any additional coursing of air up to the stoppings as far as possible. In order to prevent building up of pressure of gas behind the sealed off area it will be necessary to make arrangements for bleeding of gas from the sealed off areas. Air sampling pipes should be provided for all sealed off areas as already recommended in this office Circular No. 30 of 1964 to keep a check 1 on the atmospheric condition behind the isolation stoppings.

However, where there are any practical difficulties in isolating the old workings in a mine, the matter may be referred to DGMS for advice.

(Cir. 66/1964 and 43/1966)

CMR 147

1. Searching for contrabands and examination of Safety Lamps at entrances to underground workings—To ensure thorough searching of contrabands and examination of Safety Lamps, suitable one way traffic arrangement may be provided at the entrance to the underground workings where persons descend or ascend the mine, so that workpersons have performe to form queues, and the persons coming up from the mine do not mix with those going down the mine.

In addition, during the rush hours at the beginning of each shift, atleast one of the supervisory officials may be specially deputed to be present to ensure order and proper searching for contrabands and examination of safety lamps.

(Cir. 29/1960)

2. Use of cell operated wrist watches by persons working in below ground coal mines and oil mines—Nickel cadmium cell operated wrist watches are now readily available in the country. A number of persons employed in the mining industry wear them while at work

In the absence of certification by the manufacturers and precise information regarding the current in the circuit and the temperature rise of components in the watch, it is difficult to establish if they are inherently or intrinsically safe. Further, test results on any one types of watches may not hold good on other type available in the market.

As open spark in the watch could cause ignition of inflammable gas under certain conditions of connection, may I suggest that persons employed in belowground coal mines as well as in oil mines shall be advised not to wear or carry electronic watches in hazardous areas while on duty.

(Cir. Tech. 2/1987)

CMR 149

Ventilation Officers—At some mines, the ventilation officer is made responsible (by the management) for short-comings in respect of ventilation, gas and coal dust in any part of the mine. This should not be the position as a ventilation officer is meant to assist the manager in the overall control of ventilation problems, while routine ventilation matters should be the responsibility of the supervisory staff of the district concerned (including the assistant managers). In some cases, ventilation officers are being used as relieving assistants contrary to the duties specifically prescribed for them vide circular No. 74 of 1965.

There is thus a need for positive steps to make the ventilation officers more effective in their staff function by (i) defining their functions more specifically within the organisation (particulary vis-a-vis production officials), and by (ii) giving them the staff and equipment necessary for their work. It should be appreciated that work of ventilation officers requires special aptitude and training so that it is advisable for ventilation officers to be given this assignment for somewhat longer periods. They should however, be deemed to be part of the general mine management staff and placed on production work in rotation so that their chances of promotion vis-a-vis their colleagues do not suffer. This is necessary to attract good persons to work as ventilation officers.

(Cir. 63/1967)

LIGHTING AND SAFETY LAMPS

CMR 153

1. Supply of belts with cap safety lamps—Wherever workers are provided with cap lamps they should also be issued suitable belts (which need not necessarily be of leather) for supporting the battery.

(Cir. 36/1962)

2. Improper wearing of cap lamps—As explosive carrier was carrying a cap lamp which was hung from his shoulder by a piece of wire. While the shotfirer was preparing priming cartridges, the battery of the cap lamp of the explosive carrier fell over the primed cartridges that were lying on the ground resulting in a blast which caused a fatal accident. A miner who happened to be present there was torn to pieces and the explosive carrier had broken spine.

The above tragic accident brings to light the unsafe practice of hanging the cap lamp from the shoulder. It has been noticed that cap lamps are sometimes hung from the shoulder by a belt and often by the cable of the cap lamp. It is obviously advisable that the battery of a cap lamp is attached to leather/canvas belt which is tied around the waist.

(Cir. 80/1963) CMR 154

1. Use of Flame Safety lamps—Flame Safety lamps are required to be issued to all shotfirers and supervisory staff and should be kept burning at all places where electrical equipment is in use. In addition to above it is advisable to provide one flame safety lamp for every group of persons working in a face or elsewhere.

While for *shotfirers* and supervisory staff it is necessary to provide gas testing lamps with relighting device, in other cases ordinary flame safety lamp would be adequate. It is observed that adequate number of flame safety lamps are not provided to meet with the above requirements. The following types of flame safety lamps are available from indigenous sources:

Velox Type GL5--without relighting device.

Velox Type GL60 & GL7—with relighting device.

Necessary action to comply with the above requirements shall be taken.

2. Flood-lights in Depillaring areas—Suitable Hood lighting should be provided in every depillaring area. In mines other than those to which regulations 122(2) do not apply and are not in Second and Third degree, this may be done by providing every such area with four or more 250 watt bulbs (or equivalent lighting) so placed that glare and deep shadows are avoided.

In mines to which regulations 122(2) apply and are in Second and Third degree, every depillaring area shall be provided with general lighting by a cluster of not less than 15-20 cap safety lamps placed on a suitable stand in the area. These lamps should be in addition to the lamps carried by individual workman.

(Cir. 42/1961)

3. Flood lighting in depillaring areas in first degree seams—Vide notification no. 13766 G dated 13th May 1969, the D.G.M.S. has, in exercise of powers conferred under Reg. 154(2) of the Coal Mines Regulations, 1957, specified that suitable flood-lighting with four or more 250 watt bulbs (or equivalent lightings) so placed as to avoid glare and deep shadows, shall be provided in every depillaring area in First Degree gassy seams where the height of the workings

exceeds 3 metres. This order supercedes all previous notifications issued under Reg. 154(2) of the Coal Mines Regulations 1957.

(Cir. 36/1969)

4. Standard of lighting in coal mines—In exercise of the powers conferred by Reg. 154(2) of CMR 1957 and in supercession of all previous notifications issued on the subject, the D.G.M.S. has required that all persons employed belowground in coal mines shall be provided with efficient electric lamps of a type approved by him under Reg. 2(2), vide notification nos. 3193 G and 17398 G dt. 25.1.1962 and 7.4.1964 respectively, with effect from the date of notification i.e. 9th Oct., 1972.

The above notification no. Genl/19924 G dated 9th Oct., 1972 has been published in the Gazette of India, Part III, Section IV dated 13.10.1973.

Managements are requested to comply with the requirements of the above notification at an early date.

(Cir. 1/1974)

5. Standard of Lighting in Opencast Coal Mines—In pursuance of Reg. 154(2) of CMR 1957 the standards of lighting to be provided during working hours at different places or areas where natural light is insufficient in Opencast mines have been specified vide Government Notification No. GSR-804, dated 18.6.75, published in the Gazette of India dated 28.6.75 Part III Section 3(i).

The said Notification is reproduced below for guidance and strict compliance.

NOTIFICATION

Dhanbad, the 18th June, 1975

G.S.R. 804--In exercise of the powers, conferred on me as the Chief Inspector of mines, under Clause (b) of Sub-regulation (2) of Regulation 154 of Coal Mines Regulations 1957, I hereby specify, that the Standards of Lighting to be provided during working hours at different places or areas where natural light is insufficient in opencast mines in the manner and at the level indicated in the Appendix.

Provided that where the undersigned is of the opinion that conditions obtaining at any mine are such as to render compliance with the standards specified in this notification not reasonably practicable or not necessary, he may be an order in writing exempt such mine for the compliance of this notification subject to such conditions as may be imposed in such order.

APPENDIX

Sl. No.	Place/Area to be illuminated	Manner to be in which it is illuminated	Minimum standard of illumination	Plane/Level in which the illumination is to be provided
1	2	3	4	5
			LUX	
1.	General working areas as determined by the Manager in writing		0.2	At the level of the surface to be illuminated

2.	Work place of Heavy Machinery	So as to cover the depth and height through which the machinery operates	5.0 10.0	Horizontal Vertical
3.	Area where drilling rig works	So as to illuminate the full height through which the machinery operates	10.0	Vertical
4.	Area where Bulldozer or other tractor mounted machine works.	So as to illuminate the full height of the rig	10.0	At level of the Crawler tracks
5.	Places where manual work is done	To be provided at level of the surface on which such work is done	5.0 10.0	Horizontal Vertical
6.	Places where loading, unloading or transfer, loading of Dumpers, trucks or train is carried on	-	3.0	Horizontal
7.	Operator's cabin of machines of mechanisms	To be provided up to 30.0 a height of 0.8 metres from floor level	30.0	Horizontal
8	At hand picking points along a conveyor belt.	To be provided up to a distance of not less than 1.5 metres from the picker	50.0	On the surface of the conveyor belt
9	Truck haulage Roads	To be provided at level of the road	0.5 to 3.0	Horizontal
10	Rail haulage track in the pit	To be provided at level of the rail heads	0.5	Horizontal
11	Roadways and foot paths from bench to bench		3.0	Horizontal
12	Permanent paths, for use of persons employed etc.		1.0	Horizontal

(Cir. Legis. 1/1976)

CMR 154 / MMR 148

1. Standards of lighting in Mines—The Technical Committee on Mining Standards appointed by the Government of India submitted its report in respect of Standards of Lighting in Mines 1963. The Government of India have accepted the recommendations made by the Committee. The recommendations of the Committee are reproduced below.

STANDARD OF GENERAL LIGHTING.

"Adequate general lighting standard" can reasonably be provided only at the places mentioned in Reg. 151 of Coal Mines Regulations and the corresponding provision of Metalliferous Mines Regulations. The committee is of the view that, in view of the large number of factors involved, it would not be advisable to suggest any statutory standards in respect of "general lighting arrangements". If, however the roof and sides are kept properly white washed and stone dusting as required under the statute is done on the floor, illumination to the following standards might provide the necessary visibility for the safe and efficient work at different places:

Place	Recommended minimum average illumination level (in lumens per sft.) for satisfactory light
(a) Pit bottom	1.5 to 3.0
(b) Main Junctions	1.25
(c) Roadways	0.4
(d) Haulage engines, control gear and Haulage drum	1.5

These standards are for purposes of guidance only and not for legislative enactment, for depending on other factors, better visibility may be achieved with lower illumination or even the standards mentioned above may give inadequate lighting.

FLOOD LIGHTING IN DEPILLARING AREAS

The Committee notes that the DGMS has already stipulated the provision of suitable flood lighting in every depillaring area in gassy mine of First Degree.

This flood lighting should be such as to provide at least 1.5 lumens per sft. of illumination at the floor level. This should be achieved in practice by using a cluster of six 100 watt bulbs at a distance of about 6-7 metres from the area to be illuminated. A suitable reflector (preferably of matt surface) should be used so that glare is minimised.

The Committee also strongly recommends that the possibility of using FLP type flood lights in depillaring areas in mines also be explored.

INDIVIDUAL LIGHTS

The Committee understands that 'mug butties' have already been withdrawn from coal mines and the DGMS has also stipulated that all workers belowground in coal mines should be provided with efficient electric lamps of approved type by 31st December, 1964 at the latest. The Committee is

of the view that, as far as lighting in development faces is concerned, nothing more is economically possible.

The Committee would however like to stress the importance of keeping the electric lamp assemblies, particularly batteries, in good condition so that the lighting performance of the lamp is kept at optimum level.

The Carbide lamp is a very efficient and suitable light for use in stone drifts (in coal mines when permissible and in metalliferous mines).

IMPORTANCE OF LOCAL LIGHTING

Over and above the general illumination, local lighting also is of importance for various individual tasks. The role of caplamps in doing this needs no amplification.

EYE STRAIN

It would appear that an illumination of 0.25 ft. candle can be considered to be quite reasonable objective with the object of eliminating eye strain at work of a class normally undertaken by a coal miner. The Committee is of the view that if the recommendations made by it in this respect are followed, the illumination standards would improve sufficiently to eliminate eye strain of mine workers.

(Cir. 14/1964)

2. Standard of lighting in Opencast Metalliferous Mines—In pursuance of Reg. 148(2) of MMR 1961, the standards of lighting to be provided during working hours at different places or areas where natural light is insufficient in Opencast mines have been specified vide Government Notification No. GSR-829, dated 18.6.75, published in the Gazette of India dated 5.7.75 part II Section 3(i).

The said Notification is reproduced below for guidance and strict compliance.

NOTIFICATION

Dhanbad, the 18th June 1975

G.S.R. 829—In exercise of the powers, conferred on me as the Chief Inspector of Mines, under Clause (b) of Sub-regulation (2) of Regulation 148 of Metalliferous Mines Regulations 1961, I hereby specify, that the standards of lighting to be provided during working hours at different places or areas, where natural light is insufficient in opencast mines, in the manner and at the level indicated in the Appendix.

Provided that where the undersigned is of the opinion that conditions obtaining at any mine are such as to render compliance with the standards specified in this notification not reasonably practicable or not necessary, he may by an order in writing exempt such mine from the compliance of this notification subject to such conditions as may be imposed in such order.

APPENDIX				
Sl. No.	Place/Area to be illuminated	Manner in which it is to be illuminated	Minimum standard of illumination	Plane/Level in which the illumination is to be provided
			LUX	
1.	General working areas as determined by the		0.2	At the level of the surface to be

	Manager in writing			illuminated
2.	Work place of Heavy Machinery	So as to cover the depth and height through which the machinery operates	5.0 10.0	Horizontal Vertical
3.	Area where drilling rig works	So as to illuminate the full height of the rig	10.0	Vertical
4	Area where Bulldozer or other tractor mounted machine works		10.0	At level of the Crawler tracks
5	Places where manual work is done	To be provided at level of the surface on which such work is done	5.0 10.0	Horizontal Vertical
6	Places where loading, unloading or transfer, loading of Dumpers, trucks or train is carried on		3.0	Horizontal
7	Operator's cabins of machines of mechanisms	To be provided up to a height of 0.8 metres from floor level	30.0	
8	At hand picking points along a conveyor belt	To be provided up to a distance of not less than 1.5 metres from the picker	50.0	On the surface of the conveyor belt
9	Truck haulage Roads	To be provided at level of the road	0.5 to 3.0	Horizontal
10	Rail haulage track in the pit	To be provided at level of the rail heads	0.5	Horizontal
11	Roadways and foot paths from bench to bench			Horizontal
12	Permanent paths for use of persons employed etc.		3.0	Horizontal
			3.0	Horizontal

(Cir. Legis. 3/1976)

3. Provision of individual lights in opencast mines—The standards of lighting to be provided during working hours at different places or areas where natural light is insufficient in opencast mines have been specified vide circulars Legis. 1&3 of 1976.

The general lighting scheme of an opencast mine is generally connected to a common power source. It is observed that during electric power failure, which may occur at any time the whole area becomes absolutely dark. At time such a situation may lead to occurrence of an accident.

It is hereby advised that individual lights may be provided at night to the workers in opencast workings. This will be in addition to the general lighting scheme.

(Cir.Tech. 13/1979)

CMR 157/MMR 151

1. Re-wired fuses for electric cap lamps—The fuse in an electric cap lamp is an important component on which the safety of a cap lamp largely depends. The cap lamp being neither intrinsically safe nor flameproof (a lamp is usually safe because of the statistical improbability of ignition, due to the special care that is taken in its design and construction) it is the fuse which provides the only safety valve in the lamp. The fuse is intended for restricting the amount of current flow between the conductors of the cable cord, if short circuited just outside the battery container or the cord armour, to such a value as will not produce sparks that will ignite an explosive mixture of methane and air. Utmost care is therefore taken by the manufacturers to ensure that the fuses are made to specifications from the purest material available in the world.

It has been noticed that a number of collieries have started using fuses made locally by themselves. This is a dangerous practice and should be stopped forthwith. Only the fuses supplied by the manufacturers of the approved electric cap lamps should be used for replacement purposes, otherwise the lamp should not be considered to be approved for use in underground coal mines.

(Cir. 71/1964)

2. Replacement of cap lamp components/parts—According to Reg. 157(4) of Coal Mines Regulations 1957 and Reg. 151(4) of Metalliferous Mines Regulations 1961 only genuine components manufactured by the manufacturers of the lamp to approved specifications are to be used in cap lamps. Compliance with this requirement is of utmost importance in the interest of safety. Managements are advised to act accordingly.

(Cir. Tech. 17/1982)

3. Safety lamp cabins—The Safety in Mines Conference which met in January 1957 has noted that barring a few exceptions the standard of facilities provided for the cleaning and maintenance of safety lamps in mines leaves much to be desired. The Conference has therefore made a recommendation that more attention should be paid to the maintenance etc. of flame safety lamps.

Steps should be taken to ensure that proper cabins are provided and necessary equipment and staff employed for the purpose of proper cleaning and maintenance of safety lamps at every mine.

(Cir. 16/1959)

4. Maintenance of Oldham cap lamps—M/s Oldham & Sons supply a set of pamphlets to mines using their lamps. These leaflets give instructions and advice about proper maintenance

and upkeep of such lamps. One of these leaflets has been specially prepared with a view to drawing attention to the proper maintenance of cap lamps from safety point of view. An extract from the same is reproduced below.

Maintenance of cap lamps

(Extract from Pamphlet No. 4 of M/s. Oldham & Sons)

Introduction—Like any other piece of electrical equipment, electrical safety lamps require careful and regular maintenance if maximum efficiency and safety are to be obtained. The following notes emphasise a few of the maintenance procedures concerned with safety:

1. Sealing of locks—It is important that the head of lock pin (which secures the head piece) and the head of the screw for Locking Plate (which locks the battery cover) are covered with 'Lock Seal' wax. New cap lamps despatched from the Factory are sealed in this manner, and after a headpiece or battery cover has been opened by the lamp cabin staff for maintenance purposes, the locks should be similarly re-sealed. Effective sealing is an essential feature contributing to the safety of the lamp.

The 'Lok Seal' wax, prepared and supplied by Oldham & Sons (India) Ltd., is of a special quality and has been found to be the most suitable for the purpose of sealing. It is supplied in conveniently sized blocks which can be broken up and melted as required in a shallow sump over a small electric or oil stove. Specially designed spoons are also obtainable from the manufacturers for pouring the wax into the lock recesses.

The Coal Mines Regulations state that no unauthorised person shall un-lock or open, attempt to unlock or open a safety lamp. If sealing with 'Lock Seal' is carried out, any attempt to open the lamp can easily be detected, particularly if a special seal mark is impressed in the wax before it hardens. The lamps must be opened only by the lamp cabin staff and in no circumstances should any lamp be opened underground.

It is also essential that whenever the cap hook has been removed the securing nut should be tightened and sealed with solder. This will prevent any unauthorised person from removing the cap hook and gain access to the negative charging contact.

2. Lock spring testing—In order to prevent any accidental or deliberate short circuit between the negative charging contact and positive charging contact stud, the negative charging contact is locked in an inaccessible position beneath the cap hook in a recess in the headpiece moulding. This negative contact covered by the hook barrel which, because of the lock spring, cannot be rotated to remove the charging contact, except by means of the charging key on the charging frame. It is obvious, therefore that the lock spring must be tested periodically to ensure that it is functioning correctly, and a specially designed instrument is supplied for this purpose. This is the Lock Spring Torque Tester, which is fitted with a key head differing only slightly from the normal charging key. When the tester is inserted into the lock barrel and tubed, it is easy to detect whether the lock spring is functioning correctly, or whether it is broken or corroded. This instrument is so designed that a spring which is in working order cannot be broken during testing: after the requisite torque has been applied, the handle will slip and prevent any excessive force from breaking the lock-spring.

3. Replacement of fuses—The fuse is situated in the circuit as a safety measure to guard against excess current flow in the event of a short circuit. Before replacing a blown fuse, the lamp should be thoroughly examined for the defect which caused the fuse burn out, otherwise the replacement fuse may bum out also.

On no account should any fuse be re-wired or obtained from any other source than the manufacturers, Oldham & Son (India) Ltd or their agents. Kilburn & Co. Ltd.: to do so will notify the safety approval which stipulates the use of genuine Oldham spare parts.

4. Care of cables—The correct method of using an Oldham ‘GW’ Cap Lamp is to wear the headpiece fixed to a helmet and the battery attached to a belt.

If the lamp is worn by the user in this manner the cable cannot be strained by being tied around the waist, or damaged by being held between the teeth near the headpiece end. Apart from avoiding damage to the cable, cap lamp which is worn correctly will not be lost or damaged by falls of rock, runaway tubs or careless handling of machines and materials. If a lamp is not worn by the user but placed on the ground, the cable is particularly vulnerable to damage.

Cables should be replaced before their conditions deteriorates seriously. When a lamp fails and the fault cannot be located in either the battery or the headpiece, the cable should be examined for cuts and abrasions which may have severed the conductors causing a short circuit. Internal damage can often be detected by flexing the cable at the various points.

5. Checking of lamps—After each shift, when all the lamps from that shift have been replaced on the charging frames, the lamp cabin staff should carefully examine them for faults and damage. Particular attention should be paid to lens rings, headpiece glasses, cables and cable glands. Bulbs should also be checked. A glance at the charge indicator meter above each lamp will enable lamp cabin staff to check that the lamp is taking charge correctly, and that the fuse is intact. Any faults detected should be rectified immediately, so that lamp may be ready for use on the following day. After each shift, lamps should be cleaned if necessary; and a check made to see that the lock seals are intact.

(Cir. 13/1964)

5. Approval of outer glass cylinder of Velox safety lamp—The DGMS has approved the outer glass cylinder manufactured by M/s Borosil Glass Works Ltd. and supplied by M/s J.K. Dey & Sons, 13, Old China Bazar Street, Calcutta-700001 for use with Velox Type GI-50, GI-60 and GI-7 Flame Safety Lamps under Reg. 157(4) of the Coal Mines Regulations 1957 and Reg. 151(4) of the Metalliferous Mines Regulations 1961.

(Cir. Appr. 13/1992)

6. Use of gas for demonstration of gas caps—A flame safety lamp is not safe in an atmosphere containing acetylene gas. In a recent incident in a mines safely exhibition, when a flame safety lamp of approved type was lowered in a chamber containing mixture of air and acetylene gas, there was an explosion which resulted in breakage of glass pans of the gas testing chamber.

As such acetylene shall not be used in gas demonstration apparatus.

(Cir. 11/1967)

7. Compulsory use of methane for demonstration of gas caps—As coal mines are now being treated as gassy, not only examinations for gas testing have to be conducted by the Directorate but the; mine management has also to arrange gas testing demonstration to teach and train workers and staff in gas testing. Vocational Training Centre have also been opened in different mines which have to provide gas testing facilities.

For demonstration of gas caps not only a suitable apparatus is needed but also suitable gas. Different mixtures of gases like domestic cooking gas, vapour of volatile inflammable liquid are being used as substitute to methane. The texture of the cap and luminosity vary according to the hydrocarbon predominating in the mixture and usually fuel cap is more pronounced. The use of substitutes increases the probability of errors considerably that the trouble taken to obtain or produce methane is well justified by the results obtained. Therefore no gas other than methane should be used for demonstration purpose. Till methane is commercially available in cylinders. The mine managements could also easily produce methane from cow dung. Two old oil drums and a small length of pipe and a few valves is all that is required. Total cost of a small gas generating plant would not amount to more than Rs. 100/-

Different kinds of apparatus are in use in mines. Gas testing demonstration apparatus should be such that the products of combustion of the lamp are kept separate from firedamp/air mixture. The flame of the lamp is easily adjusted while the lamp is in the apparatus. A definite percentage of methane is admitted in the gas chamber by use of varying lengths of capillary tubes so that error of reading of the instrument is avoided and candidates can see different types of caps at the same time. In addition to the gas cap demonstration chamber discussed above, every mine can improvise a flame safety lamp by adjusting its air inlets so that methane could be directly fed into the lamp by a flexible pipe. The gas could be varied by adjusting a valve. The candidates could handle this lamp which will not only show them gas cap but also give confidence for preparing the lamp for a test and properly testing for gas thereafter.

The above note is not meant to restrict on ingenuity in designing suitable apparatus. It gives only guidance to make necessary arrangements for demonstration for gas testing purposes. In case any clarification is needed concerned Joint Director may be consulted.

(Cir. 19/1969)

8. Gas cap demonstration by 'Calgas'—According to the earlier instructions in force, gas cap demonstrations and gas-testing examinations are to be arranged by using methane under pressure. As there is difficulty in procuring methane under pressure, it has been decided that there should be no objection to the use of CALGAS etc. for demonstration of gas-caps and for gas-testing examinations.

(Cir. 38/1971)

9. Fuel for use with Velox GL-5, velox GL-60 and GL-7 type approved flame safety lamps—From time to time enquiries have been received in this Directorate regarding fuel to be used in these lamps and the storing facilities necessary for storing the same at the mines. In this connection the relevant extract from a letter received from the manufacturers is given below:—

1. "The Kerosene is appropriate fuel for 'Velox' type GL-5 Flame Safety Lamp."
2. That (a) Esso solvent spirit No. 1425.
(b) Burmah Shell 'BP-55 or equivalent are appropriate for 'Velox' Relighting type GL-60 and relighting GL-7 Gas Testing lamps.

According to the Governmental Petroleum Act, the fuels for types GL-60 and GL-7 lamps are required to be stored in a specific store as prescribed by the Chief Inspector of Explosives, Old High Court Building, Nagpur, vide the Petroleum Act, 1934.

It is known that most of the bigger and medium Size collieries have arrangements of storing petroleum, resulting that the aforesaid two fuels can be stored without any added difficulty. The collieries other than as stated above can also make similar arrangement if they either contact the Chief Inspector of Explosives, Nagpur/or his Regional Offices. Formalities

are very simple and once the storing licensing is granted, renewal will be required once in a year. For procurement purpose the collieries may contact (1) Esso/Standard Eastern Inc. 6, Church Lane, Calcutta-1, (2) Burmah Shell Oil Storage and Distributing Co. India Ltd., 31 Binoy Badal Dinesh Bag, Calcutta-1 or other Regional Offices/Depots/Agents who have their branches all over the country, and (3) M/s Goenka Chemical Enterprises, 110, Narkeldanga Main Road, Calcutta-11.

(Cir. 33/1973)

CMR 158 / MMR 152

1. Precautions against fire -in lamp rooms—Over the last few years, there have been a few cases of outbreak of fire in cap lamp cabins at mines.

In order to prevent recurrence of such incidents, the following measures are recommended:-

(1) Charger shall be protected by fuses of rating not exceeding fusing current of 2 amps and made of silver wires. The protection for ammeter shall be done in the same way as aforesaid.

(2) Charger shall be so designed and constructed that in the event of heavy sparking therein, the possibility of the igniting particle finding its way out of the charger enclosure is completely eliminated.

(3) Parts used in charging frames for supporting the batteries or for mounting thereon any electrical component or parts carrying current shall be of steel or such Other material in order to prevent the ill-effects of instantaneous short-circuits or sustained ones, the effect of which may not be perceptible in its incipient stage.

(4) Every lamp cabin shall be manned by trained persons in each working shift who, in addition to their normal duties, will look after the normal functioning of the lamp charger.

(5) The Engineer/Electrical Supervisor shall inspect all electrical installations in the lamp cabin at least once a week and carry out requisite tests to ascertain that the installation is in a safe condition. Results of their examination shall be entered into a bound-paged book kept exclusively for that purpose.

(6) No flammable material shall be stored inside any lamp cabin particularly where charging racks are located.

(7) Fire extinguishers (suitable for dealing with electrical fire) shall be provided in every lamp cabin which shall be maintained in working order.

(8) The construction of lamp cabin shall be such as to provide adequate facilities for dealing with cases of fire which might occur therein as also for the safe escape of the persons on duty therein.

(Cir. Tech. 14/1979)

2. Precautions against fire in cap lamp cabins—Attention is invited to this Directorate's Technical Circular No. 14 of 1979. You were advised inter alia that the parts used in charging frames for supporting the batteries or for mounting thereon any electrical component or parts carrying current shall be of steel or other similar materials.

I regret to note that due attention has not been paid to comply with the said precautionary measure inspite of the fact that such metal frames are readily available indigenously.

You are advised to take immediate steps to comply with the above recommendation in order to secure safety of persons employed in and around lamp cabins and also to prevent loss of valuable equipment.

(Cir. Tech. 3/1983)

EXPLOSIVES AND SHOTFIRING

CMR159/MMR153

1. Only dry gunpowder should be issued—Only dry gunpowder should be issued to explosive carriers: otherwise, besides the usual danger, there is tendency of the shotfirers taking it to a fire for drying it out.

(Cir. 2/1947)

2. Use of LOX. in opencast coal mines—Recently, there was an incident of fire with the use of L.O.X. under the following circumstances.

Blasting was done with LOX in the overburden of the opencast workings of a coalmine. Old developed coal pillars were being quarried. One of the shot holes in the overburden punctured into the underground workings and as such it could not be stemmed properly before blasting. LOX cartridge in the inadequately stemmed hole was thus blasted without sufficient confinement. In all probability, a part of the charge which had not blasted, communicated down below and configured to set the coal debris lying belowground in the gallery on fire.

In order to avert such situations, you are advised that LOX shall not be used for blasting in overburden within 15m of u.g. workings in the coal seam immediately below or in the vicinity.

(Cir.Tech. 11/1979)

3. Danger associated with use of ANFO in pyrite bearing ores—In the United States of America Ammonium Nitrate-Fuel Oil (AN-FO) explosives were in use in an open pit copper mine where two non-fatal accidents occurred. It was thought that the accidents were caused by misfired charges of AN-FO. The actual ore from the vicinity of the accidents and the ingredients used to prepare the AN-FO charges onsite were examined. A thorough investigation into the matter revealed the following—

"Ammonium nitrate-fuel oil (AN-FO) mixtures are used as blasting agents in mining pyrite-bearing ores. The temperature of these ores can increase by the continuous, though at times slow, oxidation weathering of the pyrites. At elevated temperatures, AN-FO reacts exothermally with pyrite and the reaction becomes self-sustained at $120 \pm 10^{\circ}\text{C}$.

The Bureau of Mines has conducted an investigation to determine the reactivity of mixtures of AN-FO with pyrite containing ferrous sulphate. The results of tests in a heated vessel simulating a hot borehole demonstrate that small amounts of ferrous sulphate, a major product of pyrite weathering, initiate a self-sustained exothermic reaction with AN-FO at 80°C . Five per cent by weight of urea was found sufficient to prevent a reaction among the three ingredients, at least within the limits of the test, which reached 180°C . Smaller amounts of urea and of potassium oxalate slowed down the reaction and delayed its onset to higher temperatures, but did not prevent it."

For fuller details about the investigations a reference may be made to U.S. Bureau of Mines Investigation Report No. R.I. 8373 of 1979.

In case the mining activities under your control fall within the parameters indicated above, you may take appropriate action.

(Cir. Tech. 4/1980)

4. Quality and condition of explosives provided for use in mines—Reg. 159 of the CMR 1957 and Reg. 153 of MMR, 1961 require that the explosives provided for use by the Owner, Agent or Manager shall be of *good quality* and as far as can be known in *good condition*. It has come to the notice of this Directorate that suitable checks and controls have not been provided at every mine magazine to comply with the said requirement. Needless to mention that use of explosives which are not in good condition leads to hazards which can be easily avoided.

I trust you would, in consultation with the manufacturers or suppliers of explosives, take immediate steps to institute suitable checks and controls to comply with the aforesaid statutory requirement.

(Cir. Tech. 5/1985)

6. Storage of explosives beyond its shelf life—It is understood that following the general shortage of explosives sometime last year, a number of magazines had built up large buffer stocks to tide over shortfall in supply. This has, however, resulted in a situation when old stock of explosive had been kept in storage beyond its shelf life in some places. This is, therefore, to caution you that old stock of explosive should not be used in the mine beyond its shelf life. Further you are advised to take immediate action to destroy such old stock in the manner given in Circular 57 of 1964.

(Cir. Genl. 1/1981)

CMR 160

1. Temporary storage of explosive near the entrance of a mine—According to the Reg. 160(2) of CMR 1957 "the JDMS may permit the use of any store or premises specially constructed at or near the entrance of a mine, for the temporary storage of explosives intended for use in the mine or of surplus explosive brought out of the mine at the end of a shift."

The Department of Explosives have pointed out that, even for temporary storage, a license has to be obtained from the Chief Inspector of Explosives in India and provision mentioned above goes counter to the Indian Explosives Act.

A sketch showing the details of construction of a typical small magazine suitable for the temporary storage of explosives not exceeding 500 lbs. is reproduced. The roof of the magazine may be flat instead of an arched one.

Application for licensing of such a magazine for temporary storage of explosives has of course to be made to the Chief Inspector of Explosives in India, Nagpur.

(Cir. 15/1960)

2. Safe destruction of blasting explosives—Instructions issued by the Office of the Chief Inspector of Explosives for destruction of high and other explosives are reproduced below—

Instructions for destruction of Blasting Explosives—

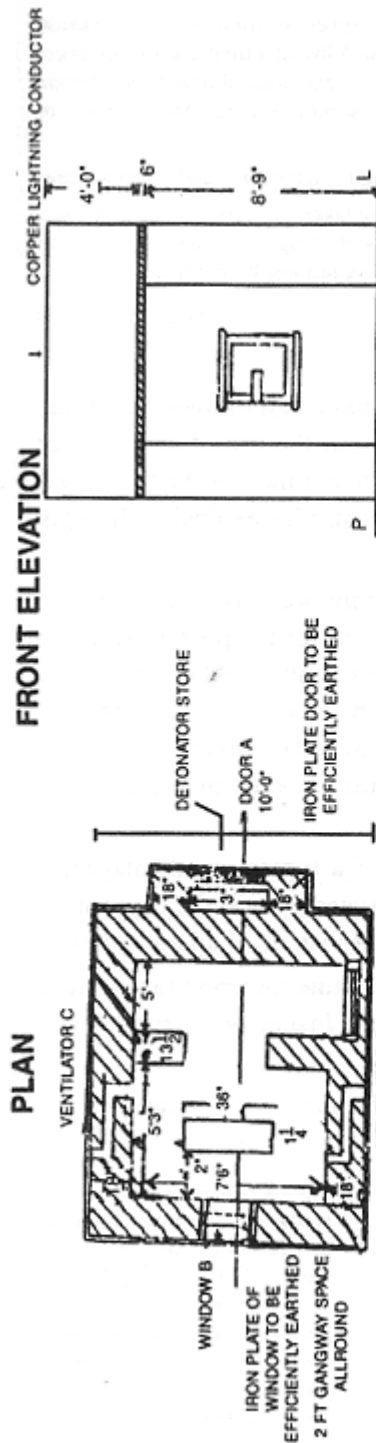
(1) *Gunpowder*—Gunpowder should be thrown into water preferably hot water which dissolves out the saltpeter and renders the explosive harmless. An alternative method is to lay it out in a train and fire this from one end by means of a piece of safety fuse; but if more than one train is laid, care should be taken to lay the second at such a distance from the site of the first as to run no risk of its being fired by the heated soil, as many serious accidents have occurred in this way.

(2) *Nitrate of Ammonium explosives*—These should be scattered on damp soil. These are so hygroscopic that even on a dry summer day a short exposure to the air renders them harmless, but it is generally easy to find a ditch damp enough to take immediate effect. If not generously applied these explosives make an excellent manure.

(3) *Nitro-compounds, gelignite, gelatine and other similar explosives*—Not more than 50 pounds of explosives should be destroyed at a time. A clear space of ground, about 100 yards all round should be selected, and a line of shavings or dry straw or grass laid down. On this the cartridges should be placed in a continuous line not more than two abreast with the cartridge wrappers and any other available paper below them. Paraffin or other similar oil, should then be poured over the shavings, straw or grass and cartridges for combustion. The line of shavings, straw or grass should be prolonged some distance beyond the explosives (say 20 ft.) and lit with a short length of safety fuse and the operator should then retire quickly to a safe distance.

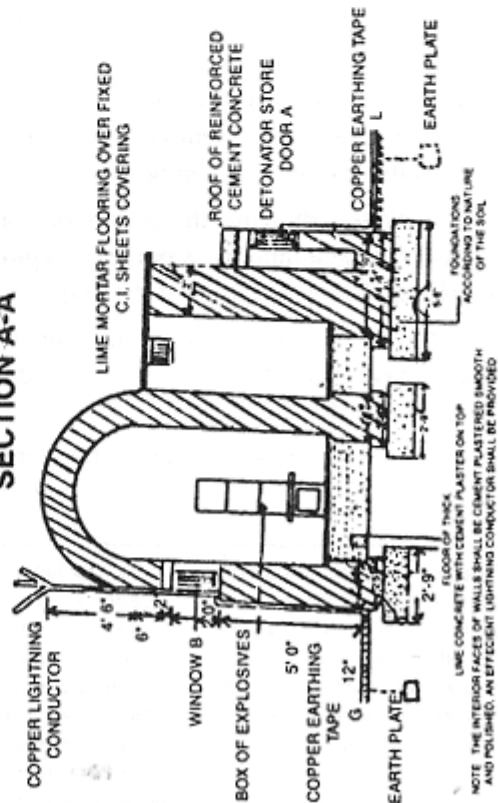
The ground on which the destruction is to take place should be clear of dry grass and inflammable substances. The direction of the fire should be at about an angle of 45 degrees to the direction of the wind and the fire should be ignited from the weather end.

(4) *Dynamites*—Even in small cartridges and small quantities dynamites burn very easily



- REFERENCES**
- A- DOOR OF 1/4" WROUGHT IRON PLATE FACED INSIDE WITH WOOD WITH BRASS HINGES AND FITTINGS
 - B- WINDOW OF 1/4" WROUGHT IRON PLATE FACED WITH WOOD ON THE INSIDE WITH BRASS HINGES AND FITTINGS
 - C- VENTILATOR 9" X 4" Z TYPE FITTED WITH A FRAME OF IRON BARS SET FIRMLY IN THE WALL ON THE OUTER FACE; THE BARS TO BE 3/4" SQUARE IRON SET ANGLEWISE WITH THE FRAME; OPENING TO BE PROTECTED WITH BRASS WIRE GAUZE OF MESH 8 TO THE LINEAR INCH.
- VENTILATOR V SHOULD BE PROVIDED WITH TOP OF THE VENTILATOR 5'-6" ABOVE THE FLOOR

PLAN OF A SMALL MAGAZINE
with detonator annexe



to detonations. The degree of confinement caused by the cartridge wrappers is often sufficient to cause explosion. Dynamite should never be burnt in larger quantities than 5 lbs. at a time and the wrappers must be opened and unrolled. The site on which the destruction is to take place should be so chosen, and the fire initiated by means of safety fuse of such a length that no risk is run by personnel or property in the event of the fire changing to explosion.

(5) *Safety fuse*—This should be destroyed by burning in lengths in the open under precautions.

(6) *Detonators*—Detonators should be disposed off by being taken to deep river, or to the sea, and then thrown into deep water by twos and threes, or they may be thoroughly soaked in mineral oil for 48 hours and then be destroyed one at a time, under suitable precautions, by burning.

(Cir. 57/1964)

MMR154

Temporary storage of explosives near the entrance of a mine—According to Reg, 154 (2) of MMR 1961, the JDMS may "permit the use of any store or premises specially constructed at or near the entrance to a mine, for the temporary storage of explosives intended for use in the mine or of surplus explosives brought out of the mine at the end of a shift".

The question of a suitable design of such a store was taken up with the Inspectorate of Explosives who pointed out that, as even for temporary storage a license had to be obtained from the Chief Inspector of Explosives and he had agreed to liberalize some of the safety distance requirements in respect of such temporary stores. The safety distance which is now being required to be observed round the magazine at or near the entrance to mines for temporary storage of explosives is given in the statement given below.

A sketch showing the details of construction of a typical small magazine suitable for the temporary storage of explosives not exceeding 500 lbs is given for your information. The roof of the magazine may be flat instead of an arched one.

Necessary application for licensing of such a magazine for temporary storage of explosives has, of course, to be made to the Chief Inspector of Explosives, Government of India, Nagpur.

Distance to be kept clear for temporary storage magazine at or near the entrance to the mines

Distances between Magazine and Room or workshop used in connection with the magazine, any other explosives magazine or store for explosive with the consent in writing of the occupier: Magazine Officer.	Distance between magazine keeper's or chowkidar's dwelling house, railway including mineral and private railway, canal (in active use) or other navigable water, dock pier or Jetty, market place, public recreation and sports ground or other place where the public are accustomed to assemble, public highways, private road which is a principal means of access to a temple, mosque, church, gurdwara, other place of worship, hospital, college, school or factory; river wall, sea wall, reservoir or bonded tank.	Distance between magazine and dwelling house, retail shop, Govt. & Public buildings, temple, mosque, church, gurdwara, or other places of worship, college, school, hospital, theatre, cinema or other building where the public are accustomed to assemble; factory, building or works used for the storage in bulk of petroleum spirit, gas or other inflammable or hazardous substances, buildings or works used for the storage and manufacture of explosives or of articles which contain explosive Aerodrome, furnace, kiln or chimney, quarry or mine pit heads, power house, wireless station, warehouse or other building.

For Magazines storing explosive not exceeding 100 Ibs.	44' mounded	44' mounded	75'
For Magazines storing explosive not exceeding 150 Ibs.	44' mounded	44' mounded	100'
For Magazines storing explosive not exceeding 200 Ibs.	44' mounded	44' mounded	150'
For Magazines storing explosive not exceeding 400 Ibs.	44' mounded	80' mounded	159'
For Magazines storing explosive not exceeding 500 Ibs.	51' mounded	104' mounded	208'

(Cir. 65/1965)

1. **Approval of mechanically propelled vehicle for transport of explosive under Reg. 164A(2) (a) of CMR 1957**—By virtue of powers conferred upon me under Reg. 164A(2) (a) of the CMR 1957, I hereby approve all mechanically propelled vehicles which are duly licensed under Rule 76 of the Explosives Rules 1983 for transport of explosives in mines subject to the conditions stipulated in the license.

(Cir. Approval 2/1986)

CMR161/MMR155

Preparation of gun powder cartridges—The use of a bare iron sheet in preparing cartridges of gunpowder is not permissible under the Indian Explosives Act. Tin sheets may, however, be used for the purpose.

(Departmental Instruction)

CMR 163

1. Cases and containers for carrying explosives—The following precautions are suggested—

1. In mines using caplamps the shot-firer and his helpers should fit a red plastic cover on their caplamps during the process of firing shots.
2. A leather box with polythene compartment may be used for carrying detonators.
3. A strong container should be used for carrying explosives cartridges. It is preferable if the locks of such containers are operated by the exploder key.

(Cir. 18/1960)

2. Pilferage of explosive: employment of trustworthy persons and checks—The owners, agents and managers should instruct and impress on their subordinate staff responsible for handling and using explosives (particularly detonators and high explosives) the necessity of exercising strictest vigilance to prevent leakage of explosives.

1. Only such persons should be appointed as magazine incharges, shotfirers and explosive carriers, who have been found to be entirely trustworthy.
2. The number of shotfirers and explosive carriers should be kept to a minimum.
3. Senior officials should frequently have surprise checks on the amount of explosives with carriers and shotfirers at different times during the shift.

(Cir. 2/1940 & 4/1949)

3. Pilferage of explosives through authorised persons—It has been noted that pilferage of explosives has taken place from some of the mines through authorised persons, mainly shotfirers. Pilfered explosives usually find their way to undesirable persons and used for anti-social activities. To stop this pilferage it is necessary to check the antecedents of shotfirers and to keep a watch on them.

Managements are requested to furnish DGMS with a list of the shotfirers in service at their respective mines on 1st January every year with the following details:

1. Name in full:
2. Father's name:
3. Residential address:

4. Home address:
5. Number and kind of certificate he holds for firing shots:

A copy of the list should be sent to the Superintendent of Police having jurisdiction in the area in which the mine is situated.

Managements are also advised to enforce strict check or a kind of personal search by the attendance clerks at the mine entrance at the time the unspent balance is brought to the surface by shotfirers.

(Cir. 13/1956 & 9/1957)

4. Pilferage of explosives through authorised persons—Attention is invited to circulars 13/1956 and 9/1957 regarding pilferage of explosives through authorised persons in mines. It has been reported by the Superintendent of Police, Dhanbad, that pilferage of explosives on a large scale is taking place from some of the mine magazines and that explosives are going to the hands of undesirable persons. In order to stop such an undesirable practice it is essential that explosives are issued to the shotfirers very carefully after ascertaining their actual needs. It is equally necessary that the magazine clerk and the shotfirers are kept under constant watch to ensure that there is no misuse of explosives. The quantity of explosives actually used by the shot-firer should be checked by a senior officer of the rank of an Assistant Manager. The magazine incharge should be asked to maintain a proper account of the quantity of explosives issued from the magazine and the number of shots fired.

(Cir. 44/1963)

5. A scheme for prevention of pilferage of explosives—A scheme for prevention of pilferage of explosives in mines which is based on successful practice at some of the larger mines in Jharia and Raniganj coalfields is reproduced below. It is recommended that the scheme may be adopted with modification, if necessary, to suit local conditions so that the pilferage of explosives in mines through authorized persons is prevented in interest of safety as well as from the security point of view.

A SCHEME FOR PREVENTION OF PILFERAGE OF EXPLOSIVES

Selection of Shot-firers/Blasters and Explosive Carriers

1. It is essential that the explosives are not handled by undesirable persons who may indulge in antisocial activities. Only such persons shall therefore be appointed as shotfirers, blasters and explosive carriers whose antecedents have been checked with police and/or through any other means.'

Cases or Canisters of Explosives

1. All cases or canisters (referred to as 'boxes' hereinafter) used for carrying of explosives shall satisfy the following requirements :

(a) The lid of the box containing explosive and detonators shall be self locking in the sense that the lid must lock automatically when it is fully closed. The lock may open only by the exploder key which is in the possession of the Shotfirer/Blaster at all times, or any other suitable device.

(b) All boxes used for carrying of explosives and detonators shall be colored.

The color of the boxes shall be different for different shifts e.g. the color of boxes used in three shifts may be:

first shift : red

second shift : yellow

third shift : white

(c) (i) All boxes shall be numbered serially in each color.

(ii) Each shotfirer/blaster shall be allotted one particular number irrespective of his shift. Thus if No. 1 is allotted to a particular shot-firer/blaster, he would take Red Box No. 1 in 1st shift. Yellow Box No. 1 in 2nd shift, and White Box No. 1 in 3rd shift.

(d) Spare boxes of different colors shall be kept available in the magazine. *Explosive boxes*

3. The original explosive boxes (usually containing 50 lb. of explosive) shall be opened in the magazine in the presence of assistant manager or any other competent person (other than magazine clerk) specially authorised by the manager for the purpose. Whenever possible the number of cartridges found in each box shall be counted and entered in a box along with their weight.

N.B.: The first part of this clause is also usually a condition of the License.

Transit Slips

4. Explosive Issue and Return Voucher (specimen attached) shall be prepared by the Under Manager/Assistant Manager/Overman (or Foreman). As far as possible these slips shall be prepared after enquiring about the amount of balance coal left during the previous shift and the number of shots required during the following shift. (For development galleries the manager shall fix the number of shots per cut for guidance of the assistants).

Check in the Magazine

5. The number or cartridges of explosive and detonators issued to every shot-firer/blaster shall be counted by the Magazine Clerk and entered in the **transit slip**. The magazine clerk shall sign the same, put the slip inside the box, close the box and hand over the exploder key or the key of the lock (if it is other than the exploder key) to the shot-firer/blaster.

Check at the pit top (beginning of shift)

6. At the pit top or incline mouth every box of explosive shall be opened and checked by the attendance clerk, who shall note the amount of explosives found in every box and make an entry thereof in the **Transit slip**. He shall then sign the slip, put the slip inside the box, close it and then hand over the exploder key to the shot-firer.

Provided that the shifts of shot-firers/blasters may be staggered to enable the attendance clerk to perform the above duty properly and without any danger to work persons during rush hours.

Provided further that where it is not possible to stagger the shifts, this check may be done by the overman/foreman .at the surface or at the Reserve Station underground before the commencement of shot-firing operations.

Checks Underground

7. At the end of shot-firing operation and at least once more during the shift the Sirdar shall count the number of cartridges and detonators left with shotfirer, make an entry thereof in the Transit slip and sign the same.

8. During the shift, the overman/foreman and assistant manager shall check the boxes occasionally, and sign the Transit slip.

9. At the end of the shift the overman/foreman shall check the boxes, enter the balance quantity of explosive in the Transit slip, and sign the entry.

Check at the pit top (end of shift)

10. (i) The shotfirer blaster shall get his boxes checked by the attendance clerk on duty at the end of the shift. The Attendance Clerk shall count the number of cartridges and detonators, make an entry thereof in the Transit slip and sign it.

Provided that the shifts of shot-firers may be staggered to enable the attendance clerk to perform the above duty properly and without any danger to work-persons during rush hours.

Provided further that where it is not possible to stagger the shifts, this check may be done by the overman/foreman at the Reserve Station underground or at the surface.

(ii) The attendance clerk (or the overman/foreman, as the case may be) shall directly return the Transit slip to manager for checking.

Return of unused Explosive to Magazine

11. The shot-firer/blaster shall return the boxes to the magazine, and deposit key of the box with the magazine clerk.

Final Checks

12. The manager or an assistant manager or any other competent person specially authorised by the manager for the purpose shall countersign every Transit Slip received from attendance clerks or overman/foreman, as the case may be. He shall check the entries in the slip against the entries made in the issue and return Explosive Register maintained under Regulation 162(4) of the CMR or Regulation 156(4) of the Metalliferous Mines Regulations.

13. All the statutory explosive record books including the book maintained under Reg. 179(b) of the CMR or Reg. 169(b) of the MMR shall be checked by the manager or an assistant manager specially authorised by the manager for the purpose.

Stock Checking in the Magazine

14. The manager or an assistant manager specially authorised by the manager for the purpose shall once at least in every week check the stock of explosives in the Magazine, and compare it against the records maintained by the magazine clerk.

General

15. Any overwriting of entries in the Transit Slip shall be countersigned by the person making the same.

Restriction

16. This scheme shall not apply to mines where an approved system of bulk conveyance of explosives is in force and where an underground magazine is provided under Regulation 160(3) of the CMR or Regulation 154(3) of the MMR.

(Cir. 33/1964)

6. Measures to be taken for preventing pilferage of explosives—In addition to measures suggested vide DGMS Cir. No. 2 of 1940, 4 of 1949, 44 of 1953 and 33 of 1964, the following additional measures should be taken to prevent pilferage of explosives :

(1) All explosive magazines in the mine area should be well illuminated and well guarded.

(2) Strict check should be kept on mining sirdars and shot-firers in mines to ensure that there is no pilferage of explosives.

(3) More pit head magazines may be constructed (after obtaining approval of the concerned authorities) so as to encourage the mining sirdars and shotfirers to deposit unused explosives.

(4) The proper maintenance of records pertaining to stock, issue and return, use etc. of explosives should be strictly monitored regularly by the manager and counterchecked by officer senior to manager.

(Cir. Tech. 3/1992)

CMR 165/MMR 159

1. Reserve Stations—The reserve stations should be so sited that:

1. The place has no overhanging sides or prominent undercuts. The roof is adequately supported, and the place is kept white-washed.
2. The place is kept clean, is free from loose debris, and is adequately fenced.
3. The reserve station and all places lying within 18m of the same are cleaned of coal dust, and the roof, floor and sides in the area are adequately treated with approved type of stone dust. The floor of the workings in the 18m zone should be particularly treated with at least 2 cm thick layer of stone dust, and
4. No energies electric cables are allowed to pass within the distance of 90 metres from the reserve station.

(Cir. 24/1962)

2. Storage of explosives in reserve stations—It has been brought to my notice that in some mines reserve stations are used for storing explosive required for the whole mine for the day. This is not merely a contravention of the provisions of Indian Explosives Act, but is highly dangerous. No explosive can be stored at any premises or place unless it is licensed under the Indian Explosives Act. Reserve station under the provisions of Reg. 165 of the CMR 1957 or corresponding provisions of the MMR 1961, are meant for keeping securely locked explosive canisters issued to a shotfirer for use during the shift. Managements are directed to ensure strict compliance with the above.

(Cir. Tech. 6/1980)

CMR 167

Tool for detecting cracks in shotholes—The following specifications have been laid down for the tool to be used for detecting cracks in the shotholes :

1. *General*—A straight stiff rod or tube made of copper or wood with a flat prong at one end which forms an integral part of it or is securely attached to it and which is made of or tipped with hard wearing metal.
2. *Dimensions*—Length of rod or tube: Six inches longer than the depth of the shothole but in no case more than 4'6".

Diameter of rod or tube—Half the diameter of the shothole but in no case more than half an inch.

Length of prong—Not less than three-quarter inch and not more than one inch from the centre of the rod or tube to the tip of the prong.

Width and thickness of prong at tip—Not more than 3/32"

The break detector may incorporate a scraper attached to the outer end. The scraper attachment should comprise not more than half a disc.

(Cir. 17/1958)

CMR168/MMR162

1. Stemming material—The stemming material most commonly used in this country is clay, a plastic mixture being formed into plugs which are then allowed to dry out in the sun. The plugs thus attain a consistency similar to that of unborn brick and are often so hard that very forceful treatment is required in the shotholes to break them down. Such plugs are completely unsuitable as stemming material.

The stemming material should be compact but not hard. The use of mixture containing 70% fine sand, 30% clay and a small percentage of calcium chloride to keep it in a plastic condition is recommended for the purpose.

(Cir. 49/1959)

2. Use of water or gel ampoules for stemming of explosive charges—Use of water ampoules for stemming of explosive charges has found an increasing application in coal mining industry in other countries.

Experience in the mines of National Coal Board, U.K. over many years has proved that the use of water or gel filled ampoules as stemming for explosive considerably reduces the risk of methane ignition and the amount of dust and fumes from shot-firing thereby creating safer and better environmental conditions in the mines.

It is also claimed that water stemming reduces the possibility of deflagration, is more efficacious than the conventional stemming and brings down the degree of projection of fragments.

In view of the above advantages, it is proposed to introduce water/gel filled ampoules as stemming for explosive charges in a progressive manner in our underground coal mines of III and II degree of gassiness by 30th June, 1981 and 30th June, 1982 respectively. I shall be pleased if necessary action in this respect is taken by you.

Following guidelines may be useful to you in introducing this system in your mines :

(a) The ampoules should be of self-sealing type (in ampoules meant for being filled inside holes, a 'slit' self-sealing valve should be provided)

(b) The material chosen for manufacture of ampoules should be :

- (i) 'non-inflammable'
- (ii) such as would not cause harmful effects to the skin when handled
- (iii) adequately strong (wall thickness 0.015 cm.)
- (iv) adequately resistant to wear by abrasion and to heat, and
- (v) antistatic.

(c) Should be as close a fit as possible and should have adequate holding ability, in a shothole (self-restraining type may be desirable for blasting off solid).

(d) Normally, one water ampoule, about 38 cms. in length may be used in shotholes upto 1.5m in depth. Where the shotholes are deeper than 1.5m, another ampoule may be inserted at the back of the hole.

(e) A plug of solid stemming should be used at the in bye as well as the out bye ends of the shotholes.

(f) Shots stemmed with water ampoules should be fired as quickly as possible, preferably within one hour of the commencement of charging, at a face.

Samples of ampoules may be got tested at CMRS or some other national laboratory for the above properties as well as for efficacy in preventing ignitions of firedamp.

(Cir.Tech. 2/1981)

3. Self sealing PVC Water Ampoules for use in shotholes—Attention is drawn to D.G.M.S. (Tech.) Circular No. 2 of 1981 regarding use of water or gel ampoules for stemming of explosive charges. The circular contained broad guidelines on the type of material and construction and method of use of water ampoules. It was also advised to get samples of water ampoules tested at C.M.R.S. or other National Laboratory.

2.0A notification under Reg. 181(3) of CMR 1957 has been issued requiring that after 1st March 1982, no water or gel ampoules shall be used in underground coal mines unless the same is of Type, Make and Standard approved by the undersigned.

3.0 Indian Standard specifications for water or gel ampoules have not been formulated. National Coal Board have drawn up exhaustive specifications for self-sealing P.V.C. water ampoules viz. N.C.B. specifications No. 414/1964. It is proposed to follow these specifications for indigenous water ampoules also.

4.0 N.C.B. specifications referred to above lay down details of—

- (i) the material for construction of water ampoules.
- (ii) dimensions of water ampoules.
- (iii) physical properties like tensile strength and elongation at break, dimensional stability, tear strength, blocking, low temperature extensibility, extensibility after heat ageing.
- (iv) tests of finished ampoules like Weld Strength test, Drop test, Gas pressure test. Valve efficiency test. Fire resistance test and Electrical resistance test.

5.0 Central Mining Research Station, Dhanbad is equipped to conduct the above tests. You are advised to ensure that water ampoules for use in your mines conform to the N.C.B. specification No. 414/1964 and are duly approved by this Directorate.

6.0 The water ampoules may be filled underground at any convenient place where water is available although it is recommended that they are filled at a point near to the place where they are to be used so as to eliminate any transport cost. The ampoules can be filled by means of a foot operated filling valve supplied by manufacturers or by a valve and filling tube which may be colliery made.

6.1 Before charging a shothole, a plug of solid stemming should be used at the in bye end. After the shothole has been charged, the water ampoule should be inserted into the shothole and pressed upto the charge. A plug of solid stemming should then be inserted.

6.2 Normally, one ampoule, about 38 cm. in length may be used in shotholes upto 1.5 metres in depth. Where the shothole exceeds 1.5m in depth, another ampoule may be inserted at the back of the hole.

Shotholes stemmed with water ampoules should be fired as quickly as possible, preferably within one hour of the commencement of charging at a face.

(Cir. Tech. 2/1982)

4. Length of fuse outside the cartridge in fuse firing—The idea of specifying the minimum length is that the shot-firer/blaster gets adequate time to take shelter after he has lighted the fuse.

In certain cases long lengths of fuse are inserted into gun-powder cartridges with the result that the effective length of fuse outside the cartridges becomes much less than 1.2 metres. As a result, the shot-firer/blaster gets much less time to take shelter after he has lighted the fuse.

For the sake of safety of persons engaged on the dangerous occupation of handling explosives, it is necessary that not less than 1.2 metres of fuse is kept outside a cartridge.

(Cir. 45/1963)

5. Forcing down of explosive cartridges—Forcing a cartridge of explosive down a shothole is always fraught with danger particularly when it is stuck up. Instruction exists in the Regulations when the shot-hole is of insufficient size [Reg. 168(9) of CMR 1957 and Reg. 162(9) of MMR 1961].

It is equally dangerous when attempts are made to press or force a cartridge stuck up in a shothole of bigger size either due to some obstruction in the shothole or the cartridge having fallen diagonally. In drawing attention to the danger associated with such practice, it is required that at no stage should attempts be made to push any cartridge down when it gets stuck up either because of insufficient diameter, obstruction in the shot-hole or any other reason.

Such shot-hole should be dealt with in the manner laid down in the regulations for misfired shots.

(Cir. Tech. 1/1975)

6. Shots in shafts and tunnels to be fired electrically—In exercise of the powers conferred on the Regional Inspector of Mines under Reg. 168(14) of the CMR 1957 and in exercise of the provisions of Reg. 202 of CMR 1957, the DGMS has specified that every shot to be fired in a shaft or tunnel shall be fired electrically.

A similar requirement has been made under Reg. 162(14) of MMR 1961 also.

(Cir.Legis.6&7/1991)

7. Blasting in fire areas—A number of fires are known to be active in different coalfields. Any attempt to win coal from these areas involving blasting is fraught with danger. In a recent major accident, 6 persons were killed when a Nitroglycerine based explosive was being used in an opencast coal mine where fire existed.

Some trials have been carried out in the recent past by R & D wing of DGMS in collaboration with Explosives Utilization Wing of CMPDIL and by CMRS in extraction of coal from

opencast mines where fires existed. Based on the experience gained so far, it is recommended that while blasting in hot strata (either in OB or coal), the following precautionary measures should be adopted :

(1) (a) No explosive other than slurry and emulsion explosives shall be used. (b) Blasting shall be done with detonating fuse down the hole.

(2) Temperature inside the blast holes shall be measured (before filling with water) and if the temperature exceeds 80°C, in any hole, such hole shall not be charged. Records of measurement of temperature in each hole shall be maintained in a bound paged book.

(3) All blast holes shall be kept filled with water. When any hole is traversed by cracks or fissures, such hole shall not be charged unless it is lined with an asbestos pipe and the hole filled with water. In addition, bentonite should be used for sealing any cracks at the bottom of the holes.

(4) Detonating fuse shall not be laid on hot ground without taking suitable precautions which will prevent it from coming in contact with hot strata.

(5) The charging and firing of the holes in any one round shall be completed expeditiously and in any case within 2 hours.

(6) Blasting operations shall be carried out under the direct supervision of an assistant manager.

It is, however, clarified that permission/relaxations under different regulations which may be applicable (e.g. using more than one type of explosive etc.) shall invariably be obtained before carrying out blasting operations.

(Cir. Tech. 2/1985)

8. Blasting in fire areas—Condition (1) (a) of circular Tech. 2/1985 is modified to read as follows :

(1) (a) No explosive other than slurry and emulsion explosive shall be used.

(Cir. Tech. 2/1990)

9. Charging and firing of explosives in a crack, i.e. in an improperly drilled, charged and stemmed shot hole—Recently there had been an accident from a secondary blasting in an opencast mine. The enquiry revealed that about 62.5 kg. of explosives was placed in a crack measuring 7m by 4 m and 0.25 m in thickness without sufficient confinement in a toe of a dragline bench. The result was that a blasting projectile measuring 21 cm by 21 cm and 4 cm in thickness and weighing about 4.5 kg. flew through a distance 330m and hit a person who had taken shelter beneath a tree, inflicting fatal injuries to him.

Your attention is drawn to the provisions of Reg. 168(1), which requires firing of shot in a properly drilled, charged and stemmed shothole and Reg. 170(1) of the CMR 1957 read with DGMS (Tech.) Circular No. 8 of 1982 on taking proper shelter. Compliance of these mandatory provisions and circulars will go a long way in preventing such type of accidents.

(Cir. Tech (SOMA) 5/1999)

CMR169/MMR163

1. Specifications of cable for shot-firing—In super session of Cir. 23/1960, the following specifications for shot-firing cables are hereby notified for guidance:

(a) **Cable for single shot-firing**—Two core cable, each core consisting of a conductor of at least four copper wires of not less than 0.018 inch in diameter, with insulation and further protection against mechanical wear and damage not less than that of P.V.C. (Poly vinyl Chloride) 0.025 inch in thickness with a figure of eight construction, or of vulcanized rubber or P.V.C. 0.020 inch in thickness, the two cores twisted, wormed and covered with a sheath of cotton braid, tough rubber or P.V.C.

(b) **Cable for multi-shotfiring**—Single-core cable, consisting of a conductor of at least three copper wires of not less than 0.036 inch in diameter, insulated to withstand at least 250 volts, and further protected against mechanical wear and damage.

(c) **Cable for shot-firing in shafts**—Two-core cable, each core consisting of a conductor of at least seven copper wires of not less than 0.029 inch in diameter, insulated to withstand at least 250 volts and adequately protected against mechanical wear and damage.

Note': The following methods of insulation and protection for multi-shotfiring cables are regarded as suitable:

1. Insulated by vulcanized rubber or P.V.C. protected by taping, braiding and fire resisting compounding;
2. Insulated by vulcanized rubber protected by a tough sheath or P.C.P. (Polychloroprene) sheath; or
3. Insulated by P.V.C., protected by a P.C.C. sheath.

(Cir. 70/1966)

2. Approval of shot-firing cables—Approval for the shot-firing cables to be used in mine to several manufacturers based on specification No. 115 issued by the National Coal Board, U.K. has been issued. As Indian Standard Institution has now published necessary specification for the shot-firing Cables vide IS: 5950 of 1971, it shall be ensured that while ordering shot-firing cables, after 30th September, 1974, that they are covered by a fresh approval from this Directorate and in compliance with IS : 5950 of 1971.

(Cir. 25/1974)

3. Maintenance and repair of exploders—Attention is drawn to the provisions of Reg. 169(1) (c) of the CMR 1957 on the subject of maintenance of electric shotfiring apparatus (exploder), which are reproduced below :

"(i) No apparatus shall be used which is defective; and every apparatus shall, once at least in every three months, be cleaned and thoroughly overhauled by a competent person.

(ii) If the apparatus fails to fire all the shots in a properly connected circuit, the shot-firer shall return the apparatus to the manager, under manager or assistant manager as soon as possible, and it shall not be used again unless it has been tested on the surface and found to be in safe working order.

(iii) The result of every overhaul, test or repair as aforesaid shall be recorded in a bound-paged book kept for the purpose, and shall be signed and dated by the person making the overhaul, test or repair".

2.0 It has been brought to my notice that in many mines maintenance of exploders is not being given due attention.

In a recent case (Cir. 4/1965) the exploder sent for repairs was reported to have the following defects—

- (i) the handle was in such a condition that it could tear any time.
- (ii) the bottom studs were slotted (The original studs had hexagonal head).
- (iii) out of four pins on the "Resistor Packs" one was broken and the base was cracked.
- (iv) the Micro switches did not show continuity in the Meter.
- (v) the batteries had lost their emission.

In another case (Cir. 5/1975) a defective exploder was issued to shot-firer for use leading to a fatal accident to the shot-firer. On examination at the CMRS glaring defects were observed in the exploder involved. An extract from the CMRS report is reproduced below—

"In the physical examination it was found that the connection to the neon lamp was disconnected and hence there is no visible light indication when the key of the exploder is kept in charged position. The connection of the switch has been found to be tampered. When the key of the exploder is turned, there is no visible light indication and output is continuously available at the firing terminals till the key is turned to the 'fire position'. This is undesirable. Because of the tampering there is no time limit to the firing current impulse. This will affect the safety of the exploder."

You are no doubt aware that an exploder in poor condition may fail to fire required number of shots thereby giving rise to misfires. It can also lead to dangerous consequences in gassy coalmines because safety during electric shot-firing in gassy atmosphere also depends upon safety features of exploder. These features could get disturbed due to poor maintenance. It is therefore emphasized that regular maintenance of exploders must be carried out as per the requirement of the regulations. Cleaning, overhauling and testing of exploders should be done strictly in accordance with the instructions given in maintenance manual issued by the manufacturers and it is advisable that the competent person responsible for cleaning and overhauling the exploders is thoroughly trained by the manufacturers of exploders.

3.0 It has been also brought to my notice that at times exploders are being repaired by unauthorised agencies. It is to be emphasized that only the work of maintenance of exploders is to be done at mine level and any servicing and repair of an approved exploder must be carried out only by the manufacturer of the exploder or by the agency authorised by the manufacturer and approved by DGMS. In this context, the agencies where repair work of various types of exploders can be carried out are indicated below :

	Type of exploder l.	Agency for repair work
1	Schaffler—350	IDL Chemicals Ltd.

		Post Box No. 1 Sanat Nagar (IE) P.O. Hyderabad-500 018
2	'Rihno' brand exploders	M/s Electronic Equipment Manufacturing Co. 1, Acharya Jagdish Chandra Bose Road, Calcutta.
3	ME-6 (Six shot exploder)	(i) IEL Ltd. 34, Chowringhee, Calcutta-700 016 (ii) M/s Jivon & Co. (P) Ltd. 97, Gray street, Calcutta-5. (iii) M/s Andrew Yule & Co. Ltd. Calcutta. (iv) M/s Mining Craft, P.O. Raniganj.
4	ME—12 (Twelve shot exploders)	IEL Ltd. 74, Chowringhee, Calcutta-700 016
5	25 Shot Sanjoy exploder	M/s Sanjoy Industries, Main Road, Jealgora, Dhanbad.
6	'Star' brand exploders	M/s Electrical Equipment Corporation 13/63 Punjabi Bagh, New Delhi.
7.	25 Shot exploder of M/s Swastik	M/s Swastik Mining Industries, Lal Bazar, P.O. Jharia, Dhanbad

A repaired exploder shall not be brought into use unless accompanied by a Usability Certificate granted by the repairer clearly indicating that all the safety devices in the exploder are in order. In addition, the Colliery Engineer must satisfy himself regarding the same and record in the book to be maintained for the purpose. The Usability Certificate should also indicate the nature of servicing and repair done and the results of tests done regarding (a) Duration of current impulse, (b) Output voltage, (c) Residual current.

4.0 Under Reg. 169(1) (c) (iii) of the CMR 1957, systematic records of every overhaul, test or repair of exploders are required to be maintained in a bound paged book. It is suggested that in this book, a few pages should be ear-marked for each exploder. A complete history of maintenance, test repair, overhaul etc. of every exploder in use, since the date of its introduction, should be kept recorded on these pages. Every entry in the book shall be countersigned by the engineer.

(Cir. 4/1965, Tech. 5/1975 & Tech. 3/1987)

4. Servicing and repair of exploder—M/s Mining Craft, P.O. Raniganj, Burdwan, have been authorised for carrying out servicing and repair of Little Demon,

ME-6 and Beethoven types of Exploders subject to the following conditions—

1. After servicing and repair involving only the mechanical parts, the exploder shall be thoroughly tested and a Usability Certificate, mentioning the nature of servicing and repair done, shall be given along with the serviced exploder to the management. Such tests should include performance test with at least 10 rounds of detonators (using fuse heads both of IEL and IDL make),

2. After any repair or replacement involving essential parts such as condensers, resistances etc. in addition to the tests at repairer's workshop the repaired exploder shall be check-tested at the Central Mining Research Station, Dhanbad only for the following:

(a) Duration of current impulse,

(b) Output Voltage,

(c) Residual current,

and a copy of the report of such check test shall be furnished to the management and also forwarded to the Director General of Mines Safety. A Usability Certificate as at (1) above shall also be given with the exploder.

3. In case the above check tests indicate—

(a) Duration of current impulse more than 4 millisec.,

(b) Output voltage variation more than +1% of rated voltage, or

(c) Any residual current,

the repaired exploder shall not be put into use till the defects are fully rectified and rechecked as at (2) above.

4. In case the defective micro switch/micro switches are replaced by those identical with the original micro switches and imported from makers of the same, the check tests at the Central Mining Research Station, Dhanbad shall not be required. However the fact of such replacement should be clearly stated in the Usability Certificate to be given with the exploder so repaired.

5. This approval may be amended or withdrawn at any time if considered necessary in the interest of safety.

(Cir. 43/1972)

5. Approval of indigenous make batteries for ME-6 exploder—M/s Union Carbide India Ltd., 1 & 3, Brabourne Road, Post Box No. 486, Calcutta-1 can now regularly supply the batteries but in view of the present stipulation of six weeks life for the battery it would be in mine management's interest to place standing orders with the firm in advance to facilitate prompt manufacture and regular supply of the batteries to meet their requirements.

It may be added in this connection that the manufacturer is investigating the possibility of improving the quality of the battery. When an improved type of battery becomes available its life may be extended depending upon result of fresh tests at the Central Mining Research Station, Dhanbad.

6. Circuit Testers—Blasting circuits in the blasting operations in opencast mines are being tested by circuit testers which have not been approved by DGMS. In one of the opencast mines, there recently occurred a very serious accident when a single shot was being tested by a

Meco Circuit Tester manufactured by M/s Measurements Corporation, Bombay. Therefore, unless a circuit tester has been approved by DGMS the same shall not be used for the purpose of testing blasting circuits in any mine. So far, only one Circuit Tester namely 'GYRO' Ohm Meter manufactured by M/s Gyro Laboratories Pvt. Ltd., Bombay, has been approved by this Directorate for the purpose of testing blasting circuits in a safe manner in a mine.

(Cir. 3/1973)

7. Use of circuit continuity tester during electric shotfiring in mines— Reg. 169(5) (c) of CMR 1957 and Reg. 163(4) (c) of MMR 1961 require that the circuit shall be tested for electrical resistance or for continuity with an apparatus 'specifically' designed for the purpose.

It is hereby clarified that whereas the apparatus for use in belowground coal mines has to be of a type approved by DGMS (vide notification issued under Reg. 181(3) of CMR 1957), in all other cases, the apparatus referred to, should be either of a type approved by DGMS for use in belowground coal mines or conform to requirements of Appendix A of IS: 9836-1987 (including latest amendments thereto).

(Cir. Appr. 7/1992)

8. Danger due to explosives during testing of electric detonator—Recently there has been an accident in a stone quarry resulting in death of four persons due to premature detonation of a primed cartridge of special gelatine. The detonator in the prime cartridge was being tested by a multi meter by a person who was not holding the required competency certificate, when the shot exploded resulting into the accident.

Enquiry into the accident revealed that testing of the detonator was being carried out without using an apparatus specially designed for the purpose in contravention of Reg. 169(5)(c)/Reg. 163(4)(c) of CMR, 1957/MMR, 1961 and without taking proper shelter in contravention of Reg. 170/164 of CMR 1957/MMR 1961.

The accident resulting in loss of four invaluable lives was caused due to failure to comply with the provisions of safety laws. In this connection it may be mentioned that the circuit continuity tester used for electric shot firing in mines need to be either of a type approved by DGMS or conform to requirements of Appendix-A of I.S. 9836-1981 as amended up to date

Managements are requested to comply with provisions of the safety laws and safe practices in usage of explosives to prevent recurrence of such accident in future.

(Cir. Tech. 1/2000)

CMR170/MMR164

1. Zone of influence of blasting—It has been observed in a few accidents in underground coal mines in the recent past that falls of roof and sides had taken place due to vibrations initiated

by blasting in nearby areas. In fact, there have been a couple of fatal accidents where the shotfirer taking shelter had been involved in such falls. Other accidents involved other persons taking shelter or approaching the place of blasting for making it safe. In all these accidents, the immediate provocation was the influence of blasting in nearby areas. This brings us to the question of specification of zone of influence of blasting so that no body enters the same before making it secure and what is more important, does not remain within this zone at the time of blasting. The urgent necessity of this is highlighted in the context of the increased use of explosives and in particular of blasting in solid.

Attention to this hazard was drawn vide Circular No. 18 of 1963. In view of the diversity in the nature of coal, manager of each mine was requested to determine for his mine the zone likely to be affected by blasting, depending upon nature of roof, method of work etc. In the recent fatal accidents, this suggestion had not been given effect to, resulting in the avoidable loss of life.

Attention is therefore again drawn to this danger and it is to reiterate the suggestion made in the earlier circular and immediate implementation of the same is recommended. The zone of influence of blasting should be determined immediately and it should be ensured that nobody remains in this zone, while blasting is going on. Nobody should be allowed to enter the same before the area is thoroughly inspected and made safe.

A diligent compliance with this suggestion would eliminate this hazard in our mines.

(Cir. Tech. 11/1977)

2. Danger from blasting operations in opencast workings—1. Under the extant regulations, before a shot is charged, stemmed, or fired, the shotfirer/ blaster is required, amongst other things, to ensure that all persons within a radius of 300 metres from the place of firing (referred to hereinafter as danger zone) have taken proper shelter, apart from giving sufficient warning by (efficient signals or other means approved by the manager) over the entire danger zone.

2. An analysis of fatalities which occurred in our mines during the last few years has revealed that nearly 6% of fatalities are associated with the use of explosives. And, a large number of such fatalities are because of not taking proper shelter. What would constitute 'proper shelter' for the purposes of the aforesaid regulation is a moot point. However, for a proper appreciation of the causes of and circumstances attending such accidents some of the typical accidents under different major cause groups are described below :

A. Accidents due to human failure

(i) Not posting guards at all points of entry into danger zone:

"While blasting was in progress in a limestone quarry, a non-employee entered the danger zone and was struck on the head by a flying piece of stone which was projected some 230 metres from the site of holes."

(ii) *Not warning all concerned within the danger zone :*

"While one manually drilled shot hole about 38 cms deep, was charged with gun powder and fired with safety fuse, a piece of stone measuring about 15 cms cube was projected over a distance of nearly 181 metres from the site of the shot hole, where it struck a worker of adjoining mine inflicting injuries which proved fatal on way to hospital."

(iii) *Not taking shelter inspite of being warned:*

"While seven shot holes each about 0.68 metres deep, were blasted in a stone quarry with the help of gun powder and safety fuse, a piece of stone. from the site of shot holes was projected over a distance of nearly 145 metres, where it struck a new mine worker who was employed in

an adjoining pit within the same mine and who had failed to take proper shelter inspite of being cautioned by the Blaster, killing him instantly."

(iv) Ignoring the warning and not muffling the shots :

"In a stone quarry ten shot holes, each about 1.5 metres in depth, were fired in two rounds of 5 holes each. While the second round of 5 holes was fired with the help of special gelatine explosives and electric detonators, a piece of stone weighing about 2 kg was projected from the quarry to a distance of about 150 metres, where it struck a person who had just then come out of his house, inspite of warning signals given by the Blaster. Incidentally, although arrangements for muffling the shots were provided yet these were not utilized."

B. Accidents owing to failure of certain types of structures to provide adequate shelter within the danger zone

(i) "While 45 shot holes, 100 mm in dia and about 2.7 metres in depth, charged with ANFO and special gelatine explosives were blasted with the help of millisecond delay action detonators in a bauxite quarry a number of laterite pieces weighing about 12-20 kg each, projected from the blast fell on the wooden rafter roof of a blasting shelter at a distance of nearly 17 metres. After breaking the roof the laterite pieces struck the foreman and blaster, killing the foreman."

(ii) "In a stone quarry five shot holes each about 5 cms in dia. and charged with gun-powder were fired in one round with the help of safety fuse. A piece of stone weighing about 10 kg was projected form the quarry over a distance of about 60 metres and fell on tiled roof of a hut. It punctured the roof and hit one of the residents on the leg causing injuries."

(iii) "While 27 shot holes in coal, each 10 cms in dia. 5.4 to 6.0 metres deep, charged with 14 to 18 kg of explosives, were fired in one round, three pieces of coal, each weighting about 1 kg flew over a distance of nearly 115 metres, fell on thatched roof of a tea stall and after piercing the same struck one person, inflicting serious injuries which proved fatal one hour later."

(iv) "Four holes, each about 5.4 metres deep, charged with 9/10 kg of ANFO and 2 cartridges of formablast, were fired with safety fuse. A projectile from the site of these holes travelled over a distance of nearly 300 metres and fell on asbestos roof of feeder canteen of the mine. The projectile pierced asbestos roof and struck a worker on the head, inflicting injuries, which proved fatal about 2 hours later."

(v) "In. an iron-ore mine while 8 shot holes, each about 1.2 metres deep, were charged with special galatine explosives and fired with safety fuse, a piece of iron ore weighing about 2.5 kg was projected over a distance of approximately 61 metres from the site of shot holes, hitting a tipping tub made of 6 mm thick steel sheet on its side causing a dent over an area of 24 cms x 16 cms. A worker who Had taken shelter inside the tipping tub with his head resting against the spot struck by the projectile, received injuries on the skull which proved fatal instantly."

C. Accidents occurring beyond the stipulated danger zone

(i) "At the end of day's work while two rounds of shots, each comprising 10, small diameter shallow holes, were fired with the help of special gelatine explosives, an employee of the contractor who was returning home and had reached a spot just outside the danger zone, was struck on the back of his head by a piece of stone causing instantaneous death."

(ii) "In a rock phosphate mine while 35 shot holes, each about 115 mm in dia. and 7.2 metres deep, were charged with 1200 kg of O.C. gelignite and ANFO and fired using delay action detonators, a piece of stone measuring 12 cms x 10 cms in size was projected over a distance of about 332 metres from the site of shot holes and after piercing asbestos cement sheet roof of a beneficiation plant under erection, struck a worker on the head inflicting injuries which proved fatal on way to hospital."

(iii) "While 19 shot holes, each about 1.5 metres deep and charged with one cartridge of SG explosive (80% strength) were fired in stone with the help of ordinary detonators and safety fuse, a piece of stone flew over a distance of about 365 metres and struck a railway wagon and after rebounding therefrom hit a loader who was loading the wagon in a railway siding, situated outside the leasehold of the mine, where blasting was done, causing serious bodily injuries."

(iv) "While blasting was being done in an iron-ore quarry an office-boy taking shelter at a distance of 460 metres from the site of blasting was hit by a flying fragment about 8 cm cube in size causing injuries which proved fatal shortly thereafter."

D. Some peculiar accidents

(i) "While deep hole blasting was done in overburden bench a piece of stone measuring about 1m x 0.7m x 0.6m, instead of being projected away from the free face, flew in the opposite direction and landed on a mine tipping tub 58 metres away which was being used as shelter by the blaster. The tub was damaged causing fatal injury to the blaster."

(ii) "In a limestone mine while 34 large diameter holes varying in depth from 6 to 14 metres drilled on a pattern recommended by an Expert Organisation were charged with 777 kg of explosives, stemmed with sand, earth and stone dust and fired using delay action detonators, some pieces of stone from the quarry were projected to a distance of about 485 metres from the site of the holes hitting three persons causing injuries and also damaging tiles of houses in the village and window of the Church."

From the above it may appear that there is a case for revising the limit of danger zone from 300 metres to at least 500 metres and for prescribing that all those who must remain within the danger zone at the time of blasting should take shelter in 'substantially built' shelters. Since it is difficult to define a 'substantially built shelter' which could be considered adequate for different types of blasting parameters, it would appear necessary that when the entire area of danger zone and a distance of at least 200 metres beyond cannot be got vacated, the shots should be fired by controlled blasting technique with milli-second delay action detonators or be muffled in manner such that flying fragments cannot project beyond a distance of ten metres from the place of firing. In either case, the techniques of blasting and/or muffling should be got approved from the concerned Director of Mines Safety.

(Cir. Tech. 8/1982)

3. Hours of blasting in opencast mines—It is dangerous to carry out blasting operations in opencast workings during the whole shift while other work is also being done in the area for under such circumstances it is difficult to ensure that all persons within the danger zone (i.e. 300 metres from the place of firing shots) have taken adequate shelter.

It is highly desirable that all blasting operations (including carrying of explosives into the working area, preparation of priming cartridges including soaking LOX cartridges, charging of shot holes, stemming of shot holes and firing) in opencast workings should be restricted to periods when the workings are generally clear of other work persons, i.e. the period between two consecutive shifts or at beginning or end of a working shift.

Where blasting is carried on in adjacent blocks or areas, the minimum distance between such blocks should not be less than 300 metres.

(Cir. 11/1961)

4. Simultaneous blasting with fuse in opencast workings— It has been seen that, in many opencast mines a number of shotfirers/blasters are engaged side by side for simultaneous blasting operations. As shots fired by all such shot-firers/blasters are likely to go off together, it is difficult to count them for ascertaining whether there has been any misfire or not. If in case there is slight time stagger in blasting operations some of the shotfirers/blasters may be injured by missiles thrown off by other blasting in the neighborhood, as they may not be able to take proper shelter in time.

It is therefore advisable that, where a number of shotfirers/blasts are employed in proximity to each other (i.e., 300 metres) only one shotfirer/ blaster at time may fire shots, and the interval between two shotfirers/blasters firing shots should not be less than 30 minutes.

(Cir. 1/1967)

4A. Blasting at two sites simultaneously—Recently two shot-firers were carrying out blasting operations in a district in a coal mine in the same shift. In course of time, both of them connected the detonators to their cable at the respective faces and kept the exploder end of the cable in the same gallery. Thus, the ends of the cables of the two shot-firers were lying close to each other, ready to be connected to the exploders. There was no overlapping of the cables. Subsequently one of the shot-firers finished checking his cable earlier and came to the aforesaid gallery to connect it to the exploder but instead of connecting his own cable, he connected his exploder to the cable of the other shot-firer and turned the key. The other shotfirer who has still checking his cable accompanied by a helper, received injuries from projected pieces of coal and his helper died on the spot as a result of the blast.

The occurrence is being brought to notice so that suitable steps may be, taken to avoid possibility of such accidents.

(Cir. 33/1974)

5. Inadequacy of one right angle bend in shelter— An accident due to use of explosives occurred in a coal mine under the following circumstances—

"While electrical blasting was being done in a dip heading (15 metres from the junction) and the shotfirer had taken shelter in a level gallery after negotiating one right angle turn, at a distance of 18 metres from the junction with dip gallery, flying fragments of coal after rebounding from corner of pillar/pillar sides/tubs standing in the level gallery hit the shotfirer inflicting minor injuries."

During the past several accidents have occurred in more or less similar circumstances in which persons were seriously injured. This brings to light the inadequacy on one right angle bend by itself in preventing injuries from flying pieces of coal/stone.

This fact may be impressed upon shotfirers, other members of supervisory staff and officials at mines and depending upon the size of pillars in the mine, a sufficient length of cable should be issued to the shotfirer, so that he is able to fire shots from a place beyond the reach of flying fragments of coal and other strata. In deciding the place from where shots should be fired and other persons should take shelter it may be borne in mind that negotiating two right angle bends would keep the people out of danger.

(Cir. 16/1970)

6. Taking shelter— During an enquiry into an accident due to shotfiring, it was found that one of the persons withdrawn from a gallery within 4.5m of another gallery approaching it, was injured by the flying projectiles from a gallery which holed through to it. This accident indicates danger to persons due to flying fragments on holing through. It should therefore be impressed on the shotfirers and other supervisory officials that precaution laid down vide Circular No. 16 of 1970 shall also be complied with in respect of persons in any gallery within 4.5m of the place of shotfiring.

(Cir. Genl. 3/1979)

7. Blasting in quarries beyond day light hours—Precautions exist to prevent danger from projectiles due to blasting operations carried out in opencast working within the danger zone of 300 metres. However when such operations are carried out beyond day-light hours, it may not be possible to ensure that all persons in the danger zone had taken shelter. There is also the possibility of some inadvertent entry into the danger zone by workers or even outsiders. Possibility of persons remaining unprotected in the danger zone therefore cannot be ruled out and hence additional precautions are required.

It is therefore felt that shots, if fired after day hours, should be muffled so that flying fragments from blasting cannot project beyond a distance of ten metres from the place of blasting.

The above may be noted for strict compliance in all blasting operations.

(Cir. Tech. 8/1976)

8. Danger zone in opencast mines—Reg. 164 of the MMR 1961, as amended by notification No. 1093 dated the 20th September, 1974 specifies that in opencast workings a blaster shall not charge or fire a shot unless sufficient warning by efficient signals or other means approved by the manager is given over the entire area falling within a radius of 300 metres from the place of firing (referred to as the danger zone) and the blaster has ensured that all persons within the danger zone have taken proper shelter.

During the last four years six accidents, including one fatal, have occurred in different opencast mines in which persons beyond the aforesaid danger zone of 300 metres have been hit by projectiles from the place of firing. The maximum distance at which a person was struck was about 362 metres. Except at one mine, where the depth of shot holes was 5 metres, jack hammer holes, about 1.5 metres deep, were fired at the other mines, where accidents took place.

The above accidents amply demonstrate that the minimum distance specified in the regulation, is not adequate in all circumstances. May I, therefore, request you, in the interest of

safety, to treat all places within a radius of 400 metres of the place of firing as the danger zone. Necessary action is being taken to suitably amend the Regulations.

(Cir. Tech. 15/1977)

9. Danger from blasting operations in coal mines having belowground workings— 1. In DGMS (Technical) Circular No. 8 of 1982 attention had been drawn to accidents taking place as a result of firing shots in opencast workings without ensuring that all persons within the danger zone have taken adequate shelter.

2. In this circular I wish to invite your attention to some of the common unsafe practices in the use of explosives that are taking a toll of human lives in belowground workings of coal mines.

3. During the year 1980 seven fatal accidents occurred in coal mines out of which three were due to non-compliance with the provisions of Reg. 170(3) of the CMR 1957, viz, firing shots at a face without removing persons from another face within 4.5 metres of the former, as a result of which coal parting burst inflicting injuries to persons at the other face. Similar lapses accounted for two fatal accidents in 1981 and three fatal accidents in 1982 (upto August). Such accidents are taking place both in development and depillaring areas. Some of the typical accidents under this cause group are indicated below :

(a) *Development District with thin Parting between the two faces—* While a shotfirer fired a round of shots at a development heading having about 1.5 metres of coal parting against the adjacent gallery, flying fragments released from the other side of the parting hit a water spraying mazdoor who was spraying water at the other gallery. The mazdoor died instantly.

(b) *Development District with comparatively thick parting—* While two working places in a development district had approached within 4.5 metres of each other and a round of shots was fired in one of the said working places, without removing persons from the other, the projected pieces of coal struck three underground loaders, inflicting serious bodily injuries on them. One of the injured succumbed to his injuries two hours later.

(c) *Development District having two shotfirers—* While two explosive carriers were charging and stemming shot holes at a development face in the presence of a shotfirer, three shot holes were fired by another shotfirer at another development face which had approached within 4.5 metres of the first face. One of the explosive carriers and the shotfirer working at the first face sustained injuries due to flying pieces of coal ejected due to blasting. The explosive carrier succumbed to his injuries after 24 hrs.

(d) *Development District—* While two working places in a depillaring district had approached within 4.5 metres of each other and a round of shots was fired in one of the said working places, without withdrawing persons from the other, the projected pieces of coal struck two underground loaders, one of whom succumbed to his injuries six hours later.

4. This office has already issued a number of circulars on the above danger (No. 52 of 1971, No. I(Tech.) of 1977), yet, such accidents have been occurring with alarming frequency. It is time that some concerted action is taken to prevent their recurrence. One suggestion in this direction is that the Overman incharge of district who carries a hand plan of the district as required by Reg. 40(1) (b) of the CMR 1957, should be charged with the responsibility of giving instructions in writing to the concerned shotfirer when the provisions of Reg. 170(3) are attracted in district under his charge. In fact, the Overman need not wait for the two working

faces to approach within 4.5 metres of each other before he cautions the shotfirer. Such a step can be taken by him when the faces approach within 10 metres of each other so as to cover up any inaccuracies in the hand plan available with him. Once this has been done, the Shotfirer would become aware of the existence of danger on this account and would take necessary steps to withdraw persons from the vulnerable places. Thus, if Surveyor, Overman and Shotfirer are vigilant we can see an end to accidents due to this cause.

5. The other major unsafe practice commonly adopted by some shotfirers is to fire shots without ensuring that all persons have either been removed from the danger zone or that they have taken adequate shelter from flying pieces of coal/stone. DGMS Circular No. 16 of 1970 underlines the desirability of taking proper shelter (by negotiating two right angle bends from the face where shots are being fired). Although by and large the suggested practice is followed yet in some cases a grave error is committed unwittingly. It happens in the following manner. Some shotfirers prefer to get the required number of holes necessary for blasting the full face drilled at a time. They also charge and stem all these holes at a time, but the same are not fired in one round. In such circumstances persons working in the district on being asked to take proper shelter by Shotfirer or his helpers do so but after hearing the sound of blasting assume that firing of shots at the particular face is over and leave the shelter. Meanwhile, the shotfirer and his helpers go back to the face to make electrical connection to fire the shots not fired in the first round, return to the place from where shots are fired and fire the shots without realizing that when they were at the face making electrical connection to fire the next round of shots persons who were supposed to keep out of the danger zone have inadvertently entered the same when the second round of shots are fired, resulting in accidents. There is thus an urgent need to eliminate the above unsafe practice from our mines, which is incidentally prohibited under Reg. 168(16) of CMR 1957.

6. It is sincerely hoped that managements will spare no efforts to eliminate from our mines accidents due to above causes.

(Cir. Tech. 16/1982)

10. Accidents due to blown through shots u.g.—There have been eight accidents in recent times due to blown through shots at the time of blasting in belowground workings. Three of these accidents resulted in fatalities.

Specific provision exists in the regulations indicating the precautions to be taken before blasting is to be done in any working which had approached within 4.5 metres of another working. Reg. 170(3) of the CMR 1957 stipulates that all persons should be withdrawn from all the working places which had approached within 4.5 metres of the working face being blasted and that the same be fenced off to prevent persons inadvertently coming in direct line of the shot.

All the eight accidents were due to failure of the shotfirer in this respect.

It should be impressed upon the shotfirers to observe the different safety precautions as enjoined by law to avoid unwarranted injury or loss of life to workers.

(Cir. 52/1971)

11. Accidents due to blown through shots in underground workings—

1.1 Accidents due to blown through shots continue to occur despite very clear safety precautions laid down in the regulations and circulars issued by DGMS recommending additional precautions to prevent such accidents. These precautions in brief, are given below:

(1) Withdrawal of persons from the face and fencing off entrance to the same before shots are fired at other face which is within 4.5 metres of the above face, [Regulation 170(3) of CMR 1957 and Circular 52 of 1971].

(2) Putting up of notices and erecting portable fencing with caution boards **in** all approach galleries to the place of firing as well as in the face that has come within 4.5 metres of the same (Circular 1 of 1977).

(3) Mining sirdar to supervise the shotfiring operation to ensure the aforesaid precautions (Circular 1 of 1977).

(4) Overman to give instructions in writing to the concerned sholfirer when the provisions of Regulation 170(3) are attracted in the district under his charge and when the faces have approached within 10 metres of each other (Circular Technial 16 of 1982).

2.1 In order to prevent accidents due to blown through shots, it is further advised that the work at one of the two faces approaching each other should be temporarily discontinued and connection made by advancing along one direction only when the two faces have -approached to within 9 metres of each other.

Accordingly, entrance to the temporarily stopped face should be kept fenced off in order to prevent inadvertent entry of work- persons therein. Of course, other precautions as enumerated at 2, 3 & 4 would also need to be taken at the same time.

2.2 When a face is temporarily discontinued as per para 2.1 above, it should be ensured that the stopped face is always kept dry by providing drains, siphon or pump as may be necessary to do so.

2.3 In some cases, a working face may be approaching a gallery or roadway. In such case also, it shall be ensured that when the parting between the side of the gallery or roadway and the face is 9 metres or less, all approaches to such gallery or roadway should be fenced off before charging, stemming or firing of shots at the face so as to prevent persons approaching the place where connection is likely to be established.

2.4 It is hoped that the additional precautions as given above will go a long way in bringing down accidents due to blown through shots.

(Cir. Tech. 6/1983)

12. Accidents due to projectiles in belowground coal mines—(a) Direct hit by projectiles—Every year, a number of persons are injured/killed by projectiles at the time of blasting by coming in direct line of the place of blasting. Adequate precautions exist in the Regulations to prevent inadvertent entry into such dangerous areas. Obviously there is some failure somewhere in the observance of the stipulated precautions.

Enquiries have revealed that quite often such accidents take place after the first round of blasting is completed and during the course of second and subsequent rounds of blasting. The persons involved are those that approach the face of blasting in direct line. This would show that the shotfirer and the guards posted by them are not vigilant. It thus happens that workers are able to enter the blasting area under the presumption that blasting is over. In some cases other workers had strayed into the blasting area and became victims of projectiles.

There is thus a dire need to educate and caution all concerned on the need to ensure that nobody is in a position of danger before shotfiring. The workers likewise have to be educated not to rush into the working areas for loading blasted coal on their own presumptions but to wait clearance by the shotfirer or his helper.

Another fact of the accident due to blasting is the increasing trend of accidents due to "blown through shots". The dangers inherent in this respect had already been highlighted in Circular No. 52 of 1971. It has however been observed that these dangers had not been eliminated and year after year, such accidents are on the increase. The precautions in this respect are clearly spelt out in CMR Reg. 170(3) viz., withdrawal of persons from all working places which had approached within 4.5 m of the working face being blasted and fencing off

the same to prevent persons coming in direct line of the shots. The continued incidence of such accidents is a sad commentary on the compliance with these simple provisions.

In drawing your attention to these easily preventable accidents. I am to request you to kindly ensure strict compliance with the provisions of Reg. 170 so as to eliminate totally any danger due to projectiles to any work person.

Apart from compliance with the prescribed statutory precautions, it is felt desirable to devise a system which would further aid such endeavors at ensuring safety. One step could be to put up notices prohibiting entry into all dangerous areas. This notice may be in the form of a pedestal board or a horizontal bar across the gallery etc. The notice could bear the inscription (in red color) DANGER:

BLASTING GOING ON : DO NOT ENTER—preferably in the vernacular, easily understood by the workers in the mine. Such obstacles could be positioned at all the approaches to the blasting area by the shotfirer or his helpers and would be removed by them only after completion of blasting and making the area safe. It must however be clearly understood at this stage that these precautions are to be in addition to the positioning of guards etc. as stipulated in the statute and not a substitute or replacement.

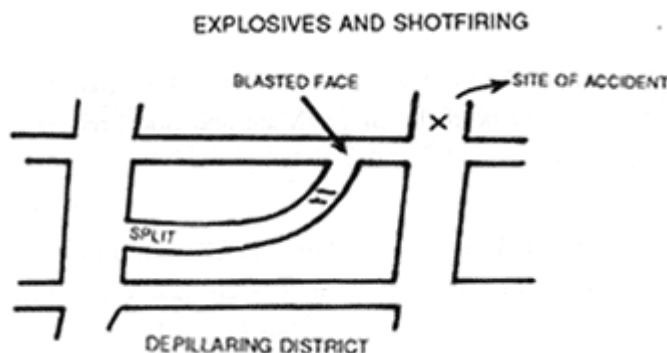
(b) Blown through shots—In so far as accidents due to blown through shots are concerned, it is necessary to ensure adequate compliance with provisions of Regulation 170(3). Since the incidence of several accidents indicates failure at the level of shotfirer, it is necessary to highlight the same. Further, it should be stipulated that apart from the shotfirer, the mining sirdar of the district be made responsible for ensuring compliance with these provisions. No shotfiring in a face which has approached with 4.5 m of other workings be permitted unless the mining sirdar of the district is there to supervise blasting operations.

It is expected that if simple precautions are taken and efforts made to ensure strict compliance with the law, there would be no accident due to use of explosives.

(Cir.Tech. 1/1977)

13. Taking proper shelter underground as envisaged in Reg. 170 of CMR 1957 and 164 of MMR 1961—In a recent accident one person was seriously injured and five others received minor injuries while a split gallery holed into the upper level and the blasting projectiles hit the person who had taken shelter in a rise gallery (off the gallery in which the blasted face joined). This is illustrated by the sketch below:

In this connection attention is drawn to Cir. No. 16 of 1970 wherein it was suggested that negotiating two right angle bends for persons to take shelter would keep the people out of danger. In the instant case although the person had taken shelter after negotiating more than two bends, direction of bends was not judiciously chosen and the person took shelter at a place which was directly behind the split gallery.



This incident may be brought to the notice of all shotfirers/blasters as well as other officials connected with blasting operations for ensuring that the two right angle bends are negotiated in the direction away from the direction of blasting/progress of face.

(Cir. Tech. 2/1992)

14. Accidents due to blasting—Three accidents recently took place due to blasting when persons were injured or killed when hit by projectiles traveling through long bore-holes. These accidents are briefly described below;—

1. In an underground non-coal mine blasting was carried out at a development drive. Projectiles travelling through a 3.6 m. long and 7.5 cms. dia. borehole, (driven from an adjoining drive) struck and caused serious internal injuries to a guard who was standing in direct line of the borehole at the adjoining drive. He died three hours later. Investigations revealed that one of the shot holes got connected with the borehole providing path for the projectiles.

2. In another underground non-coal mine, while blasting was done at a sloping face, the force of blasting found easy outlet through an exploratory borehole about 23 metres long and hit a timber mazdoor who had taken shelter in the adjoining drive connected with the sloping face through the exploratory bore hole.

3. In a coal mine, while blasting was done at a slice in a pillar under extraction, the force of blasting found easy outlet through long borehole (which was drilled earlier to prove a dyke) and injured two loaders who had taken shelter at a place in direct line of the hole.

It will thus be seen that projectiles resulting from blasting can travel even through long bore holes and can cause accidents. This danger may be given due publicity amongst supervisory officials and workers.

In order to avoid such accidents following precautions may be taken:—

1. Boreholes drilled for exploration or tapping water etc. shall be shown on " the plan or tracing of the workings provided to supervisory officials.
2. The approach to the end of borehole shall be fenced off before blasting to prevent any person coming in direct line of the borehole.
3. No shot hole shall be drilled within 0.6 metres of any borehole.
4. The supervisory official viz. Asstt. Manager/Overman/Foreman shall, where applicable personally brief the Sirdar/Mate and Shotfirers/Blasters on the necessity of taking precautions at 2 and 3 above.

(Cir. Tech. 15/1982)

15. Accidents due to Explosives : The CARD system—In every sphere of human activity there is a possibility of an accident and work is no exception. Unsafe act and unsafe conditions of work lead to an accident in mines. Two recent accidents on 14th Nov. 95 and the other on 16/17th March 1996 due to explosives caused us to take serious note of the failures involved and it was considered necessary to review the causes and circumstances leading to such accidents.

Investigations into earlier accidents due to explosives have established that accidents occur mainly due to errors and slippage on part of supervisory staff (human elements) and due to absence of good system of blasting. It has been proved time and again that an effective enforcement of the existing procedures would make a welcome dent in the figures of the accidents due to use of explosives.

The major causes of these accidents in underground mines may be broadly presented as below :

- Blown through shots and hit by projectiles from the opposite face.

- Direct hit by projectiles on the front side of the face.
- Drilling into misfired shots.
- Miscellaneous causes other than above.

1.0 Danger from blasting operations in coal mines having below ground workings.

1.1 Causes

1.1.1 Blown through shots and hit by projectiles from opposite face.

Condition-A

A review of accidents was made in 1982 and attention of the management was drawn to unsafe practices in the use of explosives that took a toll of human lives in belowground coal mines.

The major cause of these accidents was found to be non-compliance with the provisions of Regulation 170 (3) of the CMR 1957 viz. firing shots at a face without removing persons from other face having parting within 4.5m, which resulted in flying pieces of coal inflicting injuries to the workers. Such lapses accounted for 7 fatal accidents in 1980, 2 in 1981 and 3 in 1982. In addition some more accidents resulted in serious and minor injuries and, clearly established that a good number of underground workers and blasting crew were exposed to this dangerous operation. Accidents due to this type of cases were occurring even though guidelines and preventive measures were issued through Circular No. 52 of 1971, No. 1 (Tech.) of 1977. It was therefore suggested in the Cir. No. 16 of 1982 that the overman incharge of the district who had to carry hand plan as per Reg. 40 (1) (b) shall take necessary steps when the faces approach within 10m of each other and consequently the shotfirer would become aware of the existence of danger on this account and would take necessary steps to withdraw persons from the vulnerable places. Thus if the surveyor, overman, mining sirdar and shotfirer are vigilant and do their routine duty this type of accidents can be prevented.

The precautions already laid down during 70's and early 80's in different circulars on accidents due to blown through shots are summarized below :

- Withdrawal of persons from the face and fencing off entrance before the shots are fired at other face which is within 4.5m of each other (Reg. 170 (3) read with Circular 52 of 1971)
- Putting up of notices and erecting portable fencing with caution boards in all approach galleries when/the faces approached within 4.5m (Circular 1 of 1977).
- Mining Sirdar to supervise the shortfiring operation to ensure the precautions of putting up fencings and other precautions (Circular 1 of 1977).
- Overman to give instructions in writing to the concerned shortfirer when the provisions of Regulation 170 (3) are attracted and when the faces have approached within 10m of each other. (Circular 16 of 1982).
- It was further advised that work at one of the two faces approaching each other should be temporarily discontinued and connection made by advancing along one direction. The approaches to discontinued gallery shall be fenced off. (Circular No. 6 of 1983).
- When a faces is temporarily discontinued it should be ensured that stopped face is always kept dry. (Circular No. 6 of 1983).

During analysis of the causes and circumstances leading to the accidents it was revealed that giving instructions to shotfirer in writing by overman and supervision of the Mining Sirdar for putting fences and stoppage of one of the faces and making connection from one side when the faces were within 10m to each other were all time consuming and needed action plan. As a

result these instructions were not being complied with and accidents due to these causes continued to take place.

A review of the accidents due to blasting with thin parting and hit by projectiles from the opposite face for a period of last 5 years has now been made and the causewise analysis is presented in table-1.

Table-1. Causewise incidence of fatal accidents due to blasting in coal mines.

Year	Projectiles (on same side) Direct line		Projectiles (Opposite side) Blown through Thin Parting		Mixture	
	No. of accident	Death	No.	Death	No.	Death
1991	2	2(6)	1	1(2)	1	1(3)
1992	-	-	-	1(6)		-
1993	2	2	-	1(2)		-
1994	3	1(1)	1		1	1(3) 1(4) 1(3)
1995			1 1 1 1	2(12) 1(2) 1(2) 1(7)	1	1(3)

Figures within parenthesis indicate number of persons exposed to danger due to blasting.

It is observed that except in 1994, accidents due to this cause occurred every year since 1991, and in the year 1995 there were four accidents resulting in death of 5 persons and involving 23 persons. The investigations in these cases revealed that the shotfirers were aware of the parting between the two faces but persons were not withdrawn and fenced off as per standard precautions. It is therefore established that there is a need for development of good blasting management-practice by formulating a code of safe practices and making all the supervisory staff and officers accountable for lapses in compliance of code of safe practices.

1.1.2 Direct hit by projectiles on the same side.

Condition-B

The unsafe practice commonly adopted by some shotfirers was the main cause of accident under the condition. Here the shotfirer used to fire shots without ensuring that all persons were removed from the danger zone or that they had taken adequate shelter from flying pieces of coal/stone. D.G.M.S. Circular No. 16 of 1970 however, outlined the desirability of taking proper shelter.

It was also revealed that unsafe practice of firing shots in a face in two rounds instead of one created confusion amongst the workers who inadvertently entered the danger zone when the second round of shots was fired and this resulted in hitting by projected pieces of coal resulting in accidents. This practice of blasting in two rounds of charged shots for convenience of the shotfirer or for some other reasons (viz. inadequate exploder capacity; more than 10

shots are to be fired in a face) is not permitted under Regulation 168 (10) & (16) and this was pointed out vide Circular No. 16 of 1982.

Moreover adequate precautions exist in the Regulation to prevent inadvertent entry into such dangerous areas but there used to be failure somewhere else in the observance of these stipulated precautions.

Thus there is a need to educate the workers on the system of blasting and not to rush into the workings unless asked to enter the face by the shotfirer or his helper. There is also a need to explain to them the implication of danger zone and to be outside the zone or to be at the resting place. All the operations to be carried out by the shotfirer may be in quick succession and may lead to lapses somewhere and therefore the whole system of blasting is to be evolved involving also mining sirdar, senior supervisor and officers in the operation.

1.1.3 Drilling into misfired shots

Condition-C

Accidents due to this cause in coal mine has been occurring even though the statute provides detailed precautions. One of the major reasons is lack of proper system of inspection after firing and hurry on the part of shotfirer to leave the mine as soon as the shots are fired.

Another reason as supported by second school of thought that when a round of holes is connected in series either all the holes will fail to blast or all of them will blast, and there is no chance of a single misfired hole. However enquiries into misfired shots with different type of detonators have proved that due to varying characteristics of electric detonators possibility of one or more holes in a round of shots failing to detonate cannot be ruled out.

1.2 Prevention

For compliance of adequate precautions and thereby to prevent accidents due to above major causes, a system approach for introduction of code of safe practices has been suggested.

Card System

Under the existing system, the errors and omissions arising out of 'human elements' in the conduct of blasting operation are generally not recognised by the officers and supervisors. The card system is therefore designed to reduce the errors due to human elements to the minimum and ensure effective compliance with the laid down procedures and precautions which ultimately would result in preventing accidents due to explosives.

The simple logic behind the card system is that whenever a card of any supervisor/competent person is under the possession of his boss or other competent person it is accepted as a proof that dangers arising out of any operation (here blasting) have been explained to him and he has handed over his card as a proof of his acquaintance with the dangers of the operations or compliance with the procedures. This system will take care of all the ills of verbal instruction/confirmation which in majority of the cases create confusion in the confined environment of underground workings.

In this system *the blasting operations would be carried out by a team of officers and supervisors with well defined areas of jurisdiction and responsibility of each.* If each one does his job sincerely the whole operation would be safe.

Definitions

Shotfirer (SF) means the Mining Sirdar-cum-shotfirer who is to blast the face.

Explosive Carrier (EC) means who carries explosives and also assists the shotfirer in blasting and as well as guarding the entries/approaches to the site of blasting.

Shotfiring Mazdoor (SM). The worker whose services are temporarily requisitioned at the time of blasting is temporarily SM for the designated period. SM is selected from sincere face workers and he is given the charge of guarding whenever more number of shortfiring personnel is required. He would assist the SF in guarding the entries during blasting.

The Mining Sirdar, Shotfirer and Explosive carriers are issued cards. The S.Ms. are issued cards by the overman before start of blasting operation. The cards bear the name of the person, his personal number and designation. The cards are signed by the Manager or Safety officer of the colliery, the records of which are maintained.

Duties

Assist. Manager/Under Manager. To ensure that the Mining Sirdar, Shotfirer and Explosive carriers have been provided with cards duly signed by the Manager or Safety officer. He is also to ensure that some spare cards are issued to the overman of the district for use in case more than regular number of assistants are required for guarding the entries. A list of persons from the category of face workers (who are being groomed for the supervisory examination) spread over three shifts is to be prepared by him in advance who could be requisitioned for the job of Shotfiring Assistant temporarily as and when required. He shall ensure that in every shift adequate number of assistants are on duty under the control of the Overman and the Mining Sirdar.

Overman. To ensure that no person is engaged in blasting without a card with him duly signed by the Manager or Safety officer and that sufficient number of shotfiring assistants have been provided to the shotfirer. He is to carry the spare cards and issue to the face workers from the prepared list as and when required.

He is to inform the Mining Sirdar and Shotfirer whenever the working faces approach within 10m of each or two sets of workings approach within 10m of each other.

He shall ensure that guards have been placed at the vulnerable entries which are not within the blasting zone.

Mining Sirdar. To supervise blasting operations when the faces are within 10m of each other. He shall discuss with the overman before positioning the guard at the entries to the opposite face. He shall be with the shotfirer when the guards are posted at different entries.

Shotfirer. In addition to his duties of firing shots he is to discuss with the overman and Mining Sirdar for posting guards.

Explosive carrier/S.M. Shall carry out the duties assigned to him by the shotfirer. He shall hand over the card to the shotfirer before blasting and shall not leave the place unless asked by the shotfirer. He shall collect the card from the shotfirer after shotfiring.

Magazine clerk. He shall check the card of the S.F. and B.C. before issue of explosives to them.

Blasting with card system

Condition A

When two faces are within 10m of each other. (Refer Sketch-1, 2 & 3)

The Manager shall issue instructions in writing to work only one side of the face at a time in one shift which is considered to be safe practice. The following procedures in different stages shall be followed in chronological order to ensure safe blasting (Annexure-1).

Stage-I. The overman shall study the plan and explain to Mining Sirdar (MS) and Shotfirer (SF) when two faces have approached within 10m. The overman in presence of Mining Sirdar shall inform the workers about stoppage of opposite face. The opposite face shall be adequately fenced off under guidance of overman and in presence of Mining Sirdar.

Stage-II. Overman will discuss with Mining Sirdar and Shotfirer for identification of vulnerable entries for posting of guards. If more number of guards is required, the overman will issue cards to face workers who would be designated as SM. Care shall be taken to post guard at places with at least 2 right angle bends.

Stage-III. The overman will collect the card of shotfirer as a proof that information about 2 faces approaching within 10m has been communicated to shotfirer, and adequate number of assistants has been provided. The Mining Sirdar shall hand over his card to the shotfirer as a proof that the opposite face has been stopped and fenced off adequately.

Stage-IV. The Shotfiring Mazdoors (SM) shall be posted at the required places and the cards of Shotfiring Mazdoors (S.M.) shall be collected by SF. The S.M. shall not leave the place till he is asked by SF to do so.

Stage-V. Before blasting shotfirer will go round the area and post the guards (EC) at the identified places to be guarded. The EC shall ensure that workers are withdrawn from the designated face to be guarded and are taken to shelter beyond the blasting zone. EC shall hand over the card to SF and shall remain at the place specified by the SF and shall not leave the place before getting his card back from the SF.

Stage-VI. After completion of firing and inspection of the face the shotfirer shall intimate the Mining Sirdar. The Mining Sirdar after checking the face and securing roof and sides shall inform the shotfirer to allow the workers to enter the face.

Stage-VII. The shotfirer shall go round the place and hand over the cards to the EC/SM. He then allows the workers to enter the faces.

Stage-VIII The shotfirer shall hand over the card to mining sirdar.

Stage-IX. After completion of blasting in the shift the shotfirer shall collect the card from the overman.

Condition-B

Under normal condition of blasting—Direct hit by projectiles in front of the face as shown in sketch No. 4.

In this case adequate parting between opposite faces exists. So the entries to opposite faces need not be fenced off. The following procedure in different stages shall be followed in chronological order to ensure safe blasting (Annexure-II).

Stage-1. The overman shall study the plan and explain to the Mining Sirdar (M.S.) and Shotfirer (SF) about the vulnerable entries for posting of guards. The overman will arrange for adequate number of assistants (SM) for posting as guards in addition to explosive carriers (EC) wherever required. The shotfirer (SF) shall handover the card to overman as a proof that he has been informed about the condition of different faces, no faces are approaching within 10m to each other and adequate number of assistants has been provided.

Stage-11. The shotfirer shall prepare charges in the face and after completion of charging post Shottiring Mazdoors (SM) whenever required at the appropriate places and collect cards from them. The shotfiring mazdoor shall ensure that no workers enter within the danger zone. He shall not leave the place till the card is collected by the shotfirer and he is asked by the shotfirer to move from the place.

Stage-III. The rest of the blasting preparation prior to firing shall be completed. The shotfirer shall post explosive carriers and collect cards from them. He will take adequate shelter and after giving adequate warning shall fire the shots.

Stage-IV. After waiting for some time the face environment shall be checked by the shotfirer. He shall intimate the condition to the mining sirdar.

Stage-V. The Mining sirdar shall check-up the face and after securing roof and sides allow the workers to enter the face.

Stage-VI. The shotfirer shall go round the workings and hand over the cards to E.C. & S.M.

Stage-VII. After completion of blasting of the district the shotfirer shall collect the card from the overman.

Condition-C

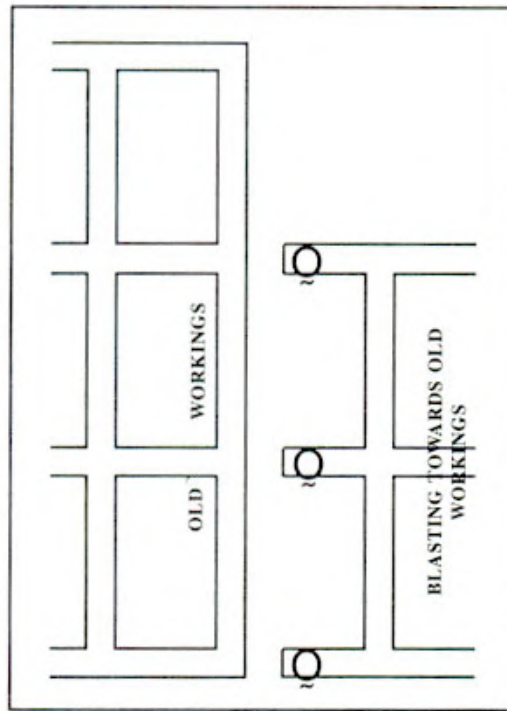
Drilling into Misfired shots

Stage-I. The overman who kept the card of the S.F. under possession shall not return the card unless a joint inspection is made in 2/3 faces blasted at the end of shotfiring operations.

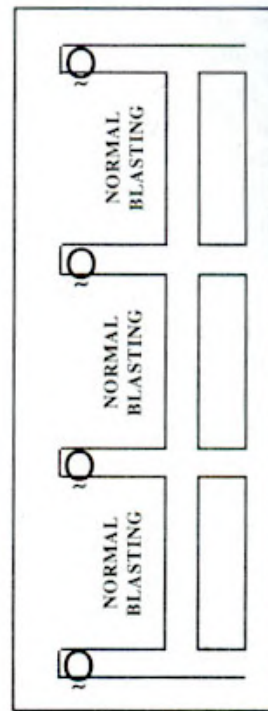
Stage-II. The whole system of blasting can be improved by continuous monitoring of blasting efficacy and therefore reducing the possibilities of misfired shots.

1.3 Supervision. The blasting operations shall be under the charge of Assistant Manager/Under Manager of the mine.

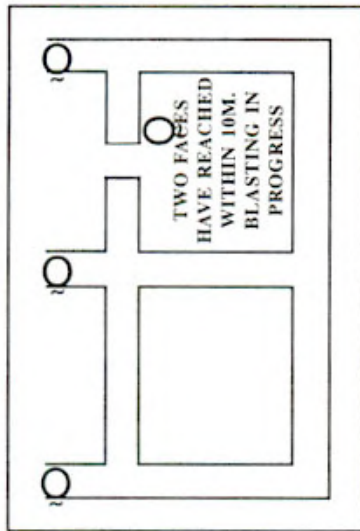
(Cir. Tech. 4/1996)



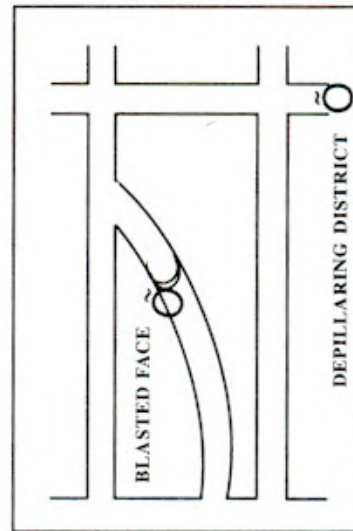
SKETCH-3



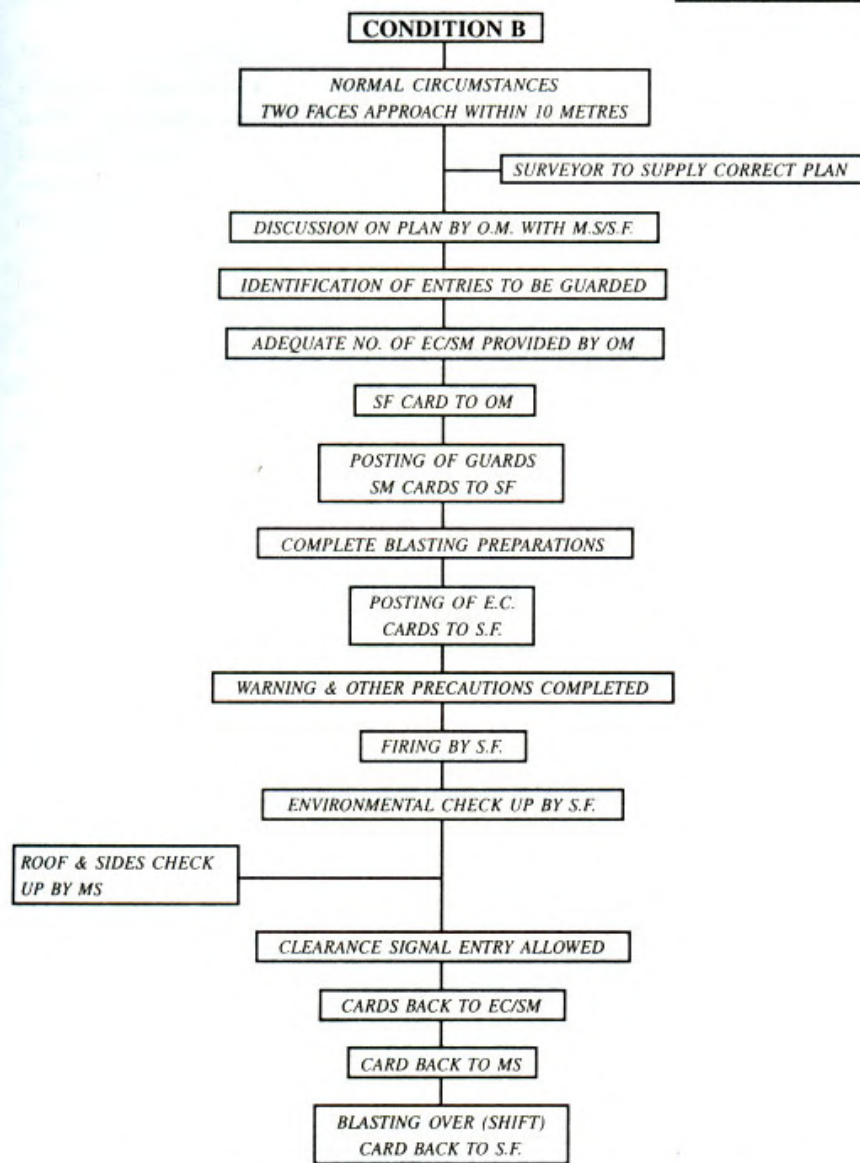
SKETCH-4



SKETCH-1



SKETCH-2

ANNEXURE-1

**SUGGESTED SYSTEM APPROACH FOR SAFE BLASTING
(CONDITION-B)**

**Damage of structures due to blast induced ground vibrations in the mining areas—
1.0 Introduction**

In response to increased demand of coal and other minerals, a number of large opencast mines have come into operation. Some of these opencast mines are located near surface structures like residential buildings, schools etc. When blasting is done in these opencast mines, ground vibrations are generated outward from the blast areas which cause damage to surrounding surface structures. The vibrations radiating from the blast holes while passing

through surface structures, induce vibrations on the structures causing resonance. The component of ground motion can affect the structures through compression and tension and also through vertical and horizontal shearing effects. Blast induced ground vibrations create socio-economic problems for the mine management as well as the people residing in vicinity of these mines. As only 20-30% of energy of commercial explosives used in mines is utilized for fragmenting the rock, the rest of the energy is transmitted through the earth in the form of ground vibrations resulting in damage to the surrounding structures.

2.0 Damage criteria

Peak particle velocity has so far been considered as the best criterion for evaluating blast vibrations in terms of its potential to cause damage. Extensive studies on the problem have established that frequency of the wave is also equally important factor to consider the effect of damage.

The blasting damage is generally classified into following four categories—

Sl. No.	Category	Description of damage
(i)	No appreciable damage	No formation of noticeable cracks.
(ii)	Threshold damage	Formation of fine cracks, fall of plaster, opening & lengthening of old cracks, loosening of joints, dis-lodging of loose objects etc.
(iii)	Minor damage	Superficial not affecting the strength of structure(s). Hair line cracks in masonry around openings near partition, broken windows. Fall of loose mortar etc.
(iv)	Major damage	Formation of several large cracks, serious weakening of structures, shifting of foundation, fall of masonry, ruptures of opening vaults etc.

3. Natural Frequencies

Elements of building construction such as sprung floors, stud partition walls, ceilings and windows can all react as mass-spring systems, each with its own natural frequency of about 4-24 Hz. (low frequencies). Ground vibrations at these frequencies amplified by the structures increase the risk of damage. When the low frequency ground vibration coincides with the natural frequency of the structure resonance is originated. The resonance is a state in which the structure absorbs most energy progressively becoming deformed with time, until plastic deformation occurs. Therefore even the low peak particle velocity of ground vibrations at natural frequency of structures is more harmful to the structure. Natural frequencies of brick and concrete structures generally vary from 8-16 Hz.

4. Structural response

All structures develop cracks from natural causes like periodic changes in humidity, temperature and wind velocity. Changes in soil moisture cause foundation cracks. The width of old cracks change seasonally and number of cracks increase with the time. This damage is independent of damage caused by blasting.

The cracking location and the wall material have an influence on the particle velocity at which cracking begins. If the original structure is not inspected thoroughly, there may be chances of biased opinion on the type of cracks. Thus, it is important to place transducer properly for the correct assessment of damage.

In the mud houses, a number of cracks develop before blasting and these cracks widen and get extended with the passage of time. These cracks are further widened and get extended due to blast induced ground vibrations. Concrete structures vibrate for longer duration than brick and mud structures. Concrete walls have free top and show no cracks at vibration levels for which mud and brick walls can damage. Cracks develop in concrete walls with large vibration level. Cracks in brick-structures can be observed at junction of walls, roof and at window comers. Brick walls with clay mortar and cement-sand mortar behave in the same fashion. Steel structures can sustain more vibration level.

The magnitude of vibration on structures is much more than on the ground. Duration of vibration in structure is also longer than that of ground vibration. Multistoried buildings are more sensitive to blast vibrations than the single-storied buildings.

To predict the extent of damage and to take preventive measures, it is necessary to measure ground vibrations due to blasting. Studies on structural response of ground vibration in the structures of different constructions within the mining areas under Indian conditions are limited and therefore such study should be carried out to ascertain the degree of damages for improvement and standardization of damage criteria under Indian conditions.

5.0 Measurement of blast induced ground vibrations

5.1 Instrumentation

The instrument selected for monitoring blast induced ground vibration shall be simple, light, compact, easily portable, battery operated, digital form output, triggering by geophone etc. Triaxial transducers for recording blast vibration shall have a linear frequency upto 500 Hz. and capable of recording particle velocity upto 100mm/s.

5.2 Methodology

The transducers shall be placed near the structure on the solid undisturbed ground and should be placed well in contact with the ground. For structural response the transducers shall be placed horizontally over the wall, floors and ceilings. A minimum of 15 points of observations corresponding to a minimum of 10 blasts shall be made for better prediction with a high index of determination.

5.3 Predictor Equation

The least mean square method of regression analysis shall be used to interpret the data. The square root scale distance shall be used for analysis and interpretation of data when

blasting is done on surface and measurements are taken on the surface; or the blasting is done underground and measurements are taken underground. On the other hand, if blasting is done on the surface and the measurements taken underground the cube root scaled distance shall be used.

6.0 Guidelines on experimental blasting

6.1 Factors

Major factors affecting particle velocity of ground vibration are type and amount of explosive charge used, distance from the charge to the point of observation (surface structures), geological, structural and physical properties of the rock that transmits the vibrations, height of structures and blast geometry. Use of safe charge/delay, in-hole delays with non-electric initiation systems, proper burden, inclined holes in conformity with slope of bench, deck charge, airdeck, sequential blasting, cleaning off loose pieces of rocks from the blast site and proper stemming of holes bring reduction in blast induced ground vibrations. Controlled blasting methods in conjunction with effective muffling of holes will control ground vibration and also arrest fly rock.

6.2 Plan

A plan showing structures belonging to the owner and not belonging to the owner in different prominent shades be prepared. The plan shall incorporate details of construction of the structures in a tabular form. Plan should also show 50m, 100m, 200m and 300m zones from the structures, the place of experimental study and the limit upto which blasting is proposed to continue

6.3 Study/Observations

In a particular mining area with built-up structures where deep hole blasting is to be introduced for the first time, experimental blasting shall be carried out by any research/academic institute much before the structures fall within the blasting danger zone. The type of instruments, the methodology and predictor norm as recommended in para 5.0 shall be followed in measurement of blast induced vibrations. Based on the study, the safe charges for different zones shall be determined and recommendations made in the report. In a cluster of buildings of different types existing close to each other, the safe charge for the buildings/structures requiring greater protection against damage shall be assessed and recommended.

6.4 Structural response

During the study the response of the structures assuming different natural frequencies should be calculated and plotted on a figure. Software with the different programmers are available now for the said plot and should be used for convenience.

6.5 Monitoring

In order to ensure effective control over the vibration and related damages there is a need of regular in-house monitoring and the managements should train the blasting personnel during the experimental study and start observations on their own during the regular blasting operations.

7.0 Recommended permissible standards of blast induced ground vibrations

7.1 Technical considerations

Permissible standards for different type of structures have been arrived at considering the importance of buildings and structures. The buildings of historical importance and multi-storied structures are likely to get damaged with low level of vibration and therefore permissible standards are to be lowest. Similarly buildings not belonging to owner but with mud/brick in cement construction and others with good construction (RCC and framed structures) should also be protected but higher permissible standards than that of the level fixed for first category has been allowed.

Buildings belonging to owner of the mine are constructed for a limited period—generally equal to life of the project. Managements accept that these buildings constructed within the mining area are likely to suffer some damages during extraction of minerals but the damages should be repairable. Therefore, slightly higher permissible levels of vibrations have been allowed in such cases.

7.2 Permissible standards

Depending on the type of structures and dominant excitation frequency, peak particle velocity (ppv) on the ground adjacent to the structures shall not exceed the values given below in the table.

Table : Permissible Peak Particle Velocity (ppv) at the foundation level of structures in Mining Areas in mm/s

Type of structure	Dominant excitation frequency, Hz.		
	<8 Hz.	8-25 Hz.	>25 Hz.
(A) Buildings/structures not belonging to the owner			
(i) Domestic houses/structures (Kuccha, Brick & cement)	5	10	15
(ii) Industrial Buildings (R.C.C. & Framed structures)	10	20	25
(iii) Objects of historical importance - & sensitive structures	2	5	10
(B) Buildings belonging to owner with limited span of life			
(i) Domestic houses/structures (Kuccha, Brick & cement)	10	15	25
(ii) Industrial Buildings (R.C.C. & Framed Structures)	15	25	50

In view of complexities of the problems it is hoped that managements would take adequate measures as recommended above to ensure that the blasts made near surface structures are carried out with utmost care and precautions. The blast induced ground vibrations should be within the permissible limits as specified above.

(Cir. Tech. 7/1997)

Accidents due to blown through shots in coal mines during blasting operations belowground—Blow through shots still continue to be common cause of fatal accidents in belowground coal mines, despite clear safety provisions being laid down in the Coal Mines

Regulations, 1957 and circulars issued on the subject by DGMS from time to time. Analysis of such type of accidents revealed that unsafe acts and practices lead to such accidents.

Recently there had been an accident in a coal mine due to blown through shots in a development face causing fatal injuries to three drillers. Inquiry into the accident revealed that while two working faces had approached within 1.8m of each other and a round of shots was fired in one of the faces, without withdrawing persons from the other, blasting projectiles from the blown through shot struck, buried and killed the three drillers immediately.

Your attention is invited to Regulation 170(1) & (3) of the CMR 1957 and DGMS (Tech) (S & T) Circular No. 4 of 1996 which lays down in details precautions that are required to be taken to prevent accidents due to explosives, including blown through shots.

I am to request you to take immediate steps as may be deemed fit for compliance of the aforesaid provisions which will go a long way in prevention of such type of accident, in future.

(Cir. Tech. 11/1999)

MMR168

1. Precautions in case of sockets etc.—According to Reg. 168 of the MMR, 1961 which specifies precautions to be taken against danger from sockets, all loose rock should be removed from the face before commencement of drilling in any working place. The area lying within a radius of two metres of the proposed shothole is also to be thoroughly cleaned or washed down and carefully examined for the presence of misfires or sockets.

An accident occurred in a mica mine underground when two mazdoors were seriously injured while breaking a big piece of stone, measuring approximately 75cm x 60 cm x 60 cm which was blasted down at the place nearly 2 years earlier. This big piece apparently contained an old socket with left over explosive as there was sudden blasting while the two mazdoors were engaged in breaking it with hammers.

Precautions laid down in Reg. 168 do not cover a case like the one described above. It is, however, advisable that search for sockets should be made in big pieces of boulders also whether aboveground or belowground, before attempting to break them. For this purpose the boulders should be thoroughly cleaned or washed down with water and a careful examination made by a competent person for the presence of misfires or sockets. If any socket is found, it shall be dealt with in the manner prescribed in Reg. 167.

(Cir. 22/1973)

2. Socket to be plugged—A driller was injured in a mine while he was engaged in drilling shot holes at a level face. Drilling crew had just commenced drilling a hole when the drill rod slipped and entered a socket in the proximity, exploding unused charge therein. The socket had not been relieved as required under Reg. 168(2) of the MMR, 1961. Such accidents can occur even during drilling of relieving holes adjacent to a misfired hole or a socket. One simple way of avoiding the danger is to keep the misfired hole or the socket plugged by a wooden plug. (For first inspection after blasting, see p. 505)

(Cir. 23/1970)

CMR 173

Use of double copper coated steel tube delay detonators—Double copper coated steel tube coal delay detonators manufactured by M/s. IDL Chemicals Ltd., have been provisionally approved for use in gassy seams of first degree. Although these detonators are provisionally

approved for use in gassy seams of first degree, yet it is obligatory on the part of individual Mine Managements to obtain an exemption from the provisions of Reg. 173(b) of the CMR 1957 for the use of detonators other than copper tube detonators.

Rusting of steel tube detonators may constitute hazard in their handling and use. Adequate steps shall, therefore, be taken during storage of these detonators to obviate the risk of rusting. A competent person should examine these detonators before the same are issued for use. If any signs of rusting are noticed, the rusted detonators shall not be issued for use and the matter shall be reported to this Directorate and the concerned Director of Mines Safety.

(Cir. Tech. 6/1981)

CMR 174

1. Withdrawal of Provisional Approval of the Exploder IS-10 (modified) manufactured by M/s Indo Shipping Co., Calcutta—In view of the unsatisfactory performance of the aforesaid exploder the provisional approval granted vide this Directorate letter No. 14f39) 69-Genl.-1990 dated the 19th January 1971 and circulated vide circulars No. I and 36 of 1971 has been withdrawn with immediate effect.

(Cir. 22/1973)

2. Shelf-life of Eveready battery type 276-P of 9 volts—This type of battery is being used with RHINO 12 and RHINO-25 exploders in PVC casing. Shelf life and effectiveness after firing certain number of rounds of shots has been assessed at the Central Mining Research Station.

It is therefore advised that while using this type of battery the following limitation shall be strictly observed :

"The battery type 276-P of 9 volts while in use shall be replaced by a new battery of the same type either after 4 months from the date of manufacture stamped on the same or after firing 1000 round of shots whichever is earlier."

(Cir. 41/1971)

CMR175

1. Testing for inflammable gas before blasting—In particular, the shotfirer should test carefully for inflammable gas at the mouth of the shothole(s).

(Cir. 1/1940)

2. Use of a clay plug at the back of a shot-hole—Wherever permitted explosives are used, a plug of stemming shall be placed at the back of every shothole before it is charged. This provides an added precaution against the danger arising from the presence of a crack at the back of the hole, as such cracks are not easy to detect.

Of course, any hole in which a break has been found should not be charged as required by Reg. 175(4) of CMR 1957.

(Cir. 46/1959)

3. Shot-firing in Second and Third degree gassy seams—Shotfirers do not always check for gas before firing each shot with the result that there is a possibility of the subsequent shots being fired in gas liberated by the previous shot. It is desirable that the shots are fired simultaneously, but this may not be always practicable specially in view of the present difficulty in importing multi shot exploders. Special attention should be paid to the practice of shotfiring to ensure that where shots are fired singly, the shotfirers check for gas before each shot is fired. The number of shots being fired by each shotfirer may also be reviewed. The

number of shots may be reduced if it is found by actual observations that the shotfirer cannot fire all the shots already fixed with precautions laid down for shotfiring in Second and Third Degree gassy seams.

(Cir. 27/1962)

4. Shot-firing in Second and Third Degree gassy mines in the afternoon and night shift—

The practice of shot-firing in the afternoon and night shifts is generally lax and the shotfirers tend to fire the shots without taking all the necessary precautions. The manager should either himself check occasionally or specially depute an assistant manager to pay particular attention to ensure safe practice of shot-firing in the afternoon and night shifts in gassy mines.

(Cir. 47/1959)

5. Shot-firing in second and third degree gassy mines after giving an undercut—During the process of undercutting the face of gallery a fairly large quantity of CH₄ is likely to be liberated with the result that CH₄ concentration in the general body of air within a radius of 10 ft. from the face increases. The following precautions should, therefore, be taken in all gassy mines to guard against the danger of accumulation of inflammable gas—

- (1) no machine cut should be made unless the arrangements provided for wet cutting are functioning properly,
- (2) after making an undercut, drilling of shot-holes should not be commenced until a competent person had found the place free from inflammable gas,
- (3) no shot-holes should be charged until a careful check has been made for the presence of cracks etc.

(Cir. 57/1962)

6. Solid blasting—Attention is invited to Circular 24 of 1974 regarding approval of Soligez (Composition GE-14) for solid blasting. There seems to be a misunderstanding that because of this approval it is no longer necessary to obtain special permission from the DGMS for introducing solid blasting if aforesaid explosive is used.

This is to clarify again (as in earlier Circular No. 11 of 1970 and 18 of 1970) that the approval is only for the type of explosive to be used for solid blasting. It is obligatory to get permission from the DGMS under specific Regulation, such as Reg. 168, Reg. 175 etc. to carry out solid blasting in coal mines.

Managements are therefore requested to take necessary action as indicated before introducing solid blasting in any of the mines/seams.

(Cir. Legis. 3/1975)

7. Additional precautions in solid blasting—Consequent upon the introduction of Solid Blasting in coal, there have been some incidents of drilling into sockets containing remnant charges of explosive/misfired charges, resulting in injuries to drillers and other persons present nearby. With a view to guard against such incidents, I have to direct you to strictly follow the under mentioned instructions:

- (1) The provisions of Reg. 168(5), 169(5) (e), 169(5) (c) and the provisions of Reg. 178 applicable to stone drifts should be strictly complied with.

(2) Every case of misfire shall be enquired into and the provisions laid down in Reg. 41(8) shall be followed for the purpose.

(3) Record of misfires maintained under Reg. 177(8) shall be more specific. It shall mention the details of the type of explosive and detonator used in the misfired hole.

(4) A general pattern of shot-holes shall be worked out to give most satisfactory results and the shotfirer should always adopt the same in day to day blasting operations.

(5) The shotfirer shall carry out his duties in a thorough manner. Any tendency on his part to rush through the operations must be severely dealt with. Subordinate supervisory staff like overmen and sirdars should ensure that the shotfirers carry out their duties under the regulation particularly those under Reg. 176 & 177 in a conscientious and thorough manner. The manager and senior supervisory staff shall ensure that control, management and direction are such as to ensure proper compliance of law by the shotfirers and other officials and workers. The coal-cutters and loaders must be disciplined not to interfere with legal and safe practices.

(6) As required under Reg. 175(2), the shotfirers shall test for inflammable gas in the prescribed manner. This incidently would contribute to more thorough examination of the place of shotfiring. Since only 'Solid Blasting' is being done, this precaution has to be complied with at all times.

(7) Only approved types of shot-firing apparatus and cables in good order shall be used. Any serious defect in any approved apparatus, cable and explosives shall be brought to the notice of this Directorate forthwith.

(Cir. Tech. 2/1976)

CMR 176/MMR 166

1. Inspection after shot-firing : preventing accidents from fall of roof/ sides—Some accidents have occurred due to careless examination of the places of firing after shots had been fired. When working places and galleries in the vicinity are not properly examined and dressed after shot-firing, falls of roof and sides may occur resulting in casualties.

Although the zone within which the workings may be examined and made secure after blasting at any working place has not been stipulated under the regulations, it is obviously desirable to secure all places within such distance of the place of firing which are likely to be disturbed because of the shot-firing operations. In each case, therefore, the zone likely to be affected should be determined by the manager of the mine according to local conditions of roof and nature of work. Necessary steps in this regard should be taken and instructions should be issued to shotfirers and supervisory staff to see that all places falling within the zone likely to be affected by shot-firing are examined and made secure before workpersons are allowed to enter the said zone or the working place(s).

(Cir. 18/1963)

2. Blasting between shifts: The Blaster firing shots to make first inspection after blasting—At some mines firing of shots is done between two shifts, with the result that the blaster/mining mate who charges and fires shots does not make the first inspection after firing of shots. The mate/blaster of the succeeding shift who does not know direction of shot holes drilled, charged and fired by his predecessor, faces difficulty in locating the dangers arising out

of the actions of his predecessor. This is not a satisfactory arrangement which also comes in conflict with the provisions of the Regulations. It is therefore requested to ensure that invariably the mate/blaster who charges and fires the shots also makes the first inspection after blasting. If the inspection reveals a misfire or a socket, he should either deal with it himself or before leaving the place he should confer with his successor and apprise him of the situation. If for any special reason this procedure is not possible, the matter shall be discussed with the Joint Director concerned and suitable precautions as advised by him shall be taken to eliminate the danger.

(Cir. 23/1970)

3. Adequacy of ventilation while using explosive in underground metalliferous mines—During trials for assessing fume characteristics of new explosive formulations from IDL and IEL for use in underground metalliferous mines, it has been observed that unless ventilation is of high standard, carbon monoxide and/or nitrous fumes formed by blasting of practically all types of explosive above the threshold/ceiling limits internationally accepted for these noxious gases are met with for some time after the blast and thus injurious to the health of the workpersons in the vicinity.

In view of this, it is advised that while using any explosive, be it NG-based, AN based or slurry, in underground metalliferous mines, the following precautions regarding ventilation should be observed :

- (1) Arrangements should be made to circulate such quantity of air upto the site of blasting as to ensure, after every round of blast, dilution of carbon monoxide and oxides of nitrogen in the blasting fumes to less than 50 parts per million and 5 parts per million respectively within a period of 5 minutes.
- (2) For drivages more than 50m long a suitable auxiliary ventilator should be provided to ensure atleast 150 m³/min ventilation air current within 4.5m of these faces.

In addition, in view of the difficulty of sampling and analyzing for CO and nitrous fumes as well as paucity of suitable detector tubes for these gases, no person should be allowed to re-enter the place where blasting has been carried out unless the fumes are cleared and unless a period of atleast 15 minutes has elapsed from the time of blasting.

(Cir. 30/1973)

4. Precautions against blasting fumes—In a recent accident five persons were killed after being exposed to blasting fumes on the return side of a stope while blasting operation had been carried out with Ammonium Nitrate Fuel oil (ANFO) explosive. In this case ANFO was used for plaster shooting. A study conducted by R & D wing of this Directorate revealed that even with NG-based explosives, nitrous fumes produced during plaster shooting were as much as 11/2 times of those produced in normal shothole blasting. For ANFO, the corresponding figures were even higher.

In order to guard against such accidents, the following precautions should be taken—

- (1) No plaster shooting with ANFO should be done at all belowground.
- (2) The manager should determine and specify the period of waiting after blasting in any place on getting a special study done with the type(s) and the maximum amount of explosive used in the mine at any place underground in any one round, taking all precautions, and no person shall enter or be permitted to enter the place of blasting during the waiting period so specified. The waiting period to be specified shall be such that the proportion of nitrous fumes and carbon

monoxide in the air at the end of such period at the working place does not exceed 5 ppm and 50 ppm respectively in any event.

(3) The manager should issue written instructions to all concerned so as to ensure that no person including the shotfirer/blaster takes shelter or otherwise remains in the return air from the place of blasting during the blasting operations and until the waiting period specified by the manager as above expires.

(Cir. Tech. 4/1984)

5. Inspection after shotfiring—Reg. 176 of the CMR 1957, requires that after a shot has been fired, shotfirer shall not enter or allow any other person to enter the place until atmosphere in the area is free from dust, smoke or fumes and that he shall before other person enter the place, make a careful examination and with his assistants, if any, make the place safe.

A question has been raised whether shotfirer is required to make the roof and sides safe under the above regulation. It is hereby clarified that making the roof and sides safe is the responsibility of officials superior to shotfirer i.e. Sirdar, Overman, Assistant Manager and not of the shotfirer. After atmosphere in the area is free from dust, smoke or fumes, shotfirer shall inspect the place for misfires, sockets or remnants of explosives. If the area is found safe with respect to atmospheric conditions and presence of sockets etc., his superior officials shall take further action for getting the roof and sides dressed and supported.

This may be brought to the notice of all concerned.

(Cir. Tech. 9/1985)

CMR177/MMR167

Accidents due to drilling into misfired holes—Recently some accidents have taken place due to misfired holes near the floor at development faces which remained undetected as the same were covered with blasted coal. When the next round of shot holes was being drilled, the explosive charge in the misfired hole was intercepted by the drill bit and it detonated, causing injuries to the drillers. Two such accidents are described below :

1. While a driller and two helpers were engaged in drilling holes from top of a coal heap covering a portion of the face in development district, the drill rod came in contact with the misfired charge of a previous blast and the charge exploded. The driller and one of his helpers sustained serious injuries when hit by flying fragments projected by the blast while the other helper escaped with minor injuries.

2. While a shotfirer was directing drillers to drill a hole for blasting a portion of unbroken floor coal at a development face, an undetected misfired hole of the previous round was intercepted by drill bit causing the misfired explosive charge to detonate. The shotfirer and one of the drillers received serious bodily injuries.

In both the cases described above shots were fired off the solid. There is an impression that when a round of holes is connected in series either all the holes will fail to blast or all of them will blast and that there is no chance of a single misfired hole. Due to varying characteristics of electric detonators, possibility of one or more holes in a round of shots failing to detonate cannot be ruled out. Thus, the following precautions shall be taken to prevent accidents of the type described above—

1. Before drilling a round of shotholes, all coal from the face shall be cleaned and the face shall be checked for any misfire or socket. This shall be done by the shotfirer.
2. If any misfire or socket is detected it shall be dealt in the manner stipulated in Reg. 177.
3. The above precautions may be brought to the notice of all concerned.

(Cir. Tech. 2/1983)

CMR179/MMR 169

1. Statutory report of shotfirer—It has been seen that the daily report forms currently used by Shotfirers leave much to be desired. The information furnished by the subordinate supervisory staff is usually of routine and casual nature, and as such it does not serve the desired purpose of the statutory reports.

In order to improve the quality and utility of such reports, revised form of daily report of shotfirer has been prepared keeping in view the statutory duties prescribed for and/or normally expected of them. The same is given below. It is requested that the same may be got printed and supplied to the shotfirers for use;

It is recommended that this new form be introduced w.e.f. 1.1.1984.

(Cir. Genl. 6/1

SHOTFIRER'S DAILY REPORT (Reg. 179(b) of CMR1957)

Name of
Owner.....

Name of Colliery.....

No. of Pit or
Incline.....

Name of District/Section.....

Date.....Shift.....

...

Explosive	Number of Cartridges		
	taken	used	returned
A. Permitted (i) P5 (ii) P3 (iii) PI B. Non-Permitted High C. Others (specify) 1. 2.			

Detonators A. Delay action Electric :

No. 1

No. 2

No. 3

No. 4

No. 5

No. 6

B. Instantaneous Electric

C. Ordinary

III. Safety fuse/Cordtex [(Specify length in m)]				
Places where shots were fired	No. of holes made	No. of rounds fired	No. of shots per round	Total shots fired
1.				
2.				
3.				
4.				
5.				
6.				

- Whether treatment of coal dust with water was done before shots were fired (Reg. 171)
- Particulars of working faces approached within 4.5 m of each other, and where shots were fired.....
- Misfires, if any.....
- Precautions taken against misfire (Reg. 177).....
- Blown out shots, if any.....
- Deficiency of clay, sand or stemming materials, if any.....
- efficiency of shotfiring tools, if any (Reg. 167).....
- Condition of Electric Shotfiring apparatus. (Reg. 169).....
- Information given to succeeding Shotfirer.....
- Any other remarks :

Signed.....

Date.....Time.....

For case in which the person, who made the above examination is unable to write (Regulation 197) Left thumb mark of.....

I, the undersigned hereby certify that I have written the above report in the presence of.....and at the dictation

of.....and have read it over to him

is his language and he has made his left thumb mark in my presence.

Time.....Signed.....

Counter Signature Manager/Asstt. Manager Date

DESCRIPTIVE REPORT

Format of daily report of blasting overman/blasting foreman for mechanized opencast mines—As per recommendation 2.7 of the seventh conference on safety in mines, formats of daily reports of blasting overman (Reg. 179 of CMR 1957) and blasting foreman (Reg. 169 of MMR1961) have been devised. The same are given below.

The format presently used for writing of report by shotfirer/blaster shall continue in mines other than mechanized opencast mines.

(Cir Gen. 3/1990)

Daily report of BLASTING OVERMAN in opencast workings (being made with deep hole blasting) of a colliery under Regulation 179 of Coal Mines Regulations, 1957

Name of colliery.....Name of Owner.....

Date.....Shift and Shift hours.....

Name of quarries where shot holes were fired Mechanised Manual

(1).....

(2).....

(3).....

I. EXPLOSIVE (kg)

S. N.	Name of Explosive	Taken	Used	Returned	Detonator (instantaneous, delay, relays etc.)			
					Type	Taken	Used	Returned

II. FUSE (m)

Type Taken Used Returned

Safety fuse

Detonating fuse

III. HOLES FIRED

(A) Average depth of a hole(m) Diameter(mm).....

(A) Average depth of a hole (m).....diameter

Location where shots were (roundwise)	No. of holes fired in a round	Charge per round in kg.	IN CASE OF DELAY BLASTING			
			Charge in various delays			

0	1	2		

- 1.
- 2.
- 3.
- 4.

Total Note: Burden and spacing (in m) shall be mentioned.

(B) Total no. of holes fired.....in Rounds.....

No. of holes misfired, if any.. .

.Time of blasting.....to.....

Precautions taken against misfired holes :

IV. ADEQUACY OF:

- (i) Shotfiring tools
- (ii) Stemming material
- (iii) Muffling device*
- (iv) (a) Shotfiring cable*
 - (b) Circuit tester
 - (c) Exploder* (availability & condition) (where applicable)
- (v) Siren
- (vi) Demarcation of danger zone on ground
- (vii) Helpers/guards to prevent entry of persons into danger zone
- (viii) Blasting shelter (s)

V. Details of sleeping holes, if any

VI. Any accident/incident due to blasting/explosive

VII. Information given to succeeding shotfirer

VIII. Any other remark

I, the undersigned, hereby certify that I have written the above report after making thorough inspections.

Date.....Time.....

Counter Signature

Signature Manager/Asstt. Manager

In-charge of blasting

Blasting Foreman

Name of Blasting Foreman (Blaster)

Daily report of BLASTING FOREMAN in opencast workings (being made with deep hole blasting) of a mine under Regulation 169 of the Metalliferous Mines Regulations, 1961

Name of colliery.....Name of

Owner.....

Date.....

Shift

and

Shift

hours.....

Name of quarries where shot holes

Mechanised

Manual were fired

(1).....

.....

(2).....
 (3).....

I. EXPLOSIVE (kg)

S. N.	Name of Explosive	Taken	Used	Returned	Detonator (instantaneous, delay, relays etc.)			
					Type	Taken	Used	Returned

II. FUSE (m)

Type	Taken	Used	Returned
Safety fuse			
Detonating fuse			

III. HOLES FIRED

(A) Average depth

of a hole (m).....diameter(mm).....

Location where shots were fired(roundwise)	No. of holes fired in a round	Charge per round in kg.	IN CASE OF DELAY BLASTING				
			Charge in various delays				
			0	1	2	...	...
1							
2							
3							
4							

Total..... Note: Burden and spacing (in m) shall be mentioned.

(B)Total no. of holes fired.....in.....rounds

No. of holes misfired, if any., ...

Time of blasting.....to.....

Precautions taken against misfired holes :

IV. ADEQUACY OF:

(i) Shotfiring tools

(ii) Stemming material

(iii) Muffling device*

(iv) (a) Shotfiring cable*

- (b) Circuit tester
- (c) Exploder* (availability & condition) (where applicable)
- (v) Siren
- (vi) Demarcation of danger zone on ground
- (vii) Helpers/guards to prevent entry of persons into danger zone (viii) Blasting shelter
- (s)

V. Details of sleeping holes, if any

VI. Any accident/incident due to blasting/explosive

VII. Information given to succeeding shotfirer

VIII. Any other remark

1. the undersigned, hereby certify that I have written the above report after making thorough inspections.

Date.....Time.....

Counter Signature

Asstt. Manager In-charge of blasting

Signature Manager/

Blasting Foreman

Name of Blasting Foreman (Blaster)

2. Statutory report of Blaster—It has been seen that the daily report forms currently used by Blaster under Reg. 169(d) of MMR 1961 leave much to be desired. The information furnished by the subordinate supervisory staff is usually of routine and casual nature; as such it does not serve the desired purpose of the statutory reports.

In order to improve the quality and utility of such reports, revised form of daily report of Blasters has been prepared keeping in view the statutory duties prescribed for and/or normally expected of them. The same is given below. It may be got printed and supplied for use to the said officials as early as possible.

(Cir. Gen. 3/1985)

approaching within 4.5 mts. of each
other, and whether shots were fired.....

Misfires, if any.....

Precautions taken against:

Misfire (Reg. 167) :

Blown out shots, if any.....

Deficiency of clay, and or

stemming materials, if any.....

Deficiency of shotfiring tools,

if any (Reg. 161).....

Condition of electric shotfiring apparatus (Reg. 191):

Information given to succeeding

Shotfirer :

Any other remarks:

Signed:

Date : Time :

For case in which the person, who made the above examination is unable to write (Regulation
197) Left Thumb Mark.....

I, the undersigned, do hereby certify that I have written the above report in the presence
of.....

and at the dictation of.....

and have read it over to him in his language and he has attached his left thumb mark in my
presence.

Time.....Signed.....

Countersigned:

Manager/Asstt. Manager/U.G. Manager

DESCRIPTIVE REPORT (ANY SPECIAL REMARKS)

(Cir. Genl. 3/1985)

MACHINERY PLANT AND EQUIPMENT

CMR 181

1. Use of non-FLP electric equipment in gassy mines—It is hereby informed that in a degree II and III mine non-flame proof apparatus may only be used under the following situations and circumstances:—

(a) In the intake airway at any place more than 270m (900 ft) from any development working face or a goaf edge (whether packed or not) provided the percentage of inflammable gas in the general body of the intake air does not any time exceed 0.5 percent.

(b) In the intake airway at any place not less than 90 metres (300 ft) from a goaf edge or a depillaring area if it is isolated by explosion-proof stopping each consisting of a set of two brick-in-cement stopping having a thickness of at least one metre and with an intervening space of not less than 9 metres packed solid with incombustible materials and provided that—

(i) the percentage of inflammable gas in the general body of the intake air does not at any time exceed 0.5 per cent, and

(ii) the air circulating around the depillaring area/goaf edges is separated from the intake airway by pucca masonry ventilation stopping.

(Cir. 30/1961)

2. Use of non-FLP apparatus: Clarifications and procedure of application etc.—In continuation of this office circular No. 30 of 1961, it is hereby informed that where the depillaring operations have been or are being done in conjunction with stowing/packing, the goaf would be considered to have been effectively packed only if the packed goaf edges are isolated by brick in cement stopping each not less than 1 metre in thickness and which are well keyed into the roof, floor and sides. Such stopping should be constructed against all packed goaf edges, which fall within the zone between 90 metres and 270 metres of the place where a non-flame-proof apparatus is intended to be used. Other requirements with regard to the limitation of percentage of inflammable gas in the general body of the intake air, and the separation of the intake airway from the air circulating around the depillaring area/goaf edges remain the same as in the case of areas depillared with caving system and where the goaf edges are isolated by means of explosion proof stopping.

Applications for permission to use non-flame-proof apparatus in situations and circumstances mentioned as above and as indicated in this office circular No. 30 of 1961 will be favorably considered by DGMS on the merit of each case, but nothing contained in the circulars on the subject should be deemed as granting blanket permission to use non-flame-proof apparatus in gassy mines.

Applications for exemption from the use of flame-proof apparatus may be made to the DGMS with a copy to the. Dy. Director of Mines Safety, Electrical. Every such application should be accompanied by a plan showing:

(i) Ventilation system of workings.

(ii) Site at which non-flame-proof apparatus is proposed to be installed or used.

(iii) Particulars of non-flame-proof apparatus at each site.

(iv) Quantity of air being circulated at each site, and at the point before the intake air reaches the first face (whether active or discontinued) before the last ventilation connection in the district. The air measurements should be given for normal condition of ventilation, and after stoppage of the surface mechanical ventilator for one hour.

(v) Analysis result of mine air for CH at each site under normal condition of ventilation and with the surface fan stopped for one hour.

(vi) When the site for the non-flame-proof apparatus is within 270 metres (900 ft) of a goafedge/depillaring area, manner of isolation of the goaf edges, and the line of ventilation stopping separating the air circulating around the site and the goaf.

(Cir. 51/1962)

3. Flameproof apparatus approved for use in gassy mines—According to the standard specifications for flameproof enclosures of electrical apparatus adopted in different countries including U.K. and India, apparatus approved for use in one group of gases is not necessarily permissible for use in another group unless the equipment is certified and approved by the recognised authority for use in both the Gas Group atmospheres.

The main objection to the use in coalmines of flame-proof electrical equipment certified for groups of gases other than Gas Group I lies in the type of cable intended to be used. What is designed exclusively for Gas Group II and/or Gas Group III may not admit of the attachment of a cable sealing and dividing box to the terminal box of the said flame-proof equipment for use in gassy coal mines. Again, what is designed and approved for the three groups of gases, namely Group I, Group II and Group III might be delivered to the users with a cable attachment which is not suitable for use in mines.

It is therefore necessary that correct type of flameproof equipment should be obtained for use in gassy mines and to do so it should be clearly specified while ordering for such equipment that the equipment must be certified/approved for Gas Group I and provided with cable sealing and dividing box/boxes suitable for the particular type of cable used in the mines. Similarly in the case of portable or transportable apparatus, the type and size of the flexible trailing cable intended to be used with the apparatus should be intimated to the suppliers so that suitable flame proof connector for the cable is supplied with the apparatus.

For the flame proof equipment certified only for Gas Group II and/or III which are already in use in gassy mines, it is advisable to check up and see that the cables are attached to the terminal box of the apparatus concerned using cable sealing and dividing box/boxes designed and manufactured for use with the equipment. It should also be ensured that the attachment of a cable sealing and dividing box to the box of a flame-proof equipment is in properly designed flameproof joint. If this is not done immediately, such apparatus should be withdrawn from the mine.

(Cir. 64/1964)

4. Dangerous practices of alteration or modification of flame-proof electrical apparatus—In a number of mines alteration and modification in gate-end boxes and drill panels is being done with indigenous components of different capacity and grade disturbing at times the circuit constants and designed rating of the flame-proof apparatus. This is considered to be very dangerous practice and must be stopped forthwith.

(Cir. 64/1973)

The following condition should also be deemed to have been included in letters of permissions for use of non-flame-proof apparatus in gassy mines, which have already been issued from this office.

"In the event of any change in system of ventilation or other circumstances affecting the safe use of the apparatus, the owner, agent or manager shall forthwith inform DGMS and JDMS; the above permission shall be deemed to have been cancelled and the non-flame-proof apparatus shall not be used again without fresh permission from DGMS."

(Cir. 32/1963)

5. Flameproof features of coal drills—Electric coal drills, manufactured by different companies and in use at some of the coal mines were sent to CMRS for testing of flameproof characteristics and compliance with IS: 2148-1981 (specifications for flameproof enclosures of electrical apparatus). The drills had been in use in degree II and degree III gassy mines for periods in excess of 3 years.

2. Physical examination of the drills revealed poor maintenance and a number of deviations from the Indian Standard Specifications in respect of flame paths, gaps, diametrical clearances and fasteners. Observations made in the test reports received from CMRS are reproduced in the Appendix below for ready reference. It may be noted that use of such equipment in mines is fraught with serious consequences.

3. The importance of maintenance of flame-proof characteristics of the electrical, particularly equipment used at the coal face, cannot be over emphasized. DGMS Circular No. 48 of 1974 lays down detailed guidelines for maintenance of flameproof characteristics of electrical equipment used in mines. It is requested once again to take effective action to ensure that flameproof apparatus retain their characteristics as long as they are in use. Where this cannot be done, the equipment may be withdrawn, in a phased manner, to obviate danger.

Appendix

OBSERVATIONS ON PHYSICAL EXAMINATION OF ELECTRIC / ROTARY COAL DRILLS

(1) No warning inscription is provided on the detachable switch inspection cover against opening unless power is switched off elsewhere. This violates clause 11.1 of IS: 2148-1968 and clause 22.1 of IS: 2148-1981. However, two rivet holes intended for fixing warning inscription label were observed on the switch inspection cover.

Note: A warning inscription label advising against removal without switching off power at source must be provided on the detachable switch inspection cover for compliance with the above clauses of standards.

(2) Several small pitting marks were observed on the flanged surfaces of the switch inspection cover.

(3) Some rusting was observed inside the plug insulator housing where plug insulators match.

(4) It was observed that some tampering had been done on a portion of flanged surfaces of the switch enclosure during maintenance. This has reduced the length of flamepath on the flanged portion from 13 mm (min) to 10 mm (min).

(5) Shrouds around heads of screws (2-M8 x 25 long) used for fixing plug insulator housing to socket insulator housing were found damaged which gives access to ordinary tools for opening them by unauthorised persons. This violates clause 10.9 of IS: 2148-1968 and clause 13.10.2 of IS : 2148 of 1981.

(6) Warning inscription provided on the plug of bolted type plug and socket is not conspicuous (advising against removal without switching off power at source).

(7) No warning inscription is provided on the coal drill terminal plate against opening it unless power is switched off elsewhere. This violates clause 11.1 of IS: 2148-1968 and clause 22.1 of IS : 2148-1981.

(8) The machine surface over motor seal (NDE) is interrupted by many small holes (spot). It must be continuous and uninterrupted (clause 7.3.5 and 7.3.6 of IS: 2148-1981).

(9) All the fixing bolts are used without any spring washers.

(10) A portion of the plug insulator was found broken.

(11) The effective length of path of the stud and its hole in plug insulator is less than 25 mm (clause 7.3.4 of IS: 2148-1981).

(12) The diametral clearance between stud and its hole in plug insulator is also more than 0.5 mm.

(13) Some rusting was observed on the machine surface over the terminal cover and plug housing.

(Cir. Tech. 6/1987)

6. Use of oil filled rotary compressor in underground gassy mines—The use of oil filled rotary compressor in underground gassy mines is not considered safe. The experience gained in U.K. mines reveals the above fact and they have already stopped using such compressors in underground coal mines in that country.

Suitable action should therefore be taken so that oil filled rotary compressors are not used in underground gassy mines, and any such compressor in use underground is withdrawn forthwith.

(Cir. Tech. 12/1979)

7. Approval of Alignment Laser type 030/Ex/007 rated at 110V/550 volts, 50 or 60 Hz having cast red brass FLP enclosure, with an output of less than 0.2 milliwatts per 7 mm beam diameter—The above Alignment Laser manufactured by Stolz A.G. Switzerland and marketed in India by M/s Sarvatra Exports Pvt. Ltd., H-4, Janpath, Cannaught Place, New Delhi-110 001 has been approved under Reg. 181(3) of CMR 1957 for use in coal mines subject to the following conditions :

1. (a) Every unit shall be identical in construction and performance to the sample which was officially tested in CMRS and subjected to field trials.
- (b) No alteration in design or construction of equipment shall be made except with the prior approval in writing of the DGMS.
2. DGMS approval mark No. SA-10/84 shall be etched at a conspicuous place on the equipment.
3. The mine managements shall obtain permission from the concerned Dy. Director General of Mines Safety for use of equipment in their mines.

(Cir. Apprl. 9/1987)

8. Approval of Gravimetric Dust Sampler type 113A—The Gravimetric Dust Sampler type 113A manufactured by Casella London Ltd., Regent House, Britannia Walk, London N17 ND and marketed in India by M/s Lawrence & Mayo (India) Pvt. Ltd., Scientific & Engineering Instruments Division, 11, Government Place East, Calcutta-700 069 has been approved by the DGMS by letter No. 16(20)/ 82-Genl/4924 dt. 13th Dec., 1989 under Reg. 181(3) of CMR 1957

and Reg. 124(2) (i) of the Metalliferous Mines (Amendment) Regulations, 1988 subject to the following conditions—

- (1) Each unit shall be identical to that tested in CMRS vide test report No. V/2/16 dated 1.4.85 and shall be in accordance with the drawings submitted to Central Mining Research Station, Dhanbad.
- (2) Each dust sampler shall carry DGMS approval No. SA-8/89 (a copy of design of DGMS approval plate is enclosed).
- (3) Each unit shall be accompanied by detailed operating manual and a copy of this letter.
- (4) A strong after-sales technical service shall be provided.
- (5) Any complaint from the users shall be promptly attended to and brought to the notice of this Directorate.
- (6) An officer of this Directorate may at any time draw a sample of the equipment and get it tested at manufacturer's cost.

This approval is being accorded without prejudice to any other provisions of the statute which may be or may become applicable at any time and may be amended or withdrawn if considered necessary in the interest of safety.

(Cir. Approval 1/1990)

9. Telephone cables, control cables and other low voltage cables—Low voltage cables excepting flexible cables used for electrical systems operating at voltage in excess of 100 volts have been excluded from the preview of Reg. 181(3) of CMR 1957, vide notification No. GSR 279 dt. 12.5.92 published in Gazette of India (pan II- Section 3(i) dated 6th June, 1992.

In the past some approvals have been granted by this Directorate in respect of telephone cables, control cables etc. for use in low voltage systems.

It is hereby clarified that any low voltage cables (excepting the flexible cable) used for electric system operating at voltage in excess of 100 volts which has been tested and covered under valid BIS License shall be treated at par with the cables having DGMS approval granted in the past.

(Cir. Legis. 5/1992)

10. Use of high pressure hydraulic hoses belowground in coalmines—

Much of the equipment in use depends on high pressure hydraulics for movement of machinery and its parts. In case of powered supports in longwall faces, tendency is to go for more and more initial setting pressure to improve strata conditions at the faces.

With the introduction of high hydraulic pressures, hose failures are becoming more frequent and more hazardous. To minimize such failures, use of quality hoses manufactured to standard specifications appears essential.

It is recommended that hydraulic hoses used in underground coalmines shall conform to specification no. BS 174 of 1992 and end fittings to 638 of 1978.

It is further recommended that before use of such hoses, user shall ensure that hoses have undergone following tests as per requirement of aforesaid standards. The testing shall be done at Govt./recognised test house for the items 1 to 6 as indicated against each test. For the rest items, test facilities shall be available at manufacturer's works and test shall be conducted there.

1. Pressure impulse test	R & D centre, Ministry of Defence, Dighi Pune or any other recognized testing laboratory mutually agreed between the user and manufacturer.
2. Ozone resistance test	Automotive Research Association of India (A CSIR Unit), Pune or any other recognised testing laboratory mutually agreed between the user

	industry and manufacturer.
3. Hydrostatic stability and burst pressure test	-do-
4.Cold flexibility test	-do-
5. Fire resistance test	Central Mining Research Institute, Dhanbad
6.Electrical resistance	-do-
7. Adhesion	Facilities to be available with the manufacturer.
8. Resistance to oil immersion	-do-
9 Tensile stress and strain	-do-
10 Hydrostatic proof pressure	-do-
11 Abrasion resistance	-do-
12 Adhesion between components	-do-

Any marking on the hose should be as per BS: 174 : 1982; however, as the hose is not covered under the approval list of D.G.M.S. so far, stamping of any approval No. on hose is not considered mandatory.

For proper quality control of the hoses supplied by the manufacturers, user industry must ensure that manufacturers have adequate manufacturing and testing facility at their works. The manufacturer must supply test certificate of the hose with each lot.

It is expected that these points will be taken care of in the interest of safety as well as performance.

(Cir. Tech. 4/1990, 1/1991 & 1/1996))

11. Appliances, equipment and machinery required to be approved under Reg. 181(3) of CMR 1957—DGMS has specified, in super cession of all earlier notifications on the subject, that the following appliances/equipment/machinery are required to be approved under Reg. 181(3) of the CMR 1957:

1. Fire resistant brattices including plastic sheeting and semi rigid or flexible fire resistant ventilation ducting.
2. Friction props and prop setting devices.
3. Hydraulic roof supports
4. Link bars

5. Water ampoules and Gel ampoules
6. Fire resistant hydraulic fluid
7. Man riding haulage systems
8. Detaching hook
9. Cage suspension gear including bridle chain
10. Winding Rope
11. Balancing Rope
12. Automatic Contrivance
13. Power Brake
14. Automatic speed chart recorder
15. Haulage rope for man-riding
16. Conveyor Belting
17. Locomotive
18. Internal Combustion Engines
19. Flameproof and Intrinsically safe electrical equipment or apparatus
20. Cables used for high voltage or medium voltage electrical systems and flexible cables used for electrical system operating at voltage in excess of 100 volts.
21. Self Rescuer (As per Reg. 191 D)

Safety Belts should conform to IS: 3521—1983 and covered under valid BIS license to use IS certification mark. Such safety belts shall be treated at par with the safety belts accorded approval by DGMS in past.

(Cir Legis. 1/1993)

12. Experiments/Field Trials of mining equipment etc. It has come to our notice that sometimes experiments or field trials are being carried out by CMRI or other educational institutions at some of the mines, without getting any prior concurrence from this Directorate.

You would kindly appreciate that such experiment might adversely affect the safety of workers if the same were not carried out properly under specified conditions with required precautionary measures. It is therefore desirable that prior consent or concurrence be obtained from this Directorate, whenever any new trial or experiment is to be done at a mine having a bearing on safety or health of workers employed at the mine. In this connection, it may be pointed out that recently an experiment was being done at one of the mines with rigid steel props, and it was noticed by officers of this Directorate that the same had got bent in a depillaring area creating a dangerous situation.

I would, therefore, request you to issue necessary directions to all concerned advising them to take prior concurrence from DGMS before undertaking or allowing any experiment or field trial to be conducted, whether it is in respect of any new type of roof support or new explosives or mining equipment, or adoption of a new technology etc.

(DGMS letter No. Genl/4001 dt. 28.3.1984 to heads of all coal and non-coal mines, and CMRI, ISM, BHU, IIT Kharagpur etc.)

13. Experiments/Field Trials of mining equipment etc.— Attention is invited to this office letter No. Genl/4001 dated the 28th March, 1984.

Doubts have been raised, whether the requirement of prior approval/concurrence from DGMS is necessary in respect of all new types of roof supports, all new explosives, all mining equipments and adoption of every new technology, etc.

The matter has been considered and it is clarified that, prior approval/concurrence of DGMS is necessary in respect of such of the equipment, machinery, appliances, material, technology etc. only, which have direct impact on safety.

The items of equipment, machinery appliances and material which are considered critical have already been identified and prior approval from DGMS in respect of the same is mandatory. An up-to-date list of the types of equipment, machinery, appliances and material which need DGMS approval before use in mines together with the relevant provisions of statute is enclosed for ready reference. (Appendix A). This list is reviewed from time to time and if considered necessary new items are added through Gazette Notifications.

Matters regarding adoption of any new technology or introduction of any new type of support systems are likewise regulated through one or more of the existing statutory provisions.

The main intention behind issue of the letter under reference was to remind all concerned, or the statutory requirement that, before carrying out any experiment/trial with any such 'listed' equipment, material, etc. even by a research or educational institution, prior approval/concurrence from DGMS is necessary.

[(DGMS letter No. 14(13) 91-Genl/6420-59 dt. 14.10.1991) to Chief Executives of all coal & non-coal mines, CMRI, ISM, BHU, IIT (Kharagpur)]

APPENDIX A

List of Mines Safety Equipment and material required to be approved by DGMS under Coal, Metalliferous & Oil Mines Regulations and Mines Rescue Rules.

Equipment/Material	Provision of Regulation	
	CMR 1957	MMR 1961
1. Flame Safety Lamp	2(2)	2(2)
2. Cap Lamps	2(2)	2(2)
3. Permitted Explosives	2(23)	2(24)
4. Tub Couplings	89 (1) (c)	97 (1) (c)
5. CO Detector	113(3)(c)	116(3)(b)
	118A(3)(a)(i)	120 (1) (b)
	119(l)(b), 121	120 (2) (c)
	125 (3) (b)	122,126 (3)
	142 (5)	(b) 141 (5)
6. CO, Detector	119(2)(d)(ii)	
7. Dust Extractor	123 (3) (b)	124 (2) (b)
8. Stone Dust Barrier	123 (2) (c)	-
9. Methanometers	145 (1) (a)	-
10. Glass of Flame Safety Lamp	157 (4)	151 (4)
11. Cap Lamp Bulbs	157 (4)	151 (4)
12. Oil for Flame Safety Lamp	157 (5)	151 (5)
13. Mechanically propelled vehicle for transport of explosive	164 (A) (2) (a)	
14. Exploders	174	165 (3)
15. Protective Footwear	191	182
16. Helmet	191-A	182-A
17. Self-rescuers	181 (3)	-

18. Fire-resistant brattices including plastic sheeting and ventilation ducting	181 (3)	-
19. Safety belt	181(3)	
20. Friction Props & Prop setting devices	181(3)	
21. Hydraulic roof supports	181(3)	
22. Link Bars	181(3)	
23. Powered supports	181(3)	
24. Fire resistant hydraulic fluid	181(3)	
25. Man-riding haulage system	181(3)	
26. Detaching Hook	181(3)	
27. Cage suspension gear including bridle chains	181(3)	
28. Winding Rope	181(3)	
29. Balance Rope	181(3)	
30. Haulage rope for man-riding	181(3)	
31. Underground conveyor belting	181(3)	
32. Underground Locomotive	181(3)	
33. Internal combustion engine (for underground use only)	181(3)	
34. Flame proof & Intrinsically safe equipment	181(3)	
35. Cable	181(3)	
36. Automatic Contrivance	181(3)	
37. Power Brake	181(3)	
38. Automatic speed chart recorder	181(3)	
39. Emergency Steam Valve	181(3)	
40. Water ampoules/Gel ampoules for stemming explosive	181(3)	

List of equipment required to be approved by DGMS under Mines Rescue Rules, 1985

Equipment	Provision of Mines Rescue Rules, 1985
1. Breathing apparatus	Rule 11 (5)

2. Smoke helmets & apparatus serving the same purpose	"
3. Reviving apparatus	"
4 Electric Safety Lamps & Flame Safety Lamps	"
5 Gas Detectors	"
6 Self Rescuers	"

List of equipment and material required to be approved under Oil Mines Regulations, 1984

Equipment/Material	Provision of Regulations
1. Safety belt and life line	27
2. Petroleum storage tanks (specification approval)	55
3. Pipe lines and fittings (specification approval if not as per ISS)	62
4. Electrical lighting apparatus	84
5. Protective footwear	87
6. Protective helmet	88
7. Electrical equipment for use in hazardous area (Zone 1 and 2)	73

14. Quality control of equipment purchased by mines for safety purposes—The DGMS had issued a Circular letter No. 14 (13) 91-GenV6374-419 dt. 14.10.91 to the Chief Executives of all mining companies as reproduced below—

"The DGMS grants 'type' approval to various types of equipments, appliances and materials for use in mines on the basis of 'type test' reports. For this purpose 'type test' reports from the following test houses/institutions are acceptable:

- (i) any National Laboratory under the CSIRO or Govt. Test House, Alipore or Bureau of Indian Standards Laboratory;
- (ii) any laboratory/test house functioning directly under or under the aegis of a Central Government Ministry/Department and which has been specifically approved by the DGMS; or
- (iii) any laboratory/test house of an educational institution or of a public sector undertaking which has been specifically approved by the DGMS.

Needless to say that the test reports should cover all the tests prescribed in the relevant standards(s) and/or by DGMS. If, however, any such laboratory/test house is not fully equipped to

carry out all the required tests, then the tests could be carried out in more than one laboratory/test house.

It is the duty and responsibility of both manufacturers and users to ensure proper quality of the equipments commercially produced/procured for use in mines. For this purpose there are certain 'routine' and 'acceptability' tests prescribed by the ISI/BIS and/or by DGMS and Users. Such 'routine' or 'acceptability' tests may, however, be conducted in any laboratory or test house as agreed to by the manufacturers and users.

The aforesaid are the bare minimum and any user can ask for additional acceptance tests.

To ensure the quality of the equipment, it is expected that the following steps would be taken by the users—

- (1) To organise and establish a proper quality control cell manned by persons having proper knowledge and expertise in the subject.
- (2) To establish a team of Inspectors who can visit the premises of the manufacturer to ensure proper manufacturing process and witness/oversee testing at the manufacturers end and, where necessary, to draw samples and get the same tested at another laboratory.

(Cir. Appr. 1/1992)

Note : For circulars on use and maintenance of flameproof apparatus—see portion on Electricity Rules.

15. Approval of equipment—DGMS grants 'type' approval to various type of equipments, appliances and materials for use in mines on the basis of 'type test' reports. For this purpose test reports from the following test houses/institutions are acceptable:

- (1) Any National Laboratory under the CSIR or Govt. Test House, Alipore or Bureau of Indian Standards Laboratory;
- (2) Any laboratory/test house functioning directly under or under the aegis of a Central Government Ministry/Department and which has been specifically approved by the DGMS; or
- (3) Any laboratory/test house of an educational institution or a public sector undertaking which has been specifically approved by DGMS.

Needless to say that the test report should cover all the tests prescribed in the relevant Indian Standard (s) and/or by DGMS. If however, any such laboratory/test house is not fully equipped to carry out all the required tests, then the tests could be carried out in more than one Laboratory/test house.

It is the responsibility both of manufacturers and users to ensure proper quality of the equipment commercially produced/procured for use in mines. For this purpose there are certain 'routine' and 'acceptability tests' prescribed by the ISI/BIS and/or by DGMS and users. Such 'routine' and 'acceptability' tests may be conducted in any laboratory or test house as agreed to by the manufacturers and users.

However, as a cross-check, it is advisable to get some of the routine tests done from National Test Houses or other test houses as indicated in para (1), (2) and (3) above as well.

(Cir. Tech. 5/1994)

16. Use of fire resistant hydraulic fluid in machinery used belowground in coal mines—

Use of approved type of fire resistant fluid in machinery working belowground in coal mines is mandatory as required under Reg. 181(3) of CMR 1957.

Mineral oils are not suited for the purpose as the same do not possess fire resistant properties.

I understand from the feedback from various coal companies that FRHF used in SDL and LHD machines have been found satisfactory in general but a few incidents/ occurrences of jamming of valves, premature failure of seals, breaking up of the emulsion, premature failure of pump have been reported.

In view of safe and effective use of the fluid, the following guidelines shall be strictly complied with—

1. Contamination in the fluid

Contamination of hydraulic system can cause tremendous damage to the hydraulic system. In mineral oils, the contamination present may settle down at the bottom of the tank but in emulsified FRHF, the contamination like coal dust etc. may not settle down and the whole contamination/particles travel at high speed which may cause enormous damage to seals/gaskets, pumps etc.

The problem can be solved in two ways—

- (i) Change of filters at an interval of 500 hrs. as recommended by the equipment manufacturer.
- (ii) Maximum contamination takes place during topping up of the fluid by opening of the lid of the tank in the coalface. Such manual topping up shall be discouraged. Topping up must be carried out directly from the fluid container to the tank by hose pipe with the assistance of hand pumps provided by the equipment manufacturer. Maximum contamination level has been indicated by M/s I.O.C. in one of the seminars to be 0.1% of the fluid by weight provided the contamination is abrasive like coal/silica. But it requires further study by the users, oil manufacturers and equipment manufacturers.

2. Life of FRHF

Since contamination plays a vital role in safe use of the fluid, apart from complying with the recommendation mentioned at para 1, the hydraulic system including the tank of each machine shall be cleaned at least once in a year and charged with fresh fluid after replacing the filter by a new one.

3. Mixing of FRHF of different make

Basic petroleum oils in the fluid may be of different makes and additives added may also be different, so it is not recommended at present to mix the fluids during use. A detailed study on the effect of mixing of fluids of different makes on stability, wear and corrosion is needed before inter mixing of various fluids.

4. Seal/Gasket Compatibility

The various fluids may affect the various seals in different proportion depending upon the polymeric material used. Equipment manufacturer should indicate the compatibility of recommended fluid with the seals used by them.

(Cir. Tech. 2/2000)

CMR182/MMR 172

1. Precautions in use of grinding wheels—There have been cases of breakage of grinding wheels causing serious injuries to work-persons. The following precautions are laid down for adoption during their handling and use—

- (1) Grinding wheels shall be inspected carefully for any damage/crack etc. just before use.
- (2) Operating speed of wheel shall not be more than the maximum operating speed for which it is rated.
- (3) While mounting grinding wheel on the machine, care shall be taken to ensure that correct and clean mounting flanges and mounting blotters are used. Mounting hole of the wheel should not be altered and the correct tightening pressure be applied on the mounting nut.
- (4) Before starting the machine, it should be ensured that the 'Work Rest' is suitably adjusted, and the guard, covering one-half of the grinding wheel, is positioned.
- (5) While grinding, safety glasses or any other type of eye protection should be constantly used by the operator and he should not jam the job into the wheel.
- (6) The job should not be ground at the side of the wheel and no material should be ground unless the wheel is designed for such purpose/material respectively.
- (7) Whenever a grinder is started, the operator should not stand in front of the wheel and none should be normally present at the place of use of such grinders within reasonable unsafe area.

(Cir. Tech. 7/1979)

2. Precautions in tyre inflation—Recently in one of the mines there was a fatal accident in which a fitter helper died. While opening the shuttle car wheel underground, the tyre burst throwing out the locking ring with tremendous force causing the fatality. The matter was further examined and found that the wheel locking ring was indigenously developed and its sectional profile was not matching with the wheel rim groove.

To avoid such accidents in future *in underground mines or in opencast mines* where heavy earth moving machineries are used, only suitable type and matching locking ring of correct size shall be used. Periodically the locking ring shall be examined for every tyre mounted vehicle for its suitability and record of such examination shall be maintained. While fitting a new locking ring it should be ensured that the same fits correctly in its rim groove.

(Cir. Tech. 9/1979)

The causes of failure of the pulley and bracket fixture were (i) unsatisfactory maintenance and (ii) weakness in the design of the fixture.

The jib pulley is generally fitted on its bracket by a pin (bolt). The design of the pin and the fixture varies with different makes of the machine. The important points, however, are as follows—

- DGMS 438

In the interest of safety all the coal cutting and similar machines working at mines shall be checked to ensure that the points stated above are satisfied.

(Cir. 27/1971)

4. Accidents caused by compressed air due to use of sub-standard equipment, poor maintenance and defective installation—Investigations into a few serious and fatal accidents resulting from the use of compressed air equipment have revealed that substandard equipment, defective installation and unsatisfactory maintenance were mainly responsible for the accidents. The following safety measures should therefore be strictly followed where high pressure compressed air is used either aboveground or belowground in mines—

1. Air valve, pipes, bends and other fittings of compressed air system should conform to I.S.S. and should have I.S.I. marking where the I.S. has been formulated. Equipment conforming to A.P.I. can also be used. Certificates conforming to I.S. or A.P.I. should be obtained for every such part.
2. Compressed air distribution system should be provided with suitable isolating valve at every branching off point. Where compressed air is conveyed belowground in the mine, main air line should be provided with suitable isolating valve in the underground so located that air supply to underground can be effectively and quickly stopped.
3. Suitable water trap or drain cock should be provided before isolating valves and accumulated water in the trap should be properly drained before opening the isolating valve.
4. Suitable pressure should be provided on the outlet side of isolating valves on the main air range on the surface as well as underground to ensure proper functioning of the valve.
5. Hose pipe conveying high pressure air should be of reliable make, robust, of tested quality and antistatic type. The fittings of the hose pipes should be properly secured to protect accidental disconnection.
6. The compressor should be properly maintained. The lubricating oil used in the compressor should be of a suitable type to minimize production of CO, and harmful gases in the compressed air.
7. In underground coalfaces or headings after the compressed air range has been closed, the face or headings should be checked for presence of inflammable gas and the same, if present, should be satisfactorily cleared by ventilation before the high pressure air is admitted to any equipment.

(Cir. Tech. 4/1977)

5. Accidents from use of sub-standard or defective equipment and faulty practices in welding and cutting by oxy-acetylene gases—Investigations into a few serious accidents have revealed that either sub-standard equipment is used or necessary safety precautions are neglected while using oxy-acetylene gases for welding or cutting etc, in the mines.

The gases in the cylinders are generally under high pressure between 126 and 140 kg/cm and very serious consequences can result from bursting of the high pressure equipment. It is, therefore, necessary that due regard to safety is given in the use of such equipment and oxy-acetylene gases.

The following instructions should be complied with in the use of oxy-acetylene welding and cutting: —

- (1) Equipment of reliable manufacturer only should be used. The equipment should have I.S.I. certification mark.
- (2) Equipment should be kept clean and in good condition so that it is safe. No oil or grease should be applied in the attachment of the regulator or the blow pipes.
- (3) Whenever gas cylinders are transported from one place to another, the regulator and other attachments should be disconnected and the cylinder caps should be put on to prevent any damage during transit. During transport the gas cylinders should not be rolled on ground except when empty. They should be carried on proper rubber wheel trolley or similar means of transport.
- (4) While working with gas cylinders either for welding or cutting, adequate precautions should be taken against storage of inflammable material nearby. Cotton waste soaked with oil or grease should not be kept in the vicinity where such work is carried on. Suitable lighters should be used for lighting the gas at the blow pipe instead of fire made from cotton waste or any other source.
- (5) Rubber hoses should be inspected periodically to see that they are not damaged by leaks, cuts, cracks etc., and can safely withstand the gas pressure.
- (6) Suitable fire extinguisher and sand should be readily available at the work site.
- (7) All oxy-acetylene welders should use goggles and hand-gloves. Lenses of the goggles should be of approved and standardized tint.
- (8) The gas blow pipe for welding or cutting should have in built non-return valve.

(Cir. Tech. 6/1977)

6. Failure of drill rods—There have been cases of failure of drill rods thereby exposing the drillers on work to risk of accidents. Investigation into some of the cases has revealed that such breakages occur due to the following reasons presuming that the drill rod is of good quality and free from manufacturing defects: —

Part A. (1) A loose chuck bushing of the drill machine.

(2) Unevenness and wear on the drill rod shanks mating surface with the piston of drill machine.

(3) A loose clamp of drill machine holding the drill rod.

(4) Worn out tip of drill rod or blunt tip.

(5) Life of drill rod being over etc.

Part B. The following measures in this regard are suggested for immediate compliance: —

(1) No rod having lower tip dia. than the minimum specified should be used. This measurement can be done after every grinding of tip by a template which manufacturers supply or can easily be made in a mine workshop.

(2) When the body of the rod is worn out it can easily be seen in case of hexagonal rod which when worn out will look round when it should be withdrawn from service.

(3) Suitable timely checking of defects mentioned under items (i), (ii) and (iii) of part A above, during the course of repair and maintenance in repair shed should be undertaken. Spare drill machine should be made available so that properly checked and maintained one's replace the used one's in the face and thus undergo timely and regular checking/maintenance. Drill machines should be numbered and date of maintenance should be recorded.

(4) A pusher leg be invariably used wherever practicable so that the operator can remain at a distance and where the weight of drill machine is supported on the same. This will provide more safety to the operator in case of drill rod breakage.

(5) Normally the life of a rod is indicated by the manufacturer in terms of metres drilled. If such figures are not available by experience it can be established by the user. Once the life of a rod is over, the same should be withdrawn from service.

(6) Painting of the central hole which carries water for purifying by suitable chemical so as to prevent rusting, pitting etc. Time to time cleaning of the hole by scale removing compound can be undertaken if necessary.

(Cir. Tech. 5/1978)

7. Precautions against inadvertent movement of HEMM during repair—

A fatal accident occurred recently in one of the mines. While a mechanic-cum-driver was adjusting the engine clutch of a stopped Leyland comet tipper lorry, the engine started itself due to inadvertent short circuit at solenoid switch and the lorry moved in the reverse direction. The mechanic -cum-driver was instantaneously run over by the front right wheel of the lorry and killed on the spot.

In this connection attention is once again invited to the Circular (Tech.) 36 of 1972 and Circular No. 3 of 1981 which cover requirements for proper care, maintenance and examination of heavy earth moving vehicles. It is further to say that the following procedure be adopted to avoid recurrence of similar accidents—

(1) Parking brake must be used while parking vehicles. The gear shift lever should be engaged in reverse while vehicles are on down gradient or on level roads and low gear positions while on up-gradients.

(2) In existing vehicles solenoid terminals and connection cable be suitably insulated to avoid inadvertent short circuiting of solenoid terminals.

(Cir. Tech. 11/1983)

8. Checklist for inspection of drills and compressors—In continuation to DGMS (Tech)

Inst. No. 6 of 1987 dt. 3rd Dec., 1987 checklists for drills and compressors are given in Appendix I & II below—

Appendix I

Inspection check list for Drills

CHECK

Travelling Mechanism—(a) That all foundation bolts of reducer, motor track pad and hub (in case of tyre mounted) are in good condition and properly tightened;

(b) for correct tension of track;

(c) for reducer oil;

(d) the condition of track link, pin, sprocket wheel and tension or condition of tyre air inflation, tightening of hub bolt (in case of tyre mounted);

(e) for the correctness of brake system and its adjustments.

Hydraulic System—(a) for the correct oil level in hydraulic tank;

(b) for the leakage of oil through hoses and cylinder;

- (c) internal leakage of hydraulic cylinder, return valve and all other valves;
- (d) the clogging of filters;
- (e) for proper operation of hydraulic systems like leveling jack, drill-stem make & break arrangements.

Mast & Chassis—(a) all nuts & bolts for good condition and that they are properly tightened;
 (b) for wear and greasing of pulley, rollers, sheaves of mast;
 (c) proper fixing up of hydraulic cylinder and their bearings;
 (d) for lubrication of wire ropes and its satisfactory condition;
 (e) proper lubrication of sliding block;
 (f) the drill stem make and brake arrangement, correctness of thread and spanners;
 (g) the holding device of stem for proper gripping of stem;
 (h) for the correct oil level in reduction gear;
 (i) for the good condition of mast rest blocks.

Hammer—(a) for correct operation of hammer;
 (b) lubrication system for proper operation;
 (c) the threads for good condition;
 (d) condition of rollers, diamond bit and its surface;
 (e) for any excessive wear.

Operator's Cabin—(a) for proper fixing of cabin;
 (b) for correct operation of air, water pressure and rpm meters;
 (c) the cabin glasses & doors for any damage and that they are properly tightened;
 (d) the ladders & railings for good condition.

Dust suppression Unit—(a) the water tank for any leakage;
 (b) that the water pump is working properly;
 (c) the hoses for any leakage;
 (d) the hood around drilling face to prevent slurry and dust to spread out.

Any other check—(a) any other check which may be necessary.

Appendix II

Inspection check list for Air Compressors

CHECK

Compressor Assembly before starting—(a) Control filters for water drain-off;
 (b) air receiver for water drain-off;
 (c) accumulation of dirt on oil cooler;
 (d) that the air filter is clean;
 (e) for correct condition & level of oil in receiver;
 (f) that all foundation bolts are properly tightened;
 (g) that the compressor is in level position;
 (h) all the oil hoses for leakage & wear;
 (i) the air hose connections for tightness;
 (j) that the parking brakes are 'ON'.
 (k) for the correct air pressure in tyres;
 (l) the tightness of coupling bolts;
 (m) that safety valve is fitted with air receiver;
 (n) that hydraulic test on air receiver is being performed at required pressure and interval.

Compressor Assembly before starting—(a) for the correct oil pressure;
 (b) oil leakage through seals, oil cooler, compressor and hoses;
 (c) for the proper air pressure of delivered air and at inter-stage;
 (d) that the oil temperature is not excessive;

- (e) for the correct operation of loading and unloading valves;
- (f) operation of safety valve;
- (g) for any abnormal sound.

After stopping compressor—(a) the proper operation of blow-down valve.

Before Shifting—(a) the satisfactory condition of toe-bar and drill rod.

DIESEL ENGINE AS PRIME MOVER

Before Starting—(a) that the foundation bolts of engine & radiator are properly fixed;

- (b) the correctness of alternator mounting;
- (c) for proper tension of V-belt;
- (d) for the cleanliness of air filter and crank case breather;
- (e) for correct oil and water level.

After Starting—(a) for correct oil pressure and temperature of both oil and water;

- (b) that the engine is free from any abnormality;
- (c) for engine blow-by;
- (d) for air filter clogging indicator;
- (e) the correctness of maximum and minimum engine rpm.;
- (f) for any oil and water leakage.

Electrical Motor & prime mover—(a) the tightness of foundation bolts;

- (b) the correctness of cable and their joints;
- (c) the starter for proper functioning including protective systems/relays;
- (d) that the motor is not over-heated and there is no abnormal sound;
- (e) that the commutator and carbon brush are in good condition and well maintained.

Other Check—(a) any other check which may be necessary.

(Cir. Tech. 3/1990)

9. Audit/Inspection of equipments on hire/Contract—Investigation into a number of accidents connected with equipments/machinery involving equipments on hire/under contract have revealed that, sub-standard equipments and unsatisfactory maintenance were mainly responsible for the accidents.

Recently a fatal accident took place in an oil mine when the crane super structure fell off its turn-table during the operation. The enquiry has revealed that the crane belonged to a contractor and there was no system for audit for such equipments though system of auditing exists in the mine for departmental machinery/equipments.

In this connection your attention is once again invited to the DGMS (Tech.)

Circular No. 36 of 1972, (Tech.) Circular No. 3 of 1981, (Tech.) Circular No. 2 of

1986 and (Tech. Circular No. 1 of 1989 which cover the requirements of proper care, maintenance and examination of equipments. It is further to say that apart from the measures suggested in the circulars, the following procedure be adopted to avoid recurrence of such accidents :

- (i) All contractual/hired machinery engaged in the mine shall be audited/ inspected by a team consisting of mine officials and contractor's technical personnel for their suitability before engaging in the mine.
- (ii) The contractor equipments are also to be checked by a competent person of the mine periodically.

(Cir. Tech. 1/1999)

10. Accident in coal handling plant/crushing plant in mines—Recently an accident occurred in Coal Handling Plant of a coalmine in which the bunker structure collapsed and two

persons were killed. Enquiry was conducted and samples of failed and other pillars were sent to a National Institute of Engineering Technology for failure analysis

During enquiry by this Directorate, it was revealed that the design and drawing of the Coal Handling Plant was taken from a neighbouring mine of the same company. Capacity of bunker in the neighbouring mine was 100 tonnes, while the capacity of bunker of this mine was 160 tonnes. But the number and size of pillars were kept same i.e. 6 pillars of 356mm I section.

The conclusion of reports from National Institute of Engineering Technology was as follows:

1. The original bunker supporting structure of neighbouring mine was unsafe and was having poor stability. The bunker structure was serving at the cost of Factor of Safety and also full conceivable loads never occurred simultaneously. By increasing the capacity of Bunker in this mine it was made further unsafe. This Bunker structure was working in the plastic stage and with excessive deflection not permitted under code of practice (IS-800) and as such finally collapsed.

2. Fatigue cracks appeared to have propagated in the flange to a length of 40-50mm (almost 30% of the width of flange) resulting in possible bending of column and ultimately led to cleavage type of brittle fracture in remaining portion of I section leading finally to failure of pillars.

There had been failure of out door structures in various mines in the past also resulting in serious and fatal accidents. Similar failure of a twin steel bunker took place in another coal mine in 1996 when also it was noticed that the structure design was not stable due to inadequate factor of safety and the structure members subsequently got badly rusted and corroded and thus became further weak and subsequently collapsed after 7 years of use.

Based on the recommendations made in the report of the National Institute of Engineering Technology and the findings of the enquiries conducted by this Directorate, it is suggested that the following precautions shall be taken in order to prevent similar failures of structures.

1. The structures of Coal Handling Plant/Crushing Plant shall be designed taking into consideration all sorts of conceivable loads for making them safe as per Indian Standard code of practices IS 800. Adequate stability bracing shall be provided to avoid excessive deflection.
2. The composition of steel used in fabrication of structures shall be conform to IS 2062: 1992.
3. Steel used for fabricating the structure shall be free from defects as per IS 2062: 1992. The finished material should be reasonably free from surface flaws, lamination, rough/jagged and imperfect edge and all other harmful defects.
4. Foundation of all the pillars shall be shrouded with cement concrete so that water may not come in contact with steel to avoid corrosion/pitting etc. The surface area near pillar shall be cleaned regularly to remove coal/other materials piling above shrouded portion of pillar. Adequate care shall be taken so that pay loaders tippers working under bunker do not damage pillars by hitting.
5. For detection of defects in the CHP/crushing plants of mines, all such structures may be examined by an expert team including a member having expertise in design of structures. Suitable measures should be taken to strengthen the existing structures wherever required. A system of annual inspection of such structures using visual and non-destructive testing techniques shall also be introduced in all mines.

(Cir. Tech. 2/1999)

CMR 183

Safe operation of air compressors—In an incident in a mica mine a number of workers including three drillers were overcome by noxious gases delivered from a compressed air pipe line during drilling operation. Two of the drillers died within a short time.

An enquiry revealed that the electrically operated air compressor had been running for some time past with worn piston rings. The scraper rings were prominently worn out and some of them were broken and had got stuck inside the slot for rings on the piston. Understandably therefore, there had been abnormal loss of crankcase oil, before the incident. This oil which was being pumped to the air receiver and the pipe range along with the compressed air had settled down inside the receiver and along the length of the pipe range. Before the incident the compressor had been going out of order frequently due to carbon deposit on the valve seats etc, and the operator used to open the parts out, clean them in kerosene oil, and refill them. In this way the compressor was made to work again without attending to the main defect. After one of these cleaning operations, compressor was started but the pump delivering water for cooling the air at the intercooler failed. This allowed the compressed air temperature to rise igniting the kerosene oil on the air valves, which in turn initiated burning of the deposited lubricating oil in air receiver and in pipe range.

Noxious gases produced for the combustion of oil were delivered underground along with the compressed air to the drills which were being operated at the time by the deceased. It was apparent that the incident could have been avoided if only compressor was maintained properly as required under Reg. 173(1) of the MMR 1961. It would be realized that the incident might as well have resulted in a disaster involving large number of persons if there was an explosion inside the compressed air system.

To avoid similar accidents, the following precautionary measures should be taken in addition to the requirements of the regulations:

(a) Drain cocks should be provided not only below air-receiver but also at all low points along the pipe range.

(b) The drain cocks should be kept open during starting of the compressor and they should be closed after compressor has been started and clean air has been found coming out through the drain.

(c) A log book should be maintained to record consumption of oil per day, hourly reading of air pressure, temperature, cooling water flow, and other relevant particulars.

(d) When any serious defects such as excessive oil consumption, low pressure, high temperature etc. are noticed, the compressor should be stopped till the defects are rectified and the compressor is overhauled when required.

(e) Internal parts of compressor and pipeline should be washed with hot water and soda after they are cleaned with inflammable oil and before they are refitted.

It is further recommended that the compressor should be provided with the following control fittings, as far as possible:

1. a thermometer or a temperature recording device at the intercooler.

2. a thermostatic control which would cut off power in case of abnormal rise of air temperature.

(Cir. 10/1966)

CMR 184/MMR 174

Cleaning of running belt conveyors and provision of guards and fences—

A number of fatal accidents take place with belt conveyors in underground mines. On examination of causes of these accidents it is revealed that the accidents took place mainly for the following reasons—

- (1) non provision of suitable guards, fences at the drive head and tail end of belt conveyor. [contravention of CMR 184(2) & MMR 174(2)]
- (2) cleaning of belt and conveyor drums when the machinery was in motion. [contravention of CMR 184(3) & MMR 174(3)]

It is, therefore requested to take suitable steps in respect of items (1) & (2) above to prevent recurrence of such accidents.

It is further suggested that the persons responsible for care, maintenance and cleaning of belt conveyors are exposed to short term refresher courses at the Vocational Training Centres.

(Cir. Tech. Sapicom 12/1983)

CMR 186

1. Machinery operators to hold gas testing certificates—The provisions of Reg. 186(2) of the CMR 1957 require that in gassy seams of Second and Third degree, no person shall be appointed to supervise or operate any electrical machinery, apparatus or appliance other than a telephone or signaling device of an electric lamp or light, unless he holds a Gas Testing Certificate.

2. The above provision came into force in the year 1957 and during the last fourteen years many machinery operators have obtained Gas Testing Certificate. A number of them, however, have still to acquire the certificate, which is a matter of concern when viewed in the background of the importance of the measure and the time allowed to acquire the skill and quality at the examination.

3. Because of the importance of the issue it came up for discussion at the recent meetings of the Standing Safety Advisory Committee when the members expressed the view that not only machinery operators but every person employed in a belowground mine should be trained so as to be competent to check for presence of inflammable gas. This being the ultimate goal, it is requested to expedite the training of machinery operators in the first instance and also assist them in appearing at the examinations.

4. Now that Vocational Training Centres have been established in various parts of coalfields covering practically all mines and under Rule 17 of the Mines Vocational Rules, 1966, every person eligible to appear at the Gas Testing Examination has to undergo a course of training as detailed in the VIII schedule, the infrastructure for complying with the statute appears to have been well taken care of. A little concerted effort to draw these persons to the training centres by

offering some incentive and to ensure that they acquire the required skill would further the interests of safety in mines.

5. Members of the Standing Safety Advisory Committee also made another valid suggestion that no person should be appointed as machinery operator unless he possesses Gas Testing Certificate.

6. It is needless to emphasize that heavy responsibility rests on machinery operator specially if inflammable gas were to appear at the site of an energized electrical apparatus. Rule 126 of the Indian Electricity Rules, 1956 requires that in a situation like this, supply of electricity to the apparatus shall be immediately disconnected and incident reported to an official of the mine. If an operator is not able to detect presence of inflammable gas on a flame safety lamp it is obvious that he will not be in a position to comply with the rule and take necessary precaution.

Managements working seams of Second and Third Degree of gassiness should treat the issue with the seriousness it deserves.

(Cir. 54/1971)

2. Gas-testing certificate and winding engine driver's certificate—

According to Reg. 186(2) of the CMR 1957 relating to working and examination of machinery, no person shall be appointed in a gassy seam of second or third degree, to supervise or operate any electrical machinery, apparatus and appliance other than telephone or signaling device or an electric lamp or light, unless he holds a gas-testing certificate, and that every such person shall whilst on duty be provided with and carry an approved flame safety lamp. It has been brought to the notice of this Directorate that the provisions of the said regulation are not being complied with in some gassy mines of second and third degree.

Similarly, a number of winding engine drivers continue to be employed without the requisite qualifications viz. possession of 1st or 2nd Class Winding Engine Driver's Certificate as prescribed under Reg. 71/(1) of CMR 1957.

Whilst every effort should be made to ensure strict compliance with the aforesaid statutory requirements in the interest of safety of workers, it is recommended that whenever making any new appointment of operators of electrical machinery or apparatus or appliances and that of winding engine driver, possession of the requisite statutory certificates should be made an essential requirement of service.

(Cir. Exam. 1/1984)

MISCELLANEOUS REGULATIONS

CMR 187/MMR 177

1. Fencing—To obviate unnecessary reference in this respect, it is desirable that a standard procedure is followed in constructing fences for various purposes. Appendix I give the details of different types of fences, while Appendix II gives the situations in which the different types of fences should be used. Fences provided in mines should generally conform to these requirements.

APPENDIX I

Types of Fences

Type	Particulars of construction of fence
S1	0.40 metre thick brick all in lime mortar not less than 1.20 metres high with a barbed wire fence not less than 0.60 metre high (with wires not more than 0.25 metre apart) on top.
S2	0.40 metre thick brick wall in lime mortar not less than 1.50 metres high, with a parapet top or 0.75 metre thick stone wall in lime mortar not less than 1.50 metres high.
S3	Wire ropes, wire rope strands or barbed wire supported by movable post-stands (wooden, iron or concrete), the gap between adjacent members being not less than 0.30 metre and the bottom-most member not more than 0.25 metre and the top-most member not less than 1.00 metre from ground level.
G1	Rigid steel fencing, vertical members being not more than 3.00 metres apart and the gap between adjacent horizontal members not more than 0.25 metre, the bottom-most member being not more than 0.15 metre and the top most member not less than 1.00 metre from ground level. The vertical members of the fencing should consist of girders, channels or angle irons not less than 5x5 cm in cross-section or rails not less than 10 kg, weight per metre, steel pipes not less than 7.6 cm in diameter; or reinforced concrete posts not less than 15x15 cm section. The horizontal members of the fencing should consist of expanded metal sheets with holes not greater than 10 cm size, of steel pipes not less than 2.5 cm diameter, of solid rods not less than 2 cm. diameter, of strap iron not less than 2.5 : 0.6 cm in size.

G2	Barbed wire fencing, with specifications similar to G1 except that the horizontal member should consist of barbed wire.
G3	0.50 metre thick stonewall in lime mortar, not less than one metre high. or Wire ropes with pillars, vertical members being not more than 3.0 metres apart, and the gap between adjacent horizontal members not more than 0.25 metre, the bottom-most member being not more than 0.15 metre and the top-most member not less than one metre from ground level. The verticle members of the fencing should consist of props,not less than 13 cm in diameter, of iron pipes not less than 10 cm in dia; of girders not less than 5x5 cm or rails not less than 10 kg weight per metre; of concrete pillars; or of brick or stone in lime mortar. The horizontal members of the fencing should consist of wire ropes or wire rope strands of barbed wire.
G4	Rigid wooden fencing, vertical members being not more than 1.50 metres apart; and the gap between adjacent horizontal members not more than 0.25 metre, the bottom-most member being not more than 0,15 metre and the top-most member not less than one metre from ground level. The vertical members should not be less than 5 cm in diameter.
G5	Metallic guards of sheet metal or of wire mesh or of expanded metal.
U1	Wire ropes, wire rope strands or barbed wire or wooden rollas nailed or fitted on vertical props set flush on the sides of the gallery and also in the middle of the gallery if necessary; the gap between the adjacent members being not more than 0.30 metre, and bottom-most member should not be more than 0.25 metre and the top-most member not less than one metre from ground level.
U2	Two wire ropes, wire rope strands, barbed wire or wooden rollas fixed (preferably with cement or lime mortar) in the sides of the pillars across the gallery, at a height of about 0.60 and 1.0 metre respectively.

APPENDIX II

Uses of various types of Fences

Situations	Type of Fencing to be used
1. Storage tanks for water to be used in connected with mining	S1 with suitable gate (with locking any operation arrangements) for authorised entry
2. Top of abandoned shafts or inclines	S2
3. Top of working inclines	S2
4. Top of storage bunkers for sand etc.	S1 and S2 or G2
5. (a) Top of abandoned quarries and S1 or S2 subsided areas and tramlines if lying with 100 ft. of residential building etc. (b) Top of other abandoned quarries	S2 or G 1 if fencing within 5 metres from edge and G3 or G4 if the fencing is at a distance greater than 5 metres from the edge.
6. Subsided surface. Surface likely to subside; surface above underground fire etc.	Natural growth of thorny bushes may also be used for the purpose.
7. Top of working quarry: (a) moving fronts (b) others	S3 or G2 As in situation 5 above
8. Tops of underground staple pits, sumps and insets and mid-landing in shaft	S2 or G1
9. Open tops of drifts	S2, G1 or G4
10. Top of working shaft	G1

11. Moving & dangerous parts of Machinery	G1 or G5
12. Tramline bridges and gantries	G2
13. Moving shafts, couplings and gears of machinery	G1 or G5
14. Entrance to the site of an accident or to a place where inflammable or noxious gas has been found (or where there is some other danger) and the danger has not yet been removed	U1
15. Entrance to goaves	U1 to be provided out by the first support at the goafedge
16. Disused galleries	U2

(Cir. 11/1959)

2. A design of temporary fencing around working quarries—A suitable method whereby a temporary fencing may be created wherever necessary is shown as in sketch under Reg. 112.

(DGMS Departmental Instruction dt. 21.11.45)

3. Accidents in discontinued/abandoned workings—Every year some unauthorised persons or villagers get involved in accidents while surreptitiously working in an abandoned/discontinued mine. They have occasionally to pay the supreme price of such a folly with their lives or get maimed for life, but this does not in any way absolve a mine management from discharging its Obligations under law to keep the entrances to all such workings adequately fenced or blocked off. Recently a fatal accident occurred in a mine when six villagers went to an abandoned quarry to cut coal surreptitiously when a mass of overburden measuring about 4.2 m x 3.6 m fell from a height of about 3.6 m killing one of them (a boy aged 12 years) on the spot and injuring three others. Such instances occur every now and then, be it a coalmine or a metalliferous mine.

This is, therefore, to remind to get the fencings of all such places checked up and put them in order wherever there be any deficiency. Suitable steps should also be taken to ensure that the fencing remains intact and secure.

(Cir. 22/1974)

CMR 190/MMR 181

1. Preventing entry of children in mine premises and fencing of abandoned installations—

While four boys were taking shelter underneath an abandoned haulage foundation, the foundation collapsed injuring all the four boys— one of them succumbed to his injuries in the hospital.

Entry of persons below/ eighteen years of age in any part of the mine is prohibited under section 45 of the Mines Act 1952.

It is therefore recommended that:

(i) any part of the equipment or installation not being used for the mining purpose currently shall be totally dismantled, or properly, adequately and duly fenced off effectively. If any covering is to be done, it should be done in a permanent safe way;

(ii) mine management should ensure that children do not enter the mine premises/workings (current or abandoned) so as to endanger their lives.

(Cir. Tech. Sapicom 1/1997)

2. Unauthorised dwellings over dangerous workings— Several unauthorised dwellings have sprung up over areas already depillared or where depillaring is in progress. Dwellings have also been constructed over disused workings of mines, which are either waterlogged or not accessible for inspection due to the entrance having been destroyed. As such unauthorised dwellings may collapse and cause danger to the persons living therein. It has been suggested to the management that whenever any such dwellings are being constructed the local authorities may be informed to stop construction in time. They may also be able to render some assistance in the interest of the management to stop construction of such unauthorised dwellings in the premises of the mine.

(Cir. 1/1955)

3. Safety Campaign—As the mining industry is expanding considerably and as mining is becoming more intensive and more hazardous because easy coal and minerals in the development stages of the working mines have been exhausted, it is necessary that a serious campaign for safety should be instituted by mine managements with a view to improve the present working conditions. For this purpose :

(1) The management of every mine should arrange and conduct safety classes for the supervising staff, various categories of skilled labour, miners and other workers, illustrating the most efficient and safest method in which work and the duties allotted to the workers should be carried out. These classes should be complemented by audio-visual instructions.

(2) The lectures on general safety may include:

(a) good practices in supporting roadways and workings under various conditions.

(b) how common and typical accidents occur and how they can be avoided.

(c) the use and handling of explosives.

(d) dealing with coal dust.

(e) travelling of men in shafts.

(f) practice of handling and attending haulage and pumping machines.

(3) Such classes should be held separate for different categories of workers impressing the different hazards and dangers to which workers are exposed and the best way to avoid them.

(4) The attendance at the classes be encouraged by giving preference to the regular attendants while considering promotions to higher grades.

(5) No recruitment of different categories of skilled labour should be made except from those who have grasped the rudiments of their jobs from these classes. As far as possible none should be allowed to work underground, till he had some initial training in general safety.

In addition. Safety Weeks should be observed in every mine at intervals not exceeding 3 months with a view to ensure that good practices described in safety classes are followed. During the Safety Week all operations in the mine should be carried out with a great stress on safety.

Periodical reports of safety classes and safety weeks may please be sent to the JDMS concerned to enable him to watch the progress. .

(Cir. 15/1956)

4. Plan for safety and health—At the 31st session of the State Labour Ministers Conference held at New Delhi on the 19th & 20th of July, 1980 the question of safety measures in factories and mines like chemicals and textiles. Iron ore mines etc. was discussed and the following recommendation was made :

"The occupier of every factory and the owner of every mine should set out in writing his plan and arrangements in the field of safety and health and the various responsibilities exercised under these arrangements, and bring this information to the notice of every employee."

The above recommendation is brought to your notice for immediate compliance.

(Cir. Genl. 3/1980)

5. Constitution of Pit Safety Committees—The Pit Safety Committee should be constituted and should function at every mine in accordance with the rules given in the Appendix. Where the Safety Committee has already been formed, its constitution should be modified to fall in line with the said rules.

Surveyor should also be a member of the Committee.

Appendix **Pit Safety Committee**

1. *Formation*

At every mine employing 100 persons and above, a Pit Safety Committee shall be formed.

2. *Composition*

(1) The following shall be the members of the committee in a gassy mine employing 500 persons and above :

1. Manager	1	11. Shot-firer/Blaster	
2. Assistant Manager	1	12. Fitter	1
3. Ventilation Officer	1	13. Timberman	1
4. Engineer	1	14. Line Mistry	1
5. Safety Officer		15. A trammer—preferably underground trammer	1
6. Welfare Officer	1	16. Engine Driver	1
7. Medical Officer	1	17. Face workers preferably safe workers only	1
8. Overman/Foreman	1	18. One from each shift	3
9. Sirdar/Mate	1	19. Surveyor	1
10. Dust Incharge	1		

(2) In any other mine employing more than 100 persons the number of members of the committee may be varied keeping in view the general composition given in sub-clause (1) above and, as far as possible ensuring representation of all major categories of workers employed at the mine.

3. *Term of office*

The term of office of the members of the Pit Safety Committee shall be one year.

Provided that except for manager, welfare officer, safety officer, ventilation officer, engineer, assistant manager (if there is only one) all other members shall be rotated after a year, as far as possible in order of seniority.

Provided further that in case efface workers, the safe worker of the previous year who has been a member of the committee once shall not be eligible to become member again.

4. Scope

The Pit Safety Committee shall consider and discuss all matters brought before it concerning safety at the mine but shall not deal with matters relating to wages, wage-rates, labour disputes etc.

Explanation—The idea is that all the efforts of the committee should be directed only to the safety aspect of the employees.

5. Functions

The following shall be functions of the Pit Safety Committee—

- (1) Visit surface and underground parts of mine on a fixed day in a month with a view to meeting the workers on spot to talk to them on matters of safety, inviting suggestions on safety and for checking general standards of safety of the section visited.
- (2) Invite and consider suggestions for safety.
- (3) Review minor, serious and fatal accidents at the mine during the previous month and suggest extra measures that may be taken to prevent recurrence of accidents.
- (4) Enquire independently into all serious accidents, and such minor accidents that may be referred to the Pit Safety Committee by the manager for inquiry.
- (5) Discuss recommendations of Inspector of Mines on matters of safety, and such extracts from the violation letter of Inspector of Mines that may be placed by the manager before the committee for information and such actions as may be considered necessary.
- (6) Take active part in organising and observing Mines Safety Weeks.
- (7) Undertake publicity and propaganda work at the mine for creating safety consciousness amongst the workers and assist all other bodies engaged in this type of work.
- (8) Promote safe practices and lend active support to all measures intended for furthering the cause of safety in the mine.

6. Quorum and Meetings

- (1) 60% of the total membership shall constitute a quorum. Provided that if a meeting is postponed due to lack of quorum, the next meeting shall be held irrespective to the quorum.
- (2) The manager shall preside over every meeting of the Pit Safety Committee. In his absence, the next senior-most person of the managerial staff shall take the Chair.
- (3) The Safety Officer shall act as the Secretary of the Committee. Provided that the assistant manager or overman (if there is no assistant manager) shall act as the Secretary until a Safety Officer is appointed at the mine.
- (4) The committee shall hold at least one meeting in every month.
- (5) The Director/Assistant Director of the National Council for Safety in Mines and an Inspector of Mines may occasionally attend the meeting of the Committee.

7. Recommendations and Implementation

- (1) The management shall take early action on the recommendations of the Pit Safety Committee.

(2) Disciplinary action, if any, recommended by the Committee for negligence resulting in an accident at the mine shall be in accordance with the Standing Orders of the mine.

8. *Accident Enquiry Sub-Committee*

(1) The Pit Safety Committee shall appoint a Sub-Committee to enquire into every serious accident and such minor accidents at the mine that may be referred to the Pit Safety Committee by the manager for inquiry. The Sub Committee shall consist of the following members of the Committee :

(i) Safety Officer or where there is no Safety Officer, an Assistant Manager, if appointed.

(ii) Engineer or Assistant Engineer, if employed.

(iii) Overman/Foreman

(iv) Sirdar/Mate

(v) Worker's representative on the Pit Safety Committee from the same category to which injured person(s) belong(s).

(2) The Sub-Committee may co-opt any person employed at the mine to assist in the enquiry.

9. *Minutes of the Meetings*

A record of the minutes of the meeting of the Pit Safety Committee shall be kept. A copy of the minutes shall be sent to the Director, National Council for Safety in Mines and the Regional Inspector of Mines.

(Cir. 49/1964 and 21/1966)

6. Activating of pit safety committees—The Jeetpur Court of Inquiry in its report has made the following pertinent observations in respect of Pit Safety Committees with a view to enlisting active co-operation and participation of workers in matters of safety :

"Safety to be effective should be based on safety consciousness of all those engaged in the work of production. This would include the workers who are only engaged to do such work but in fact suffer most when accidents occur. A deliberate attempt should, therefore, be made to enlist the co-operation of workers and their unions and to create interest in safety matters amongst them. A serious attempt should be made by the management concerned with the help of safety offices to revive, where necessary, and generally to activate the Pit Safety Committee for this purpose. Enquiry reports on fatal accidents, as well as general reports by the Safety Officers or by the DGMS on Standards of Safety followed in the collieries, should not only be made available to the Pit Safety Committees, but actually discussed in depth at their meetings. A feeling of involvement should be created where both management and workers get equally involved in the matter of observing safety standards."

2.0 It may be recalled that guidelines for the constitution and functioning of Pit Safety Committees were spelled out in Circular No. 49 of 1964. The Second Safety Conference while taking note of this circular had recommended that a representative of workers unions should also be a member of Committee. Accordingly, vide Circular No. 90 of 1966, the mine managements were advised to reconstitute the Pit Safety Committees. Although formation of Pit Safety Committee is now only voluntary, it is proposed to make it a statutory requirement after an enabling clause is incorporated in the Mines Act as provided in the Mines (Amendment) Bill, 1972 which is now before the parliament.

3.0 The question of activating Pit Safety Committees was also discussed at the recently Concluded Third Conference on Safety in Mines (Calcutta: 14-15 July, 1973), when it was unanimously agreed that Pit Safety Committees should be suitably activated so that they play a positive role and make a fruitful contribution to accident prevention at mines.

4.0 This is therefore, to request you to take suitable steps in order to ensure that activities of the Pit Safety Committees formed at mine(s) under your control are so directed, and regulated that maximum benefit can be derived from their work in the interest of raising general safety standards at the mine(s). The concerned Joint Director and/or the Director of Mines Safety in charge of the zone may also be consulted in implementing the recommendation of the Third Safety Conference.

(Cir. 49/1973)

7. Recommendation of the Silewara Court of Inquiry : functions of the Pit Safety Committee—

The Court of Inquiry into the causes and circumstances attending the accident, which occurred in the Silewara Colliery on 19.11.75 resulting in the loss of 10 lives due to sudden inrush of water, in its report has made the following observations regarding functioning of the Pit Safety Committee at the mine :

"The meetings were usually held once a month; some were cancelled for want of quorum or other unstated reasons. The minutes show that the Committee functioned mostly as a forum for education of workers with regard to mine safety. It is difficult to say that the subordinate staff took the Committee and its meetings very seriously. They might have done so if there were a separate Safety Officer functioning as Secretary of the Committee unburdened with other responsibilities; this unfortunately was not the case. Under the stimulus of positive initiative of such Secretary the subordinate staff might have felt themselves encouraged to talk about the aspects of the mine workings, which posed threats of danger. Apart from the education of workers, these meetings seem to have been largely taken up with requests for various kinds of facilities to workers working underground. The minutes show that matters relating to serious dangers in the underground were not at all raised or discussed."

The Court of Inquiry has made the following recommendations in this respect—

"The scope of the functions of the Pit Safety Committee to be enlarged to include consideration and discussion of matters relating to existing danger in the underground workings of the mine."

Attention is also invited to DGMS Circular No. 49 of 1973 whereby the measures for activating Pit Safety Committees at mines in the light of the recommendation made by the Jeetpur Court of Inquiry, were specific for suitable action.

It has been realised by all concerned, particularly during the Safety Conference, that the Pit Safety Committee must make a positive contribution towards prevention of accidents. Therefore, the observations made by the Silewara court of Inquiry as mentioned above are naturally a matter of great concern. Admittedly, a renewed bid should be made to make the Pit Safety Committee function in a purposeful manner.

Suitable steps as recommended should be taken in consultation with the National Council for Safety in Mines and the concerned Director of Mines Safety.

(Cir. Tech. 15/1979)

8. The need for good construction of high walls—In a fatal accident a 18m long x 4.5m high x 38cm thick wall on one side of an incline cutting collapsed after two weeks of its construction on a loader. The wall was made up of brick in cement mortar of a ratio 1: 8 and was built on the stone floor of the incline cutting. The space between the back of walls and sides of the cutting was filled with sand and weep holes were also provided in the brickwork.

The basic defect that led to collapse of the wall was lack of deep and secure foundation commensurate to the total height. Further as a good civil engineering principle, the ratio of cement to sand should not have been less than 1: 4.

Constructing high walls without proper and secure foundation and with poor cement: sand ratio mortar is hazardous. This may be noted and it may always be ensured that such construction is under supervision and control of a competent and qualified (civil) engineer.

(Cir. 40/1971)

CMR 191 /MMR 182

1. Use of synthetic fiber clothes and non-conducting footwear by shot firers/ blasters and their helpers—Static charge can be generated and stored on bodies of persons wearing synthetic fiber clothes and/or socks and non-conducting shoes or boots. It is learnt that the potential of such charge during dry months may go upto 60,000 volts, especially on a cold day in a dry climate. This can discharge through the detonator wire insulation to the ground if the wires touch the charged body and may lead to firing of the detonator with dangerous results.

It is, therefore, advisable to ensure that blasters/shot firers and their helpers do not wear synthetic fiber clothes and socks whilst on duty. It should also be ensured that they are provided with and wear only non-conducting type of shoes or boots, e.g. leather sole footwear.

(Cir. Tech. 1/1985)

2. Protection of workers against Noise and Vibration in the working environment—Unlike other major countries practically no work has been done in Indian mines so far to study the hazards of noise and vibration in the working environment. There can, however, be no doubt that we have to tackle this problem with the increasing mechanisation of mining operations. Probably, this problem already exists in the following situations, amongst others—

- (1) while operating pneumatic drills etc,
- (2) near Heavy Earth Moving machinery,
- (3) in locations housing continuously operated machinery like surface mechanical ventilator, surface screening plants, underground main pumps etc,
- (4) during operation of Anderton Shearer machine etc.

2.1 It is known that exposure to noise may interfere with speech communication, cause annoyance and distraction. It has been reported that it may also reduce output and efficiency and cause fatigue apart from various health disorders unrelated to the effects on the hearing.

2.2.1 It is often asserted that noise reduces output and efficiency and affects morale. A change in noise level, up or down, from those to which persons are accustomed may cause adverse effects, which quickly subside. It is difficult to demonstrate any prolonged effect on performance or working efficiency but in as much as sound can cause annoyance, difficulty in communication etc. this may become a factor for absenteeism etc.

2.2.2 Fatigue may result from having to talk loudly or from extra effort caused by misunderstanding—a matter difficult to assess objectively. It has been claimed that many noisy occupations cause ‘nervous irritability and strain’ but the reaction varies greatly in different individuals.

2.2.3 In certain circumstances, noise may cause a decreased electrical resistance in the skin, reduction of gastric activity, or electro-myographic evidence of increased muscle tension.

2.2.4 All the above consequences are leading to even fatal/serious accidents in mines.

3.1 It is felt that a time has come when some noise limits should be indicated as a goal to be achieved, the main objectives in this regard being:

- (a) to prevent a risk of hearing impairment;
- (b) to prevent interference of communication essential for safety purposes;
and
- (c) to eliminate nervous fatigue with due consideration to the work to be done.

Recommended Noise Standards—3.2 Based on the recent ILO Code of Practice* the following standards and guidelines are provisionally recommended for attainment, as far as practicable:

3.2.1 A warning limit value of 85 dB (A) may be set as the level below which very little risk to an unprotected ear, of hearing impairment exists for an eight hour exposure.

3.2.2 The danger limit value shall be 90 dB (A), above which the danger of hearing impairment and deafness may result from an unprotected ear:

Provided that during emergencies, or because of unforeseen technical reasons, a worker may be temporarily authorised to exceed the daily dose, but only if on the next day he recuperates so that the maximum weekly dose does not exceed the value specified above.

3.2.3 A worker should not be allowed to enter, without appropriate ear protection, an area in which the noise level is 115 dB (A) or more.

3.2.4 Personal protective equipment shall be worn, if there are single isolated outbursts of noise which can go above 130 dB (A) Impulse or 120 dB (A) 'Fast'.

3.2.5 No worker shall be allowed to enter an area where the noise level exceeds 140dB(A).

Identification and marking of Risk Areas—4.1 In order to identify risk areas, noise levels should be measured where;

- (a) an inspection discloses that such risk may exists;
- (b) the workers complain that they are subject to an uncomfortable or disturbing level of noise; or
- (c) speech intelligibility is impaired (in a normal voice) at a distance of 50 centimeters (20 inches) or less;

4.2 Marking of the following risk areas and equipment should be done so as to:

- (a) indicate clearly equipment producing noise in excess of 85 dB(A);
- (b) display prominently a suitable sign forbidding entry to all except those wearing appropriate means of protection.

Measurement of Noise Level—5.1 Noise should be measured whenever speech intelligibility is impaired (in a normal voice) at a distance of 50 centimeters (20 inches) or less. Measurement of noise may be made in one of the following ways:

- (a) at the level of the worker's head in his ordinary working posture; or
- (b) with the microphone at 1 metre away from the worker's head in this position, and on both sides. Should the figures obtained vary from one place to another, the highest value ought to be taken.

5.2 The persons responsible for monitoring noise and vibration in the working environment should have received appropriate training in the measurement and control of noise and vibration. They should be equipped with suitable instruments to do the job.

5.3 It is no doubt important to ascertain whether the technical preventive measures remain effective. For this purpose, there should be periodical inspections and checks of the risk areas and equipment. For this purpose, a systematic programme of assessment of noise levels should be undertaken.

Protective measures and technical control—6.1 Use of following protective equipment may be considered in appropriate cases :

- (a) ear-plugs, which can be used more than once;
- (b) disposable ear-plugs (ear-plugs made of ordinary cotton wool are prohibited);
- (c) ear-muffs; and
- (d) helmets and other specialized ear-protectors.

6.2 Needless to say, personal hearing protection should on no account be in lieu of technical prevention. Appropriate measures to prevent generation, transmission, amplification, and reverberation of noise and vibration should therefore be taken when machinery and equipment is being designed. Noise and vibration levels should also be amongst the factors to be taken into account when any machinery or equipment is to be ordered. Accordingly, there should be a close liaison with manufacturers with a view to reducing noise and vibration emission of such machines and equipment. Obviously, it is preferable to purchase quieter equipment, or which produces less vibration than to be compelled later on to take steps against excessive noise and vibration.

6.3 When neither by suitable design of equipment nor by their installation, noise and vibration levels can be brought below the danger limits, the following protective measures may be considered :

- (a) enabling workers to have easy access to soundproof booths either totally or partially enclosed;
- (b) providing workers with adequate hearing protection and anti-vibration devices;
- (c) providing workers with anti-vibration working platforms; or
- (d) limiting time of exposure to excessive noise or vibration.

Vibration Limits—7.1 As for the vibration limits, aim should be to take appropriate steps which will ensure desirable degree of comfort and protection required especially against:

- (a) vibrations affecting the hands and arms (vibrating tools); and
- (b) whole body vibration transmitted through the supporting surface.

7.2 No specific vibration limits are indicated because available scientific data is inadequate. However, for a continuous exposure maximum permissible levels of vibration, depending on daily exposure, should be laid down, in the light of current scientific knowledge, technical progress, and possibilities of prevention.

Action—8.11 shall be pleased if suitable steps are taken by you to reduce, by all appropriate means, the exposure of workers to any excessive noise and vibration. The DGMS may please be kept informed of the action taken in this regard.

(Cir. Tech. 18/1975)

3. Protection of workers against noise—Based on the ILO Code of Practice certain standards and guidelines were provisionally recommended vide Cir. (Tech.) 18 of 1975 for protection of workers against noise.

2.0 Recent surveys in some mines have shown that operators of pneumatic jack hammer drills, rock breakers, rocker shovel, mechanical loader, shovels, dragline and other heavy earth moving machines and other persons working in the vicinity thereof are getting exposed to sound levels higher than those recommended in the above circular.

The surveys indicated the following noise levels near different machinery :

2.1 In an underground metalliferous mine (i) jack hammer drills (ii) rock breaker (iii) rocker shovel	—106dB(A) —106dB(A) —104dB(A)
2.2 In an underground coal mine, (i) near shearer (ii) transfer point (iii) tail end of belt conveyors (iv) power pack of pump (v) drive head of AFC	—96dB(A) —99dB(A) —89 dB(A) —91 dB(A) —96dB(A)
2.3 In an opencast mine, (i) near drill (ii) in dumper cabin while moving (iii) diesel shovel(in cabin)	—111 dB(A) —103dB(A) —89dB(A)

3.0 Such high noise levels are likely to affect not only the safety of persons exposed to noise but also their productivity. It is, therefore, recommended that immediate steps be taken to control noise level and afford necessary protection to workers against noise. Given below are some suggestions for noise control and ear protection:

3.1 Noise exposure is the product of the noise level and the exposure duration and hence may be controlled by reducing either. However limiting noise level reaching the ear by noise reduction at the sources is by far the most cost effective and positive approach whereas reduction of exposure duration, the common administrative action of personnel rotation to spread the exposure amongst several workers should be resorted to in special situations only when noise control is impractical or not feasible.

3.1.1 The first method of noise control is to plan work areas, so that employees and noise sources are kept as far apart as is practicable.

3.1.2 Control can be also affected at the source by engineering design of the machine or equipment and its proper installation and maintenance e.g. damping impact noise, noise insulation by sound absorbing materials, acoustic barriers or enclosures etc.

3.2 In situations where noise control at source is just not possible and purely as a temporary measure while engineering work is being undertaken, personal ear-protection should be used.

3.2.1 The actual ear protection is a function of construction of the defender, frequency of noise and the fit of the device to the subject and differs widely with different manufacturers. Attenuation quoted by the suppliers is the average of change in hearing threshold obtained on a number of subjects when the

protector is correctly fitted. The assumed protection is also frequency dependent—typically the attention provided goes from little or nothing at low frequency upto 35 to 40 dB (A) at high frequency.

3.2.2 The normal range of hearing of a healthy young person extends from approximately 20 Hz to 20 kHz. The human ear is most sensitive to sound between 2 kHz and 5 kHz and less sensitive at higher and lower frequency. In terms of sound pressure level (SPL), audible sound ranges from the threshold of hearing at 0 dB (A) to the threshold of pain which can be over 130 dB (A)

3.2.3 It is necessary to consider design of protection against the frequency spectrum of the noise in question in order to calculate dB (A) level inside the ear canal. Since protection is afforded only if the defender is worn properly, it is advisable to choose a device with lower performance if its comfort factor is significantly better than the heavy duty type.

On the basis of acoustic measurement, different types of hearing protectors can be placed in one of the following categories of protection—

Low—for noise level	85	-	100dB(A)
Medium-do-	100	-	110dB(A)
High-do-	110	-	120dB(A)
Extra High-do-	above	-	120dB(A)

3.2.4 A list of different types of hearing defenders in use in British coal mines is given in the Appendix.

4.0 Effective personal hearing protection programme essentially comprises of the following constituents—

- (i) assessment of noise exposure level.
- (ii) determination of level of residual protection after implementation of reasonably practicable noise control measures.
- (iii) selection of protectors to give the required attention.
- (iv) worker's perception of the consequences of not wearing protector correctly.
- (v) selection of protector acceptable to the individual worker for the period of required use.
- (vi) selection of mutually compatible item of other personal protective equipment required.
- (vii) training of wearers to ensure that they know how, where and when protectors should be fitted.
- (viii) demarcation of the work locations where protector should be worn.
- (ix) adequate supervision to ensure protectors are worn correctly, when and where required.
- (x) maintenance of protector in an efficient and hygienic condition.

5.0 Early steps may please be taken—

- (i) to reduce, by the appropriate means, the exposure of workers to any excessive noise and
- (ii) to procure suitable sound level meters and conduct noise level surveys in the manner recommended in DGMS Cir. (Tech.) 18 of 1975.

Appendix I HEARING PROTECTORS-APPLICATION

Level of protection: Low; L - for noise levels 85-100 dB (A)

Medium: M - for noise levels 100-110 dB (A)

High: H - for noise levels 110-120 dB (A)

Extra High: X - for noise levels above 120 dB (A)

Protection Type	Protection level	Possible application	Typical Reduction dB(A)
(a) Earmuffs			From to
<i>Air stream Helmet Mounted</i>			
Recal Quick Snop	M	Dint Header operator	95-70
<i>Helmet mounted</i>			
SuperC	L	Road Header operator	97-85
Belcap L	L	Road Header operator	97-84
Recal Quick Snap	M	Working near Auxiliary Pan	115-85
Silenta Super	H	Air leg Borer operator	118-89
<i>Special helmet mounted</i>			
Thereford Type E	L	Semi-automatic welder	92-69
<i>Headband mounted</i>			
Bilson Loton	L	Planer operator	98-73
Recal Ultra moff 2	M	Wire Brush operator	106-89
Ear 1000	H	Nylon hand grinder operator	114-86
(b) Ear plugs			
Bilson Soft	L	Profile Burner operator	93-68
Ear Foam	L	Methane Drainage pump	93-70
(c) Earmuffand Earplug combined			
Ear 1000 Muff	L	3 Air Leg Borer operator	123-85
EarPlug	*	Drop Hammer operator	114-78

*For use with standard safety helmets incorporating welding shields for face.

(Cir. Tech. 5/1990)

CMR 191 A/MMR 182 A

1. Use of safety helmets and protective footwear by workmen—It has been found that some workmen go into a mine without wearing safety helmets and protective footwear provided to them by the management. This shows that adequate steps are not taken at such mines to ensure strict compliance with the statutory requirements according to which no person shall go into or work, or be allowed to go or work in a mine unless he wears the said protective equipment.

It is apparent that some persons should be specially deputed by the manager for a check at the pit-top or at mine entrance.

This duty may be entrusted either to a body checker or banksman or any other suitable person, who should be appointed in writing for this work, in addition to his other duties whenever possible.

(Cir. 74/1973)

2. Use of safety helmets by loaders—Some difficulty has been experienced to enforce statutory requirements in case of loaders, who carry loaded baskets on heads. Loaders seem to find it difficult to adopt themselves to the helmets with the head loads.

There appear to be following three alternatives to solve the problem of loaders:

(1) Loaders should be provided with helmets fitted with adjustable chinstraps. They should put on the helmet when actually not carrying a head load, but while they are engaged in carrying such loads, they may remove the helmet from the head and throw it over on to their backs.

(2) The loaders change the mode of carrying the load by putting it on their shoulders, and wear the helmet with a chinstrap to permit it from falling off their head while carrying the shoulder loads.

(3) The head load to be carried over top of the head with a ring type of padding permanently fixed to the helmet (by means of soft wire like used detonator leads) serving to provide a 'seat' for the basket. In this case, a band of cloth may be tied around the forehead to provide a cushion between the helmet and the forehead.

One of the above mentioned three alternatives may be adopted whichever is preferred by the loaders. Method of serial No. 2 would appear to be particularly suitable for thin seams. Practice at serial No. 3 has been actually adopted at some of the mines with complete success. The 'ring' is made locally by the loaders and it is of the same design as is at present commonly used by persons while carrying head loads.

(Cir. 72/1967)

3. Interval for free supply of helmets to mine workers—From time to time requests are received from the mine managements asking for extension of the interval of free supply of helmets to the mine workers. The matter has been carefully considered and by virtue of powers under Reg. 191A(2) of CMR 1957 and 182A(2) of MMR 1961, the DGMS has permitted the supply and use of approved helmets for a period not exceeding five years in respect of the following—

(i) workers employed in opencast workings.

(ii) workers employed on the surface of the mines.

This permission is granted only on trial basis and may be amended or withdrawn if considered necessary in the interest of safety.

Notwithstanding anything contained in para I, the interval of supply of helmets to the underground workers of the mines shall not exceed three years as laid down in sub-regulation (2) of Reg. 191A of CMR 1957 and 182A of MMR 1961.

(Cir. Legis. 2/1975)

4. Replacement of harness of safety helmets—Safety helmets manufactured according to IS : 2925 and having IS Certification mark license are approved by this Directorate for use in mines. According to the regulations, helmets are to be supplied free of charge, at intervals not exceeding three years. While the life of a helmet is 3 years, its harness consisting of a headband, inner cushioning and crown straps is subject to damage and deterioration at a fast rate requiring frequent replacement.

The head-band and crown straps have specified widths and the harness has to be so attached that the lower edge of the headband is level with the lower edge of the shell of the helmet. Also the strap shall ensure a clearance of at least 30 mm. between the top of the wearer's head and inside of the top of the helmet crown at the smallest size adjustment of the headband. As per specifications, harness of the same sizes of helmets shall be interchangeable between shells of the same size.

In view of the above important factor involving safety of the wearer, it is essential that a harness must be replaced by one of correct size and dimensions. It is, therefore, advised that harness for such replacement must be obtained from the manufacturer of the particular type of helmet or otherwise approved. Also such replacement should preferably be made once in every six months.

(Cir. 32/1974)

CMR191 B/MMR182B

1. Use and supply of protective goggles or shields to the workers to prevent eye injuries—Owner, Agent and Manager of every mine is required to provide the following classes of persons with protective goggles or shields fitted with unsplinterable glass or other suitable material so as to prevent eye injuries:

1. persons engaged in breaking, chipping or dressing stone, ore or any other mineral.
2. persons engaged in workshop on jobs involving work of cutting, chipping, grinding or drilling, ore, mineral or such other substance.
3. welders and their helpers, and
4. persons who are engaged in any operation in which they are exposed to the risk of injury to their eyes due to flying fragments of any substance or otherwise.

(Cir. 29/1974)

2. Use of gloves—Trammers and persons handling machinery are exposed to the hazard of injuries to hands. In some of the cases gloves are being used by these categories of workers. Experience in these mines indicated that rate of accident involving hands (including fingers) could be brought down considerably by use of suitable types of gloves. In one mine, such accidents were brought down by nearly 30% by use of gloves in one year.

Accidents not only cause hardship to the injured persons but also affect productivity. In order to reduce accidents to hands, it is proposed to issue shortly a notification under Reg. 191B of the CMR, 1957 and Reg. 182B of the MMR, 1961, requiring the use of gloves by all trammers and persons handling machinery in mines. Pending issue of such a notification you are advised to take action to provide suitable types of gloves to these categories of persons immediately.

As per information available from the mines where gloves are being used, a list of manufacturers of gloves is enclosed for your guidance. Some of the mines are procuring gloves from local sources. You may procure gloves from any of the sources but the same should be of good quality and suitable for use under mining conditions.

I trust you will take immediate action to comply with this directive.

(Cir. Tech. 1/1983)

ANNEXURE

LIST OF MANUFACTURERS OF GLOVES FOR USE IN MINES

1. M/s. Berco Welding & Electrical Private Ltd., Jullunder.
2. M/s. Associated Mechanical Industries, Belgaum.
3. M/s. Sersenraj Enterprise,
C/o Mr. S.K. Jain, Nag Nagar, Dhanbad.
4. M/s. Industrial Protective Equipments, 62, Bentink Street, Calcutta-700 069.
5. M/s. Mohsin & Co., Madras.
6. M/s. Swastik Enterprises, Bangalore.
7. All India Women's Conference, Kalyan Niketan Road, No. 19F Area, Jamshedpur.

3. Accidents caused by jerks during cutting timber by power operated high speed saw—

Investigation into a fatal accident caused by jerk of a circular saw revealed that during cutting of timbers in power operated saws, a severe jerk is felt when some knot or any other unforeseen defect remains in the timber as the speed of the saw is very high.

To prevent such accidents—

- (1) the operator should wear goggles and leather hand-gloves,
- (2) suitable padded leather shield should be provided to protect the abdomen and the chest,
- (3) feeding of timber into the saw should be done by the pressure of hand only and a high fence should be provided in between the timber and body of the operator so that in case of any back thrust, the fence can absorb the momentum.

The fence should be either hinged type or shielding type so that it is opened only when the timber is placed in the machine.

(Cir. Tech. 3/1977)

4. Use of line-men's safety belt—That a safety belt should be used whenever electricians or competent persons are required to work at the top of an overhead line pole is a recognised good practice which should not normally need a reminder. However, it appears that there are still some lapses as was seen when an accident occurred in a mine recently when an electrician fell from the top of an overhead pole and received fatal injuries. The mishap could have been easily avoided if only the electrician had been provided with and used a lineman's safety belt (made to IS: 3521-1955 Specifications for Lineman's Safety Belt and Strap).

(Cir. 28/1967)

CMR191D/MMR182D

3. Supply of Self-rescuers—It may be recalled that the Jeetpur Colliery Court of Inquiry had recommended, inter alia, that the use of self-rescuers should be popularized and introduced on compulsory basis. The matter was discussed at the Third Conference on Safety in Mines (Calcutta: 14-15 July 1973) when it was agreed that self-rescuers should be introduced early.

Use of self-rescuers is compulsory in a number of other countries like UK, France, West Germany, Poland and USSR. The question of providing self-rescuers to workers employed in mines in our country too has been under consideration of DGMS for quite sometime. The main difficulty has been lack of indigenous equipment. Notwithstanding the same, it is now considered desirable that the introduction of self-rescuers in Indian mines should not be delayed any further even if it becomes necessary to import this essential piece of safety equipment in the interest of safety of workers employed belowground in coal mines.

A programme of phased supply of self-rescuers to persons employed belowground has therefore been drawn up spread over a period of three years as indicated below:

Period	To be supplied to all underground employees in:
(1) Up to 31.12.1975	all Degree III gassy mines, and other underground mines specially liable to spontaneous heating and fires.
(2) Up to 30.9.1976	all Degree II gassy mines
(3) Up to 30.9.1977	all Degree I gassy mines.

The above decision was communicated in August 1974 to the Chairmen/ Chairman-cum-Managing Directors of all Public Sector Undertakings and all other concerned mine managements. It is expected that necessary arrangements for providing self-rescuers in accordance with the above phased programme has already been initiated and will be complied within the stipulated periods.

(Cir. Legis. 8/1975)

4. Maintenance and use of self-rescuers—Your attention is drawn to this Directorate's Circular No. 8 (Legis) of 1975 regarding introduction of self-rescuers in coalmines in a phased manner. The **Court of Inquiry** into the causes of and circumstances attending ignition of inflammable gas which occurred on the 22nd Jan., 1979 at **Baragolai Colliery** has also recommended, inter-alia, that self-rescuers should be issued to all underground workers.

Self-rescuer is a life saving equipment. It is, therefore, of utmost importance that the equipment is maintained in working order. Training should be given to all workers in their use and those who have been issued self-rescuers must be persuaded to carry them,

The following aspects relating to maintenance and use of self-rescuers need particular attention

1. Written instructions regarding care and maintenance issued by the manufacturers or suppliers of self-rescuers should be fully implemented.
2. A competent person should be made responsible for examination and maintenance of self-rescuers.
3. Each self-rescuer should be serially numbered and the same self-rescuer should be issued to a person everyday.
4. Self-rescuers should be stored in the lamp room or in an adjacent well ventilated room on suitably constructed racks and arranged serially,
5. A card for recording details like results of periodic weighments and physical condition etc. should be made out for each self-rescuer. The card should be filled *ii* and signed by the

competent person responsible for examination and maintenance of self-rescuers. In addition, check inspections of a few self-rescuers selected at random may be made by an official of the rank of at least Assistant Manager who should also countersign the card.

6. It should be ensured that each worker carrying a self-rescuer is fully trained in the use of the same. Besides the actual use in emergency he may be briefed about the following—

- (a) How to carry the equipment.
- (b) The circumstances under which a self-rescuer should be used and when should it be taken off.
- (c) After putting on a self-rescuer, what a person should not do.
- (d) During actual use, the self-rescuer is likely to get hot. It should neither be removed nor pass breathing be resorted to.

For the purpose of training of personnel, assistance from the manufactures/suppliers should be taken. Use should be made of training model self-rescuers, audio-visual means like slide with recorded commentary, films etc. available with the manufacturers/suppliers of the self-rescuer.

(Cir. Tech. 7/1982)

3. Proper quality assurance, storage, maintenance & use of Filter Self Rescuers—Self-rescuer is essentially a life saving escape type of protective equipment used in emergency for escaping to safety through an irrespirable atmosphere containing highly toxic carbon monoxide gas. Therefore, it is of utmost importance to ensure that the same should be of proper design, construction and quality as per specified standards. While in use, it should be properly stored, maintained and handled with care so that it provides adequate protection in emergency.

The importance of the self-rescuer as a life saving equipment, the need for maintaining the same to the highest degree of availability and important issues connected with use and maintenance of filter self-rescuers had been brought to the attention of the industry vide DGMS (Tech.) Circular No. 7 of 1982.

The importance of providing, maintaining and proper storage of filter self rescuers also came to sharp focus after an occurrence of the disaster due to fire in New Kenda Colliery of M/s. E.C.L. on 24.01,1994.

The testing of filter self rescuers came into prominence when a few of the samples of filter self-rescuers collected from the mines by DGMS officials and subjected to Break-through Test in the Artificial Lung Simulator Machine provided at DGMS, Dhanbad failed. Since the samples tested were drawn from those actually being used in the mines, the matter gained greater seriousness. It was felt that proper quality of such life saving products was not checked by the user.

Till recent past, facilities for testing of FSRs as per BIS specifications was provided with manufacturers only. No National Test House Laboratories had such facilities. The need for having testing facilities with an independent agency was long felt. Testing facility was developed at CMRI, Dhanbad in 1996. However none of the coal companies including Coal India Ltd. who are the main users of the FSRs, have any testing facilities as yet.

In view of the above, a committee was set up by the undersigned to look into the use of filter self-rescuers with a view to determine whether self-rescuers adhere to the prescribed standards and approved design, assess their quality and condition and review the existing quality control, testing and maintenance procedure by users and suggest remedial measures to ensure their sustained availability with proper quality.

The Committee during enquiry observed that storage, maintenance and use of filter self-rescuers in coalmines was far from satisfactory. Filter self-rescuers were not being generally weighed at regular intervals in most of the mines. Moreover, accurate weighing machines were not available in most of the mines. From the data submitted by coal companies, it revealed that substantial number of filter self-rescuers had gained weight beyond the permissible limit and were therefore unfit for use in mines. The mine management however remained oblivious of this fact. It reveals that standard of maintenance of the self-rescuers in the mines is generally not satisfactory at all.

Proper storage and use of filter self-rescuers is particularly important as the life of filter self-rescuers depends on the same. Improper storage and use may lead to damage of outer container and consequent ingress of moisture, which will render the catalyst of filter self-rescuer ineffective. The ineffectiveness of the catalyst is reflected by gain in weight. Therefore, as a check for effectiveness of the filter self-rescuers, periodic weighing in sensitive and accurate weighing machine is essential and this forms the most important feature of the regular maintenance schedule.

Regarding 'shelf life' of filter rescuers, BIS 9563: 1980 states as follows:

"The filter self-rescuers shall at no time gain in mass by more than 12 grams at which stage it shall be considered to have lost its effectiveness. This gain in mass shall not take place in less than 4 years from the date of manufacturing.

Note -1: Further, if a vacuum sealed self-rescuer is found to have opened, it shall be weighed immediately, and if found within the limits, then it should be resealed as per manufacturer's instructions."

The committee observed that most of the instructions of DGMS (tech.) No. 7 of 1982 were not being complied with. Therefore, the chance of ineffective filter self-rescuers continued to be used by the mine workers, always remain high. It is necessary to ensure that the aforesaid recommendations of circular are strictly complied with. The existing maintenance, checking, testing and use of filter self-rescuers at the mine level, gives enough scope for improvement. Measures and suggestions to improve the same are given below:

1. It is necessary for all coal mining companies having belowground mines to have their own quality control and testing facilities for filter self-rescuers possibly at apex level i.e. ISO, Rescue Stations, CMPDIL etc. A system shall be established for quality assurance at the user end. The quality control and sample checks should be carried out at the procurement stage and then periodically during its use in the mines.
2. A thorough check shall be carried out of all self-rescuers being used in belowground coal mines to ensure that these are as per prescribed standard IS; 9563-1980 and of proper quality. In case any sub-standard or defective equipment is detected, the same shall be immediately removed from the mine and replaced by proper one.

3. Most of the mines don't have a system for weighing of FSR. In some mines, where it is provided, it is by grocers pan and weight, which cannot measure gain in weight upto 12 g accurately. Suitable sensitive type of balance shall be used for accurate weighing of the self-rescuers. Moreover, filter self-rescuers should be weighed at least every three month to determine the gain in mass. Filter self-rescuers shall at no time gain in mass by more than 12 grams at which stage it shall be considered to have lost its effectiveness.

4. Filter self-rescuer is essentially an escape type of personal protective equipment. It should not be used for purposes other than escaping to safety through an irrespirable atmosphere containing CO. The practice of dealing fires using filter self-rescuers should be discontinued.

5. Filter self-rescuers shall be carried by each person going belowground and shall be kept with him while at work. Sufficient number of filter self-rescuers shall be provided at the mines in good condition so that the same can be issued to individual persons by name, which will improve maintenance, upkeep and proper usage.

6. In respect of care, maintenance and use of self-rescuers a detailed circular was issued to the industries in 1982 bearing DGMS (Tech.) Circular No. 7 of 1982. Recommendations of this circular shall be strictly complied with.

Defective filter self-rescuers may create false sense of security to the mines with serious consequences. It would be prudent on the part of the user to maintain a vigilant eye on the quality and upkeep of filter self rescuers in the interest of safety of persons employed in the underground coal mines. Correct action in this regard shall be taken at the earliest.

(Cir. Tech. 7/1999)

CMR199A/190A

1. Marking of escape routes for emergency—At times an eventuality may arise in an emergency, when some miners might have to walk out of the mine workings unattended or unescorted by mine officials. It therefore appears necessary that escape routes from different sections or parts of the mine, where workers are engaged on work, should be prominently designated by suitable markings, which are clearly visible underground. This simple measure is also recommended for implementation in addition to the usual mock rehearsals once at least in a quarter.

(Cir. 10/1973)

2. Model standing orders in the event of a Fire. see circular 59/1967 under Reg. 120.

GENERAL

1. Call for Safety on Public Address System—All the passengers travelling in the most sophisticated form of modern transportation viz, by Air, are reminded of the basic elements of personal safety in every flight in spite of the fact that such persons are by and large, the most educated and well informed. This is because of the need to remind them to take protective safety and for proper and prompt action in case of necessity. There is however no such timely reminder to persons engaged in the most hazardous of all peace time professions viz., mining. Such a need is all the more greater because of the relatively poor background of education of the general mass of workers. I am therefore writing this to call upon you to provide for a public address system at the pit top/attendance room/lamp room or a convenient place in your mine where workers largely assemble before going to work and issue therefrom certain basic reminders on personal safety at the beginning of each shift. These have to be necessarily few if they are to catch the attention of the workers. Examples of the messages could be:

Wear your boots and hats.

Check your cap-lamp.

Ensure discipline and enter the cage in an orderly manner.

Travel only by travelling roadway.

These can be supplemented by specific warnings on the condition of work in the working district as e.g. Timber being withdrawn in 14 level depillaring district. 27th level off 14 dip gallery fenced off because of bad roof. Goaf adjoining 22 level depillaring district talking. South pit fenced off because of overhanging sides etc.

The idea is to remind the workers of their obligation to ensure their personal safety and to warn them of specific dangers existing in the mine, if any, in that particular shift.

These messages should be addressed at the beginning of every shift in mining parlance of the workers and continued for and during the period earmarked for workers reporting for and going down the pit. Such messages should be duly recorded in a book and the system should be under the overall control of the Safety Officer of the mine where there in one, or under me manager in other cases. The under/asst. managers of each shift should report to this system the peculiar/special features in their areas/in their shift.

(Cir. Genl. 3/1957)

2. Inadvisability of frequent changes in composition of workgroups and the importance of Group Factor in general—The ILO Coal Mines Committee on Safety in Coal Mines (1956) has stated in its report that while the psychological factor may apply to any isolated individual "it is of particular importance when it is applied to a group. The collective attitude endangering safety would appear to be molded by the relations between the various persons". From this point of view it has proved useful to form teams of face-workers whose members always remain together.

Considering this aspect, the Safety in Mines Conference held in January, 1959, recommended that a system by which the composition of work-groups is not subject to frequent change is more conducive to safety than one in which new work-groups are formed frequently. As the practice in this country for family groups or village groups to work together is tending to go out of fashion with the gradual mechanisation of mines the recommendation above deserves special attention.

(Cir. 52/1959)

Prime Minister's 'SHRAM AWARD' ; A scheme for recognition of outstanding contribution by 'Labour'—This is to inform you that Government of India, Ministry of Labour have introduced a scheme entitled 'Prime Minister's Shram Award' to workmen is recognition of their outstanding contribution towards production and for showing exemplary zeal and enthusiasm in the discharge of their duties. These awards would be announced every year on the eve of the Independence Day—the 15th August.

The other details of the awards under reference and also the guidelines for selection of workmen for Shram Awards are indicated in the Annexure.

Wide publicity should be given to the scheme so that all workmen and Trade Union Leaders know about it. It may also be prominently exhibited in the notice board of your mine.

ANNEXURE

PRIME MINISTER'S SHRAM AWARDS

1. SCOPE : The awards will be given to persons covered by the definition workmen under the Industrial Disputes Act, 1947.

2. DETAILS OF AWARDS : the awards in the order of precedence, are **SHRAM RATNA, SHRAM BHUSHAN, SHRAM VIR and SHRAM SHRI/SHRAM DEVI.**

3. PRIZES : The cash prize and the number of such awards in a year would be as follows:—'

	Name of Award	Amount of prize	Cash No. of Awards
1.	Shram Ratna	Rs. 1.00.000/-	1
2.	Shram Bhushan	Rs. 50,000/-	2
3.	Shram Vir	Rs. 30,000/-	3
4.	Shram Shri/ Shram Devi	Rs. 20,000/-	4
			Total : 10

While the total number of awards in one year would be ten in case awards for any one or more categories are not being given, these can be distributed among the other categories. Along with the cash prize, the awardees would also receive a "SANAD", on the day the investiture ceremony is held.

(1) SHRAM RATNA—being the highest award will go to a worker of really outstanding caliber.

(2) SHRAM BHUSHAN—will be awarded to workers who have made exceptional contribution in productivity/production and has also shown innovative abilities of high order.

(3) SHRAM VIR—will be awarded to workers who have shown exceptional zeal and enthusiasm for work and have had significant contribution towards productivity.

(4) SHRAM SHRI/SHRAM DEVI—will be awarded to workers who have a continuous record of dedicated service and high order of productivity.

4. ELIGIBILITY OF AWARDS : (1) Mainly those workmen will be eligible for award who are engaged in manufacturing and productive processes and whose performance is assessable. Workers solely engaged in routine service duties would not be eligible.

(2) Awards will be given to workmen who have a distinguished record of performance, devotion to duty of a high order, specific contribution in the field of productivity, proven innovative abilities, presence of mind and exceptional courage. The awards may be given to those workmen also who have made supreme sacrifice of laying down their lives in the conscientious discharge of the duties.

(3) There should be adequate representation of women and handicapped workers who have made outstanding contribution in the areas specified above.

5. **PERIOD:** The awards will be announced every year on the eve of the INDEPENDENCE DAY-15TH AUGUST.

6. **RECOMMENDATIONS FOR AWARDS:** The Ministry of Labour would be inviting recommendations for grant of awards some time in the beginning of every year. Mine Managements are required to send their recommendation (SIX COPIES) by the 15th of APRIL of that year, accompanied with full citation, containing the personal particulars of the individuals recommended and highlighting also the achievements of the individual, which merit conferment of an award.

(Cir. Gen. of 1985)

4. Application for permission, exemptions etc. to the DGMS—In order to cut down avoidable correspondence and visits to mines and to expedite action on applications for permissions/exemptions etc., under the statutory provisions, it is requested that the following steps should be taken:

(1) While forwarding the application to the DGMS two copies of the same complete in all respects (i.e. prescribed proforma, plans, sections etc.) should be sent to the respective Joint Director of Mines Safety.

The original application to the DGMS need not contain more than one set of enclosures; however, in every application a line should be included to the effect that two copies of the application with all enclosures have been forwarded to the Joint Director of Mines Safety.

(3) The application should be complete in all respects.

(4) The plans submitted should be clear prints on durable paper and they should show all the necessary details.

(Cir. 40/1968)

5. Load shedding—Due to frequent load shedding in the coalmines of Jharia Coalfield serious difficulties are being faced by the industry. In as much as the load-shedding have an adverse effect on ventilation, pumping and winding, they constitute a serious safety problem.

During a meeting with power companies and representatives of mine managements, it transpired that if 20% relief was assured during the peak periods, it may be possible for the supply companies to ensure uninterrupted supply of power to the consumers. While efforts are being made to improve power generation, as a short term remedy, and to achieve the 20% reduction in the maximum demand, the following measures are recommended: —

(1) To flatten the 'peak-loads' (every day during the periods of 10.00 - 13.00 and 18.00 - 22.00 hours) by restructuring pumping operations during these periods; intermediate and main pumps may be run during non-peak hours;

(2) To stagger the running hours of all machinery;

(3) To stagger the rest days of the employees.

(Cir. 35/1972)

6. Preparation of Roster of Officers on Duty on Holidays—The Jeetpur Colliery Court of Enquiry in its report made the following pertinent observation, amongst others, with a view to encouraging better management practices in the interest of safety in mines:

"The tendency not to be on active duty on holidays is very marked amongst the officers since unlike most of the workers they do not get either overtime or even compensatory holidays for working on the weekly or other days of rest. This is a position which needs to be rectified. Some compensation should be provided for work on days of rest and regular roster of officers who should be on duty prepared for such days, and the officers concerned clearly told what their duties and responsibilities are for that day."

The recommendation is timely, since in the larger pits that are now coming up, some regular repair and maintenance work of plant and machinery etc. is essential almost on every rest day in a week and provision of adequate supervision on such days is necessary for proper control of operations specially in the gassy coal mines. Bigger installations and repair jobs are taken up when pits are closed on two or more consecutive holidays.

The matter was discussed at the recently concluded Third Conference on Safety in Mines held in Calcutta, when it was unanimously agreed that regular roster of officers who are on duty on rest day or holiday should be prepared and the officers concerned told about their duties and responsibilities for that day. As recommended by the Conference, it is proposed to make a suitable provision in this regard in the law in due course. In the meanwhile, you are advised to implement the above recommendation under intimation to the concerned Joint Director of Mines Safety as well as this office about details of the Scheme introduced in the mines under your control.

(Cir. 48/1973)

7. Reclassification of circulars—It has been decided that in future, for sake of convenience in reference, circulars issued by this Directorate will be classified into following subjects:

1.Circulars referring to approval of safety equipment and other material	D.G. (Appl.) Circular No.
Circulars on technical matters	D.G. (Tech.) Circular No.
Circular clarifying certain Provisions, Amendments of Legislation, Notifications etc.	D.G (Legis.) Circular No.
Circulars connected with examinations and bye-laws etc.	D.G. (Exam.) Circular No
Circulars connected with welfare, health and hygiene	. D.G. (Welfare) Circular No.
Circulars of general nature.	D.G. (Genl.) Circular No.

This year seven circulars have so far been issued. It is requested that these circulars may kindly be renumbered as indicated below:

<i>No. of circulars issued up to 1.2.75</i>	<i>New No. of circulars (subject wise)</i>
1 of 1975 -2 of 1975	D.G. (Apprl.) Circular No. 1 of 1975
3 of 1975	D.G. (Tech.) Circular No. 1 of 1975
4 of 1975	D.G. (Legis.) Circular No. 1 of 1975
5 of 1975	D.G. (Legis.) Circular No. 2 of 1975
6 of 1975	D.G. (Apprl.) Circular No. 2 of 1975
7 of 1975	D.G. (Legis.) Circular No. 3 of 1975
	D.G.(Exam.) Circular No. 1 of 1975

You are requested to kindly afford wide circulation to all concerned in your establishment from your end as well whenever such circulars are received.

(Cir. Genl. 1/1975)

8. Recommendations of the Jeetpur/Kessurgarh/Chasnalla & Sudamdih Courts of Enquiry—This is to invite your attention to some of the important recommendations made by the aforementioned courts of enquiry, reproduced in the Annexure as follows:

1. (a) Recommendations of the Jeetpur Court of Enquiry: Annexure 1-A.
(b) ILO Code of practice on prevention of accidents due to explosion in coal mines: annexure 1-B.

In para 9.1.4 of the report of the Jeetpur court of enquiry, it was recommended that the draft ILO code of practice for prevention of accidents due to explosions should be considered. The ILO Code of practice No. ISBN 92-2-101062-7 was published in 1974. Some of the good practices which may be adopted under Indian mining conditions, are given in this Annexure:

2. Recommendations of the Kessurgarh Court of Enquiry: Annexure II.

3. Recommendations of the Chasnalla Court of Enquiry: Annexure III.

Although the report of the court of enquiry does not contain any "Recommendations" as such, some changes in the provisions of Regulation 127 of Coal Mines Regulations, 1957 have been suggested. Till such time that the regulations are so amended, it would be desirable to adopt the measures suggested and given in the Annexure, as additional precautions against danger of inundation.

4. Recommendations of the Sudamdih Court of Enquiry: Annexure IV.

Proper implementation of these recommendations can bring about definite improvement in the total safety system of the mine. You are therefore, requested to take appropriate action in the matter.

(Cir. Tech. 5/1979)

ANNEXURE - I(A)

RECOMMENDATIONS OF THE JEETPUR COURT OF ENQUIRY

1. Duties and responsibilities of mine officials

All senior and supervisory officers who have duties laid on them by the Mining Regulations and Standing Orders should be made fully aware of these duties and responsibilities. This is a task which should be taken in hand by the senior management, in this case by the Chief Mining Engineer with the help of the Safety Officer.

2. Stoppage of fan

(i) The fan should not be stopped except on the written authority of the manager or a person authorised by him (DGMS Circular No. 53 of 1973 may please be seen).

(ii) With the Manager being fully informed of every stoppage, whether the Stoppage is deliberate or for reasons outside the control of the management, there would be no occasion for him to plead ignorance of the fact that the fan remained stopped, as has been done in this case. It would thereupon be entirely the responsibility of the Manager or the Officer authorised by him to take such action to withdraw men from underground as he is required to do so under the Standing Orders. It will also be his responsibility to decide if the power should be disconnected, and if so, to what extent, after providing for essential service to be maintained.

3. Pit Safety Committee

A serious attempt should be made by the management concerned with the help of the Safety Officer to revive where necessary and generally to activate the Pit Safety Committee for this purpose.

DGMS Circular No. 49 of 1973 may please be seen.

4. Alternative source of supply for fans

Whatever arrangements are made to ensure regular supply it will be highly desirable to make certain alternative arrangements of power supply at least for groups of mines which are highly gassy in nature.

Please see DGMS Circular no. 8 of 1974, para 2(iv) (a).

5. Detection of gas

A more reliable system would be to install recording methanometers at important places in the mines, such as the main return of the major districts/seams and the main return of the entire mine. Air velocity meter should also be installed to provide a continuous record of the quantity of air flowing through the districts, seams in the mine.

ANNEXURE I(B)

Prevention of accidents due to explosions underground in coal mines Ref: ILO Code of Practice No. ISBN 92-2.101062.7 Published in 1974. 1.

Introduction

One of the recommendations of the Jeetpur Court of Enquiry was that the draft code of practice for the prevention of accidents due to explosions underground in coal mines prepared by ILO should be considered. The ILO code of practice has since been published. Some of the good practices which may be adopted under Indian mining conditions are given below; figures in bracket indicate the para number in the ILO publication.

2.0 Ventilation

General principles: (i) (a) Full consideration should be given to problems of ventilation that may arise during the life of a mine [2.1.1(1)].

(b) Adequate provision should be made at the planning stage for all foreseeable conditions that may be encountered, bearing in mind that all coal mines are potentially gassy [2.1.1(2)].

(ii) The ventilation of any mine or part of a mine should be such that in the normal course of events the system possesses adequate reserves for exceptional requirements [2.1.2].

(iii) (a) Under the responsibility of the mine manager, a single authorised person should take charge of the ventilation of a mine [2.1.3(1)].

(b) If the workings of two or more mines are unavoidably connected and thus have part of their ventilation circuit in common, this arrangement should be subject to the approval of the competent authority, and one authorised person should be designated as being responsible for the ventilation of both or all the mines in so far as the joint circuits are concerned [2.1.3(2)].

(iv) Where two or more mines are interconnected but maintain separate ventilation system, a positive and effective means of separation should be provided, making use of fireproof and explosion of proof doors or stopping [2.1.4].

(v) (a) When planning the method of working of a mine, it should be divided into independent ventilating districts in order to limit the consequences of an explosion or a fire [2.1.5(1)].

(b) Each district should have an independent intake commencing from a main-intake air course and an independent return airway terminating at a main air course [2.1.5(2)]

(c) A figure should be set for the maximum number of persons normally permitted to be in each independent ventilating district at any one time. This figure should be restricted to a minimum [2.1.5(3)].

2.1 Ventilation plan

Ventilation plans covering the operation as well as the proposed development of each colliery should include details of the ventilation arrangements to be adopted at each stage of development, as well as the scheduled date for each change [2.2.1].

2.2 Ventilation fans belowground

(i) Where the ventilation of a heading or other localised working place is ensured by an electrically operated auxiliary fan, special provision or arrangements should be made so that—

(a) the fan is so placed or operated that it will be running in fresh air uncontaminated by firedamp;

(b) the power supply to the fan is maintained in the event of a shut-down of any or all other plant in the working place;

(c) electricity can be supplied to the working place only when the auxiliary fan is running; and

(d) on restarting the fan after a prolonged shut-down, sufficient time is allowed to elapse to clear any accumulation of gas or foul air before the supply of electricity to the working place is re-established [2.4.3].

(ii) Where an auxiliary fan is kept running continuously to prevent the accumulation of gas in a heading, provision should be made for a suitable warning device to be actuated if any excessive heating or other fault arises at the fan motor [2.4.6].

2.3 Gas emission and ventilation requirements

(i) In making provision for ventilation requirements, a sufficient margin should always be provided to meet the typical mining contingencies that experience has shown may conceivably arise, such as—

(a) a sudden or additional firedamp emission due to a fall of roof in a waste containing firedamp, or resulting from the intersection of a blower or from a sudden outburst of gas; or

(b) an outflow of gas, following a fall in barometric pressure, from a firedamp-filled waste or from a fissure leading to large cavities or to bed separation (which may not necessarily be found immediately adjacent to the seam being worked) [2.5.6].

(ii) In certain cases, in view of the danger of gas outflows from the wastes into the workings, it may be necessary to supplement the ventilation by—

- (a) firedamp drainage;
- (b) improvement in strata control for the district as a whole; and
- (c) improvement in the support of the roof at the working face, including a strengthening of waste edge supports [2.5.7].

(iii) (a) Consideration should be given, particularly in retreating long wall faces, to bleeder or other methane drainage systems.

(b) In shaft sinking, special precautions should be taken to guard against the danger from emissions of firedamp when the shaft is approaching or is passing through coal-bearing strata [2.5.8].

3.0 Emission of firedamp

Cavities: (i) Care should be taken, through good strata control practice and prompt setting of roadway supports with a high degree of stability, to prevent the formation of roadway cavities [3.3.1].

(ii) If a roadway cavity is formed as a result of a roof collapse, appropriate steps should be promptly taken to support it in such a way as will prevent its extension [3.3.2].

(iii) (a) Roadway cavities should be filled as soon as possible.

(b) Until this can be done, the roadway should be provided with adequate ventilation so as to prevent firedamp from accumulating in roadway cavities [3.3.3].

(iv) It should not be overlooked that a fall of roof from a gas filled cavity can bring the gas down and cause it to mix with the air current in the roadway, and so give rise to firedamp atmosphere within the inflammable range near the floor of the roadway [3.3.4].

3.1 Formation and dispersion of thin gas layers

(i) Positive measures should be taken to prevent the formation of a thin layer of gas next to the roof in mine workings and roadways, and to disperse any layer that may have formed [3.4.1].

(ii) (a) The main action taken to prevent the formation of gas layers should be the maintenance of the speed of the general ventilating air current at a level sufficient to dilute the gas as it is given off from the strata.

(b) Where such action is not practicable, measures should be taken to increase the air speed in the area covered by the layering [3.4.2].

(iii) The attention of all supervisory mine officials should be drawn to the fact that a layer of gas may be found close to the roof of mine roadways and working faces and that it may move against the direction of the air current [3.4.3].

Gas testing and air sampling

(i) (a) If the results of analysis of successive routine samples show a tendency for the gas content to increase, careful investigation should be made to ascertain the source and cause of the increase.

The significance of even the smallest increase should not be overlooked, in that the local effects of such a variation may be extremely important [4.4.2].

(ii) (a) Information should be secured on the variations in gas emission, and a record kept thereof, in all mines where firedamp is a recognised hazard.

(b) Where large emissions of gas are encountered, consideration should be given to the installation of continuous recording methanometers [4.4.3].

(iii) (a) Where circumstances permit, consideration should be given to the installation of a 'firedamp detection centre' which can continuously receive and record information on methane content from the monitoring devices located at key points throughout the mine.

(b) Arrangements may also be made for the electric power to be automatically cut off if the firedamp concentrations exceed a predetermined level.

(c) The centre may also be used to receive information on undesirable changes that might occur in the ventilation system [4.4.4].

iv) (a) Whenever appropriate, consideration should be given to continuous monitoring of firedamp during coal getting operation, by means of a monitoring instrument which may be mounted on certain types of coal getting machines such as continuous miners.

(b) Such instruments may be set to warn the operator of the presence of firedamp, and to cut off the power supply to the machine should the firedamp accumulation approach the danger level [4.4.5].

4.1 Restrictions on use of light alloy equipment

(i) (a) Because a particularly dangerous form of incentive friction may arise from contact between rusty steel and Sight alloys of magnesium and aluminium, the use of equipment containing such light alloys in parts of a mine where there is a firedamp hazard should be prohibited.

(b) If for practical reasons the use of equipment containing such light alloys becomes necessary, the design should include protective features such as a layer of zinc of a thickness of 0.2 to 0.3 mm or a covering of sheet metal or a suitable plastic material [5.2.1].

(ii) It should be prohibited to introduce metal foil likely to give rise to a termite reaction into a mine where there is a firedamp hazard. [5.2.2]

5.1 Electrical Apparatus

(i) (a) Special attention should be paid to providing systematic and suitable protection for electric cables or equipment, especially in places where shots are to be fired.

(b) Makeshift arrangements should not be employed, and whatever method is adopted should have been specifically designed to suit the particular circumstances [5.4.6].

5.2 Flammable liquids

(i) Only fire-resistant hydraulic fluids should be used underground for the transmission of power [5.7.1].

(ii) The immediate vicinity of any place where flammable oil or other flammable liquid is used or stored should be enclosed with or constructed of either fireproof materials or materials that have been rendered fire resistant [5.7.2].

(iii) Precautions should be taken to minimise the possibility that hydraulic fluid may come into contact with hot surfaces or electrical apparatus as a result of the rupture of a flexible pipe or some other fragile component of a machine [5.7.5].

(iv) Appropriate precautions should be taken to prevent ignition of vapor from insulating oils for electrical equipment. The provisions of paragraphs 62-68 of the ILO code of practice on the prevention of accident due to electricity underground in coal mines shall be taken into account in this connection [5.7.6].

6.0 Stone dust or water barriers

(a) The erection of stone dust or water barriers should be regarded as an essential factor in preventing the spread of an explosion in coal conveyor roads.

(b) The design, construction and sitting of such barriers should be based on careful research and practical testing having regard to the conditions under which they will be used.

(c) They should be maintained so that they will function as intended [6.3.1].

6.1 Treatment of coal dust in wet conditions

- (i) In workings that are naturally wet or damp, protective measures against explosions should be based on the use of water. However, the use or presence of water on its own to render coal dust harmless from the point of view of propagating an explosion involves certain residual hazards which should be taken into consideration [6.6.1].
- (ii) In no case should coal dust, even if wet or in the form of sludge, be permitted to accumulate in roadways [6.6.2].
- (iii) To meet the possibility of propagation of explosions, suitable precautions should be taken by spreading a quantity of an effectively waterproofed stone dust sufficient to ensure compliance with the standards required for other roads [6.6.3].

7.0 Human factors

- (i) (a) Stress should be laid at all times on the importance of the human element in the prevention of explosions.
- (b) Steps should be taken to ensure that all workers, supervisory officials and management gain an understanding of the different aspects of the mine explosion hazard and the preventive methods employed, and seek to co-operate on the widest basis to ensure the most effective application of these methods in the interests of the safe operation of the mine [7.0.1].
- (ii) Although the safety of a mine depends very largely upon the extent to which the individuals in its management and workers alike want it to be safe and are prepared to exert themselves to make it safe, the lead in this respect should be seen to come from management [7.0.2].
- (iii) The statutory requirements in relation to safety should not be looked upon as a catalogue of imperatives and penalties but rather as a code of good practice, which everyone willingly accepts and is at pains to observe, a code every departure from which will at once be challenged [7.0.4].
- (iv) Every effort should be made, through education and training, including regular instruction in basic safety rules, to develop and encourage in each individual the growth of a personal feeling of responsibility for safety [7.0.5].
- (v) Constant stress should be laid on the value of joint action by management and workers [7.0.6].

ANNEXURE- II

Recommendations of the Kessurgharh Court of Enquiry 1. Role of

Safety Unit

The role of the Safety Unit in Colliery Management needs to be re-defined. In paragraph 9.1.6 of the Jeetpur Report, I had recommended that the role of the Safety set up should be that of internal audit, and that the set-up should be reorganised accordingly. In particular, I had suggested that the Safety Officer should not be under the administrative control of the Colliery Manager, but should be a part of a separate hierarchy, the head of which should report to the Technical Director on the Board of Directors, if there is such a Director, or to the Chief Executive of the organisation. I do not know if this recommendation was considered by the Government, but even if it was, there is no evidence of its having been implemented. The Safety Officer continues to be under the immediate control of the Colliery Manager and he continues to be saddled by the latter with duties other than those connected with his own. Even if he is not so saddled, his direct subordination to the Manager deprives him in practice of his right of constructive

criticism, which should be his main function. It may possibly be an exaggeration to say that the accident under enquiry could have been averted if there had been such an independent Safety Officer in the Colliery, but it would certainly be no exaggeration to hold that such an officer could well have been expected to point out that the Systematic Timbering Rules were not being followed, and thus fore-warn the Manager against what was really the main cause of the tragedy.

I would, therefore, like to reiterate that the Management of a group of mines like B.C.C.L. should organise an internal safety wing completely independent of local mines management. This wing should be headed by a Senior Safety Inspector of the rank of a General Manager, possibly designated General Manager (Safety), who should report direct either to the Chief Executive, or to a Functional Technical Director of the Board, if there is one such. The General Manager (Safety) should have a Sufficient number of Inspectors under him who will supervise the work of the Safety Officers, of whom there should be one in every colliery, as at present. Neither the Inspectors or the Safety Officers should be either administratively or functionally under the Agent or the Mine Manager, or any other officer belonging to the production hierarchy. They will be responsible only to their superiors in their own hierarchy.

The role of the Safety hierarchy would be advisory and critical, if necessary, but not executive. The Safety Officer, for instance, will point out deficiencies, if any, to the manager, but not pass orders on the Mines Management to rectify these deficiencies except under the authority of the Manager. If, however, the Safety Officer is dissatisfied with the safety conditions, it will be his duty to report this state of affairs to his superiors in his own hierarchy, on the other hand, not being subordinate to the Colliery Manager. It will not be open to the latter to allot duties to the Safety Officer or make entries in his Personal File or his Confidential Character Roll.

2. Co-operation of the Workers and their Unions

A nominee of the union, or where there are more than one union in a Colliery, of the union having the largest membership, should be associated with the Internal Safety Wing during their inspections. In concrete terms, I would recommend that the Safety Officer attached to a Colliery, accompanied by the nominee of the union, should inspect all the mines in the Colliery once every month. The Inspectors functioning under the General Manager (Safety), as recommended by me, should also when they inspect the mines be accompanied by the nominee of the union. The Inspection Reports drawn up in both these cases should be signed also by the union representative with such clarifactory or dissenting remarks, and also with such further suggestions in regard to safety matters, as he might wish to make. These Inspection reports should be put up to and considered by the General Manager (Safety), and while the latter should have the right to accept or reject any suggestion made in the reports either by the Inspecting Officer or by the Union representative, he should, in case he rejects any of these suggestions, record his reason for doing so.

ANNEXURE-III

Recommendations of Chasnalla Court of Enquiry

1. Unusual seepage of water within 60 metres of any disused and abandoned workings

The proviso to Regulation 127(3) may be amended to include similar action to be taken within 60 metres of any disused and abandoned workings.

2. Additional details on plans accompanying application made under Reg. 127(3)

The plan must also contain the outline and necessary details of the proposed new working for which permission is being sought. (This will ensure that no variation of the plan sanctioned would be permissible, without referring the matter again to the Chief Inspector).

3. Record of galleries and bore-holes

In a case where Regulation 127(5) applies, a written record of the measurements of the galleries made and of boreholes made must be maintained by the competent persons under whose supervision the precautions envisaged by Sub-Reg. (5) are carried out.

4. Stoppage of work in case of heavy seepage of water

On line with the proviso to Regulation 127(3), workings (irrespective of whether they are approaching disused and abandoned workings or not) where any heavy seepage of water is noticed, should be stopped and should be resumed only after the Chief Inspector's permission has been obtained.

ANNEXURE IV

Recommendations of the Sudamdih Court of Enquiry

1. In each mine, there should be a standing order with regard to action to be taken when there is an accident; which should in particular mention (a) the authorities that must be immediately informed, (b) in what order they should be informed, (c) telephone numbers of these authorities, (d) specially in regard to the Rescue Station, nearest telephone in case their telephone is not in working order, (e) the nearest mines which should be approached for voluntary rescue teams; these should tally with the mines in the standing order for Rescue Station (recommendation 2 below). These standing orders should always hang in the rooms of the senior officers and there should be mock trials once a quarter at least as far as the mine itself is concerned.
2. There are no clear instructions laying down the authority, which should take control of rescue and recovery operations in an emergency. In practice at present the DGMS is expected to exercise this control. It would be preferable to give this responsibility to a group consisting of a senior official of the management, a representative each from DGMS, Rescue Station, and of the recognised union of the workers. This group should take decisions and direct operations from the Control Room. To start with it should be recognised that the management (the senior most officer present at the mine) would have to and must take the necessary decisions.
3. It would be advantageous to provide or earmark a special room as a rest room for rescue teams. Such a room should have rescue plans, standing orders on rescue work, the plans of the various parts of the mine, and some canteen facilities readily available not far from its location.
4. The number of methanometers and safety lamps in stock should be enough to deal with the maximum requirements which may arise and there should in addition be a reserve in both items. For supervisors, they should all be in supervisor's pool and there should ordinarily be no occasion for a supervisor to seek this equipment from the officers' pool.
5. During each holiday in a degree III gassy mine some officer of the rank of Under Manager and above should pay a surprise visit for an underground inspection in each shift.
6. Whenever a degree III gassy mine is closed for holiday or holidays, on the first shift of the next working day, an officer should be earmarked for ensuring a check for gas in all parts of the mine according to a set schedule before the workers are allowed in.

7. The Regulation on the handing over charge by the sirdar in the district i.e., underground, should be strictly enforced. The overman should also be enjoined to wait until he is relieved. During rest days and holidays persons on roster duty should also be-required to go only after handing over charge to their successors, and except with permission in writing from a senior officer no roster duty person should leave his duty unless relieved by a successor.
8. There must be a programmed of inspections by officers of Mines Safety as well as of Internal Safety Wing of the management. While there should be frequent surprise underground inspections by these officers a detailed inspection in degree III gassy mines should be undertaken at least once in six months in the case of the former, and quarterly in the case of the latter, in accordance with laid down proforma.
9. Underground, inside the mine, there should be FLP and intrinsically safe telephones connected to the mine PBX so that not only in case of accidents but also to deal with other problems, communication between surface and underground improves. There should at least be a telephone in each lateral near point where the rises meet the laterals especially in high incline mines and those functioning with j horizon systems.
10. The Mines Safety Department should be taken into confidence when it is proposed to effect any important changes in mining practices. In any case a departure from the permission letter of the Mines Safety Department should be immediately brought to the notice of that Department.
11. Management should lay down norms for inspection and supervision by higher ranks to ensure that all records are properly and regularly maintained and that they are seen, scrutinized and countersigned by appropriate senior officer who should also be enjoined to issue requisite instructions where necessary.
12. All freshly recruited Asstt. Managers should be attached to suitable Mines Safety officers for 2 months to be trained on safety measures and standards.
13. There should be a vigorous and systematic programme of training workers and supervisory staff in the mines including provision for refresher courses, which should cover all personnel.
14. Automatic multipoint methane recorder should be installed in all degree III gassy mines. The indigenously developed multi point methanometer has not given good service. The experience on its development and manufacture should help to reduce the foreign exchange content even in the first buys.
15. Automatic portable methane alarms should be placed at all faces where as is likely to accumulate so that automatic audiovisual alarm is given as soon as gas concentration exceeds predetermined percentage.
16. There should be definite emergency plans for every mine and rehearsals should be undertaken periodically for evacuation rescue operations etc.

17. In gassy mines, there should be a system of inspection of spare blades of booster and auxiliary fans and of parts of other equipment in CMRS for flameproof characteristics before use in the mine.

18. It is desirable that an environmental survey is conducted before the capacity and location of auxiliary fans are decided upon. Environmental survey should include survey of pressure, quantity, temperature and humidity of mine atmosphere as well as determination of the rate of gas emission from coal seams and also from the floor and roof of coal seams. The survey should take into account the possible ill-effect of running an auxiliary fan in the neighboring working places as well as the places being ventilated by the auxiliary fan. The survey should be carried out periodically even after the installation of the auxiliary fan, as there can be installation in gas emission and air circulation.

19. There must be orders to prescribe electricians and other categories of personnel who are authorised to handle auxiliary fans within a gassy mine.

(Cir. Gen. 5/1979)

9. Submission of application for permission/relaxations under Coal Mines Regs. 1957—Your attention is invited to DGMS (Genl.) Circular No. 4 of 1978 dated 8th May, 1978 relating to submission of applications for permissions/relaxation under various statutory provisions.

It has been observed that managements of many mines submit their applications for permission/relaxations to the concerned Dy. Director-General of Mines Safety and Director of Mines Safety without forwarding copies (with plans etc.) to this Directorate. In some cases while copies of original applications are received, copies of further correspondence relating to the case with Dy. Director-General/Director of Mines Safety are not forwarded to this Directorate.

You are requested to take necessary action in the matter to obviate unnecessary correspondence.

(Cir. Genl. 1/1982)

10. Recommendations of Mahabir Court of Inquiry—As is well known a fatal accident due to inundation took place in the underground workings of Mahabir Colliery of the Eastern Coalfields Ltd. on November 13, 1989, killing six persons. Sixty five persons were also trapped and were rescued after almost seventy five hours.

The Court of Inquiry appointed to inquire into the causes of and the circumstances attending the accident made, inter alia, the following recommendations for prevention of similar accidents in future:—

- (i) development of awareness among workers and the first line supervisors of the need for identifying hazards through intensified programmes of education and training;
- (ii) activating the institution of Safety Committee, and Workmen's Inspector so that they become relevant to the safety needs of underground coal mining;
- (iii) inculcation in the minds of workers and officials in underground coal mines the need for compliance with the provisions of the safety laws and regulations;
- (iv) provision of infrastructure (wherever required) for drilling advance boreholes to detect the presence of waterlogged workings.

Managements are requested to implement these recommendations in their mines.

(Cir. Tech. 2/1993)

11. Recommendations of Silewara Court of Inquiry—See circulars under Reg. 190 of CMR 1957.

12. Observations of New Kenda Court of Inquiry—The court of inquiry appointed under section 24 of the Mines Act, 1952 to enquire into causes and circumstances attending the accident that occurred in New Kenda Colliery of Eastern Coalfields Ltd.. on 25.1.94 causing loss of 55 lives due to fire, made the following observations :

1. Workers shall be made acquainted with the existence of escape routes/2nd outlets from work places/working districts to the surface of the mine/mine outlets. Maintenance of the escape routes should strictly be adhered to and there must be markings/signs to indicate such escape routes. Mock rehearsals shall be carried out regularly to keep them aware of the escape routes.

2. There is an immediate need for development of awareness amongst workers, supervisors and management officials for identifying hazards due to fire in underground coal mines. Intensive education and training of the miners as well as supervisory staff shall be taken up in this regard. Training modules on fire hazards shall be prepared for imparting training.

3. In belowground coalmines, efficient telephone communication shall be provided and maintained from the working districts/places to the surface. Provisions of Reg. 87(4) (b) of CMR 1957 shall be strictly complied with.

4. In all working places in belowground and all other places of fire risk such as coal stocks, spoil heaps containing carbonaceous material and exposed coal surfaces liable to heating, adequate quantity of water at sufficient pressure for the purpose of efficient fire-fighting along with other fire fighting equipments shall be provided and kept maintained as required under provisions of Reg. 120(1) (a) of CMR 1957.

5. No person should be permitted to go belowground without self-rescuer. It is mandatory as per Reg. 191D of CMR 1957. It should be strictly complied with. Measures should be taken for training and re-training of workmen in proper use of self rescuers.

Proper implementation of safety measures in accordance with these observations can bring about definite improvement in the safety standards in the mines. Suitable steps may therefore be taken early in this direction.

(Cir. Tech. 6/1999)

13. Recommendations of Gaslitand Court of Inquiry—The Court of Inquiry appointed under Section 24 of the Mines Act, 1952 to enquire into causes and circumstances attending the accident that occurred in Gaslitand Colliery of M/s. Bharat Coking Coal Limited on 27th September, 1995 causing loss of 64 lives due to inundation, made the following recommendations :

(1) Before the onset of monsoon, mines situated by the side of the river or other water sources should be inspected by the Directorate-General of Mines Safety along with the mine management.

(2) The feasibility of reclamation of opencast workings including the disused ones, near rivers and major sources of water, particularly those having connections to belowground workings either directly or through subsidence cracks and fissures may be examined to prevent inundation in such mines.

(3) Detailed precautionary measures against danger of inundation should be laid down while working beneath or in the vicinity of rivers and major surface water bodies, particularly during the rainy season. This may include framing and implementing standing orders for safe withdrawal of persons, provision of float alarm as a means of warning in case of rise in water level in the river in addition to river guards and an effective and speedy communication system which can function even independent of electricity and work in adverse conditions.

(4) The need for fore-warning the mines about possible impending heavy rains, similar to the warning of impending cyclone issued in coastal areas, may perhaps go a long way in ensuring safety of mine workers from inundation. The feasibility of linking the coalfields to the local meteorological observatories for timely dissemination of information may be examined.

(5) The possibility of stoppage of winders due to non-availability of motive force, be it steam or electricity, particularly in adverse weather conditions continue to exist in the mines. Therefore, mines which have pits as the only means of exit may require captive generators in working conditions to run the winders in case of emergency. In case of steam boilers, basic precautionary measures like keeping the boilers under proper shed, providing sufficient insulation around the boilers and the pipelines as well as attending the boilers constantly particularly in adverse weather need to be religiously followed.

(6) The need for an effective communication system over and above the signaling system between the surface and belowground which shall remain in operation even with failure of electricity and also be rugged enough to remain operative in adverse conditions has been felt strongly. Suitable system may be developed, if not already available and used in belowground mines.

(7) Interline barrier is an effective means to prevent transference of danger from one mine to another. In mines where the barriers have become ineffective due to interconnections or otherwise, the same may be restored early, even artificially, by constructing suitable dams, explosion proof stopping and other methods.

(8) All disused pits, potholes and surface subsidence existing in the vicinity of river or surface source of water and where there is a danger of inundation present, shall be sealed by reinforced concrete seals or other suitable effective means.

Proper implementation of safety measures in accordance with these recommendations can bring about definite improvement in the safety standards in the mines as far as danger of inundation is concerned.

You are requested to take suitable steps to implement the recommendations of the Court of Inquiry in the mines under your control.

[Cir. Tech. (SOMA) 1/2001]

14. Additional Recommendations of Gaslitand Court of Inquiry—The Court of enquiry appointed-under Section 24 of the Mines Act, 1952 to enquire into the causes & circumstances attending to the accident that occurred in Gaslitand Colliery of M/s Bharat Coking Coal Limited on 27.9.1995 causing loss of 64 lives made the following recommendations in addition to those circulated vide DGMS (Tech) (SOMA) Circular No. 1 of 2001 dt. 18.1.2001.

(1) *Sanctity of mine boundary*: A mine boundary should be such as to contain hazards caused due to mishap in a neighboring mine with the help of suitable vertical barriers along the boundary in all seams being worked. In cases where such barriers do not exist, neighboring mines will have to be isolated and protected with construction of suitable protective measures along the boundary in all seam workings keeping in view of nature of the hazard. There should be no horizontal transfer of property between two mines.

(2) *Embankment* : Construction of embankment is an engineering activity meant to provide protective measures against hazard of inundation from surface water. The current practice of embankment construction is limited to the geometric dimensions only. There are no guidelines regarding the foundation design, the material of construction, nature of slope facing and the procedure of construction. There is an urgent need for modification and framing guidelines concerning the above parameters for embankment construction.

(3) *River channel*: In the Jharia coalfield with a high concentration of coal seams being worked in the neighborhood and under the river channels, the later are found perched at higher levels compared to the post-mining depressed surface topography of the immediate neighborhood. In case of breach of embankments constructed to provide preventive measures against inundation, the river course finds its way to the adjacent depressed land thereby providing a large source of water supply adding to the magnitude of the problem. Such topographic changes in the surface profile need to be prevented and/or remedied by suitable corrective action.

(4) *Highest known flood level (H.F.L.)*: The height of a protective embankment is related to the HFL. The HFL on the other hand is related to the amount of water flow in the river channel during a particular year. This however presupposes the cross section of the river channel remaining undisturbed. In reality this gets disturbed due to mining activity as

well as considerable amount of silting. Thus it would be necessary to adjust the HFL according to the changed river channel cross-section.

(5) *Abandoned pits* : All pits proposed to be abandoned are to be properly secured at the collar level against hazards of inundation by surface water. Managements are requested to take suitable steps to implement the recommendation of the court of inquiry in the mines under their control.

[Cir. Tech. (SOMA) 2/2001]

15. National Safety Award Scheme for mines—This is to inform you that Government of India in the Ministry of Labour & Rehabilitation, have instituted National Safety Awards (Mines) to be given in recognition of good safety performance on the part of mines covered under the Mines Act 1952. Details of the scheme are given in the Appendix.

The scheme will commence from 1982 as the contest year with 1983 as Award year.

(Cir. Genl. 2 & 4/1983)

APPENDIX

National Safety Awards (Mines) Scheme

1.0 Introductory—In the field of accident prevention in mines, it is essential to motivate and sustain the interest of management, mine officials, supervisors and workmen and any notable performance in this respect needs to be duly recognised at the national level. The Government of India have accordingly instituted National Safety Awards (Mines) to be given in recognition of good safety performance on the part of mines covered under the Mines Act 1952.

2.0 Scope—The scheme is applicable to all mines which come under the purview of the Mines Act, 1952 and that worked a minimum number of mandays specified for different groups of mines during the contest year.

The mines are placed in 11 groups for this purpose as mentioned below :

- Group (1) Coal mines with primarily underground workings that worked five lakh mandays or more in the contest year.
- Group (2) Coal mines with primarily underground workings that worked less than five lakh mandays subject to a minimum of two and half lakh mandays in the contest year.
- Group (3) Coal mines with primarily underground workings that worked less than two and half lakh mandays in the contest year.
- Group (4) Coal and non-coal mines with primarily mechanised opencast workings using heavy earth moving machinery with deep hole blasting that worked five lakh mandays or more in the contest year.
- Group (5) Coal and non-coal mines with primarily mechanised opencast workings using heavy earth moving machinery with deep hole blasting that worked less than five lakh mandays subject to a minimum of two and a half lakh mandays in the contest year.
- Group (6) Coal and non-coal mines with primarily mechanised opencast workings using heavy earth moving machinery with deep hole blasting that worked less than two and half lakh mandays in the contest year.
- Group (7) Coal and non-coal mines with primarily manual workings that worked two and half lakh mandays or more in the contest year.

- Group (8) Coal and non-coal mines with primarily manual workings that worked less than two and half lakh mandays subject to a minimum of one lakh mandays in the contest year.
- Group (9) Non-coal mines with primarily underground workings at a depth of 1000 metres or more that worked two and half lakh mandays or more in the contest year.
- Group (10) Non-coal mines with primarily underground workings at depth of less than 1000 metres that worked two and half lakh mandays or more in the contest year.
- Group (11) All oil mines.
- Note : (i) A mine is considered as having primarily underground workings if the output of underground workings during the contest year is 50% or more of the total output.
- (ii) A mine is considered as having primarily mechanised opencast workings using heavy earth moving machinery with deep hole blasting, if the output of the mechanised faces is 50% or more of the total output from opencast workings and output of the opencast workings is 50% or more of the total output,
- Other mines are considered as primarily manual opencast mines.

3.0 Categories of award

3.1 **Lowest average injury frequency rate** in the contest year.

3.2 **Longest accident free period**, subject to a specified minimum number of mandays worked without a fatal or serious accident in the contest year.

3.3 **Largest percentage reduction in the injury frequency rate** during the last two calendar years compared with the contest year. In working out the percentage reduction, disasters involving 10 deaths or more or where Court of Inquiry has been set up will not be included.

Note : Average injury frequency rate is determined as follows. The total number of persons seriously injured per one lakh mandays multiplied by three. In case several mines achieve the same lowest injury rate, the mine that worked the largest number of mandays in the contest year will be declared as winner.

4.0 Award year and Contest year

The current and preceding calendar years are called Award Year and Contest Year respectively.

5.0 Period

The awards will be given every year.

6.0 Prizes

In respect of Groups 1 to 8 there will be prizes (Winner & Runner) in each of the three categories of awards.

In respect of Groups 9, 10 & 11 there will be two prizes (Winner & Runner) in category 3.2 i.e., 'longest accident free period'.

Each winner will be presented a shield and a certificate of merit. Each runner will be presented a cup and a certificate of merit.

The managers of mines winning prize will be awarded medals.

Special commendation certificate may be granted to mines who do not qualify for award of a prize but whose performance is otherwise considered of meritorious nature.

7.0 Application for awards

Applications are to be sent by the mine managements in the prescribed form which may be obtained from the Directorate. Completed applications should reach the Secretary, National Safety Awards (Mines Committee, Directorate-General of Mines Safety, Dhanbad-826 001) not later than the closing date.

7.1 Entry fee

Every application for award under the scheme shall be accompanied by crossed postal order of the value of Rs. 15/- (Rupees fifteen) only and endorsed to the Secretary, National Safety Awards (mines) Committee payable at post office Dhanbad-826 001. Entry fee will not be refunded.

8.0 Awards Committee

The Ministry of Labour & Rehabilitation shall constitute an Awards Committee under the Chairmanship of Director-General of Mines Safety, which shall consist of not less than five members representing mining companies, workers organisations and persons selected solely on the basis of their technical ability and experience.

8.1 Decision of the Awards Committee

Any decision of the Awards Committee, in respect of the prizes shall be subject to approval of the Central Government, Ministry of Labour & Rehabilitation whose decision shall be final.

8.2 Functions of the Awards Committee

1. To scrutinize and adjudge applications received for awards.
2. To require further particulars or to defer consideration of applications for further investigation.
3. To depute any person to inspect the records of any contestant for the purpose of considering applications received.
4. The Committee may reduce the number of awards or decide not to make an award to any mine in the group(s) for any reason it may consider fit.

9.0 Commencement of the scheme

The scheme will commence from 1983 as the Contest Year, with the Award Year, 1984.

16. Winding up of N.C.S.M.—National Council for Safety in Mines, Dhanbad, an autonomous body under Ministry of Labour, has been wound up w.e.f. 15.5.1991.

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RECOMMENDATIONS OF THE FIRST CONFERENCE ON SAFETY IN MINES

Held in Calcutta on 5th-6th August, 1958

A. General

1. The manager should be given a reasonably free hand in managing the mine. All instructions regarding technical matters (even by an Owner or Agent) should be routed through the manager.
2. To enable the manager to devote more attention to safety matters, the non-technical obligations relating to building of canteens, creches, pithead baths, etc. and of payment of bonus, provident fund, etc. should be removed from the person of the manager and shared between the owner/agent, welfare/personnel officer etc.
3. Definition of 'agent' in the Mines Act should be amended to include every person (other than the owner) who takes part or has an effective say in the technical management of the mine, such as the Chief Mining Engineer, Chief Engineer etc.
4. In all large mines a suitably qualified person should be employed as Safety Officer.
5. Only experienced persons should be appointed as managers of large and/or gassy mines.
6. All large mines should employ separate senior supervisory staff to look after each of the more important safety aspects, such as, ventilation, stowing, shotfiring, machinery-maintenance, etc.
7. To improve the standard of track laying, all tracks in the mine should be placed under the charge of a suitably qualified official.
8. The standard of supervision on the afternoon and night shifts should be improved.
9. The precautions relating to the use of electricity in mines should be incorporated in the Mines Regulations.
10. The Regulations should be more specific about the standards of ventilation.
11. There is need for better standard of lighting in mines. The use of flame safety lamps and 'mug-batti's' for lighting purposes should be gradually stopped.

B. Danger of inundation

1. The standard of survey should be improved. A Senior Surveyor's Certificate should be instituted. All correlation surveys, surveys of mines before abandonment and check-surveys of all underground workings once in every 5 years, should be carried out by such surveyors.
2. Standards of accuracy of plans of different types may be prescribed.
3. A Water Danger Plan should be prepared in respect of all underground workings showing all reservoirs of water lying within 60m of any workings.
4. Construction of water-dams should be carried out under the direction of a suitably qualified senior member of supervisory staff.

C. The problem of inflammable gas in deep coal mines

1. There is need for greater awareness of the dangers of inflammable gas.
2. Greater attention should be paid to advance planning of ventilation from the very inception of a project.
3. All gassy mines should have reliable gas-detectors and methanometers.
4. In every gassy mine not less than 10% of the total workmen should be trained in gas-testing. Only lamps designed for gas-testing should be used for the purpose.

D. The problem of coal dust

I. The vastness of the problem of coal dust does not appear to be generally realised. The organization for clearing of coal dust and of treating with incombustible dust at most mines leaves much to be desired.

2. Where the rate of deposition of coal dust is high, greater resort should be had to the consolidation of road-dust and to watering.

E. *Need for research work*

There is need for research work on the following subject areas—

1. Methods of work for thick seams.
2. Methods of properly ventilating the headings in bord and pillar workings.
3. Fire damp drainage and the causes of outbursts of gas.
4. Methods of suppression of dust, of roadway treatment and on the efficacy of different methods of watering.
5. Explosibility of dusts of various coal seams in India.
6. Effectiveness of Stone-dust barriers.
7. Problem of controlling strata stresses at greater depths.

F. *Education and training*

1. Immediate steps should be taken to train all new entrants to mining. The scheme may start with gassy mines and should gradually be extended to cover all mine workers.
2. Accident prevention courses for all workers should be arranged at periodic intervals.
3. The provision of training facilities for mining supervisory staff should be expedited. Special attention should be paid to the training of mine surveyors.
4. One year specialisation courses for qualified engineers for employment in mines should be instituted.
5. A scheme of directed practical training for mining engineers should be evolved.
6. A properly equipped Mechanisation Training Centre should be opened for training machine-operators and maintenance-men.
7. Arrangements should be made for holding of refresher courses for older officials, technicians, etc. Training on the principles of TWI should be included in every curriculum of training of officials, technicians, etc.

G. *Safety competitions, etc.*

1. Safety weeks should be held occasionally in the whole industry. Safety campaigns, aimed at reducing accidents of a particular type or during a particular period, may also be useful.
2. Suitable safety awards for good safety records may be instituted by a Governmental agency amongst (i) large companies, (ii) individual mines, (iii) individual miners.
3. Large mines or groups of mines should institute a system of awarding safety prizes to district officials and individuals for low-accident performance.

H. *Role of workmen*

1. Workmen and their representatives should cooperate with the management in ensuring effective compliance with safety measures and precautions.
2. Workmen should have the right to get the mines inspected by their chosen representatives. Such representatives should be specifically excluded from dealing with matters relating to wages, wage-rates, labour disputes, etc.
3. At every large mine, a Safety Committee should be set up to discuss matters relating to safety. The Committee should be precluded from dealing with matters relating to wages, wage-rates, labour disputes, etc. The Committee may discuss the reports of inspection of workmen's representatives and also the violation letters received by the management from the Mines Department.
4. A copy of every violation letter received from the Mines Department should be posted on a special notice board.

I. Recruitment, fitness, hours of work, etc.

1. Attempt should be made to build a stabilised and permanent labour force.

Recruitment through labour contractors should be abolished.

2. Provision of housing for mine-workers should be given top priority.

3. All entrants to mining should be subjected to a physical test. All mine workers should also be medically examined at periodic intervals.

4. Where heat and humidity is above a specified level, the duration of a shift should be reduced.

5. An investigation into the fatigue factor by systematic time studies of different categories of workers in different types of mines is necessary.

J. Health hazards, compensation for accidents and diseases

1. A medical inspectorate should be set up within the Mines Department to undertake regular industrial hygiene surveys in mining areas.

2. There is a case for increasing the rates of compensation for accidents.

3. The miners' industrial diseases notifiable under the Mines Act should be compensable.

K. Safety equipment and materials

1. Steps should be taken for the manufacture of essential safety materials like fire-proof brattice cloth, incombustible dust, etc. within the country.

2. A standing committee should be set up to assess the industry's requirements of safety equipment and to promote the manufacture of such equipment in India.

3. Statistical studies should be made to find out if there is need for any protective equipment other than hats and shoes.

L. Enforcement of safety laws

1. Inspections should not be carried out to the point at which inspector's responsibility begins to be substituted for the statutory responsibility of the owner.

For the time being, the frequency of inspections may be based on the following general principles—

(a) Two general inspections every year of all mines.

(b) In all large mines, special inspections to be made with reference to a particular object in view, e.g. general supervision, ventilation, coal dust, support in depillaring areas, etc.

(c) Mines where conditions appear to be generally unsatisfactory or the standard of management inferior, should be placed under frequent inspection until the mine has been brought up to a certain standard.

(d) A number of surprise inspections should be made on the afternoon and night shifts.

2. The strength of the Mines Department should be increased to enable it to discharge its functions properly.

RECOMMENDATIONS OF THE SECOND CONFERENCE ON SAFETY IN MINES

Held in Calcutta on 9th-10th July, 1966

1. There is a need to ensure close cooperation and coordination between the Central Government and the State Governments in respect of all matters connected with the exploitation and conservation of minerals and safety of residents in mining areas. A suitable coordinating committee should be set up to ensure this.
2. The Conference was informed that on the recommendations of the Dhori Court of Inquiry and suggestions made by the Safety Experts from the U.K. and the ILO, the Chief Inspector of Mines had either already taken or proposed to take action in regard to the following—
 - (a) provision of safety lamps
 - (b) Conducting of surveys by managements to check the presence of gas
 - (c) Ventilation standards
 - (d) Installation of mechanical ventilators
 - (e) Clearance of coal dust.
3. All possible steps should be taken to ensure that the attendance registers are properly maintained.
4. The Standing Safety Committee should review the position concerning implementation of safety standards from time to time and make suitable recommendations for improvement.
5. Research should play a more positive role in safety matters.
6. Adequate foreign exchange should be made available for importing such essential safety equipment as are not manufactured indigenously.
7. A small committee should be set up to explore the possibility of manufacturing further items of safety equipment within the country.
8. Workers do not report cases of pneumoconiosis to the medical authorities for fear of being declared unfit and losing their jobs. A suitable rehabilitation scheme needs to be formulated and implemented for this category of workers. Doctors should be adequately trained for proper diagnosis of this disease.
9. On the question of rehabilitation and re-employment of other disabled mine workers, it was agreed that a training institute for these persons should be set up to develop in them skills for suitable re-employment.
10. Better coordination between the industry and the Employment Exchanges should be ensured so that workers retrenched on account of redundancy in any mine are given preference for absorption in new mines.
11. The Mines Act and the Regulations should be translated into simple Hindi and other regional languages so that workers can understand them easily.
12. The problems arising out of police inquiries into mining accidents should be pursued with the State Governments.
13. More rescue stations, equipped adequately, should be opened at suitable places to cover the mining areas.
14. All mines should have a 'Suggestions Scheme' whereby mine workers who make suggestions for improving efficiency and safety in the mine can be suitably rewarded.

RECOMMENDATIONS OF THE THIRD CONFERENCE ON SAFETY IN MINES

Held in Calcutta on 14th-15th July, 1973

1. Suitable legislation should be made for safety and rehabilitation of persons residing on surface of e.g. workings which are unsafe, or likely to become unsafe.
2. There should be a suitable legislation prohibiting/regulating new constructions in mining areas.
3. The activities of the National Council for Safety in Mines should be expanded by providing additional funds for its proper functioning.
4. Any person who is rendered medically unfit as a result of an occupational disease or mining accident should be treated at the cost of the management with full pay and if found unsuitable for the present job, the management should provide him with a suitable alternative job.
If permanent disability exceeds 50%, management may be given option of either retaining him in employment without loss in wages or retrenching him from service paying him retrenchment compensation plus disablement.
5. In the changed character of the mining industry with the recent nationalisation of all coal mines, the role and functions of the DGMS need to be redefined, its responsibilities more precisely stated and its cadre strengthened with persons of the required calibre and experience.
6. Violations detected in inspections by DGMS officers be pointed out on the spot and entered in a register kept at the mine. A copy to be displayed on noticeboard.
7. A separate set of regulations for opencast mines may be drafted.
8. Vocational training to workers should be imparted during the working hours.
9. Raising contract system in relation to mines should be abolished.
10. Occupational Health Service at Company level should be established as early as possible.
11. Workmen's Compensation Act should be amended to (a) further increase the rates of compensation, (b) bring all industrial employees, irrespective of their income, within the scope of the Act.
12. Identity cards should be issued to all mine workers.
13. The recommendations of the Jeetpur Court of Inquiry should be examined and implemented at an early date.

RECOMMENDATIONS OF THE FOURTH CONFERENCE ON SAFETY IN MINES

Held in Calcutta on 24th December, 1978

This conference was held in the normal course and not immediately after a big disaster as was the case with the previous three conferences which were held respectively after the Chinakuri, Dhori and Jeetpur explosions. This was appreciated by the members but they felt that the agenda was too heavy for one day programme, and some of the important members left the conference in protest. The other members then discussed in a general way the following suggestions of the Polish and I.L.O. experts :

- (i) The statute should be made rigorous with a view to achieving higher standards of safety.

- (ii) Mine managements should develop their own Internal Safety Organisation which should be placed directly under the charge of the Managing Director.
- (iii) New strategies should be planned to achieve the goal of reaching Zero Accident Potential (ZAP).
- (iv) A Training College should be developed to train up surveyors, engineers, ventilation officers, safety officers etc.

RECOMMENDATIONS OF FIFTH CONFERENCE ON SAFETY IN MINES

Held in New Delhi on 26th-27th December, 1980

1. Defining the Safety Policy of Mining Companies

1.1 It is unanimously accepted that every company whether in the public or private sector should have well defined policy in the field of safety and health of its employees. The policy could be laid down in the form of a resolution at the company's Board meeting. In defining such a policy the Company should spell out, among other things, the following—

(i) Objectives:

- (ii) Funds and facilities to achieve the objectives;
- (iii) The set-up for the execution of the policy at different levels, the duties and the responsibilities at each level and for close monitoring of execution;
- (iv) Arrangement for publishing the above among the different segments of mining personnel, workers, their representatives and the concerned Government departments;
- (iv) Any other matter that may arise during the execution of the policy.

1.2 An in-depth, mine wise and cause wise analysis of all fatal and serious accidents that have occurred at every mine of each mining company during the last three years shall be made by the ISO (Internal Safety Organisation) of the Company. (A copy of the analysis made should be submitted).

1.3 On the basis of the said analysis, the Board of Directors should every year, draw up a programme of Safety Campaigns at selected mines to eliminate avoidable accidents.

1.4 Effective publicity would be given to the proposed 'Safety Campaigns' and the details thereof would be finalised in consultation with workers and their representatives. The duties and responsibilities of workmen, supervisors and management officials would be spelt out and every member made aware of the role to be played by him, either alone or in groups.

1.5 The impact of such Safety Campaigns should be continuously monitored by the ISO and reported to the Board of Directors at intervals not exceeding three months. This would enable the Board to issue fresh guidelines in the matter.

1.6 Every year Company would bring out a report detailing the 'Safety campaigns launched and the results achieved. These reports would be presented before the Tripartite Committee. The first report should become available by 31.12.1981.

1.7 To prevent accidents due to failure of equipment each mining company should have a well equipped quality control cell which should not only ensure the purchase/procurement of good quality equipment/apparatus but should also monitor the performance of the same in actual use. These cells should also lay down schedules for the proper maintenance and operation of such equipment/apparatus. Periodical testing of the equipment/apparatus should also be the

responsibility of these cells, which should maintain effective liaison with the DGMS, CMRS and other Institutions. Such Internal Quality Control Cells should be set up before the end of 1981.

2. Adoption of Improved Technology

2.1 All Degree III gassy mines should have a comprehensive network of environmental monitoring system including monitoring within next two years.

2.2 (a) Tele-communication system should be introduced in a phased manner in belowground mines in the next five years, giving priority according to distance, mechanisation, degree of gassiness and problems of fire. Telecommunication should also be provided in all mechanised opencast mines in the next two years.

2.2 (b) Surface communication systems should be improved expeditiously.

2.3 (a) R&D Board of Coal India should be re-activated. R&D capabilities should be provided in each mining company in collaboration with CMRS.

2.3 (b) Cells for quality control for mines safety equipment and materials should also be set up and fully developed.

2.4 For proper development and growth of new technology, specialist cells should be set up in each Mining Company and in DGMS for Ventilation, Environment, Mechanisation and Dust Control, in addition to Strata Control unit.

3. Training & Re-training of workmen

3.1 V.T. Programme to be recast and made more comprehensive so that the future mining community is self-reliant and professionally competent to do all face operations including those required for safety. Specialised training courses should also be arranged for the development of skilled operation required for heavy earth moving equipment, longwall face equipment etc.

3.2 Adequate infrastructure should be provided at the company and area levels and efforts should be made to attract talented persons having aptitude to run the training programmes.

3.3 Training in Vocational Training Centres should be oriented towards how to do the job rather than being shown how the job should not be done.

3.4 There should be sectoral budget for training.

3.5 Central Training College/Institute should be established for training Instructors and development of special cadres of mine surveyors and mine overmen/ foremen.

3.6 Each mining company should formulate a comprehensive five year scheme for training of all supervisory staff and workers within six months. The training scheme should be implemented thereafter with the help of Central and State Government and other agencies.

3.7 Based on the requirement of trained manpower for future development of mining industry training programmes should be launched. A Tripartite Committee should be set up to advise on the modalities and infrastructure for such training.

4. Internal Safety Organisation

4.1 The Internal Safety Organisation (ISO) should be independent of the production line at all levels.

4.2 The Chief of ISO should be a senior officer next in rank only to the Director (Tech.) if any or MD/ the Chief Executive.

4.3 The ISO should be a multidisciplinary team and the field setup should start above the level of mine. The Safety Officer at the mine level being a specialist staff officer to the Mine Manager should not be deemed to be part of the ISO.

4.4 In order that the Internal Safety Organisation is able to play an effective role, detailed guidelines for their functioning may be laid down covering, inter-alia, the following :

- (i) Formulation of safety policy at the corporate level;
- (ii) Effective monitoring of the state of implementation of the policy directives on safety;
- (iii) Periodic inspection of mines for assessing status of safety;
- (iv) Enquiry into all accidents and dangerous occurrences;
- (v) Actively associated in opening new districts and in obtaining permissions, relaxations and exemptions under the statute;
- (vi) The findings of ISO should be placed before the Pit Safety Committee for discussions and dissemination.

5. *Workers' participation in Safety Management*

5.1 The Institution of Pit Safety Committees being a fine example of a cooperative effort on the part of all concerned on mines safety at the unit level, there should be recognition of the same. Participation by officials of higher management in the deliberations of the committee would ensure positive encouragement, the performance should be periodically reviewed at a level higher than the local management level.

5.2 For effective liaison, the Workmen's Inspector should be an ex-officio member of the Pit Safety Committee.

6. *Prevention of roof/side fall accidents*

6.1 While adopting the policy that with effect from 1.7.82 no worker shall be permitted to work under unsupported roof that has been freshly exposed, each Company should plan and phase out the above programme in three phases of six months each. For this purpose, suitable support systems shall be selected and provided.

6.2 Strata control unit should be set up in Mining Companies and the DGMS within one year.

6.3 In order to expose as few workers as possible under freshly exposed roof, multiple-skills would be developed in consultation with Trade Unions.

7. *Health & Prevention of Fatigue*

7.1 Immediate steps shall be taken by the mining companies to establish the required infrastructure for implementing the provisions relating to initial and periodical medical examination of mine workers.

7.2 There should be suitable machinery both in the industry and in the DGMS to carry out regular surveys on dust evaluation and evaluating dust control techniques.

7.3 In mines, supply of drinking water and adequate ventilation at working places should be ensured.

7.4 In mines where long or arduous travel is involved arrangement for transport of men should be made.

7.5 Recognising the adverse effect on health of employees while working over-time, employment of persons beyond their hours of normal duties should be minimised.

7.6 Each Mining Company should launch suitable programme for improvement of working environment and living conditions and maintenance of ecological balance, affected by air and water pollution, noise and despoliation.

8. *Accuracy of Mine Plans*

8.1 Mining Companies should make a realistic appraisal of the survey and supporting personnel required to fulfill statutory and other obligations within a period of 3 months and take immediate action to make good the shortfall during the course of next 3 years. For this purpose the Mining Companies should recruit survey apprentices and take immediate steps for training of mine surveyors either by opening specialised courses in the existing institutions or entering into collaboration with Polytechnics or Training Institutions under Survey of India etc. for meeting the present and future demand.

Mining Companies should also take steps to attract and retain qualified and competent Surveyors by formulating a suitable Survey Cadre Scheme.

8.2 Basic requirements to carry out efficient survey work and preparation of plans in terms of equipment, material and accommodation be ensured within a period of one year.

8.3 Existing survey personnel, both in the industry and DGMS, should be given refresher training and exposed to modern survey instruments and techniques.

8.4 The work of correlation of Mine plans and linking them up to the National Grid to the required standards of accuracy should be expedited and completed within a period of one year.

9. Re-organisation of Mines Rescue Service

10. *Role and Function of D.G.M.S.*

1. While carrying out its traditional role and functions including setting standards on safety, the DGMS should reassign priorities in organised sector giving greater emphasis on system examination and prevention of major accidents. Granting permissions should likewise be broad based rather than piecemeal.

2. The inspection policy should be based on :

- (a) Enquiry into all fatal and immediate serious accidents and important dangerous occurrences;
- (b) Two general inspections of all mines every year;
- (c) Follow up inspections, where necessary;
- (d) Inspections required to deal with applications for permissions, relaxations, exemptions and complaints.
- (e) Inspections required for promotional and developmental work.
- (f) Undertake special investigations, such as strata control, ventilation, slope stability, mining electronics etc.

For complying with the above norms it would be essential to provide necessary inputs.

3. A high-power Committee comprising representatives of Ministries of Finance and Labour, Department of Personnel and the DGMS may be constituted to examine and recommend the size and structure of DGMS organisation taking into account the present and anticipated size of and technological developments in the mineral industry in the country, the associated safety problems and the norms of inspection/enquiries and other statutory and non-statutory work

expected of the Organisation. The Committee might also suggest steps to be taken to attract qualified and competent officers to DGMS. The Trade Unions will place their views before the high-power committee.

Since compliance with recommendation 3 above will take some time, as an immediate measure the service and work conditions (Pay scales, allowances, transport facilities etc.) of the employees of DGMS should be improved.

Technical expertise in the DGMS shall be kept up-to-date by exposing the officers to the advanced technology in other countries and allowing them to participate in National and International Seminars.

RECOMMENDATION OF THE SIXTH CONFERENCE ON SAFETY IN MINES

Held in New Delhi on 13th & 14th January 1986

1.0 The recommendations made by the earlier conference on Safety in Mines should be fully implemented within a period of one year.

Item 2.1 : Accidents due to falls of roof and sides :

2.1.1 (i) Manager of every underground mine should formulate 'Support Plan' for support of roof, sides, back and hang wall in consultation with strata control cell where set up, CMPDIL/any technical or research institution, ISO and Safety Committee. The 'Support Plan' should be in respect of the following :

- (a) workings within 9 metres of working faces,
- (b) along tramming levels and specially at loading points,
- (c) along haulage roadways and specially at junctions,
- (d) at any other place(s) in the mine identified for support under Regulation 108 of the Coal Mines Regulations, 1957, and Regulation 112 of the Metalliferous Mines Regulations 1961.

Local geological conditions, physico-mechanical properties of strata, method of work including mechanisation and past experience etc. may be taken into account while formulating such plan. For non-coal mines, nature of strata which in many cases is massive, may be taken into consideration.

The plan should include :

- (a) type of supports e.g. safari supports, roof bolts, friction props, rigid props or hydraulic props etc.
- (b) Duties and responsibilities of Timbermen, Dressers, Sirdars/Mates, Overmen/foremen, Assistant Managers/Managers and Agents towards supply of material, erection and withdrawal of supports, inspection thereof and ensuring effectiveness of supports.

The 'Support Plan' should be submitted to DGMS for approval. In case there is delay in formulation of such plan due to involvement of various agencies, interim plan should be prepared and submitted immediately. Pending approval, the plan should be implemented.

2.1.1 (ii) No person should be employed at any place which is not supported in accordance with approved 'Support Plan'

2.1.2 ISO should investigate each and every major incidence of roof and side fall even if it does not involve any casualty. Preventive steps against such falls in future may be taken on the basis of those investigations.

2.1.3 Sufficient number of timber men and dressers should be appointed taking into consideration absenteeism and leave within a period of 6 months.

2.1.4 Intensive practical training and re-training should be given to the persons engaged in support work such as timber men and dressers etc. by experienced and qualified persons. This should be supplemented by organising workshops and at mine level at quarterly intervals preferably by NCSM.

2.1.5 No blasting in coal off-the-solid should be done except with proper type of delay action detonators and proper explosives.

Item 2.2 : Accidents due to dumpers and trucks in opencast mine.

2.2.1 Adequate care should be exercised in selection and training of operators/drivers of dumpers and trucks and any other heavy earth-moving machinery.

2.2.2 Adequate number of dumper operators and drivers of trucks and HEMM and also pitmen & dumpmen should be appointed keeping in view factors like absenteeism and leave etc. Work on overtime should be abolished.

2.2.3 Effective steps should be taken to prevent riding of dumpers and trucks by unauthorised persons. Further, adequate arrangements should be made for transport of machinery maintenance staff.

2.2.4 Dumpers, trucks and heavy earth moving machinery within mine premises should be equipped with auto-visual alarm within a period at 2 years to facilitate safe reversal.

2.2.5 Transport and loading operations, including those by contractors should be supervised by competent persons. When contractors are appointed for transport of mineral, examination of vehicles should be done by the mine management.

2.3 : Accident due to fire in Oil Mines

2.3.1 Mine managements should examine and review all installations vis-a-vis the safe distance to be maintained and work out a time-bound action plan within one year for rectification along with safety precautions to be taken in the interim period to minimise danger.

2.3.2 All fixed I.C. engines should be fitted with flame arresters and air intake shut-off valve with remote control within one year.

2.3.3 Contingency plan for fire should be framed on priority basis. While doing so, due note of the possible size and duration of fire that may develop should be considered in framing the plan.

2.3.4 A study should be undertaken to determine the causes of fire that occurred in the last five years and the remedial measures to be taken within a period of one year.

Item 2.4 : The Mine Environment with special reference to Air Borne dust and health of mine workers.

Mine Environment—Ventilation

2.4.1 Every effort should be made by mine managements to achieve the stipulated national standards with respect to mine environment in each mine. For this purpose a ventilation scheme/plan should be submitted to DGMS. No worker should be deployed at any place where environment standards are not met with.

2.4.2 Necessary facilities for monitoring the environmental parameters should be provided at mines. Facilities of continuous type monitoring should be installed within 3 years in all degree III gassy coal mines and in such other mines having active underground fire or mines having serious problems of heat as identified by mutual discussions between mine management and the DGMS.

2.4.3 Before adopting any new technology, the adverse effect if any, of the same on the environmental parameters in mines and on the health of workers employed therein should be studied by multi-disciplinary team to assess its adoptability to local conditions.

Air borne Dust

2.4.4 An Expert Group consisting of a member each from mines management, research establishment/BGML/CMPDIL and workers' representative having technical knowledge should be constituted by DGMS for laying down guidelines for conducting air borne dust surveys for different types of dust, specifying class of working and periodicity of conducting such surveys for the sake of uniformity and comparison.

2.4.5 Air Borne dust surveys should be carried out on a regular basis so as to conduct/complete the survey in each mine as recommended by the Expert Group. The Management should take suitable and necessary steps to control air borne dust in addition to quantitative surveys. Special attention should be paid to assess the chemical composition of air borne dust to ascertain its effect on the type of diseases caused by the dust.

Periodical Medical Examination of workers

2.4.6 Initial medical examination of all workers employed in underground mines should be completed in next three years. Thereafter, periodical medical examination of such workers should be done at least once in 5 years.

2.4.7 Initial medical examination of all workers employed on surface and engaged in drilling, loading and at crushing and screening plants should be completed in next three years. Thereafter, the periodical medical examination of all such workers should be done at least once in 5 years.

2.4.8 In order to complete the medical examination of all entitled workers, the management should create suitable infrastructural facilities to meet the target.

2.4.9 Categories of persons employed in oil mines requiring periodical medical examination should be identified by consultations between the management of Oil mines and DGMS.

2.4.10 DGMS should arrange to get notification issued for implementation of the above recommendations.

Item 2.5 : Accuracy of Mine Plans

2.5.1 Mining companies should expeditiously implement in full recommendations of 5th Conference on Safety in Mines regarding preparation and maintenance of mine plans, induction of qualified surveyors in sufficient numbers etc.

2.5.2 Mining companies should evolve a suitable cadre structure for mine surveyors in order to attract and retain competent and qualified persons in survey discipline.

2.5.3 It is accepted that preparation of fresh plans after connecting mines to National Grid involves work which is not only huge in quantum but complex in nature. Surveyors posted at mines would not be in a position to carry out such surveys independently. A team of qualified surveyors should be appointed at area level (as existing in CIL) which could undertake such surveys in association with mine surveyors. Such a team should also conduct and carry out regular check surveys in order to check the accuracy of mine plans at various mines.

2.5.4 Mine managements should avail themselves of various specialist facilities provided at different institutions for upgradation of skill of mine surveyors. Suitable evaluation systems tests should be conducted at the end of both short term (3-6 months) and long term courses (6-12 months) provided at such institutions for the grant of suitable certificates to the participants.

Item 2.6 Development of Human Resources for prevention of Accidents

2.6.1 Every worker should undergo appropriate training whenever there is change in his nature of job.

2.6.2 Every worker involved in an accident should undergo special and appropriate training before he is re-assigned to work in the mine.

2.6.3 The existing training facilities and programmes should be made more comprehensive, useful and result oriented.

2.6.4 Suitable organisation for training of Workmen's Inspectors and members of Pit Safety Committee should be created. Such an organisation should frame and conduct suitable and

appropriate training programmes in order to help them to discharge their responsibilities in a proper manner.

2.6.5 Mining Companies should clearly identify the need for training of supervisors working in mines. Mine managements should preferably make use of the services and expertise developed in this regard by NCSM to supplement their own efforts in order to achieve the desired results in next few years.

RECOMMENDATION OF THE SEVENTH CONFERENCE ON SAFETY IN MINES

2.1 (a) Each company should frame suitable 'Code of Traffic Rules' for regulating the movement of Heavy Earth Moving Machinery (commensurate with the capacity/size' type of machines used in the mechanised opencast mine) for enforcement in each mine. Such Code of Traffic Rules should be approved by Tri-partite Committee.

(b) The Code of Traffic Rules should be deliberated, framed and approved within a period of 6 months. The Code of Traffic Rules should be enforced in each company within a period of 12 months.

(Action : Coal Metalliferous Mining Cos.)

2.2 (a) Each company operating mechanised mines should frame suitable 'Code of Practice' for the prevention of injuries to persons engaged in tipping on stock piles, dumping of overburden at dump yards, at loading points etc. Such 'Code of Practice' should be approved by Tripartite Committee.

(b) The 'Code of Practice' should be deliberated, framed and approved within a period of 6 months. The code should be enforced in each mine within a period of 12 months.

(Action : Coal & Metalliferous Mining Cos.)

2.3 The design and maintenance of haul roads in mechanised opencast mines should be laid down by each company in respect of each mechanised opencast mine. If required, the company may consult/interact with DGMS in this regard.

(Action : Coal & Metalliferous Mining Cos.)

2.4 (a) Each company should ensure that for every mine a scheme is drawn and implemented for proper maintenance, repair, overhaul and erection in respect of heavy earth moving machinery. This scheme should cover places such as repair sheds and workshops. Necessary help, if required, should be obtained from the manufacturers of Heavy Earth Moving Machinery (HEMM).

(b) Adequate attention should be given towards proper layout of repair sheds and workshops so as to ensure due protection to work persons deployed at those places from the movement of heavy earth moving machinery therein.

(Action : Coal & Metalliferous Mining Cos.)

2.5 The operator's cabin of heavy earth moving machinery should be well designed and substantially built so as to ensure adequate protection to the operator against heat, dust, noise etc. and at the same time provide adequate safety to the operator in the event of overturning of heavy earth moving machinery. A seat-belt for the safety of the operator should also be provided.

(Action : Coal & Metalliferous Mining Cos.)

2.6 (a) Operator/driver of each HEMM should be selected from amongst persons possessing requisite qualifications. The selection process should comprise a test to check driving/operating skill, aptitude, health and oral examination of the candidate by a competent selection committee.

(b) All operators of HEMM should undergo regular checks to test their driving/operating skill, knowledge and health once in every five years, be opened in each company to provide comprehensive training so that only duly qualified and trained operators are always available commensurate with the present and future needs of the mechanised mines.

(c) Suitable training institute/training centre.

(Action : Coal & Metalliferous Mining Cos.)

2.7 A separate format for writing statutory reports by shot fires/blasters, mining sirdars/mates and overmen/foremen employed at opencast mines should be prepared and circulated early.

(Action : DGMS)

2.8 A format for writing report of inspection of dragline wire ropes should be introduced early.

2.9 A code of practice shall be drawn up for dealing with fires at different locations in opencast mines, including HEMM. Arrangements for fighting fire should be provided on all heavy earth moving machineries. Such arrangements should, if possible, operate automatically on appearance of fire.

(Action Coal & Metalliferous Mining Cos.)

2.10 Efficient lighting arrangements not below the standards prescribed in the statute shall be provided and maintained at different locations in opencast mines.

(Action : Coal & Metalliferous Mining Cos.)

2.11 Structural stability of HEMM should be examined periodically by an independent team of experts. Such an examination may invariably be made after every major repair to HEMM.

(Action : Coal Metalliferous Mining Cos.)

Recommendation on Occupational Health Services —See p. 646 Recommendations on Traffic Rules and Procedures —See p. 259 Recommendations on Code of Practice for tipping on stockpiles and dumping of OB — See p. 262.

RECOMMENDATIONS OF THE EIGHTH CONFERENCE ON SAFETY IN MINES

Held on 14th & 15th May, 1993

1.0 Review of Status of implementation of recommendations of seventh conference on safety in mines.

The committee decided to carry forward the following recommendations of the Seventh Conference on Safety in Mines.

1.1 Necessary facilities for monitoring the environmental parameters in respect of Methane & Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy coal mines and in such other mines having active underground fire. Indigenous manufacturers should be encouraged to manufacture necessary equipments.

1.2 To meet the requirement of qualified surveyors in mines, mining companies should expeditiously induct apprentices in sufficient number commensurate with the requirements & additional requirements.

1.3 Though mining companies have evolved suitable cadre structure for mine surveyors in order to attract and retain competent and qualified persons in survey discipline but the same has not yet been implemented. It should be implemented early.

1.4 Preparation of plans after connecting with National Grid by special teams shall be expedited and this work shall be completed by December, 1995.

1.5 In mines where long or arduous travel is involved, arrangement for transport of men should be made.

1.6 A code of practice shall be drawn up for dealing with fires at different locations in opencast mines, including HEMM. Arrangements for fighting fire should be provided on all heavy earth moving machineries. Such arrangements should, if possible, operate automatically on appearance of fire/smoke.

1.7 Every mining company operating mechanised mines shall create properly staffed and well equipped Occupational Health Services before 31-12-1993.

1.8 In respect of small mechanised mines which are operating in non coal sector, it may not be feasible for a small organisation to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mine operators created common facilities and infrastructure for occupational health services. Creation of such facility is specially needed for asbestos, manganese and mica mines. Simultaneously with creation of facilities for occupational health services, it is also necessary to improve quality of life of employees working in mining industry by provisions of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facility.

2.0 Prevention of Accidents in Coal Mines due to falls of roof

2.1 Because of the variable nature of the roof strata in coal mines, these should be classified using RMR method of geomechanical classification as suggested by the expert group (Paul Committee).

2.2 The pattern and sequence of support should be as per recommendations of Paul Committee & where support is required it should not more than 1.8m from the face. Blasting should not be able to dislodge the support system. In case of poor & fair roof condition the quick setting grouted bolts be preferably used.

2.3 Every year in at least 1/5th of the development districts suitable type of Steel support should be introduced.

2.4 Wherever practicable roof bolting as a method of support should be used. Its performance should be monitored regularly. A few conventional timber props may be used as indicator props.

2.5 Mining companies should take initiative to select/promote development of suitable type of drills & other accessories for use in various types of roof strata. A task-force may be created for the purpose which may oversee the introduction of steel supports.

2.6 Keeping in view the proposed replacement of conventional supports with steel supports, suitable amendments should be made under CMR, 1957 regarding duties of timbermen (support personnel).

2.7 Arrangement shall be made to get proper training to support personnel.

2.8 Development of a portable instrument for detecting the hidden slips in the roof should be taken up on priority by R & D organisations.

3.0 Safety Education and Worker's Participation in Safety Management :

3.1 Training of Work-Persons.

3.1.1 Each mining company should (either by itself or jointly) draw up model training schedules for different categories of workpersons. Such schedules should be got vetted by the tripartite review committees of respective companies by the 30th June 1994.

3.1.2 Existing Training Modules need to be updated from time to time. While adhering to M.V.T. Rules, the companies may, based on their own experience or latest informations available, modify and update these modules for training.

3.1.3 Training is a specialised subject. The in-house training staff drawn from various levels should also be provided opportunity to update their knowledge and skills to impart training by introducing properly designed modules. For this, outside faculties may also be brought in if considered necessary.

3.1.4 It is learnt that Training Modules of coal industry are already under finalisation. It is recommended that other company may use these modules as guidelines for drawing schedules for their workpersons.

3.1.5 From 1.1.95 training should be imparted as per new schedules.

3.2 Training of Supervisory Officials.

3.2.1 All front-line supervisory officials likesirdar/Mates Over-men/Foremen, Surveyors, Electrical/Mechanical Supervisors/Chargemen/foremen as well as persons supervising other surface operations should be imparted structured training in safety management, for at least two weeks, once in every five years, covering about 20% strength every year.

3.2.2 In addition to the existing criteria of eligibility to appear in Sirdar's/Mate's examination, the company should have arrangement to provide properly designed class-room training to candidates for Sirdar's/Mate's examination.

3.2.3 Modern tools including audio-visual(video) should be used for impart- ing all training.

3.3 Worker's Participation in Safety Management

3.3.1 Members of Safety Committees should be given training to prepare them to discharge their assigned functions efficiently. The syllabus of the training programme should be drawn by respective mining companies, to suit the local conditions and work practices and should consist of lecture-demonstration sessions and field visits.

3.3.2 Such training should be completed by 30.6.94 in respect of existing members and all new members should be imparted training within six months of their nomination.

3.3.3 once in a year, the meeting of the Safety Committee should be attended by senior officials of the Area and Trade Unions. The meeting may review recommendations made during the year by the Committee together with status of implementation as well as the salient features of the reports of Workmen's Inspectors.

Similarly, at the Area level similar meeting may also be held.

4.0 Occupational Health Hazards :

4.1 Part - A : Medical Surveillance

The committee feels that ILO Conventions Nos. 155 and 161 on Occupational Health Services with particular reference to prevention of occupational diseases and Health Surveillance should be compiled, with special reference to the following :

4.1.1 There should be atleast one medical officer properly trained in occupational health in each area who should also be associated with Periodical Medical Examinations.

4.1.2 At least one of the medical officers engaged in medical examinations should be trained in use of ILO classification of radiographs for pneumoconiosis.

4.1.3 Adequate facilities for x-rays and Lung function tests should be provided at each medical examination centre.

4.1.4 Health Surveillance record shall be properly maintained.

4.1.5 If the profusion of any type of pneumoconiotic opacities in chest x-ray is 1/0 or above as per ILO classification, the case shall be certified and notified as pneumoconiosis.

4.1.6 One of the medical examinations of every person should be arranged within one year of his superannuation.

4.1.7 To monitor the progress of profusion in certified cases of pneumoconiosis medical examination should be conducted at shorter intervals.

4.1.8 Each company should submit annual report on radiological results of medical examinations in the enclosed format.

4.2 Part - B : Dust

4.2.1 Every mining company operating mechanised mines should take early steps to ensure that

(a) Adequate arrangements and wherever necessary organisation and infrastructure facilities to carry out dust surveys in mines are established within a period of one year.

(b) Air-borne dust surveys are completed and necessary control measures, wherever required, taken within a period of 2 years :

(i) at all mechanised longwall faces, mechanised bord and pillar workings and road header drivages in coal mines :

(ii) at all drilling, mechanised loading and crushing operations in non-coal mines :

(iii) at all ore/coal handling/beneficiation plants.

4.2.2 Necessary training should be imparted to the persons engaged on air-borne dust surveys and control measures.

4.3 Part - C : Noise

4.3.1 The recommendations of DGMS (Tech) Circular No. 18 of 1975 shall be implemented forthwith,

4.3.2 All mining companies should take steps as regards :

(i) Standardisation of the information to be furnished by the manufacturers/suppliers; as well as its assessment procedure;

(ii) Development and supply of proper type of ear protectors including helmet mounted ear muffs.

4.3.3 Audiometry should be introduced, as a part of mandatory medical examination, for persons seeking employment in mines and for persons engaged in operations/areas where noise level exceeds 90 db (A).

4.3.4 The recommendation of VII Conference of Safety in Mines regarding the functions of Occupational Health Services are reiterated. Progress on medical examinations, surveillance of working environment, education and awareness activities shall be monitored at company level.

5.0 Safety in Opencast and Surface Operations

5.1.1 Any person to be employed to drive/operate HEMM should be trained and their competency should be evaluated by a Board constituted by the mining company. The members of such board should be persons who are not connected with imparting of training. However, the training officers may be co-opted in the Board as observer.

5.1.2 Only such fitters/mechanics who possess driver's/operator's competency certificate should be allowed to carry out test-run of HEMM.

The legal position whether the fitters/mechanics who carry out the test run would be required to possess vehicle driving licence under Motor Act would be examined for incorporating the clause in this regard if required.

5.1.3 To prevent unauthorised driving, a system should be evolved whereby the ignition key and/or cabin key always remains with the driver/operator or with specifically designated competent person(s).

5.2 Use of tractor-trailer combination on haul-roads should be discontinued. Where inevitable, the trailer should have separate brake of its own and the use of four wheeled trailer should be preferred. The operators should also be suitably trained on right selection of gears while travelling downhill.

5.3 The portion of surface haul road in mine premises where there is heavy traffic of men and machines, should have a separate lane properly fenced off from the haul road for pedestrians and two wheelers.

5.4 Wherever space permits, every mine should establish a system whereby loading and unloading operations in the stockyard are not done simultaneously at the operations.

5.5 Trucks and other heavy vehicles, not belonging to management should not be allowed in the mine premises without a valid pass issued by the competent authority of the mine.

Before the pass is issued the mine engineer should check the road-worthiness of such vehicles.

At the check gate the licence of the drivers should also be checked for eliminating the possibility of unlicensed persons driving the vehicles.

5.6 Persons engaged in surface operations and, in particular, the contractor's workers, who incidentally are often inexperienced and least informed about job-safety matters, need closer and more competent supervision. To minimise accidents due to surface operations it would be ensure that :

(i) all persons engaged at any work within the mine premises through the contractors have received relevent training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".

Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.

In case of smaller mines, such arrangement may be made by association of mine operators.

(ii) each and every operation, including the operation carried out through contractor's workers or by outside agency, is placed under the charge of a competent supervisor, duly appointed and authorised by the management, his jurisdiction being clearly demarcated.

6.0 Safety in Oil Mines :

6.1 The management of every mine carrying out exploration for and production of petroleum should lake due note of the proposed amendments to the Oil Mines Regulations, 1984 and initiate necessary preparatory actions and gear themselves up for early implementation of the proposed amendments relating to fire hazards.

6.2 The Oil & Natural Gas Commission and the Oil India Ltd. should set up task force.

6.2.1 For drawing up model information sheets, safety report, emergency plan etc. and aiding the mine managements in adopting the same with due regard to local conditions and system, and

6.2.2 For monitoring implementation of various provisions relating to fire hazards in oil mines with particular reference to provisions of—

(a) three BOPs on all drilling rigs;

(b) audio-visual alarm at driller's stand to indicate gas kick;

(c) adequate steps to prevent unauthorised entry to Christmas trees;

(d) preparation of maps showing layout of different types of petroleum pipelines, date of installation, position of controls etc.

A LEGAL OPINION ON

**"WHETHER THE FITTERS/MECHANICS WHO CARRY OUT THE TEST RUN OF
HEMM IN A MINE ARE REQUIRED TO POSSESS VEHICLE DRIVING LICENCE
UNDER MOTOR VEHICLES ACT"**

(Clause 5.1.2. of recommendations of Eighth Safety Conference)

Opinion of a Learned and Experienced Advocate

An opinion has been sought in connection with the obtaining of licence by the fitters/mechanics who are required to test-run HEMM.

Grant of licence for running a motor vehicle which may be either Road Motor vehicle, Heavy Motor vehicle or medium motor vehicle is governed by the provisions of the Motor Vehicles Act of 1988. All heavy earth moving machines (HEMM) are motor vehicles and normally person cannot run the aforesaid vehicle without possessing a driving licence as required under Sec. 3(1) of the Motor Vehicles Act. The normal presumption there is that a person cannot drive a motor vehicle without possessing the driving licence as required Under Section 3(1) of the Act. However, in our case, the question is not that simple. The question to be considered here is whether a person who is required to test-run the HEMM within the Mine Premises is required to possess licence as required Under Section 3(1).

In this connection we are required to consider the various provisions of the Motor Vehicles Act. A Motor Vehicle is defined in Section 2(28) of the Act, and the same reads as under :—

"(28) Motor Vehicle" or "Vehicle" means any mechanically propelled vehicle adapted for use upon roads whether the power of propulsion is transmitted thereto from an external or internal source and includes a chassis to which a body has not been attached and a trailer; but does not include a vehicle running upon fixed rails or a vehicle of a special type adapted for use only in a factory or in any other enclosed premises or a vehicle having less than four wheels fitted with engine capacity of not exceeding thirty-five cubic centimetres."

From the aforesaid definition, it would be seen that a Motor Vehicle is one which is mechanically propelled vehicle and used upon road. Therefore, if the heavy earth moving machinery is used upon a road then only it becomes a motor vehicle. Otherwise, the definition of Motor Vehicle as contained in the aforesaid provision will not apply to a HEMM, which is not used in a road as contained in the Motor Vehicle Act which refers to a road where public in general is permitted to move about.

A public place is again defined in Section 2 sub section 34 of the Act, which is reproduced herein-under :—

"34. "public place" means a road, street, way or other place, whether a thoroughfare or not, to which the public have a right of access, and includes any place or stand at which passengers are picked up or get down by a stage carriage."

A mine is definitely not a public place, because no thoroughfare to the general public is permitted within the premises of a mine.

Again the necessity of a driving licence is provided in Chapter-11, Section 3, sub-section-1 of the Motor Vehicles Act, which is reproduced below :—

"3(1). No person shall drive a motor vehicle in any public place unless he holds an effective driving licence issued to him authorising him to drive the vehicle; and no person shall so drive a transport vehicle (other than motorcab hired for his own use or

rented under any scheme made under sub-section (2) of section 75) unless his driving licence specifically entitles him so to do."

From the aforesaid definition it would be seen that a person is required to possess a driving licence if the following conditions exist:

The person is driving the motor vehicle in a public place and the motor vehicle in question should be used in a place other than an enclosed premises which come within the definition of Motor Vehicle as contained in Section 2, sub section 21. Therefore, in such cases, driving licence is not necessary.

In the instant case, the HEMM owned by the Company are used in an enclosed defined place namely the Mine and it is also not used for carrying loads outside the Factory premises or the Mine Premises. As such a dumper being used exclusively within the Mining premises is not a motor Vehicle but could not come within the exempted clause of Motor Vehicle.

In view of the aforesaid, it is my opinion that the provisions of the Motor Vehicles Act will not be applicable to the dumpers which are exclusively used within the Mine premises or the Factory premises as the case may be and as such there is no necessity for obtaining licence for such Fitters and Mechanics etc., who test-run the HEMM within the premises or the Mines or the Factory.

RECOMMENDATIONS OF THE NINTH CONFERENCE ON SAFETY IN MINES

Held on 2nd-3rd February, 2000 at New Delhi

1. 0 Review of Status of Implemenation of Recommendations of the 8th Conference on Safety in Mines '.

1.1 Necessary facilities for monitoring the environmental parameters in respect of methane and carbon monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy coal mines and in such other mines having active underground fire. Indigenous manufacturers should be encouraged to manufacture necessary equipments.

1.2 In mines where long or arduous travel is involved, arrangement for transport of men should be made.

1.3 In respect of small-mechanised mines, which are operating in non-coal sector, it may not be feasible for a small organisation to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mine operators creates common facilities and infrastructure for occupational health services. Creation of such facility is specially needed for asbestos, manganese and mica mines.

Simultaneously with creation of facilities for occupational health services, it is also necessary to improve quality of life of employees working in mining industry by provision of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facility.

1.4.1 Suitable type of steel/metal supports should be introduced in all the development districts in coal mines within two years.

1.4.2 Wherever practicable, roof bolting as a method of support in coal mines should be used. Its performance should be monitored regularly. A few conventional timber props may be used as indicator props.

1.4.3 Coal mining companies should take initiative to select/promote development of suitable type of drills and other accessories for use in various types of roof strata. A task force may be created for the purpose which may oversee the introduction of steel supports.

1.4.4 Development of a portable instrument for detecting the hidden slips in roof of coal mines should be taken up on priority by R&D organisations.

1.5 All front-line supervisory officials like Sirdars/Mates, Overmen/Foremen, Surveyors, Electrical/Mechanical supervisors/Chargemen/Foremen as well as persons supervising other surface operations should be imparted structured training in safety management, for at least two weeks, once in every five years, covering about 20% strength every year.

1.6 The recommendations of DGMS (Tech.) Circular No. 18 of 1975 shall be implemented forthwith.

1.7 Audiometry should be introduced, as a part of mandatory medical examination, for persons seeking employment in mines and for persons engaged in operations/areas where noise level exceeds 90 dB(A)

1.8.1 The portion of surface haul road in mine premises where there is heavy traffic of men and machines, should have separate lane properly fenced off from the haul road for pedestrians and two wheelers.

1.8.2 Trucks and other heavy vehicles, not belonging to management should not be allowed in the mine premises without a valid pass issued by the competent authority of the mine.

Before the pass is issued the mine engineer should check the roadworthiness of such vehicles.

In order to check entry of unauthorised vehicles in mine premises, each mine should establish properly manned check gate(s) at the entrance(s) where record of entry and exit of each such vehicle should be maintained.

At the check gate the licence of the drivers should also be checked for eliminating the possibility of unlicensed persons driving the vehicles.

1.9 Persons engaged in surface operations and, in particular, the contractor's workers, who incidentally are often inexperienced and least informed about job-safety matters, need closer and more competent supervision. To minimise accidents due to surface operations it would be ensured that:

All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of 'traffic rules'.

Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.

In case of smaller mines, such arrangement may be made by association of mine operators.

2.0 *Preventing Mine disasters from inundation*

2.1 Each mine shall be critically examined for its proneness to inundation and assessment regarding danger of inundation and precautions to be taken should be reviewed and updated yearly preferably before the onset of the monsoon. The recommendations may be deliberated in the (Pit) Safety Committee of the mine and information disseminated as widely as possible.

2.2 Suitable infrastructure at area level may be provided for drilling advance boreholes to detect presence of waterlogged workings in advance.

2.3 Embankments provided against river and jore to guard against inundation should be designed properly keeping in view the engineering parameters. The details of such construction should be properly shown in the underground plan and water danger plan.

2.4 Surface excavation or disturbance in or near major sources of water, which are connected or are likely to be connected to belowground workings should be filled up completely.

2.5 Detailed precautions against inundation may be laid down while working beneath or in the vicinity of river and major water bodies. This may include framing and implementing standing orders for safe withdrawal of persons, including system of information both manual and automatic, effective communication system and system of safe and timely withdrawal of persons to safety.

2.6 Mechanism may be developed for warning mines about impending heavy rains similar to warning of impending cyclone issued in coastal areas for taking necessary action. Also co-ordination with concerned agencies/departments about opening of dams in the rivers on the upstream side should be examined.

2.7 Winding system serving as sole means of ingress and egress may be made constantly available even in adverse weather conditions, failure of steam or electricity or any other reasons.

2.8 Effective communication may be established within the mine and between mines for safe withdrawal of persons. Necessary standing orders in this regard need to be framed and enforced.

2.9 Recommendations of 6th Conference on Safety in Mines to evolve suitable cadre structure for mine surveyors and upgradation of their skill by availing facilities at various institutions, appointment of qualified surveyors and providing infrastructure including computerised facility at area level to oversee survey work of the mine etc. may be implemented.

2.10 R&D efforts should be continued to develop a system for construction of water-tight chamber as last refuge belowground in case of inundation.

3.0 Preventing Mine Disasters/row Fire, and Effective Emergency Response

3.1 Considering the risk of fire, all coal mine companies shall rank its coalmines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining Companies.

3.2 Recognizing the urgent need for making the emergency plan responsive, speedy and effective, each mine shall review the existing emergency plan, at a higher level keeping in view the risk from fire.

3.3 A tripartite committee may be formed to study the feasibility of establishing rescue rooms in coal mines having risk of fire and employing more than 350 persons ordinarily employed in a shift belowground.

3.4 A tripartite committee may be formed to study the feasibility of storing oxygen type self rescuers at strategic places belowground in coal mines with risk of fire in such scale so as to cater to the needs of persons who can be affected in an emergency.

3.5 Each mining company shall formulate and implement structured training programme for development of awareness and increasing effectiveness of emergency response in case of fire amongst work persons, officials and management.

3.6 Through sustained and meaningful R&D activities, mining companies and research institutions shall help in creating a better understanding of the complex geo-mining situations leading to the occurrence of fire; which in turn will help in formulating guidelines to combat the problem of fire in effective manner. Early detection of heating, effect of reversal of fan and control of fire, other associated aspects may be studied.

4.0 Risk Management as a Tool for Development of Appropriate Health and Safety Management Systems.

4.1 Every mining company should identify one or more mines and should undertake a formal risk assessment process aimed at reducing the likelihood and impact of mishaps of all kinds in mines. Subsequently risk assessment process should be extended to other mines.

4.2 Risk assessment process should aim at effective management of risks, by identifying,

- (i) which risks are most in need of reduction, and the options for achieving that risk reduction,
- (ii) which risks need careful on-going management, and the nature of the on-going attention.

4.3 The risk assessment exercise should follow an appropriate process.

4.4 Risk management plan shall be prepared on the basis of risk assessment and implemented in the identified mines.

5.0 Quality control for Improving Safety

5.1 Each mining company and the manufacturer/supplier shall satisfy themselves that the product has valid approval where applicable and conform to relevant standards where available at the time of supply

5.2 Each large mining company may set up quality control cell or strengthen where the same exists, identify critical items which require testing for quality assurance at the time of procurement and during use and arrange testing of the same. Testing facilities may be setup wherever feasible.

5.3 Any defect or failure of approved items or those having BIS certification may be promptly brought to the notice of the appropriate authority for further action.

6.0 Communication System between DGMS Offices and Mine Management at Site,

6.1 Recognizing existence of a large variety of communication systems in mines, a comprehensive review of the existing communication systems at all mines in all mining companies should be undertaken and a consolidated status report prepared for working out a realistic and effective system of communication.

6.2 In organized mining sector, an effective internal and external system of communication besides P&T means shall be established both ways between the mines and. Rescue Rooms/stations, hospitals and DGMS offices.

6.3 Each mining company in the organized sector shall formulate and implement a comprehensive communication protocol clearly assigning duties and responsibilities of persons at various levels.

6.4 In un-organized mining sector, effective communication system shall be established in the following manner :

- (i) In large mines effective wireless communication within the mine including attendance rooms and manager's office and residence, and
- (ii) P&T telephone at manager's office and residence.

6.5 Steps shall be taken to strengthen communication system within DGMS offices and amongst DGMS offices and mine sites besides other concerned agencies.

7.0 Safety in Oil Mines - Blowout and fire hazards

7.1 *General*—Each oil company shall formulate a system to monitor all incidents of fire and blowout, whether or not involving loss of life, injuries and loss of property, investigate the causes and take necessary remedial measures.

7.2 Precautions against blowout:

7.2.1 Each oil company shall frame an action plan to provide following safety devices in all the drilling rigs :

- (a) Pit level indicator registering increase or reduction in the drilling mud volume with an audio-visual warning device near the driller's stand,
- (b) A gas detector or explosimeter at the primary shale shaker with audiovisual warning device near the driller's stand,
- (c) A device to accurately measure the mud required to keep well filled at all the time and
- (d) A device to ensure filling of the well with mud when string is being pulled out.

7.2.2 To ascertain that BOPs function properly up-to their rated capacity, it is essential that all BOPs choke manifold are pressure tested as prescribed. Adequate facilities/hydraulic test benches shall be provided in each company so that BOPs and its accessories can be pressure tested to ensure their effectiveness.

7.2.3 At regular intervals, blowout mock rehearsals shall be carried out. Drilling crew including the chemists and geologists at the well site shall be trained so that they recognize the warning signs of a kick and know what action must be taken to detect and control a kick.

7.2.4 Fitness of the drilling rigs, work-over rigs and well head equipment should be checked initially and periodically. Quality control procedures for tubings/ casings shall be appraised and strengthened.

7.2.5 At the time of drilling of the wells, geo-technical details shall be thoroughly disseminated with the concerned drilling crew to forewarn them about the presence of gas/oil bearing horizons etc.

7.3 Precautions against Fire

7.3.1 Each Oil company shall examine the condition of pipelines carrying hydrocarbon with special emphasis on :

- Trunk lines
- High pressure gas/oil pipelines

- Pipelines passing through highly populated area, rivers etc.
- Old pipe lines.

Action plan shall be prepared to take corrective action in a phased manner.

7.3.2 Plans of pipe lines of flowing wells connected with group gathering stations shall be updated showing villages, surface features, location of valves etc. and copy of such plans shall be displayed at every group gathering station.

7.3.3 Work permit system for hot work, cold work and electrical work should be formulated and implemented under the competent supervision at all the oil installations.

8.0 *Occupational Health Surveillance in mining industry*

8.1 Occupational Health services as recommended by 7th Conference where ever not yet established shall be established within a period of one year.

8.2 Each mining company operating mechanised mines shall computerise all records of medical and environmental surveillance.

8.3 Every PME Centre shall be provided with the facility for chest radiographs, lung function tests, arrangement for classification of chest radiographs and also wherever required facilities for audiometry.

8.4 All chest radiographs of Initial and Periodical Medical Examinations shall be classified for detection, diagnosis and documentation of pneumoconiosis in accordance with ILO classification for pneumoconiosis.

8.5 The PME Medical Officer in every PME centre shall be trained in occupational health and use of ILO classification for pneumoconiosis.

8.6 Each mining company operating mechanised mines shall set up an Occupational Diseases Board consisting of one Occupational Health Physician, one radiologist and one general physician.

8.7 Occupational Diseases Board shall formulate guidelines for referral re-evaluation, classification of cases of pneumoconiosis and necessary remedial actions at workplace as well as rehabilitation of affected persons(s)

9.0 *Increasing effectiveness of workers' participation in safety management*

9.1 All mechanised mines and mines using heavy earth moving machinery for exploitation of minerals, where 100 (one hundred) or more number of workers are employed should appoint Workmen's Inspectors.

9.2 In large mines sectional/departmental safety committees under the main safety committee may be constituted for specific area of operation.

9.3 The tenure of the Safety Committee shall normally be for a period of two (2) years.

9.4 Arrangements shall be made to train the trainers of the Safety Committee members.

9.5 One of the agenda items in the periodic meetings of the Boards of mining companies shall be 'Safety Performance Appraisal' of the company.

(Cir. Tech. 3/2000)

Bharat Sarkar / Govt. of India
Sharam Mantralaya /Ministry of Labour
Khan Suraksha Maha Nideshalaya
Directorate- General of Mines Safety

DGMS (Tech)(SOMA) Circular No.1

Dhanbad, Dated 04.01.2008

To,
The Owner, Agent and Managers,
of all mines.

Sub: - Recommendations of 10th National Conference on Safety in Mines held on 26th & 27th December 2007 at New Delhi.

You may be aware that the 10th National Conference on Safety in Mines held on 26th & 27th December 2007 at New Delhi. Besides reviewing the status of implementation of the recommendations of Ninth Conference on Safety in Mines, the conference had deliberated upon and had made valuable recommendations on the following subjects:

1. Contractor Work Vis-à-vis Safety.
2. Safety Issues in Mines in Unorganized Sector.
3. Occupational Health Surveillance & Notified Diseases.
4. Mechanization with a view to Phase-out Manual loading & to improve Safety Standards.
5. Reduction of Risk from Roof and Side Falls in Coal Mines.
6. Safety of contractor workers and Implementation of "Cold Work Permit" in Oil Mines.
7. Belowground Communication and Tracking System.
8. "Safety Management System" Strategies for Implementation and Path Forward.
9. Implementation of ILO Convention No. 176 in Mines.

The recommendations of the conference are hereby being brought to your attention for information and necessary action.

(M.M. Sharma)
Directorate General of Mines Safety

To

.....
For information and bringing it to the notice of the nominated Owner(s)/Agent and Managers of all Mines of the Company and Others

**RECOMMENDATIONS OF THE TENTH CONFERENCE ON SAFETY IN MINES HELD ON 26th
AND 27th November 2007, AT NEW DELHI.**

1.0 Review of Status of Implementation of Recommendation of the 9th Conference on Safety in Mines:

- 1.1 Necessary facilities for monitoring the environmental parameters in respect of Methane & Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy coal mines and in such other mines having active underground fire. Indigenous manufacturers should be encouraged to manufacture necessary equipments. Time bound programme is to be made, which should be decided in a tripartite committee at company level.
- 1.2 In mines where long or arduous travel is involved, arrangement for transport of men should be made. Time bound programme is to be made, which should be decided in a tripartite committee at company level.
- 1.3 In respect of small-mechanized mines, which are operating in non-coal sector, it may not be feasible for a small organization to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mines operators creates common facilities and infrastructure for occupational health services. Creation of such facilities is specially needed for asbestos, manganese and mica mines.

Simultaneously with creation of facilities for occupational health services, it is also necessary to improve quality of life of employees working in mining industry by provision of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facilities. DGMS should collect complete information as adequate feed back has not been received.

- 1.4 Development of a portable instrument for detecting the hidden slips in the roof of coalmines should be taken up on priority by R&D organizations. The instrument should be developed by a S&T project which should be guided by a committee consisting of an officer from DGMS and others from Coal Industry and Research Organizations.
- 1.5 All front-line supervisory officials like Sirdars / Mates, Overmen /Foremen, Surveyors, Electrical/ Mechanical supervisors/Chargemen / Foremen as well as persons supervising other surface operations should be imparted structured training in safety management, for at least two weeks, once in every five years, covering about 20% strength every year.

- 1.6 The recommendations of DGMS (Tech) Circular No.18 of 1975 shall be implemented forthwith. (Protection of workers against Noise & Vibration in Working Environment.)
- 1.7 Audiometry should be introduced, as a part of mandatory medical examination, for persons seeking employment in mines and for persons engaged in operations/areas where noise level exceeds 90 dB(A).
- 1.8
 - (a) Before the valid gate pass is issued for entry of trucks and other vehicles not belonging to management into the mine, the mine engineer should check the road-worthiness of such vehicles.
 - (b) In order to check entry of unauthorized vehicles in mine premises, each mine should establish properly manned check gate(s) at the entrance(s) where record of entry and exit of each such vehicle should be maintained.
- 1.9 Persons engaged in surface operations and, in particular, the contractors' workers, who incidentally are often inexperienced and least informed about job-safety matters, need closer and more competent supervision. To minimize accidents due to surface operations it would be ensured that:
 - (a) All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".
 - (b) Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.
 - (c) In case of smaller mines, such arrangement may be made by association of mine operators.

1.10 Preventing Mine Disasters from Inundation

- 1.10.1 Recommendations of 6th Conference on Safety in Mines –
 - (a) To evolve suitable cadre structure for mine surveyors and up gradation of their skill by availing facilities at various institutions, appointment of qualified surveyors.
 - (b) Providing infrastructure including computerized facility at area level to oversee survey work of the mine etc. may be implemented.
- 1.10.2 R&D efforts should be continued to develop a system for construction of water-tight chamber as last refuge below ground in case of inundation.

1.11 Preventing Mine Disasters from Fire, and Effective Emergency Response

- 1.11.1 Considering the risk of fire, all coal mine companies shall rank its coalmines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining companies.
- 1.11.2 Each mining company shall formulate and implement structured training programme for development of awareness and increasing effectiveness of emergency response in case of fire amongst work persons, officials and management.

1.12 Quality Control for Improving Safety

- 1.12.1 Each large mining company may setup quality control cell or strengthen where the same exist, identify critical items which require testing for quality assurance at the time of procurement and during use and arrange testing of the same. Testing facilities may be setup wherever feasible
- 1.12.2 Any defect or failure of approved items or those having BIS certification may be promptly brought to the notice of the appropriate authority for further action.

1.13 Safety in Oil mines – Blowout and Fire hazards

1.13.1 Precautions against Blowout:

Each oil company shall frame an action plan to provide following safety devices in all the drilling rigs:

- (a) Pit level indicator registering increase or reduction in the drilling mud volume with an audio-visual warning device near the driller's stand,
- (b) A gas detector or explosimeter at the primary shale shaker with audio-visual warning device near the driller's stand,
- (c) A device to accurately measure the mud required to keep well filled at all the time, and
- (d) A device to ensure filling of the well with mud when string is being pulled out.

1.13.2 Precautions Against Fire

Plans of pipe lines of flowing wells connected with group gathering stations shall be up-dated showing villages, surface features, location of valves etc. and copy of such plans shall be displayed at every group gathering station.

1.14 Occupational Health Surveillance in Mining Industry

- 1.14.1 All chest radiographs of Initial and Periodical Medical Examinations in private mines shall be classified for detection, diagnosis and documentation of pneumoconiosis in accordance with ILO classification for pneumoconiosis.
- 1.14.2 The PME Medical Officer in every PME centre of private mines shall be trained in occupational health and use of ILO classification for pneumoconiosis.
- 1.14.3 Each mining company operating mechanized mines shall set up an Occupational Diseases Board consisting of one occupational Health Physician, one radiologist and one general physician.

1.15 Increasing Effectiveness of Worker's Participation in Safety Management

- 1.15.1 All private mechanized mines and mines using heavy earth moving machinery for exploitation of minerals, where 100 (hundred) or more number of workers are employed, should appoint Workmen's Inspectors.
- 1.15.2 In large mines sectional/departmental safety committees under the main safety committee may be constituted for specific area of operation.

2.0 Contractor work vis-à-vis Safety

2.1 Employer's responsibilities

- (a) Suitable clauses (in consistence with risk of the work allotted) shall be included in tender document (including NITs) stating how the risk arising to men & material from the mining operation / operations to be done by the contractors shall be managed.
- (b) Ensure that contractors are familiar with the relevant parts of the statute, health and safety management system and are provided with copies of such documents prior to commencing work.
- (c) Ensure that contractor's arrangements for health and safety management are consistent with those for the mine owner. All the rules, regulations and bye-laws as applicable to the mine owner are also applicable to the contractor. Details of the contractors' workmen should be maintained in the owner's Form-B Register. Whereas, C, D & E Registers for contractor men may be maintained independently by the owner. All the above Registers shall be kept in the mine office of the manager.
- (d) Ensure that contracts should preferably be of longer period (three years), so that there is adequate scope of management of safety by the contractor.
- (e) Ensure that contractor's provide the machinery, operator and other staff with written safe work procedures for the work to be carried out, stating clearly the risk involved and how it is to be managed.
- (f) Monitor all activities of the contractors to ensure that contractors are complying with all the requirements of statute and the system related to safety. If found non-compliant of safety laws directing the contractor to take action to comply with the requirements, and for further non-compliance, the contractor may be suitably

penalized. Clause to this effect may be a part of the agreement between the employer and the contractor.

- (g) Where a risk to health or safety of a person arises because of a non-compliance directing the contractor to cease work until the non-compliance is corrected.

2.2 **Contractor's responsibilities**

- (a) Prepare written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with it/them.
- (b) Provide a copy of the SOP to the person designated by the mine owner who shall be supervising the contractor's work.
- (c) Keep an up to date SOP and provide a copy of changes to a person designated by the mine owner.
- (d) Ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner.
- (e) For work of a specified scope/nature, develop and provide to the mine owner a site specific code of practice.
- (f) Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring compliance all safety laws by the sub or sub-sub contractors.
- (g) All persons deployed by the contractor for working in a mine must undergo vocational training, initial medical examination, PME. They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of VT & IME.
- (h) Every person deployed by the contractor in a mine must wear safety gadgets to be provided by the contractor. If contractor is unable to provide, owner/agent/manger of the mine shall provide the same.
- (i) The contractor shall submit to DGMS returns indicating – Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment of work persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons. The return shall be submitted quarterly (by 10th of April, July, October & January) for contracts of more than one year. However, for contracts of less than one year, returns shall be submitted monthly.

2.3 **Employee's responsibilities**

- (a) An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.

- (b) An employee must, while at work, cooperate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

3.0 Safety Issues in mines in unorganized sector

- 3.1 The States in general may grant mining/quarrying leases of a size not less than ten hectares each for an appropriate period, depending on technical feasibility, so that the lessee can make medium to long-term plan for investment in infrastructure and work the mines in a safe and scientific manner. In case smaller lease needs to be granted, it should be ensured that the Central Laws, including the Mines Act are complied with.
- 3.2 In case of stone quarries on hillocks, whole of the hillock should be given out as a single lease so that necessary development could be done from top-downwards after making approach road to reach to top of the hillock before starting extraction of stone. A condition to this effect may be incorporated before granting such leases.
- 3.3 In the lease document, reference should be made to the Mines Act and the Rules and Regulations made there under for compliance. The DGMS may prepare, in consultation with Ministry of Mines a model document for grant of leases by the state governments so that the conditions of leases are such that there is a uniformity and compliance with central laws.
- 3.4 A copy of the lease document should be sent to the DGMS and lessees explicitly asked to send notice of opening of mine to DGMS in accordance to the Provisions of the Mines Act.
- 3.5 The Conference has noted that there have been instances in some States where leases have been granted in close proximity of inhabited area and within 45 m of Railway acquired land and land acquired for National and State highways, public works without consulting the appropriate statutory authority. The conference recommends that the States may grant mining leases in conformity of Central Laws.
- 3.6 DGMS should organize Orientation Programmes for officers of State Mines and Geology Departments to inform them about safety laws.

4.0 Occupational Health Surveillance and Notified Diseases.

- 4.1 Noise mapping should be made mandatory of various work places in the mine premises based on the various machines being used in concerned mines along with personal noise dosimetry of individual workmen exposed to noise level above 85 dbA.
- 4.2 Vibration studies of various mining machinery required to be done before their introduction in mining operations as per ISO standards.

- 4.3 Ergonomical assessment of all latest machines, before their introduction into mining operation as per ISO standards. Ergonomical assessment should include:
- * Assessment of work process.
 - * Assessment of working Aids/tools
 - * Assessment of working posture
- 4.4 Potability tests of drinking water supplied to the mine employees, to be made mandatory once in a year irrespective of its source, preferably after Rainy seasons, the sample of water should be collected from the points of consumption
- 4.5 Initial medical examination shall be made mandatory for all mining employees whether permanent, temporary or contractual, before they are engaged in any mining job.
- 4.6 The frequency of periodic medical examinations should be brought down from existing five years to three years for the mining employees above 45 years of age. This should be implemented in three years.
- 4.7 Standards of medical examinations for both Initial and Periodic should be modified as mentioned below in order to ensure early diagnosis of more diseases caused or get aggravated due to employment in mines.
- (a) In addition to measurement of blood pressure, detailed cardiovascular assessment of employees should be done. This should include 12 leads electrocardiogram and complete lipid profile.
 - (b) Detailed neurological examinations including testing of all major superficial and deep reflexes and assessment of peripheral circulation to diagnose vibrational syndromes.
 - (c) In addition to routine urine, fasting and post-parandial blood sugar should be included for early diagnosis of diabetes mellitus.
 - (d) Serum Urea and Creatinine should be included for assessment of Renal function.
 - (e) Hematological tests like Total count, Differential count, percentage of Hemoglobin and Erythrocyte Sedimentation Rate should be included to diagnose Blood Dyscrasias.
- 4.8 Special tests should be included in the PME for employees exposed to specific health hazard;
- (a) For employees exposed to manganese, special emphasis should be given to behavioral and neurological disturbances such as speech defect, tremor, impairment of equilibrium, adiadochokinesia H₂S and emotional changes.
 - (b) For persons exposed to lead, PME should include blood lead analysis and delta aminolevulinic acid in urine, at least once in a year.

- (c) Employees engaged in food handling and preparation and handling of stemming material activities should undergo routine stool examination once in every six months and sputum for AFB and chest radiograph once in a year.
- (d) Employees engaged in driving/ HEMM operation jobs should undergo eye refraction test at least once in a year.
- (e) Employees exposed to ionizing radiation should undergo Blood count at least once in a year.

4.9 It is proposed to include following diseases in the list of Notified diseases under Section 25 (1) of Mines Act, 1952:

- (a) All other types of Pneumoconiosis excluding Coal workers pneumoconiosis, Silicosis and Asbestosis. This includes Siderosis & Beriliosis.
- (b) Noise induced hearing loss.
- (c) Contact Dermatitis caused by direct contact with chemicals.
- (d) Pathological manifestations due to radium or radioactive substances.

4.10 For smaller mines where PME facilities are not existing, medical examinations can be done through other competent agencies.

5.0 Mechanization with a view to phase-out manual loading & to improve safety standards.

- 5.1 Keeping in view the objective of phasing out manual loading, all coal companies shall identify appropriate technology suitable for the prevailing geo-mining conditions and introduce the same in such a manner so as to phase out manual loading operations completely within a period of five years in coal seams with gradient of 1 in 5 or less, and within a period of seven years in coal seams with gradient steeper than 1 in 5.
- 5.2 While formulating the strategies for face mechanization in underground workings, it shall be ensured that back up facilities like coal evacuation, support system, ventilation arrangements etc. are compatible with face mechanization.
- 5.3 The scheme of face mechanization shall be based on proper scientific investigation. The scheme shall also include arrangements for monitoring strata behavior and environmental conditions.
- 5.4. Possibility of deployment of multi-skilled miners in the face shall be explored to reduce the exposure at hazardous areas without affecting employment.

- 5.5. Suitable training for efficient & safe operation of machinery shall be imparted to all concerned.
- 5.6 While planning for face mechanization, due considerations shall be given for long term sustainability of the technology.
- 5.7 A policy document shall be framed by each coal mining company within a period of six months for addressing the implementation issues. It shall also be ensured that all safety features are inbuilt into the system.

6.0 Reduction of risk from roof and side falls in coal mines

- 6.1 In every coal mining company, STRATA CONTROL CELL shall be established at corporate and area levels within a period of one year, to assist mine managers, for formulation of Systematic Support Rules, monitoring strata control measures in a scientific way to ensure efficacy of support system and for procurement/supply of quality supporting materials. Such cell shall be manned by adequate number of technical personnel headed by a senior official not below the rank of General Manager at Corporate level and Dy. General Manager at Area level.
- 6.2 Roof bolting shall be used as a primary means of support for freshly exposed roof in development as well as depillaring districts. For the roof category "Poor", having value of RMR of 40 or less, or where there is excessive seepage of water from the roof strata, roof bolts exclusively with resin capsules shall be used to ensure adequate & immediate reinforcement of the strata.
- 6.3 Due emphasis shall be given to support the sides of galleries while framing Systematic Support Rules.
- 6.4 Suitable steps shall be taken by the mining companies to inculcate a culture of "no work at face" other than supporting work, till the roof is supported by roof bolts up to at least 0.6 meter from the face.
- 6.5 To ensure proper drilling for roof bolting in all types of roof strata, suitable fit-for-use roof bolting machines shall be introduced in all mines within a period of one year. Such machines shall be capable of being operated from a distance or be provided with suitable canopy to protect the supporting personnel during drilling or bolting operations.
- 6.6 Risk assessment exercise shall be carried out in the mines for assessing the risk from the hazards of roof & side falls and identifying the control mechanism with specific responsibility for implementation. This exercise shall be reviewed at regular intervals not exceeding a year.
- 6.7 Each company shall take steps to impart structured training to officers, supervisors and support personnel on roof bolting.

7.0 Safety of Contractor Workers and Implementation of "Cold Work Permit" in Oil mines.

7.1 Contractor workers:

- (a) Before the commencement of the work by the contractor the job shall be thoroughly assessed for potential hazards and risks to the contractor worker and appropriate measures shall be taken to mitigate them.
- (b) Adequate supervision by the management shall be provided for the work to be carried out by the contractor.
- (c) Frequent change of contractual employee shall not be allowed.

7.2 Issue of cold work permit

- (a) Where the risk arising from the work to be performed under given circumstances at the installation, demands a stringent system of control to ensure safety of work persons, the management shall ensure that such work is carried out only by issuing a cold work permit.
- (b) The cold work permit shall be in a standardized format specifying place, time, date, and duration of such work, the precautions to be taken and other relevant details.
- (c) Relevant training shall be imparted to all concerned for successful implementation of cold work permit

Definition: "Cold work" means any work which is of non-routine nature so identified by the manager.

8.0 Belowground Communication and Tracking System

- 8.1 All belowground mines shall be provided with efficient voice communication from the working districts/places to the surface.
- 8.2 Mining companies in collaboration with research institutions/ equipment manufacturers shall initiate and fund for, suitable research initiatives for establishment of appropriate communication system for below ground mines including to locate the trapped miners.
- 8.3 Mine management in collaboration with equipment manufacturers shall evolve a system of proximity warning device in HEMM and initiate measures for its implementation.

All the recommendations should be complied within a period of four years.

9.0 "Safety Management System": Strategies for Implementation and Path Forward

- 9.1 Every mine should employ a sound risk analysis process, should conduct a risk assessment, and should develop a safety management plan to address the significant hazards identified by the analysis/ assessment.
- 9.2 The managements of every mining company should adopt the process of safety management system and commit itself for proper formulation and implementation of the same in totality. Necessary resources should be allocated for implementation of the control measures identified by the risk assessment process.
- 9.3 Necessary training of all employees of mining companies should be organized with the help of experts, both national and international, for optimal adoption of the safety management system.

10.0 Implementation of ILO Convention No.176 in mines

The Committee decided that a separate discussion be held by the Govt. of India in a tripartite forum to deliberate on the implications arising out of ILO Convention No.176.

DGMS



भारत सरकार
Government of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate-General of Mines Safety

No. DGMS (Tech) Circular(MAMID)/ 05.

Dhanbad, dated 17.07.2013

To,

The Owner, Agent and Manager of all Mines

Subject: Recommendations of 11th National Conference on Safety in Mines held on 4th & 5th July 2013 at New Delhi.

You are aware that the 11th National Conference on Safety in Mines held on 4th & 5th July, 2013 at New Delhi. Besides reviewing the status of implementation of the recommendations of 10th Conference on Safety in Mines, the Conference have deliberated upon and made valuable recommendations on the following subjects:

1. Small Scale Mining
2. Safety, Health and Welfare of Contractual Workers
3. Surface and Underground Transportation Machinery

The recommendations of the 11th Conference as enclosed are hereby being brought to your attention for information and necessary action.

Yours faithfully,

Director General of Mines Safety

To

For information and bringing it to the notice of the nominated Owner(s)/Agent and Managers of all Mines of the Company and Others.

Recommendations of 11th Conference on Safety in Mines held on 4th & 5th July, 2013 at New Delhi.

1.0 Review of status of implementation of recommendations of 10th Conference on Safety in Mines.

- 1.1(a) Necessary facilities for monitoring the environmental parameters in respect of Methane and Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy COAL and in such other mines having active underground fire.
- 1.1(b) Indigenous manufacturers should be encouraged to manufacture necessary equipments.
- 1.1(c) Time bound programme is to be made, which should be decided in a tripartite committee at company level.
- 1.2 In underground specified mines where long or arduous travel is involved, arrangement for transport of men should be made with a target of 20 % every year.
- 1.3 In respect of small-mechanised mines, which are operating in NON-COAL sector, it may not be feasible for a small organization to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mines operators creates common facilities and infrastructure for occupational health services. Creation of such facilities are specially needed for asbestos, manganese and mica mines.
- 1.4 Development of a portable instrument for detecting hidden slips in roof of COAL mines should be taken up on priority by R&D organizations. The instrument should be developed by S&T project which should be guided by a committee consisting of an officer from DGMS and others from COAL Industry and Research Organisations.
- 1.5(a) Before the valid gate pass is issued for entry of trucks and other vehicles not belonging to management into the mine, the mine engineer should check the road-worthiness of such vehicles.
- 1.5(b) In order to check entry of un-authorized vehicles in mine premises, each mine should establish property manned check gate(s) at the entrance(s) where record of entry and exist of each such vehicle should be maintained.
- 1.6(a) All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".
- 1.6(b) Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.

1.6(c) In case of smaller mines, such arrangement may be made by association of mine operators.

1.7 Considering the risk of fire, all COAL mine companies shall rank its COAL mines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining companies

1.8 Contractor work vis-à-vis safety

1.8.1 Employer's responsibilities

1.8.1(a) Suitable clauses (in consistence with risk of the work allotted) shall be included in tender document (including NITs) stating how the risk arising to men and material from the mining operation/operations to be done by the contractors shall be managed.

1.8.1(b) Ensure that contractors are familiar with the relevant parts of the statutes, health and safety management system and are provided with copies of such documents prior to commencing work.

1.8.1(c) Ensure that contractor's arrangements for health and safety management are consistent with those for the mine owner. All the rules, regulations and bye-laws as applicable to the mine owner are also applicable to the contractor. Details of the contractor's workmen should be maintained in the owners Form-B register. Whereas as C, D & E registers for contractor men may be maintained independently by the owner and shall be kept in the mine office of the manager.

1.8.1(d) Ensure that contracts should preferably of longer period (3 years), so that there is adequate scope of management of safety by the contractor.

1.8.1(e) Ensure that contractors provide the machinery, operator and other staff with written safe work procedures for the work to be carried out, stating clearly the risk involved and how it is to be managed.

1.8.1(f) Monitor all activities of the contractors to ensure that contractors are complying with all the requirements of statute and the system related to safety. If found non-compliance of safety laws directing the contractors to take action to comply with the requirements and for non-compliance, the contractor may be suitably penalized. Clause to this affect may be a part of the agreement between the employer and the contractor.

1.8.1(g) Where a risk to health or safety of a person arises because of a non-compliance directing the contractor to cease work until the non compliance is corrected.

1.8.2 Contractor's responsibilities

1.8.2 (a) Prepare written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with it/them.

- 1.8.2 (b) Provide copy of the SOP to the person designated by the mine owner who shall be supervising the contractor's work.
- 1.8.2 (c) Keep an up to date SOP and provide a copy of changes to a person designated by the mine owner
- 1.8.2 (d) Ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner.
- 1.8.2 (e) For work of a specify scope/nature, develop and provide to the mine owner a site specific Code of Practice (COP).
- 1.8.2 (f) Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring the compliance all safety laws by the sub or sub-sub contractors.
- 1.8.2 (g) All persons deployed by the contractor for working in mine must undergo vocational training, initial medical examination, PME. They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of VT & IME.
- 1.8.2 (h) Every person deployed by the contractor in a mine must wear safety gadgets to be provided by the contractor. If contractor is unable to provide, owner, agent and manager of the mine shall provide the same.
- 1.8.2 (i) The contractor shall submit to DGMS returns indicating -Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment of work persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons. The return shall be submitted quarterly (by 10th of April, July, October and January) for contracts of more than one year. However, for contracts of less one year, returns shall be submitted monthly.

1.8.3 Employees Responsibilities

- 1.8.3 (a) An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.
- 1.8.3 (b) An employee must, while at work, co-operate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

1.9 Safety issues in mines in un-organised sector

- 1.9.1 In case of stone quarried on hillocks, whole of the hillock should be given out as a single lease so that necessary development could be done from top-downwards after making approach road to reach to top of the hillock before

starting extraction of stone. A condition to this effect may be incorporated before granting such leases.

- 1.9.2 In the lease document, reference should be made to the Mines Act and the Rules and Regulations made there under for compliance. The DGMS may prepare, in consultation with Ministry of Mines a model document for grant of leases by the state Governments so that the conditions of leases are such that there is a uniformity and compliance with central laws.
- 1.9.3 A copy of the lease document should be sent to the DGMS and lessees explicitly asked to send notice of opening of mine to DGMS in accordance to the Provisions of the Mines Act.
- 1.9.4 The Conference has noted that there have been instances in some States where leases have been granted in close proximity of inhabited area and within 45 m. of Railway acquired land and land acquired for National and State highways, public works without consulting the appropriate statutory authority. The conference recommends that the States may grant mining leases in conformity of Central Laws.
- 1.9.5 DGMS should organize Orientation Programmes for officers of State Mines and Geology Departments to inform them about safety laws.

1.10 Occupational Health surveillance and Notified Diseases

- 1.10.1 Noise mapping should be made mandatory of various workplaces in the mine premises based on the various machines being used in concerned mines along with personal noise dosimetry of individual workmen exposed to noise level above 85 dbA.
- 1.10.2 Vibration studies of various mining machineries before their introduction in mining operation should be done as per ISO Standards.
- 1.10.3 Ergonomical assessment of all latest machines, before their introduction into mining operation as per ISO standards. Ergonomical assessment should include:
 - * Assessment of work process.
 - * Assessment of working Aids/tools
 - * Assessment of working posture.
- 1.10.4 Portability tests of drinking water supplied to the mine employees, to be made mandatory once in a year irrespective of its source, preferably after rainy seasons, the sample of water should be collected from the points of consumption.
- 1.10.5(a) In addition to measurement of blood pressure, detailed cardiovascular assessment of employees should be done. This should include 12 leads electrocardiogram and complete lipid profile.
- 1.10.5(b) Detailed neurological examinations including testing of all major superficial and

deep reflexes and assessment of peripheral circulation to diagnose vibrational syndromes.

- 1.10.5(c) In addition to routine urine, fasting and post-parandial blood sugar should be included for early diagnosis of diabetes mellitus.
- 1.10.5(d) Serum Urea Creatinine should be included for assessment of Renal function.
- 1.10.6 Special tests should be included in the PME for employees exposed to specific health hazard:
 - 1.10.6(a) For employees exposed to manganese, special emphasis should be given to behavioural and neurological disturbances such as speech defect, tremor, impairment of equilibrium, adiadochokinesia H2S and emotional changes.
 - 1.10.6(b) For persons exposed to lead, PME should include blood lead analysis and delta aminolevulinic acid in urine, at least once in a year.
 - 1.10.6(c) Employees engaged in food handling and preparation and handling of stemming material activities should undergo routine stool examination once in a every six months and sputum for AFB and chest radiograph once in a year.
 - 1.10.6(d) Employees engaged in driving/HEMM operation jobs should undergo eye refraction test at least once in a year.
 - 1.10.6(e) Employees exposed to ionizing radiation should undergo blood count at least once in a year.
- 1.10.7 All other types of Pneumoconiosis excluding Coal workers pneumoconiosis, silicosis and asbestosis. This includes Siderosis & Berillyosis.
- 1.10.8 For smaller mines where PME facilities are not existing, medical examinations can be done through other competent agencies.

1.11 Mechanisation with view to phase out manual loading etc.

- 1.11.1 Keeping in view the objective of phasing out manual loading, all COAL companies shall identify appropriate technology suitable for the prevailing geo-mining conditions and introduce the same in such a manner so as to phase out manual loading operation completely within a period of five years in COAL seams with gradient of 1 in 5 or less, within a period of seven years where gradient steeper than 1 in 5.
- 1.11.2 While formulating the strategies for face mechanization in underground workings, it shall be ensured that back facilities like COAL evacuation, support system, ventilation arrangements etc are compatible with face mechanization.
- 1.11.3 The scheme of face mechanization shall be based on proper scientific investigation. The scheme shall also include arrangements for monitoring strata behaviour and environmental conditions.

- 1.11.4 Possibility of deployment of multi-skilled miners in the face shall be explored to reduce the exposure at hazardous areas without affecting employment.
- 1.11.5 Suitable training for efficient and safe operation of machinery shall be imparted to all concerned.
- 1.11.6 While planning for face mechanization, due considerations shall be given for long term sustainability of the technology.

1.12 Reduction from risk from roof and sides falls in coal mines.

- 1.12.1 In every Coal mining company, STRATA CONTROL CELL shall be established at corporate and area levels within a period of one year, to assist mine managers, for formulation of Systematic Support Rules, monitoring strata control measure in a scientific way to ensure efficacy of support system and for procurement/supply of quality supporting materials. Such cell shall be manned by adequate number of technical personnel headed by a senior official not below the rank of General Manager at Corporate level and Dy. General Manager at Area level.
- 1.12.2 Roof bolting shall be used as a primary means of support for freshly exposed roof in development as well as depillaring districts. For the roof category Poor, having value of RMR of 40 or less, or where there is excessive seepage of water from the roof strata, roof bolts exclusively with resin capsules shall be used to ensure adequate & immediate reinforcement of the strata.
- 1.12.3 To ensure proper drilling for roof bolting in all types of roof strata, suitable fit-for-use roof bolting machines shall be introduced in all mines within a period of one year. Such machines shall be capable of being operated from a distance or be provided with suitable canopy to protect the supporting personnel during drilling or bolting operations.
- 1.12.4 Risk assessment exercise shall be carried out in the mines for assessing for risk from the hazards of roof and sides falls and identifying the control mechanism with specific responsibility for implementation. This exercise shall be reviewed at regular intervals not exceeding a year.
- 1.12.5 Each company shall take steps to impart structured training to officers, supervisors and support personnel on roof bolting.

1.13 Below ground communication and tracking system

- 1.13.1 Mining companies in collaboration with research institutions/equipment manufacturers shall initiate and fund for, suitable research initiatives for establishment of appropriate communication system for below ground mines including to locate the trapped miners.
- 1.13.2 Mine management in collaboration with equipment manufacturers shall evolve a system of proximity warning device in HEMM and initiate measures for its

implementation.

1.14 Safety Management system” Strategies for implementation and path forward.

- 1.14.1 Every mine should employ a sound risk analysis process, should conduct a risk assessment, and should develop a safety management plan to address the significant hazards identified by the analysis / assessment.
- 1.14.2 The managements of every mining company should adopt the process of safety management system and commit itself for proper formulation and implementation of the same in totality. Necessary resources should be allocated for implementation of the control measures identified by the risk assessment process.
- 1.14.3 Necessary training of all employees of Mining Companies should be organized with the help of experts, both national and international, for optimal adoption of safety management system.

1.15 Implementation of ILO convention No. 176 in Mines

- 1.15.1 The committee decided that a separate discussion be held by the Govt. of India in a tripartite forum to deliberate on the implications arising out of ILO Convention No. 176.

2.0 Small Scale Mining

- 2.1 The concerned authority in State Governments may grant prospecting lease/mining lease/ mining right after ascertaining technical feasibility of mineral extraction in pursuance with provisions of the mining law, so that the lessee can make medium to long-term plan for investment in infrastructure and work the mines in a safe and scientific manner. While conduct of mining operations, it should be ensured that the Central Laws, including the Mines Act are complied with.
- 2.2 The State Governments may explore the feasibility of demarcation of mining zones to avoid problems of growing habitation encroaching into the mining area, thereby creating unsafe and unhealthy conditions. However, the State Governments may take efforts to relocate the habitation already existing near mining zones.
- 2.3 The lease granting authority of State Governments may assign a unique identification number, which will serve as a common reference for all central and state authorities responsible for administration of central and state laws. The details of lease may be displayed in a board of permanent nature in a prominent place in the lease hold are showing following:
 - a. Name of lessee:
 - b. Lease number:
 - c. Period of lease:
 - d. Unique identification number:

- 2.4 The lease granting authority of State Governments may insert a clause in the lease document requiring the lessee to submit a notice of (i) commencement of any mining operation, and (ii) appointment of a manager, prescribed under the Mines Act, 1952 and Rules and Regulations framed there under.
- 2.5 The concerned authorities of State Governments may be requested to explore the possibility of introducing a course in Mining at Industrial Training Institutes in consultation with DGMS to augment the requirement of Mining Mates.
- 2.6 Orientation Programmes may be organized for officers of State Mine and Geology Departments on OSH Laws.
- 2.7 Organized mines of public and private sector may consider extending their facilities in Vocational Training, Occupational Health Surveillance and other Safety Awareness Programmes for workers engaged in small scale mining sector.
- 2.8 As a promotional initiative, social dialogue and deliberations at appropriate level may be initiated to facilitate formation of Cooperative Society/Mine Owners Association to tackle issues of resource and logistics management essential for safe and healthy mining.
- 2.9 The Conference appreciates the efforts made by Ministry of Labour & Employment and Directorate General of Mines Safety for encouraging and adopting innovative means to create awareness about OSH issues and improving compliance in small scale mining sector with public private interventions. It is recommended to continue with such initiatives vigorously and in enhanced manner.
- 2.10 The concerned authorities may explore possibilities of setting up of Mine Workers Welfare Boards for minerals like sandstone, marble and granite.

3.0 Safety, Health and Welfare of Contractual Workers.

- 3.1 The recommendations made in the 10th conference on Safety in Mines regarding safety, health and welfare of contractor's workers shall be complied within two years. Owner, Agent and Manager shall be responsible for ensuring compliance at their respective mines.
- 3.2 There shall be provisions for modifications in Notice Inviting Tenders (NITs) to fulfil the requirement of statute/circulars issued by DGMS from time to time subsequent to the finalization of NITs also.
- 3.3 The contractor shall not employ or terminate his worker without the knowledge of the mine management.
- 3.4 Payment to contractor's workers including leave with wages shall be made through bank only.

- 3.5 In case of non-routine type of work in the mine a Work-Permit system, outlining the precautions to be adopted, SOPs, supervision, persons responsible for the job etc., shall be adopted.
- 3.6 Each company shall frame a safety, health and welfare policy for their contractor's workers keeping in view the requirement of Mines Act and Rules & Regulations made there-under. The details of the policy shall be included in the tender document which will be a binding clause for the contractor.
- 3.7 Each mining company shall extend all benefits including medical facilities and payment of wages, to contractor's workers receiving injury whilst on duty. Owner, Agent and Manager shall be responsible for ensuring compliance at their respective mines.
- 3.8 Medical facilities shall be extended to contractor workers.
- 3.9 Central Government should take steps against non-compliance of the recommendations of the National Safety Conferences.

4.0 Surface and Underground Transportation Machinery:

4.1 MACHINERY FOR SURFACE OR OPENCAST OPERATIONS.

- 4.1(a) Mine Planning & Design;
The provisions of requirements of HEMMs and their installations, operations, maintenance and training shall be included in the project at planning stage.
- 4.1(b) Safety Features in HEMMs
- 4.1(b)(i) Audio-Visual Alarm;
- The sound level of AVA should be at least 5 to 20% higher than the ambient noise level; and
 - The audio frequency and its amplitude band should be increasing and uniquely heard to keep persons alert in the blind zone during reversal.
 - AVA should be of IP 67 compliance.
- 4.1(b)(ii) Anti-Skid and Tail-End Protection System;
The provision of tail end protection, bumper extension or any other device shall be provided in dumpers/tippers to prevent collision both head on and head to tail conditions.
- 4.1(b)(iii) GPS-GSM Based Navigation System;
The GPM-GSM based vehicle navigation system shall be used in large mines in a phased manner.
- 4.1(c) Risk Control and Management;
Risk Assessment and Control of Risks should be conducted by the mine management quarterly and annually.

- 4.1(d) Skill Development and Training;
General Skill Development programme should be undertaken for training of operators and all other associated staffs using state of the art technique including simulation and 3D Virtual Reality system.
- 4.1(e) Protection against Fatigue
- 4.1(e)(i) Long or Extended Hours of driving beyond 8 continuous hours with a rest interval of half an hour after four hours of continuous operation, shall not be permitted, for which biometric system of check-in & check-out system of attendance associated with suitable software shall be introduced in the mine.
- 4.1(e)(ii) Additional warning system for operator's fatigue should be provided in the machine.
- 4.1(e)(iii) Operator's Seat in the Vehicle/HEMMs should be ergonomically designed to have adequate comforts while driving continuously.
- 4.2 TRANSPORTATION MACHINERY IN UNDERGROUND:-
- 4.2(a) All steam winders should be replaced with electric winders in phased manner within a period of five years.
- OR
- Alternate access to the mine in the form of Inclines or Shafts may be considered and implemented within the same period.
- 4.2(b) Safety Features in Winding;
Detail survey of all winding installation completed 20 years shall be carried out by committee of experts and its recommendations shall be implemented.
- 4.2(c) Man-Riding System;
DGMS should initiate necessary steps to frame suitable standard for man riding system within a period of 18 months through an expert committee.
- 4.2(d) Use of Diesel Equipment belowground in Coal Mines;
An expert committee may be appointed to examine and frame standards and safety provisions for diesel equipment in belowground both coal and non-coal mines.

THE MINES ACT 1952

Sec. 2

1. Fracture of thumb or finger etc.; Definition of serious bodily injury—

It was notified earlier that the fracture of a joint of any thumb or finger etc. is not to be considered 'a fracture of any limb' within the meaning of Clause (8) of Section 2 of the Mines Act, 1952.

The meter has since been reviewed. According to Medical Dictionary, 'Limb' is defined to mean 'one of the two extremitie's; i.e., lower and upper extremities attached to the trunk. Again while "Lower extremity" is defined to mean the portion consisting of the hip, thigh, leg, ankle and foot, the term "Upper extremity" means the portion consisting of the shoulder, arm, forearm, wrist and hand. Thus foot and the arm and their members form part of a 'limb'.

A notice of serious accident should, therefore, be given whenever the fracture of a thumb or finger of a hand or toe of a foot, occurs whether or not it results in the enforced absence of the injured person from work for a period exceeding 20 days. Incidentally, since the definition of 'serious bodily injury' given in the Workmen's Compensation Act is the same as that in the Mines Act, a notice of every such accident is also to be furnished to the concerned Commissioner (or any other prescribed authority) appointed under the Workmen's Compensation Act.

(Cir. 32/1972)

2. Applicability of Mines Act to sidings etc.—The question whether "person employed on sorting out/screening ore and in loading railway wagons at the railway sidings are subject to the provisions of the Mines Act" was referred to the Government of India for clarification. It was explained to them that the operation can be carried out under varying conditions which may be classified as below:

(a) where the railway siding lies within the mine leasehold and the ore is transported by:

(i) rope or locomotive haulage or trucks belonging to the mine management;

(ii) trucks or other means of transport belonging to contractors employed by the mine management;

(iii) where the railway siding is situated outside the mine property. The distance may vary in practice, from only a few hundred yards to several miles.

The Central Government has clarified that workers employed on loading wagons under conditions (a) come under the purview of the Mines Act but not those under condition (b) above i.e., where the railway siding is situated outside the mine property.

(Cir. 3/1952)

3. Electrical accident in residential area: Jurisdiction of Electrical Inspector of State Vs Electrical Inspector of Mines—For the general information the management of all Mines and for removing certain doubts whether the residential areas, pertaining to a mine, if fed from a Power Station or Sub-Station situated in or about a mine and forming part thereof, come within the jurisdiction of Deputy Director of Mines Safety (Electrical), Govt. of India or they come within the jurisdiction of the Electrical Inspectors of the concerned State Governments, the following clarification is issued after duly consulting the Central Electricity Board, in the matter:

1. If any power station/sub-station/switch station which supplies electricity mainly for the purpose of working a mine or a number of mines under the same management, also supplies

electricity to the residential areas of the mine or mines referred to, the supply to the residential areas shall be given from a separate control gear and only that portion from such control gear to the residential areas shall fall within the jurisdiction of the Electrical Inspector of the concerned State.

2. Whereas, if the supply of electricity at a mine is obtained from a power Station/sub-station/switch station which supplies electricity, besides the mine, to other places as well only that portion from the switch gear or gears which are feeding the mine, shall fall within the jurisdiction of the Electrical Inspector of Mines, Govt. of India.

3. In case falling under Clause (1) above, the power station/sub- Station/switch station shall fall within the jurisdiction of the Electrical Inspector of Mines, Govt. of India whereas, in case falling under Clause (2) above, such stations shall fall within the jurisdiction of the Electrical Inspectors of the concerned State.

(Cir. 29/1972)

4. Mines worked through contractors—Owners of Mines worked through contractors often place the responsibility for safe working of the mine on the latter who in turn, might transfer it to sub-contractors who may have neither the means nor the skill required to do so. The provisions of this sub-section are quite clear; and the responsibility for working the mine in a safe manner (including that of providing and setting supports) still remains that of the management even when contractors and sub-contractors are employed.

Similarly the management is also responsible under Coal Mines Regulation 113 etc. for the appointment of a competent person to be in charge of every place where work is being carried on in the mines irrespective of whether the work is carried out through a contractor or sub-contractor. For the safe working of a mine it is necessary that the supervising staff and shotfirers are appointed and paid by the Owner, Agent or Manager and not by a contractor or sub-contractor.

(Cir. 3/1952)

5-Criteria for treating persons as employed below ground or otherwise— Cases have arisen where some persons are engaged to work in mines below ground for some days in a week or even for some hours in a day, while for the rest of the days or hours, as the case may be, they are engaged to work on the surface or elsewhere. For deciding their eligibility to leave with wages, overtime wages etc. a question has been raised whether such workers are to be treated as "persons employed below ground" or as "persons employed elsewhere in the mine".

In the absence of any specific provision in the Mines Act, 1952 and its rules, it is recommended that the following criteria may be adopted as a working policy:

(a) In order to determine whether or not a person is to be treated as "employed below ground" on any particular day, the total number of hours for which he was engaged on any work below ground on that day and the total number of hours he has to normally work on that day, should be taken into account and if the former is half or more of the latter, he should be treated as 'employed below ground' for that day.

(b) In order to determine whether or not a person is to be treated as employed below ground during any particular period such as a week, a month or a year, as the case may be, the total number of working days during the said period and the total number of days on which the person was treated as 'employed below ground' based on the criterion mentioned in Clause (a) above, should be taken into account; and if the latter is half or more of the former, he should be treated as employed 'below ground' for that period.

(c) In all other cases, the person may be treated as employed elsewhere in the mine.

(Cir. 16/1972)

Sec.3

1.Exemption from Sec. 83(I)--In exercise of the powers conferred by sub-section (1) of Section 83 of the Mines Act, 1952(35 of 1952), the Central Government hereby exempts the persons employed by the Oil and Natural Gas Commission on drilling and production operations at Allibet Island from the operation of the provisions of Chapter VI of the said Act except Section 36 and Sections 40 to 48 (both inclusive), subject to the conditions, that the said persons" (i) shall not be employed for more than twelve hours on any day,

(ii) shall not be employed for more than fifteen days, at a stretch,

(iii) shall, after they have worked for fifteen days at a stretch be granted rest for a period of not less than fifteen days.

(Statement No. 13 of 1968)

2. Limitations of District Magistrate as Inspector—Government of India (Ministry of Labour) Notification No. M- 41(37) 52, dated the 18th September, 1953, is reproduced below:

"In pursuance of sub-section (3) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby directs that, in exercising the powers and performing the duties of an Inspector, the District Magistrate shall not, without prior reference to the Director-General, take direct action or issue any order in respect of any matter solely connected with technical direction, management or supervision of any mine, even through such direction, management or supervision may appear to him to be dangerous or defective".

3. Appointment of District Magistrate as Inspector—Government of India (Ministry of Labour) Notification N-4141(21) 54, dated the December, 1954, is reproduced below:

"In exercise of the powers conferred by sub-section (3) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby directs that every Collector in the State of Hyderabad appointed to discharge, the functions of an Additional District Magistrate by the Government of that State under sub- section (2) of Section 10 of the Code of Criminal Procedure, 1898 (Act V of 1898), shall exercise the powers and perform the duties of an Inspector under the first mentioned Act, subject to any general or special order of the Central Government.

4. Change of designations in the Mines Inspectorate—In accordance with Notification No. 8/24/66-MI dated 3rd April, 1967 issued by the Govt. of India in the Ministry of Labour, Employment and Rehabilitation the 'Office of the Chief Inspector of Mines' will with effect from 1st May, 1967, be known as the "Directorate-General of Mines Safety" and the Chief Inspector of Mines "as Director-General of Mines Safety". The other posts in this Organisation will be designated as below:

Present Designation	New Designation
Addl. Chief Inspector of Mines	Dy. Director-General of Mines Safety
Dy. Chief Inspector of Mines	Director of Mines Safety
Regional Inspector of Mines	Jt. Director of Mines Safety
Inspector of Mines	Dy. Director of Mines Safety
Inspector of Mines (Mech)	Dy. Director of Mines Safety (Mechanical)
Electric Inspector of Mines	Dy. Director of Mines Safety (Electrical)

Asstt. Inspector of Mines	Asstt. Director of Mines Safety
Inspector of Mines (Medical)	Dy. Director of Mines Safety (Medical)
Asstt. Inspector of Mines (Medical Gr. I)	Asstt. Director of Mines Safety (Medical) Gr. I
Asstt. Inspector of Mines (Medical) Gr. II	Asstt. Director of Mines Safety (Medical), Gr. II

The telegraphic address of the head quarters organisation will remain 'Mines' but that of field Offices will be changed to 'MINESAFETY' for Regional Offices and DIRMINSAFETY for Zonal Offices. All communications made with this Organisation on or after 1st May, 1967 are to be addressed to the changed designations indicated above.

(Cir. 22/1967)

Sec. 5

Authorisation under Sec. 5(1)—The following persons appointed as Inspector of Mines under Section 5(1) of the Mines Act, 1952 are authorised to exercise the powers under the aforesaid Section within their respective areas of jurisdiction :

1. A person holding the post of Dy. Director General of Mines safety.
2. A person holding the post of Director of Mines Safety.
3. A person holding the post of Jt. Director of Mines Safety.

(Statement No. 19 of 1970)

Sec. 18

Responsibility for enforcement of Mines Act etc.— 1. Management of some mines adopt the attitude that violations of the provisions of the Mines Act, Regulations, Rules and Byelaws etc. are to be remedied only after such violations have been pointed out by officers of this Department. It is to be made clear that once the safety law has been laid down, it is the duty of the management, both morally and legally, to see that none of its provisions are breached.

It is the duty of the Inspector of Mines to enforce the provisions of Safety Legislation in mines; but this does not imply that the managements would continue to contravene the mining legislation till such contraventions are pointed out by the Inspectors. As stated above, the responsibility for complying with the Safety legislation lies primarily with the owners, agents and managers of Mines.

2. At a number of mines certain violations continue to be repeated. This is not a healthy state of affairs and steps should be taken to remedy it.

(Cir. 6/1956)

Sec. 19

Provision of drinking water in mines— According to section 19 of the Mines Act, in every mine effective arrangements should be made to provide and maintain at suitable points,

conveniently situated, a sufficient supply of cool and wholesome drinking water for all persons employed therein. The quantity of drinking water to be provided should be on a scale of at least two litres for every person employed at one time.

At some collieries drinking water is taken belowground in drums or tanks fixed on trolleys, but this system has not proved popular due to various prejudices. At a number of mines, water-bottles have been provided to every worker below ground, but this arrangement too has not proved a success, by and large.

Arrangements have been made at some of the mines to supply drinking water through pipes to points within 30 metres of the working faces, and this is perhaps the best way in which the provisions are complied with.

There is no doubt that the workers need drinking water while at work and that they are generally restoring to the unhygienic practice of consuming underground make of the water. On the other hand, it is appreciated that there is some times shortage of piped water supply on the surface and in the houses, and it may then be difficult to provide piped water underground.

Arrangement for supply of wholesome drinking water underground as may be found readily acceptable to the workers shall be made.

(Cir. 65/1967)

Sec. 22

Communication about defective workings to mine workers—During the Second Conference on Safety in Mines there was a suggestion from the workers' representatives that violations of serious nature should be displayed on the notice boards and those of minor nature should be placed before the Pit Safety Committees. A decision was not arrived at during the Conference whether to give effect to the above suggestion or not. The Chairman, therefore, promised to look into the matter to find out which type of violations can be communicated or displayed on the mine notice boards.

The Government have since decided that in future every single order issued under Section 22 of the Mines Act, 1952 should be displayed on the notice boards for a period that will be specified in the order itself.

(Cir. 23/1968)

Sec. 23

Death by heart failure— In the notices of accidents received by the Department it is sometimes mentioned that the death has probably been caused due to sudden heart failure.

Such failure of heart may be caused in the natural way or as a result of an injury received while engaged in any operations connected with mining. In the former case the occurrence cannot be treated as a mining accident. It is, however, to be appreciated that the fact of death having been caused due to heart failure can only be established by means of a post mortem examination of the dead body. Therefore in case it is felt that death has been caused by heart failure in a natural way and not as a result of any mining operations whatsoever, then dead body should invariably be sent for post mortem examination and a copy of the post mortem report should be submitted to JDMS as soon as possible.

In ease of non compliance with these instructions, the occurrence may have to be treated as an accident coming within the purview of the Mines Act.

(Cir. 37/1959)

Sec. 25

1. Notified diseases—Any case of Coal Miner's Pneumoconiosis or Silicosis diagnosed by any medical practitioner employed in the mine is to be notified to DGMS as required under the Act.

(Cir. 76/1973)

2. Mining Industrial Diseases—The following diseases have been notified by the Central Government as diseases connected with mining operations :

S.I No. Industrial diseases	Reference to Notification which notified
1. Silicosis	Ministry of Labour Notification
2. Pneumoconiosis	No. SRO 1306, dated 21.7.1952
3. Manganese Poisoning Nervous type	Ministry of Labour Notification
	No. Mi-41 (74) 56, dated 18 th
	December, 1956

3. Notified diseases— The Govt. of India in the Ministry of Labour have notified certain diseases as diseases connected with mining operations vide Notification No. SO. 2521, published in Part II, Section 3(ii) of the Gazette of India dt. 12th July 1986. The notification is reproduced below.

NOTIFICATION

New Delhi, the 26th June 1986 S.O. 2521. In exercise of the powers conferred by the sub-section (1) of Section 25 of the Mines Act, 1952 (35 of 1952), the Central Govt. hereby notifies each of the following diseases as diseases connected with mining operations :—

- (1) Asbestosis
- (2) Cancer of lung or the stomach or the pleura and paritoneum (i.e., mesotheliomas).

Under Secretary
(Cir. Legis. 5/1987)

Sec. 28

Weekly day of rest of wagon loaders etc.— Section 28 of the Mines Act provides that no person shall be allowed to work in a mine for more than six days in any one week. Persons employed on surface in loading or unloading of railway wagons are frequently employed in some mines on all the seven days in a week with the result that they do not get a weekly day of rest in every week. Since the wagon loaders are not exempted from the provisions of Section 28, the provisions of Section 29 in respect of grant of compensatory day of rest in lieu of the weekly day of rest do not apply to them except in emergencies. It is therefore essential to ensure that all persons employed in loading or unloading of wagons are allowed a weekly day of rest in pursuance of Section 28.

It may be necessary to carry out loading or unloading of wagons on all the seven days in a week. To provide for this and at the same time to satisfy the requirements of Section 28, the obvious solution is that the wagon loaders etc. employed in any one relay are divided into seven groups and each such group is given a fixed day of rest on different days of the week.

(Cir. 44/1962)

Sec. 29

Work on rest day in lieu of festival holiday— The purpose of granting a paid festival holiday is to grant a benefit in addition to those granted under the Mines Act; and this is not fulfilled if mines carry on work on the normal days of rest and declare the paid festival holiday to be the weekly day of rest. This practice should therefore be discouraged.

(Cir. 43/1959)

Sec. 38

1. Reports about employment of persons in contravention of the Act—Managements are required to submit such reports at the end of every month to Joint Director of Mines Safety.

(Cir. 7/1952)

2. Submission of notices— Though persons are often appointed in exercise of the relaxation, no notices in the matter are being received by DGMS. Care should be taken to see that notices of such employment are sent both to DGMS and JDMS concerned.

(Cir. 49/1963)

Sec. 45

Prohibition of presence of children in any part of the mine above ground—Attention is invited to section 45(2) of the Mines Act, 1952. Managements are requested to ensure that no child is allowed to be present in any part of a mine above ground where any operation connected with or incidental to any mining operations is being carried on.

(Cir. Legis. 1/1982)

Sec. 48

Attendance of labour employed by contractors— This section applies equally to workers employed by contractors.

(Cir. 11/1956)

It has been noticed at some mines that entries in the attendance registers are not made in respect of the labour employed by the contractors.

Section 48(4) of the Mines Act, 1952, reads— "For every mine, other than a mine which is exempted by the Central Govt. by general or special order, there shall be kept in the prescribed from the place separate registers showing in respect of each person employed in the mine (a) below ground (b) in opencast workings and (c) above ground—

(a) the name of the employee

(b) the nature of his employment,

(c) where work is carried on by a system of relays, the relay to which he belongs and the hours of relay, that is to say, the period of work fixed for him.

Under Mines Rule 78 the forms of registers and the procedure of entries are prescribed.

If attendance of the labour employed by the contractors is not recorded, it is a contravention of the provisions of the Mines Act, 1952 and the Mines Rules, 1955. It is therefore necessary that attendance of all workpersons including those employed by the contractors should be recorded in the prescribed attendance registers.

(Cir. 52/1965)

Sec. 75

All officers of this Directorate who are subordinate to the Chief Inspector and who have been appointed as Inspectors of Mines under section 5(1) of the Mines Act, 1952 are authorised to institute prosecutions for any offence under the Mines Act, against the Owner, Agent or Manager of any mine situated within their respective inspection jurisdiction as declared under sub-section (3) of Section 6 of the Mines Act, 1952.

This is in partial modification of this office order No. Law (52)/61-36914G dated 19.10.62.

(Statement No. 20 of 1970)

Sec. 76

Ownership of the Mine—The following information should be furnished to DGMS with a copy to JDMS concerned :

(1) In case of a firm or other/association of individuals, the names and permanent address of all the partners or members.

(2) In case of a company, the names and permanent address of all the directors.

Any subsequent change should also be notified immediately to DGMS and to JDMS concerned.

In this connection, attention is drawn to the proviso to Sec. 76 according to which it is permissible to nominate—

(1) in the case of a firm, any of the partners,

(2) in the case of an association, any of the members, and

(3) in the case of a company, any of the directors to assume the responsibilities of the Owner under the Act.

If any such nomination has been made, a notice thereof (accompanied by a duly signed resolution authorising such nomination and a letter of acceptance by the person nominated) should also be sent to this office with a copy to the JDMS concerned.

(Cir. 26/1961)

Sec. 83

1. Exemptions from application of Mines Act—A copy of Government of India, Ministry of Labour, Notification No. S.O. 3699 dated 22.11.65 as amended upto date is given below—

No. 170-59-166/G dt. 15.9.71

Government of India

Ministry of Labour & Employment, New Delhi.

NOTIFICATION

S.O. 3699—In exercise of the powers conferred by Sub-section (1) of Section 83 of the Mines Act, 1952 (35 of 1952), and in supersession of the Notification of the Government of India, Ministry of Labour and Employment Nos. G.S.R. 975 dt. 11th August 1960 and S.O. No. 633 dt. 7th February, 1964 the Central Government hereby exempts the parts of mines and classes of

persons specified in column (1) of the Schedule hereto annexed from the operation of the provisions of the said Act as are specified in the corresponding entry in column (2) thereof, subject to the conditions, if any, specified in the corresponding entry in column (3) thereof.

SCHEDULE

Name of Mine and classes of persons exempted	Provisions which from exemption is granted	Condition attached to exemption
1. (a) All coal washeries forming part of mines. (b) All coke plants forming part of mines which have	All	
*2. The following mines in the States of Assam, West Bengal & Bihar namely—	All	*Omitted vide notification S.O. No. 1063 dated 18.3.67 published in Gazette on 1.4.67.
@ The crude oil pipe line from the oil field of Naharkatia to the petroleum refineries at Noon-mati Gauhati and		Certificate u/s 82 of the Mines Act, 1952 declaring it as mine was also issued vide S.O. No. 1062 dated 18.3.67 published on 1.4.67.
3 The following mines in the State of Madras. The Briquetting and Carbonising Plant of M/s. Neyveli Lignite Corporation Ltd.	All	

4 Stone crushing plants forming part of the mines situated in Greater Bombay wherein ten or more workers are employed or were employed on any day of the preceding twelve months in the crushing and sizing of stone.	All	
5 Persons employed on the surface in loading or unloading transport trucks used for transporting ore or other material by road to or from outside destinations, or in loading or un-loading railway wagons & in screening and washing plants and on work of sampling connected therewith.	The provisions contained in Section 36.	
6 Women employed on surface in loading or unloading railway wagons or of sand or in screening and washing plants or in work connected with fighting, isolating and controlling of fires.	The provisions contained in Section 46.	Provided that no such women so exempted shall be permitted to be employed in such operations between the hours of 10 p.m. & 5 a.m. and notwithstanding anything contained in Sec. 30(2) there shall be an interval of not less than eleven hours between successive periods of employment.

7. Attendants employed on surface in power or boiler houses, engine, motor or compress or rooms, winding or hoisting, ventilation or air conditioning, mechanical screening, washing, loading or mineral dressing & separating plants, banksmen, signalmen, loco drivers, trolley men, trammers. lamp checkers & contraband body searchers.	Sec. 28 and Sub-sec. (2) of Sec. 30.	The period of work shall not normally exceed eight hours in any day.
8. Attendants employed belowground on continuously operated machinery, haulage engine drivers, pumpmen, onesetters, signal men and bellmen.	Section 28.	
9. Persons defined in Mines Rules, 1955 as holding positions of supervision or management or employed in confidential capacity.	The provisions contained in Section 29, 33, 35 and 36.	Provided that the exemption from Sec. 33 shall not (i) operate to the prejudice of the rights to which any such person may be entitled under the terms of any award agreement or contract of service:
% Amended vide No. 6/1/68-MI dt. 7.2.68		(ii) apply to any such person whose basic pay does not exceed Rs. 500/- per mensem.

10. Persons employed in welfare services including pit head baths, canteen & creches, in the issuing of foodstuff, in hospitals and dispensaries, in sanitary or conservancy work other than in underground and workshop premises, in "watch and ward" and clerks, accountants, timekeepers, register keepers and orderlies on the surface.	All provisions of Chapter VI excepting the provisions contained in Sec. 28,29,33,38,44, 45, 46 & Sub-sec. (I) & (4) of Sec. 48.	Provided that Sec. 46 in so far as it prohibits the employment of women except between the hours of 6 a.m. & 7 p.m. shall not apply to women employed in pithead baths, cretches and canteens and mid-wives and nurses employed in hospitals and dispensaries. Provided further that the Sec. 28 shall not apply to nurses midwives and dais when they are required to attend to any case of child birth.
11. Women employed in health and welfare service, and who in the course of their duties occasionally have to enter the underground workings of a mine for purposes other than manual work.	Sec. 45 in so far as it prohibits the employment of women entering belowground.	Every such woman before entering the workings belowground shall be in possession of a pass granted by the manager which shall show the date or dates and hours between which she is permitted to be present belowground.
12. Persons employed in drilling deep oilwells where such drilling has to be carried on continuously.	Sec. 28 and Sub-sec. (1) of Sec. 30	
13. Mines (other than oil mines) wherein not more than fifty persons are employed and where only prospecting operations are being carried by means of drilling.	All provisions of the Mines Act 1952 except those contained in Sec. 7, 8, 9, 44, 45 & 46.	

14. Any mine in which All seismic All survey operations are carried on * (by Oil and Natural Gas Commission) for so long as the operations (** in the mine) are confined to seismic survey.

* Omitted and

** Added vide Notification
No. S.O. 2275 dated
22.7.66

Sd/
Under Secretary

Sl. No.	Provisions exempted	Condition attached to fulfilled
1	Regulation 34 of the Metalliferous Mines Regulations 1961 (in so far as it lays down the qualifications of the manager)	1. The aggregate horse-power of machinery used in such opencast workings shall not exceed 500
		2. No deephole blasting shall be carried out in such workings
		3. The total amount of explosives used per day in such workings shall not exceed 100 kg.
		4. A person holding at least a Foreman's certificate shall be employed in addition to the number of Foremen required to be appointed under Metalliferous Mines Regulations 1961. The Foreman so employed shall be appointed as the Manager under this regulation
2.	Regulation 182 of Metalliferous Mines Regulations, 1961 in so far as it requires the provision	All persons who are required logo and work within 10 metres from any face in such opencast workings, whether such face is working face or a face where work has been discontinued for any

	and use of safely hats or helmets and boots	reason whatsoever shall be provided with safety helmets & safety safely boots while all other persons employed in such opencast workings shall be provided with safely boots
3	Regulation 15 of Metalliferous Mines Regulations, 1961	No condition
4.	Rule 40 of the Mines Rules, 1955	No condition

[No. 4(2)/70-Genl./13719G dated 2.8.1972]

2. Exemptions under Mines Act—All the mines working moulding sand are exempted from all the provisions of the said Act except those contained in Section 7, 8, 9, 44, 45, 46 and the provisions of Chapter IX of the said Act, subject to the following conditions, namely:

- (i) the depth of the excavation measured from its highest to its lowest point no where exceeds 1.5 metres;
- (ii) the number of person employed on any day does not exceed 20;
- (iii) explosives are not used in connection with the excavation; and
- (iv) the workings do not extend below the superjacent ground.

[No. S-29014/10/72-MI & S.O. 2981 dt. 10.7.72]

New Delhi, the 25th March, 1972

S.O. 1530—In exercise of the powers conferred by sub-section (1) of Section 83 of the Mines Act, 1952 (35 of 1952), the Central Government hereby exempts for a period of five months or till the cessation of the operation of the Proclamation of Emergency issued by the President under clause (1) of article 352 of the Constitution of the 3rd day of December, 1971, whichever is earlier, all the mines from the following provisions of the said Act namely:

- (i) Section 28
- (ii) Section 29
- (iii) Sub-section (1) of Section 30 and sub-section (1) of Section 31 in so far as the said sub-sections restrict the number of weekly hours to forty-eight; and
- (iv) Section 33.

Subject to the condition that:

- (a) No person shall be employed on more than one weekly day of rest out of every four weekly days of rest, and
- (b) The exemption made by this notification shall apply only to the employment of persons on one weekly day of rest out of every four weekly days of rest.

(No. S. 29014/14/71-M1)

4. Accident Statistics—Minor Accidents Register and analysis of records of accidents—A perusal of the minor accident register submitted to this Directorate/maintained at the mines has

revealed glaring omissions and near purfunctory attitude displayed towards its maintenance. In many cases, it is observed that the proforma of minor accident continues to be the outdated and outmoded register and is not in accordance with the revised form in force since 1970. In the absence of maintenance of adequate details of minor accidents, no meaningful analysis can be made of the data and the principal purpose of maintaining this register is thus defeated. It is reiterated at this stage that for a purposeful study of the status of safety in mine and identifying dangerous trends therein, a proper analysis of minor accident is necessary. In fact to make the picture complete, an analysis of the "incidents" i.e. dangerous occurrence in which no person is involved, has also to be carried out.

One reason for the inadequacy of technical data in the minor accident register is that this is maintained at the dispensary and perhaps by the Doctors or medical staff. While this may be advantageous on some counts, care has to be taken at the same time to ensure that alongwith the entries on classification of cause and place of accident, brief description of cause of accident etc. are duly filled in by the Safety Officer/Asstt. Manager (where appointed or by the Manager himself). For this purpose a proper reporting system ought to be developed whereby every accident or incident is duly reported by the shift assistant manager/overman/mining sirdar to the Safety Officer/Manager. The report should cover certain salient features of the accident or incident giving as many details as possible. The Safety Officer/ Manager should supplement additional information where required, based on his enquiries/inspections. Specimen copy of a reporting form is enclosed (Annexure I) for guidance in this respect. A separate register to record the incidents so reported should be maintained for this purpose.

Proper analysis should be made of the minor (and other) accidents/incidents. A list of tabulations that are pertinent for a proper study of the accident/incident situation at a mine is enclosed (Annexure II). This includes specimen tables also. These are not exhaustive but only illustrative. Additional analysis may be necessary in individual cases to identify in greater depth the problems obtaining at a mine.

The new classification code of cause is furnished at Annexure III. Some typical examples of description of accidents are given at Annexure IV for general information.

I trust the above guidelines will be useful to you in developing a proper reporting, recording and analysis system for bringing about reduction in number of accidents at your mines(s).

I shall be pleased if suitable action is initiated immediately on the above lines to achieve the desired objective.

(Cir. Genl. 3/1978)

ANNEXURE I

Accident/Incident Intimation Slip

Name of mine: XYZ Colliery
 District: 9 Cross-out Development
 Date of : 12.10.76 Time : 07.30 hrs., Shift: first
 Cause of Occurrence: (Give brief description)

While blasted coal was being loaded at the face, suddenly a piece of shale roof measuring 30 cms.x20cms.x 10 cms. thick fell from a height of 1.9m on one loader injuring him on his right foot and back.

Remarks : The place has been made secure/fenced off etc.

No. of persons injured : One

Name Sri Budhan Mian

Designation Loader

First-aid given Time: 09.45 hrs. By whom : Sri S. Gope (Mining Sirdar)

Signature of:

Mining Sirdar Overman Asstt. Manager Safety Officer Manager

ANNEXURE II

Statistical analysis of accidents—suggested tables

Table—1	Analysis of accidents by major cause group and place.
Table—2	Analysis of accidents for each cause group and place. This will include mine tables, one for each cause group.
Table—3	Analysis of accidents due to rope haulage by detailed sub-classification.
Table—4	Analysis of accidents by place of work.
Table—5	Analysis of accidents due to fall of roof and sides by place of accident.
Table—6	Analysis by part of body injured and sex.
Table—7	Analysis by nature of injury.
Table—8	Analysis of persons involved by age and sex.
Table—9	Analysis by shift of employment.
Table—10	Analysis by occupation and vocational training.
Table—11	Analysis by experience of worker.
Table—12	Analysis by cause and occupation (Similar tables for other causes can be made out)

Specimen tables enclosed

Table—2 : Analysis of accidents for each cause group and by place.

Note : Separate tables to be prepared for each major cause group in Table—1 (1 to 9).

For example, those for Ground movement and Explosives will be as below.

Table— 2.1 : Analysis of accidents due to Ground movement by place.

Item of cause	Place	Fatal	Serious	Minor
1.1 Fall of roof wall	Below ground			
1.2 Fall of side wall	Below ground			
1.3 Fall of side Face.	Below ground			
1.4 rock Burst or Bump	Below ground			
1.5 Air Blast	Below ground			
1.6 Premature collapse of workings/pillars	Below ground			
1.7 Subsidence	Below ground above ground			
1.8 Landslide	Opencast			
1.9 Collapse of shaft	Below ground			
TOTAL				

Table
Analysis of accidents by cause and place

Cause	Place	Fatal	Serious	Minor
1. Ground	Below ground opencast			
2. Transportation machinery (winding in shafts)	Below ground			
3. Transportation machinery (other than winding in shafts)	Below ground Opencast Above ground			
4. Machinery other than transportation machinery	Below ground Opencast Above ground			
5. Explosives	Below ground Opencast Above ground			
6. Electricity	Below ground Opencast Above ground			
7. Dust, Gas and other combustible material	Below ground			
8. Falls (other than falls of ground)	Below ground Opencast Above ground			
9. Total	Below ground Opencast Above ground			
GRAND TOTAL				

Table 2.5—Analysis of accidents due to explosives by place

Cause	Place	Fatal	Serious	Monitor

5.1	Solid blasting	Below ground	
5.2	Deep hole blasting	Opencast	
5.3	Air blasting	Below ground	
5.4	Other projectile	Below ground Opencast Above ground	
5.5	Misfires or Sockets drilling into it	Below ground Opencast	
5.6	Misfires of Sockets while breaking boulders/cutting at faces	Below ground	
5.7	Delayed ignition	Below ground Opencast	
5.8	Blown through shot	Below ground Opencast Above ground	
5.9	Other explosives accidents		
Total			

Table 3—Analysis of accidents due to rope haulage by detailed sub-classification

Sub-Classification		Fatal	Serious	Minor
1	Runaway of tubs 1.1 Due to breakage of rope 1.2 Failure of attachment to rope 1.3 Failure of coupling 1.4 Due to defective coupling 1.5 Failure of drawbar 1.6 Inadequate/non-provision/failure of sprags 1.7 Failure of stop block/buffer 1.8 Failure of engine brake 1.9 Other causes of runaway (specify)			
2	By tubs under movement 2.1 By rope 2.2 By gravity 2.3 By hand tramming in close proximity 2.4 By other hand tramming 2.5 By guiding 2.6 By uncontrolled movement 2.7 By other moving tubs			
3	By other tubs 3.1 By derailling or derailed tubs 3.2 By tubs being re-railed			
4	In the process of coupling and uncoupling (including attachment of clips) 4.1 of tubs 4.2 of tub/set of tubs with rope			

5 By sprags
5.1 being inserted
5.2 unauthorised
6 By set riding
6.1 authorised
6.2 unauthorised
7 By moving rope
7.1 direct
7.2 main and tail
7.3 endless—under rope
7.4 endless—over rope
7.5 Jig—gravity rope
7.6 other haulage rope
8 By moving parts
8.1 pulley
8.2 tub wheels
8.3 other moving parts
9. By other unspecified causes
Total

ANNEXTURE II

Table 4—Analysis of accidents by place (detailed classification)

Classification of Place	Fatal	Serious	Minor
1 Below ground .			
1.1 Development lace			
1.2 Other development area			
1.3 Longwall face			
1.4 Other depillaring/stoping area			
1.5 Trammig roadway			
1.6 Other rope haulage roadway			
1.7 Shafts and sinking shafts			
1.8 Incline/Winze			
1.9 Others (Specify)			
Total Below ground :			
2. Opencast working			
2.1 Bottom bench			
2.2 Top of the quarry			
2.3 Other benches			
2.4 Rope haulage roadway			

2.5 Other transportation roadways
2.6 Bed of quarry
2.7 Others
Total Opencast:
3. Above ground
3.1 Aerial ropeway site
3.2 Rope haulage plane
3.3 Other transportation roadway
3.4 Railway line belonging to the mine
3.5 Site of ore handling plants (including screening plants, dressing plants, crushing plants etc.)
3.6 Workshop, Powerhouse & other engine room
3.7 Depot
3.8 Stores
3.9 Others
Total Above ground
Grand Total

Table 5—Analysis of accidents due to Fall of roof and sides by place of accident A table analogous to Table 4 with more details, for example—

Place of accident	District	Fatal	Serious	Minor
Development face	District A District B			
Other Development	District A District B			
Longwall face	LT ₁ LT ₂			
Other depillaring area	District P District P			
Tramming roadway	District A District B District P			
Other rope haulage roadway	District Q District A District B District P District Q			
Etc	Etc.			
Total	District A District B District P			

District Q
LT ₁
LT ₂
Grand Total

Note Similar table for rope haulage accidents by each haulage installation in use may be made out.

Table 6—Analysis by part of body injured & Sex							
	Parts of body	Death		Serious Injury		Minor Injury	
		M	F	M	F	M	F
1	Head 1.1 Cranium (Skull, Brain, Scalp) 1.2 Eye 1.3 Ear 1.4 Others (including multiple)						
2	Neck						
3	Trunk 3.1 Back (including spinal column & chord) 3.2 Chest (ribs etc.) 3.3 Abdomen 3.4 Pelvis 3.5 Other multiple						
4	Upper Limb 4.1 Shoulder 4.2 Arm (including elbow) 4.3 Wrist & Hand (except fingers) 4.4 Fingers 4.5 Other multiple						

5	Lower Limb 5.1 Hip & Thigh 5.2 Knee 5.3 Leg 5.4 Ankle & Feet (except toes) 5.5 Toes 5.6 Other multiple
6	Multiple Locations 6.1 Head and Trunk or one or more Limbs 6.2 Trunk & one or more Limbs 6.3 Upper & Lower or more than 2 Limbs 6.4 Other multiple
7	General injuries affecting a system of the body

Note : In case of multiple injuries, use classification at (6) if the several injuries are more or less equally severe : in case some injury is more severe than the other, the classification should relate to that part of body sustaining the more severe injury.

Table 7—Analysis by nature of injury

(Table similar to Table—using the following classification of injuries)

1. Fracture (including simple & compound fracture).
2. Dislocation.
3. Sprains and strains.
4. Contusions and other internal injuries (including internal contusions, haemorrhages, lacerations & ruptures).
5. Amputations and enclinations (including traumatic avulsion of eye).
6. Other wounds (including lacerations, open wounds, cuts, contusion with wound, scale wound, loss of nails or ears, injury to nerves).
7. Superficial injuries (including abrasions, scratches, blisters, superficial wounds, superficial injuries due to foreign bodies entering eye).
8. Contusions and crushings (including haemarthrosis haemotoma and bruises).
9. Burns (including burns from hot objects, fire, scalds, friction burns etc.; excluding burns due to swallowing a corrosive or caustic substance, sun burns, effect of lighting, due to electric current and radiation effect other than burns).
10. Acute poisoning (including asphyxiation by carbon monoxide and other toxic gases).
11. Effects of weather, exposure and related conditions (including heat stroke, sun stroke, lightning).
12. Asphyxia (excluding by CO or other toxic gases).
13. Effect of electric current (electrocution, electric shock, burns due to electric current).
14. Effects of radiation (X-rays, radio active substance etc. excluding burns due to radiation).

15. Multiple injuries of different nature (when the injured person sustained several injuries of different nature and no injury is more severe than others).

16. Other and unspecified injuries.

Table 8—Analysis of persons involved by age & sex

Age	18-25 yrs.	26-35 yrs.	36-45 yrs.	46-55 yrs.	Above 55 yrs.	Total
Casualty/Sex						
1. Death	Male	Female				
2. Serious injury	Male	Female				
3. Minor injury	Male	Female				
Total:	Male	Female				
Grand Total:						
Frequency rate per (1000)	Male	Female				

Table 8—Analysis of persons involved by age & sex

First		Second		Third	
1st half	2nd half	1st half	2nd half	1st half	2nd half

Death

Serious Injury

Minor Injury

Employment

Frequency rates

Table 10—Analysis by occupation and vocational training

Occupation	Total	Death	Serious injury	Minor injury	Frequency rate
	Trained Not Trained	Trained Not Trained	Trained Not Trained	Trained Not Trained	Trained Not Trained

1. Miners
2. Loaders
3. Trammers
4. Banksmen/Onsetters
5. Timbermen
6. Tyndals
7. Machine Operators
8. Drillers
9. Dressers etc.
(as per local experience)
TOTAL

Table 11 – Analysis by experience of workers

experience	Total employment in mines		Death		Serious injury		Minor injury		Frequency rate	
	M	F	M	F	M	F	M	F	M	F
1. During period of training										
(A) Total experience in Mining										
2. Experience upto 1 Year										
3. Experience upto 1-5 Years										
4. 6-10 Years										
5. 11-20 Years										
6. 21-30 Years										
7. More than 30 Years										
(B) Experience in the job in which engaged										
8. Experience upto 1 Year										
9. —do— 1-5 Years										
10.—do— 6-10 Years										
11. More than 10 Years										

Table 12—Analysis by cause & occupation

Occupation of persons Involved	Fall of roof & sides		Haulage		Explosives	
	D. S. Inj.	M. Inj.	D. S. Inj.	M. Inj.	D.S. Inj.	M. Inj.

1. Miners
2. Loaders
3. Trammers
4. Timbermen
5. Tyndals
6. Dressers
7. Drillers
8. CCM Crew
9. Overman/Sirdar
10. Shot-firer
- 11.....etc.
as per type of persons getting
involved

Note : Similar cross tabulation can be made out for other cause groups as per requirement at each mine.

ANNEXURE III **Classification of Accidents by Cause**

1. GROUND MOVEMENT

- 1.1 Fall of roof
- 1.2 Fall of sides (other than overhangs) ,
- 1.3 Fall of overhangs
- 1.4 Rock burst or bump
- 1.5 Air blast
- 1.6 Premature collapse of workings/pillars
- 1.7 Subsidence
- 1.8 Landslide
- 1.9 Collapse of shaft

2. TRANSPORTATION MACHINERY (WINDING IN SHAFTS)

- 2.1 Overwinding of cages or other means of conveyance
- 2.2 Breakage of rope, chain and drawgear
- 2.3 Fall of persons from moving cages or other means of conveyance.
- 2.4 Falling/rolling down of objects from moving cages or other means of conveyance.
- 2.5 Hit by cages or other means of conveyance
- 2.6 By cages or other means of conveyance colliding in the shaft.
- 2.7 Other accidents due to winding operation

3. TRANSPORTATION MACHINERY (OTHER THAN WINDING IN SHAFT)

- 3.1 Aerial Ropeway
- 3.2 Rope haulage
- 3.3 Other rail transportation
- 3.4 Mechanical conveyors
- 3.5 Dumpers and other heavy earth movers
- 3.6 Rly wagon movement
- 3.7 Hand Trimming
- 3.8 Other wheeled trackless means of transportation (trucks, lorrier etc.)

4. MACHINERY OTHER THAN TRANSPORTATION MACHINERY

- 4.1 Drills
- 4.2 Coal cutting machines
- 4.3 Coal loading machines
- 4.4 Haulage engine
- 4.5 Winding engine
- 4.6 Shovels draglines excavators etc.
- 4.7 Ore handling plants (including crushing and screening plants)
- 4.8 Pumps
- 4.9 Other machinery (Specify)

5. EXPLOSIVES

- 5.1 Solid blasting
- 5.2 Deep hole blasting
- 5.3 Air blasting
- 5.4 Other projectiles
- 5.5 Misfires/sockets-while drilling into it
- 5.6 Misfires/sockets-while breaking boulders/cutting at faces
- 5.7 Delayed ignition
- 5.8 Blown through shot
- 5.9 Other explosive accident

6. ELECTRICITY

- 6.1 Overhead lines
- 6.2 Other power cables
- 6.3 Switch gear, gate-end boxes, pommel etc.
- 6.4 Energised machines
- 6.5 Other electrical accidents

7. DUST, GAS & OTHER COMBUSTIBLE MATERIAL

- 7.1 Occurrence of gas
- 7.2 Influx of gas
- 7.3 Suffocation by gases
- 7.4 Explosion or ignition of gas/dust etc.
- 7.5 Outbreak of fire or spontaneous heating
- 7.6 Other accidents due to dust, gas & combustible material

8. FALLS (OTHER THAN FALLS OF GROUND)

- 8.1 Falls of persons from height or into depths
- 8.2 Falls of persons on the same level
- 8.3 Falls of objects other than falls of ground including rolling objects
- 8.4 Other falls (Specify)

9. OTHER CAUSES

- 9.1 Irruption of water
- 9.2 Flying pieces
- 9.3 Extremity caught in between objects
- 9.4 Drowning in water
- 9.5 Buried in sand
- 9.6 Unclassified (Specify)

ANNEXURE IV

Some examples of Description of Cause of Accidents

1. While manipulating haulage rope on its drum with right hand, the middle finger was trapped between coils of the rope causing crush injury.
2. While going up the loading plank, a loading kamin slipped and fell on the ground, sustaining injury on her right knee.
3. While a loader was pushing a tub loaded with coggings sleepers, a sleeper which was protruding hit a loose prop; the prop fell down and hit the loader on his palm.
4. While a trammer was coupling two loaded tubs, (at 25th level tramming level) one tub slightly rolled back and caused injury on the wrist of his right hand.
5. While a miner was engaged in shovelling floor coal in 3rd level/2nd dip junction, a lump of coal measuring 8 cms. x 5 cms. x 3 cms. from the side fell on his right thigh inflicting a lacerated wound.
6. While a trammer was re-railing a derailed tub with the help of a 'roller', his left hand came between the 'roller' and the floor and his left thumb got injured by being crushed.
7. While a loader was loading a tub by a loaded basket, a lump of coal rolled from the basket and hit his right ring finger causing injury.
8. While a clipman was clipping a loaded tub to an endless haulage rope, he fell down and his right leg was hit by the tub wheel.
9. While a trammer was putting a sprag in the rear wheel of a loaded tub, the thumb of his left hand got trapped between the sprag and the bottom plate of the tub causing crush injury.
10. While a timber mazdoor was carrying a prop, a piece of coal measuring 30 cm. x 30 cm. X 10cm. fell from the roof at a height of 2.4m. on the prop and subsequently hit him in the left leg causing contusion and abrasion over his left leg.
11. While a driller was drilling a hole, a flying piece of coal struck him, causing injury to his upper lip.
12. While 3 loaders were loading blasted coal in 8 dip face off 25 level, shots were fired in 8 rise face off 26 level. Flying pieces of coal inflicted injuries on 2 loaders. The parting at the time of blasting was about 3 metres.
13. While shots were being fired in a level face, the shot-firer and his helper took shelter in the adjoining dip galleries. One piece of coal ejected as a result of blasting operations, hit a prop at the junction, rebounded and inflicted the helper on his nose.
14. While a shot-firer helper was returning from the face after connecting the shot-firing cable to the detonator leads and before he would take shelter, shots were fired by the shot-firer. The helper was hit by flying fragments.

5. Rules & Regulations from which exemption can be granted—An up- to-date list of Rules and Regulations from which exemption can be granted by the Chief Inspector of Mines by virtue of the authorisation granted by the Ministry of Labour and Rehabilitation is given below.

A. COAL MINES REGULATIONS, 1957

Sl. No	Notification No.	Date	Regulations/Rules from which exemption can be granted
1	2	3	4
1.	1/15/60-MI	31.3.60	Regs. 59, 74, 89, 99,127, 130,151. 172
2.	6/2/61-MI	14.4.61	Reg.s 44(6) (c), 114(4) & 168(15) (only in respect of Neyveli Lignite Mines).
3.	1/68/62-MI	5.4.62	Regulation 31(10)
4.	6/7/63-MI	5.4.63	Regulation 168(15) (only in respect of Bistrampur Colliery of NCDC)
5.	6/9/63-MI	22.4.63	Regulations 79(1) & 79(3) (b)
6.	6/11/63-MI	10.7.63	Regulations 189(3) (only in respect of Sudamdih Colliery of NCDC)
7.	6/1/64-MI	4.4.64	Regulation 169(3)
8.	6/4/65-MI (I)	26.4.65	Regulation 163(3)
9.	6/16/65-MI	17.6.65	Regulation 168(15)
10.	6/14/65-MI(2)	6.12.65	Regulation 169(5) (b)
11.	1/42/65-MI	8.12.65	Regulation 173(b)
12.	1/42/65-MI	8.12.65	Regulation 173(a)
13.	1/27/65-MI	17.1.66	Regulation 163(4)
14.	6/2/66-MI	6.6.66	Reg. 66(5) (only in respect of Moonidih Project of NCDC)
15.	6/2/67-MI	24.5.67	Regulation 95(4)
16.	6/7/67-MI	2.12.67	Regulation 80(5) (d)
17.	11018/14/70-MI	25.8.70	Regulation 75(1)(b)
18.	11018/18/70-MI	26.8.70	Regulation 161(1) & 168(5)

B. METALLIFEROUS MINES REGULATIONS. 1961

1.	6/2/63-MI	21.2.63	Regulations 82(2) & 84 (only in respect of Mines belonging to Indian Copper Corporation Ltd.)
2.	6/2/63-MI	8.4.63	Regulation 84(3) (a) & (b)
3.	6/14/63-MI	2.8.63	Regulation 87(1)
4.	6/5/65-MI	25.4.64	Regulation 163(2)
5.	6/12/64-MI	20.11.64	Regulation 61(1) (F)
6.	6/3/65-MI	17.4.65	Regulation 162(10)
7.	6/14/65-MI	23.4.65	Regulation 157(3)
8.	1/27/65-MI	4.11.65	Regulation 157(4)
9.	6/14/65-MI	4.12.65	Regulation 163(4) (b)
10.	6/2/67-MI	24.5.67	Regulation 103(4)

11. 14/4/68-MI 26.8.70 Regulation 34,115 & 182 (for open cast mines only)
12. S. 29014/10/71- 4.10.71 Regulation 35,36, 37, 38,116 and 160
 MI
- C. MINES RULES, 1955
1. 5(8)/60-MI-III 13.10.60 Rule 33, 34, 48(1), 49(4), 51(1), 59, 63,76, 77 & 78
2. 1/44/68-MI 26.8.70 Rule 40 (for opencast mines only)
- D. MINES CRECHE RULES, 1959
1. 36(3)/62-M-III 16.3.62 Rule 3 of the Mines Creche Rules, 1959

(DGMS Genl. Insr. No. 25 of 1971)

DGMS

THE MINES RULES 1955

Rule 29 A

Date of application of provision of chapter IV-A of Mines Rules— The provisions were made applicable from 1st April 1979 in respect of persons seeking employment in mines and persons employed belowground in a mine for more than fifteen years.

Subsequently, modifying the orders, the Govt. of India (vide gazette notification S.O. No. 375(E) & 376(E) both dated 11th April 1988) appointed 1st July 1988 as the date on which provisions of Chapter IV-A of the Mines Rules would come into force and as the date for the purpose of rule 29B of the rules in respect of—

- (i) persons employed belowground in a mine;
- (ii) persons employed in opencast workings of a manganese ore mine or an asbestos mine;
- (iii) persons engaged in operation of draglines, shovels, dozers, scrapers, dumpers, power drills, boring machines, locomotives, winding engines, air compressors and other machinery installed or deployed on surface or in opencast workings in a mine;
- (iv) persons engaged in crushing, grinding, dressing, processing, screening or sieving of mineral ores or stones or in any operation incidental thereto in a mine.

(Cir. Legis. 1&4/1979; Legis. 3/1988)

Provision of adequate medical attention to persons injured— Some accident cases of oil mines were examined from medical point of view in this Directorate. Some of the observations are given below :

In some cases, Periodical Medical Examination of the deceased were conducted in Sept/Oct. '89 and they were supposed to get re-examined by 1994. This was not done. Failure to conduct re-examination in time resulted in non detection of some physiological incapacitance and clinical/radiological abnormalities which should have been treated in time and the persons could have been properly rehabilitated by changing the nature of their jobs.

In some other cases although P.M.E. was conducted in time, but previous medical history and records of the deceased were not verified properly while conducting his P.M.E. The person died due to his previous disease which was not noted/over looked during his P.M.E. Careful conduct of P.M.E. might have saved his life by, perhaps, changing the nature of his job.

Some cases were attended by doctors approximately four to five hours after reporting of the incident. In a few cases timely medical attendance to the injured persons might have saved their lives. Instances of non availability of Medical Officer within the mine and non provision of immediate transport for sending the cases to nearby hospital was also noted.

It appears that Initial Medical Examination/Periodic Medical Examination of persons employed in mines are not being conducted methodically and in a systematic manner.

In view of the above observations, managements are once again requested to ensure that Initial Medical Examination/Periodic Medical Examination of persons employed in mines is done in time and in prescribed manner and medical attendance to the injured is given without loss of time. Adequate arrangement should be provided and kept ready at each mine for use in such emergencies without fail. Attention is also being drawn to the recommendations of 8th conference of safety in mines on occupational health services for compliance without further loss of time.

[Cir. Tech. (OH) (Sapicom) 5/1996]

Rule 29 B

Occupational Health Services in mining industry (Recommendations of Seventh Conference on Safety in Mines)—The Seventh Conference on Safety in Mines (1988) made the following recommendations :—

4.0 OCCUPATIONAL HEALTH SERVICES IN MINING INDUSTRY

4.1 There is a need for creation of a Department on Occupational Health Services in each mining company working mechanised mines.

(Action : Mining Cos)

4.2 Occupational Health Services shall have sufficient technical personnel with specialised training and experience in such field as. occupational medicine, industrial hygiene, ergonomics, occupational health and nursing. They should, as far as possible, keep themselves up-to-date with progress in the scientific and technical knowledge necessary to perform their duties. The Occupational Health Service should in addition, have necessary administrative personnel for their operation. Equipment and appliance of proper type should be provided for carrying out the assigned functions.

(Action: Mining Cos)

4.3 The Occupational Health Services shall carry out the following functions:

- (i) identification and assessment of the risk from health hazards at work place;
- (ii) surveillance of the factors in working environment and work practices which may affect worker's health;
- (iii) surveillance of workers' health in relation to work;
- (iv) education of workers on sanitation, cleanliness, hygiene and health care;
- (v) collaborating in providing information, training and retraining of first aiders;
- (vi) advising the management on occupational health, industrial hygiene, first-aid ergonomics;
- (vii) preparing a quarterly status report on occupational health and industrial hygiene in the mines of the concerned company. The quarterly report should include information on medical examinations, notifiable disease, status of first-aid, results of survey for air-borne dust, noise, temperature, quantity of air and sanitation in working places;
- (viii) the report of medical examination of each worker should be maintained regularly and the record of periodical medical examinations should be maintained systematically. Application of computer for storing and retrieval of data would be desirable.

(Action: Mining Companies)

4.4 The Occupational Health Services shall be headed by a Senior Officer.

(Action: Mining Companies)

4.5 Occupational Health Physician should be a member of the Safety Committee where he could contribute to the health education of workers.

(Action: Mining Companies)

4.6 (i) Management of every mechanised mine should, in consultation with experts of the Occupational Health Services, prepare a scheme for:

- (a) identification of operations and activities where factors which are hazardous to health of persons at work exist or may arise during the course of work;
- (b) monitoring the levels or values of different factors which may affect health of persons;
- (c) specifying the various control measures necessary for keeping the levels/values within the permissible limits;
- (d) health surveillance;

- (e) health education;
- (f) first-aid training.
- (ii) The above scheme should clearly specify the types of instruments to be used for monitoring, frequency of observations/examinations, type of training, education, recording of data and responsibility of various persons for implementation of the Scheme.

(Action: Mining Companies)

4.7 Management of every mine should ensure that:—

- (i) all mine workers are given basic training in first aid;
- (ii) holders of first-aid certificates are given refresher training once in two years;
- (iii) rescue trained persons acquire highest standards of proficiency in first-aid;
- (iv) ambulance vans are fully equipped with life saving drugs, medicines and appliances needed in emergency.

(Action: Mining Companies)

4.8 In respect of small mechanised mines which are mostly operating in non-coal sector, it may not be feasible for a small organisation to create a special department on occupational health services. For such small mines, it is suggested that an Association of small mine operators create common facilities and infrastructure- for occupational health services. Creation of such facility is specially needed for asbestos, manganese and mica mines. Simultaneously with creation of facilities for occupational health services it is also necessary to improve quality of life of employees working in mining industry by provision of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facility.

(Action: Mining Companies operating small mechanised mines).

(Cir.Tech. 1/1989)

Rule 29 J

Procedure For Medical Re-Examination of Cases by Appellate Medical Board, Directorate General of Mines Safety, Dhanbad—1. The applications for Medical Re-examinations submitted by appellants to the Mine Manager under Rule 29J(1) of the Mines Rules, 1955 shall be forwarded as per Rule 29J(2)(a) of the Mines Rules, 1955, to Director General of Mines Safety, Dhanbad-826001 (Attention—Assistant Director of Mines Safety (IH) & Member-Secretary Appellate Medical Board).

2. Every such application shall be accompanied with—

- (a) a copy of the medical certificate in Form 'O' issued under Rule 29F(2) of the Mines Rules, 1955;
- (b) detailed records of medical examinations including investigation reports and radiographs for comparison.

3. Every such application shall also be accompanied with a crossed and A/c payee Bank Draft of Rs. 300/- (Rupees three hundred only) drawn in favour of The Bharat Coking Coal Ltd. (BCCL), payable at Dhanbad. This amount will be considered as the tentative fees for medical re-examination payable under Rule 29J(3) of the Mines Rules, 1955.

The appellant must also come prepared to pay fees in excess of Rs. 300/- in case additional investigations are required or hospital stay is prolonged.

4. The meetings of the Appellate medical Board will be held ordinarily on the 15th January, 15th April, 15th July and 15th October every year. In case, 15th of the month is Saturday, Sunday or public holiday the meeting shall be scheduled on the succeeding working day.

5. The appellant shall be informed through the Mine Manager about date of medical re-examination well in advance.

6. The appellant shall report at 9.00 A.M. on the scheduled date of medical re-examination to—The Senior Medical Officer In charge Apex Medical Board, Koyla Nagar Hospital, Koyla Nagar, Dhanbad - 826 005
7. The appellant shall be prepared to stay at Dhanbad on his own expenses in case required for a period of 2-3 days or more.
8. The appellant should also be prepared for admission in hospital for 2-3 days or more for investigations in case required.

(Cir. Legis. 5/1989)

Rule 29K

Constitution of Appellate Medical Board—The Govt. of India have constituted the Appellate Medical Board (vide gazette notification No. S.O. 628(E) dated 24th June 1987) as follows:—

- (i) Inspector of Mines (Industrial Hygiene) (HQ), Directorate General of Mines Safety, Dhanbad. (Member & Convenor under clause (a) of Rule 29K).
- (ii) Dr. A.S. Mondal, Radiologist (Retd.), (C.M.W.O. Central Hospital) C/o Dr. Manash Saha, Govindpur Nursing Home, P.O. Govindpur, Dhanbad (Member under clause (b) of Rule 29K).
- (iii) Dr. P.K. Roy, Chief Medical Officer, Sancloria Hospital, Eastern Coalfields Ltd., Sancloria, W. Bengal (Member under clause (c) of Rule 29K).

Application for Medical Re-examination under Rule 29K of the Mines Rules 1955 may be forwarded to the Director-General of Mines Safety, Dhanbad-826 001, Attention—Asstl. Director of Mines Safety (I.H.) & Member-Secretary, Appellate Medical Board. The procedural details are given under Rule 29J.

(Cir. Legis. 7/1987)

INFORMATION REQUIRED IN VARIOUS COLUMNS

1. Name of mine.
2. Total No. of workers (surface and underground) on rolls of mine during the year under review.
3. No. of workers requiring medical examination on priority basis.
(e.g. Underground loaders, workers in crushing, milling, and screening plants etc.)
4. No. of workers statutorily required to be examined in the year.
[1/5th of (2)L.]
5. No. of Medical examinations completed. (Initial and Periodic)
6. 01-; 0/0;': x-ray Classification No.
7. 1/0; 1/1; 1/2; ILO (1980) Classification : Medical Examinations completed (5)
8. 2/1; 2/2; 2/3; 1.2 point scale; and main ILO Categories indicated.
9. 3/2; 3/3; 3/+;
10. Percentage with Simple Pneumoconiosis among those examined $(5) = (7) + (8) + (9) / (5) \times 100$; Simple Pneumoconiosis, includes Coal Worker's Pneumoconiosis, Silicosis, Asbestosis, Siderosis etc.
11. No. of workers examined (5) with large opacities (ILO, 1980, Classification), (Only suspected Progressive Massive Fibrosis to be included).
12. No. of those examined (5) who were referred to 'Pneumoconiosis Board'.
13. No. of those in (12) who were confirmed as Pneumoconiotic by 'Pneumoconiosis Board'.
14. No. of those in (5) who were confirmed as Pneumoconiotic by 'Pneumoconiosis Board'.
15. Total No. of Pneumoconiosis cases of (2) (Column 13, 14 and 15 includes cases of PMF).

TABLE-2

Age distribution of workers at medical examination in.....

(name of company) during the year ending..... 199.....

Age groups					
upto 24	25 to 34	35 to 44	45 to 54	55 to 64	all age groups

No. of MEs completed
[=(5) in table 1]

All cases of SP [=(7) + (8) + (9) in tabl. 1]

New suspect SP [= (12) in tab. 1]

Confirmed SP [= (13) + (14) in tab. 1]

Large Opacities [= (11) in table 1]

Total

TABLE•3

Details of new cases of pnuemoconiosis detected in.,(Name of company)
(with reference to column No. 13 of table (1))

SINo.	Name of register	FormB on employ	Designati No.	Age Name of mine where	No. of the years worke d in	Commulat ive exposure	Remar dust ks

employ mine
ed

Rule 29Q

1. Orientation training of Workmen's Inspectors—Rule 29Q of the Mines Rules 1955 requires appointment of Workmen's Inspectors to carry out inspections of mines on behalf of the workers employed therein. Such Workmen's Inspectors have to undergo an orientation training course consisting of not less than 30 lectures and demonstrations of not less than two hours' duration each, in accordance with the syllabus specified by and at a centre approved by the Chief Inspector vide Rule 29Q(2) (c) of the Mines Rules 1955.

The syllabii for orientation training of the following categories of Workmen's Inspectors, in Appendices I to V below, are hereby approved—

- (i) Workmen's Inspector (Mining) for both underground and opencast coal mines.
- (ii) Workmen's Inspector (Mining) for underground metalliferous mines only.
- (iii) Workmen's Inspector (Mining for opencast metalliferous mines only.
- (iv) Workmen's Inspector (Electrical).
- (v) Workmen's Inspector (Mechanical).

The National Council for Safety in Mines, Dhanbad is approved as the center for imparting orientation training to the Workmen's Inspectors under Rule of the Mines Rules, 1955.

You are requested to appoint Workmen's Inspectors in accordance with the requirements stipulated under Rule 29Q of the Mines Rules, 1955 and arrange to expose them to the orientation training course without any further delay.

APPENDIX-I

Syllabus for Workmen's Inspectors (Mining)

(for both U/G & O/C coal mines only)

- 1. Role, function, duties & responsibilities of Workmen's Inspectors in general and also as member of Safety Committee.
- 2. Inspections of workings, inquiry into accidents, incidents, complaints, preparation of sketch plan of accident/incident and writing of reports.
- 3. Role and functions of internal safety organisation and other safety forums and safety planning.
- 4. Statutory provisions regarding First Aid, Medical appliances. Health & Sanitation as per Mines Rules, 1955.
- 5. Statutory provisions regarding welfare amenities, employment of persons, leave with wages & overtime, maintenance of statutory registers as per Mines Rules, 1955.
- 6. Dangers of Mine dust during different operations, its suppression and treatment.
- 7. Occupational Health hazards & precautionary measures including statutory provisions regarding medical examination of persons employed or to be employed in mines.
- 8. Statutory provisions regarding different types of plans, study of plans with a view to hazard spotting.
- 9. Dangers from surface & u.g. water and precautionary measures including statutory provisions and various conditions suggested by D.G.M.S. from time to time.
- 10. Standard of lighting at various places, maintenance of cap lamps, personal protective equipment & problems of noise & vibrations.
- 11. Statutory provisions regarding development working and various conditions stipulated by D.G.M.S. in general.
- 12. Depillaring (both Caving and Stowing) and conditions stipulated by D.G.M.S. in general.

13. Longwall & other special methods of mining and conditions imposed by D.G.M.S.
 14. Opencast workings (Manual & Mechanised) and conditions stipulated by D.G.M.S. for the same.
 15. Stability of mine working & different types of supports. Testing of supports, support plan etc.
 16. Adequacy of ventilation & its determination, Ventilation of long headings, use of booster fans.
 17. Mining gases, their detection & dangers associated with them.
 18. Different types of explosives, common unsafe practices and precautionary measures during storage, transport and use. Dealing with misfires.
 19. Statutory provisions regarding blasting off the solid and conditions stipulated by D.G.M.S.
 20. Blasting (Shallow & Deep hole) in opencast workings, in virgin area, overdeveloped workings, over area having fire and in the vicinity of surface features.
 21. Measures to prevent fires and spontaneous heatings. Measures to deal with emergency. Inspections of fire stoppings & fire fighting equipments.
 22. Precautionary measures in the use of mechanical & electrical machines in belowground workings and statutory conditions of their use.
 23. Precautionary measures in the use of mechanical & electrical machines in O/C workings and statutory conditions of their use.
- Visits :
- 24, 25, 26 ; (1) Visit to an U/G mine to analyse & study unsafe acts & conditions. Discussion on the observations.
 - 27, 28, 29 : (2) Visit to an O/C mine to analyse & study unsafe acts & conditions. Discussion on the observations. (The total duration of each visit including discussions should be atleast six hours to make it equivalent to three lectures).
 30. Group discussion & suggestions, if any, from the participants.

APPENDIX-II

Syllabus for Workmen's Inspectors (Mining)

(For U/G Metalliferous Mines only)

1. Role, function, duties & responsibilities of Workmen's Inspectors in General and also as member of Safety Committee.
2. Inspections of workings. Enquiry into accidents, incidents, preparation of sketch plan of accident/incident and writing of reports.
3. Role and functions of internal safety organisation and other safety forums and safety planning.
4. Statutory provisions regarding First Aid, Medical appliances. Health & Sanitation as per Mines Rules, 1955.
5. Statutory provisions regarding welfare amenities, employment of persons, leave with wages & overtime, maintenance of statutory registers as per Mines Rules, 1955.
6. Dangers of mine dust during different operations, its suppression and treatment.
7. Occupational Health hazards & precautionary measures including statutory provisions regarding medical examination of persons employed or to be employed in mines.
8. Statutory provisions regarding different types of plans, study of plans with a view to hazard spotting.
9. Dangers from surface & U/G water and precautionary measures including statutory provisions and various conditions suggested by D.G.M.S. from time to time.

10. Standard of lighting at various places, maintenance of cap lamps, personal protective equipment & problems of noise & vibrations.
11. Statutory provisions regarding development workings and various conditions stipulated by D.G.M.S. in general.
12. Statutory provisions regarding sloping and conditions stipulated by D.G.M.S. in general.
13. Statutory provisions regarding special methods of sloping & various conditions imposed by D.G.M.S.
14. Stability of mine workings & different types of supports. Testing of supports, support plan etc.
15. Adequacy of ventilation of its determination. Ventilation of long headings, use of booster fans.
16. Mine gases, their detection & dangers associated with them.
17. Different type of explosives, common unsafe practices and precautionary measures. Dealing with misfires.
18. Use of site mixed slurry and ANFO explosive and various conditions imposed by D.C.M.S. in general.
19. Precautionary measures during transport and storage of explosives on surface and O/C including bulk transport of explosives.
20. Measures to prevent fires. Measures to deal with emergency. Inspections of fire stoppings & fire fighting equipments.
21. Statutory provisions regarding use of personal protective equipments and typical accidents due to their non-use.
22. Precautionary measures in the use of mechanical machines and statutory conditions of their use.
23. Precautionary measures in the use of electrical machines and statutory conditions of their use. Visits:
24. 25,26 ; (1) Visit to an O/C mine to analyse & study unsafe acts & conditions. Discussion on the observations.
- 27, 28, 29 : (2) Visit to a surface plant to analyse & study unsafe acts & conditions. Discussions on the observations. (The total duration of each visit including discussions should be atleast six hours to make it equivalent to three lectures).
30. Group discussion & suggestions, if any, from the participants.

APPENDIX-III

Syllabus for Workmen's Inspectors (Mining)

(For Opencast Metalliferous Mines only)

1. Role functions, duties & responsibilities of Workmen's Inspectors in general and also as member of Safety Committee.
2. Inspections of workings. Enquiry into accidents, incidents, preparation of sketch plan of accident/ incident and writing of reports.
3. Statutory provisions regarding First Aid, Medical appliances, Health & Sanitation as per Mines Rules, 1955.
4. Statutory provisions regarding welfare amenities, employment of persons, leave with wages & overtime, maintenance of statutory registers as per Mines Rules, 1955.
5. Dangers of mine dust during different operations, its suppression and treatment.
6. Occupational Health hazards & precautionary measures including statutory provisions regarding medical examination of persons employed or to be employed in mines.
7. Statutory provisions regarding different types of plans, study of plans with a view to hazard spotting.

8. Dangers from surface & U/G water and precautionary measures including statutory provisions and various conditions suggested by D.G.M.S. from time to time.
9. Standard of lighting at various places, maintenance of cap lamps, personal protective equipment & problems of noise & vibrations.
10. Role and functions of Internal Safety Organisations, other safety forums and safety planning.
11. Statutory provisions regarding manual 0/C mines and conditions stipulated by D.G.M.S. in general.
12. Statutory provisions regarding mechanised 0/C mines and conditions stipulated by D.G.M.S. in general.
13. Different types of explosives suitable for 0/C workings, common unsafe practices and precautionary measures.
14. Conditions for deep hole blasting and dealing with misfires.
15. Use of site mixed, slurry and ANFO explosive in accordance with the conditions stipulated by D.G.M.S.
16. Precautionary measures during transport and storage of explosive.
17. Measures to prevent fires. Dealing with emergency. Provision and maintenance of fire fighting equipments.
18. Statutory provisions regarding use of personal protective equipments and typical accidents due to their non-use.
19. Precautionary measures in the use of mechanical equipment and statutory conditions of their used.
20. Precautionary measures in the use of electrical equipment and statutory conditions of their use. Visits :
- 21, 22, 23 ; (1) Visit to a manual 0/C mine to analyse and study unsafe acts and conditions. Discussion on the observations.
- 24, 25, 26: (2) Visit to a mechanised 0/C mine to analyse & study unsafe acts & conditions. Discussion on the observations.
- 27, 28, 29 : (3) Visit to a surface plant to analyse & study unsafe acts & conditions. Discussion on the observations. (The total duration of each visit including discussions should be atleast six hours to make it equivalent to three lectures).
30. Group discussion & suggestions, if any, from the participants.

APPENDIX - IV

Syllabus for Workmen's Inspectors (Electrical)

1. Role, function, duties & responsibilities of Workmen's Inspectors in general and also as member of Safety Committee.
2. Inspections of workings, enquiry into accident, incidents, preparation of sketch plan of accident/ incident and writing of reports.
3. Role and function of internal Safety Organisation and other Safety forums and Safety planning.
4. Occupational Health hazards & precautionary measures including statutory provisions regarding medical examination of persons employed or to be employed in mines.
5. Statutory provisions regarding use of personal protective equipments and typical accidents due to their non-use.
6. Dust hazards and the safety measures; in case of belowground mines, in addition-adequacy of ventilation and its determination, ventilation of long headings, use of booster fans.
7. Basic ideas regarding different types of methods of work and conditions normally stipulated by D.G.M.S.
8. Statutory provisions regarding First Aid, medical appliances, health and sanitation as per Mines Rules, 1955.

9. Various statutory provisions for maintenance of records in respect of different machineries.
 10. Dangers associated with fire and water—important precautionary measures; in case of belowground mines, in addition dangers associated with gases.
 11. Reading of mine plans, study of schematic diagrams depicting distribution of machineries in the mine.
 12. Standard workshop practices-common defects and safety measures.
 13. Problems associated with noise and vibrations due to use of machines-corrective measures.
 14. Maintenance schedule of various machines and their proper compliance.
 15. Precautionary measures in the haulage and winders and statutory conditions of their use.
 16. Conveyors/Locos and other transportation machineries, hazards and safety measures.
 17. Main mechanical ventilator, common defects and safety measures. (In case of metal O/C mines, lecture 15, 16 and 17 may be substituted by O/C machineries).
 18. Different types of pumps, their applicability, various hazards and safety measures.
 19. Precautionary measures in cutting, drilling machines and statutory conditions for their use.
 20. Precautionary measures in the use of other mechanical equipment and statutory conditions for their use.
- Visits :
- 21, 22, 23 : (1) Visit to a mine to analyse and study unsafe acts and conditions. Discussions on the observations.
 - 24, 25, 26: (2) Visit to a surface plant to analyse & study unsafe acts & conditions. Discussion on the observations.
 - 27, 28, 29 : (3) Visit to a workshop to analyse & study unsafe acts & conditions. Discussion on the observations. (The total duration of each visit including discussions should be atleast six hours to make it equivalent to three lectures).
 30. Group discussion & suggestions, if any, from the participants.

(Cir. Legis. 8/1987)

2. Orientation training of Workmen Inspectors (Oil Mines)—Rule 29Q of the Mines Rules, 1955 requires appointment of Workmen's Inspectors to carry out inspections of mines on behalf of the workers employed therein. Such Workmen's Inspectors have to undergo an orientation training course consisting of not less than 30 lectures and demonstrations of not less than two hours duration each, in accordance with the syllabus specified by and at a centre approved by the Chief Inspector vide Rule 29(2) (c) of the Mines Rules, 1955. The syllabus for orientation training of the Workmen's Inspectors, Appended herewith, is hereby approved under Rule 20Q(2) (c) of the Mines Rules, 1955. As may be noted, this is a common syllabus for training of Workmen's Inspectors of all cadres except that in lieu of lectures at serial numbers 27, 28 and 29 a separate set of lectures has been specified for Workmen's Inspectors (Electrical).

APPENDIX - IX

Syllabus for training of Workmen's Inspectors of Oil Mines

1. Introduction to the Mines Act, 1952, the Oil Mines Regulations, 1984 and Mines Rules, 1955 with special reference to role, function, duties and responsibilities of Workmen's Inspectors in general and also as member of Safety Committee.
- 2-3. Basic operations in oil mines; drilling, production, geophysical etc.
- 4-6. Visit to production well, drilling rig, workover rig, workshop, power generating station and gas compressing station.

7. Role & functions of Internal Safety Organisation and other safety forums. Safety planning and duties of other competent persons such as Fire Officer, Installation Manager.
 8. Statutory provisions regarding different types of plans, layout of production installations, rigs etc., study of plans. Definition of Zones, 0,1 & 2; as per hazardous area classification. Safe distances.
 9. Inflammable and noxious gases, their detection and dangers associated with them. Precautions during welding/hot works in hazardous areas.
 - 10-11. Measures to prevent fires and dealing with emergencies. Fire fighting equipments. Emergency organisation. Contingency plans. Safety warning signs.
 - 12-13. Problems of noise & vibration. Ways & means to reduce these hazards. Use of personal protective equipment and accidents due to their non-use.
 14. Film show on use of personal protective equipment.
 15. Safe practices in material handling equipment, tools & tackles. Precautions during installation/ transportation of derrick.
 16. Blow out preventers (B.O.P.) and testing of B.O.P. Prevention of a blow-out & precautions after a blow-out.
 17. Safe practices in installation, operation & maintenance of field & trunk pipe lines & pumping stations/group gathering stations, central tank farm.
 18. Statutory provisions regarding first aid, medical appliances, health & sanitation as per Mines Rules, 1955.
 19. Statutory provisions regarding welfare amenities, employment of persons, leave with wages, extra wages on overtime and maintenance of statutory registers as per Mines Rules, 1955.
 20. Occupational health hazards and precautions to be taken in handling hazardous chemicals. Statutory provisions regarding medical examination of persons employed or to be employed in mines.
 21. Common unsafe practices, precautionary measures during handling, storage & transport of crude oil, condensate, natural gas L.P.G.
- *The total duration of visit including discussions should be atleast 6 hours—make it equivalent to three lectures.
22. Various statutory provisions for maintenance of records. Standard workshop practices—common defects and safety measures. Maintenance schedule of various machines including transportation machinery.
 - 23-24. Visit to oil collecting station/group gathering station/central tank (farm), pumping station, pipe line, L.P.G. plant etc. to analyse and study unsafe acts and conditions—discussions on the observations.
- (The total duration of visit including discussion should be atleast 4 hours to make it equivalent to two lectures).
25. Environmental protection.
 26. Inspections of workings, enquiry into accidents (with special reference to the requirement of Regulations 98,99 & 100 of the Oil Mines Regulations, 1984), incident and writing of reports. Statistics of accidents in oil mines, identification of hazardous areas.
 - **27. Draw-works, cat head and cat lines. Tongs and casing lines—typical accidents, precautions and maintenance.
 - **28. Precautionary measures in the use of various electrical machines, their maintenance schedule and statutory provisions.
 - **29. (a) Equipment under pressure including periodical testing etc.
(b) Safe practices in installation & operation of internal combustion engines and gas compressors including flame arresters.

30. Group discussions and suggestions if any, from the participants.

(** 27,28, 29—are for Workmen's Inspectors other than Electrical Cadre)

Lectures mentioned below are for Workmen's Inspectors of Electrical Cadre and are in lieu of lectures having corresponding serial numbers for other cadres.

27. Study of schematic electrical diagrams depicting distribution of machineries in the mine. Provisions of Indian Electricity Rules, 1956 regarding overhead line. Statutory provisions applicable to mines under Indian Electricity Rules, 1956.

28. Precautionary measures in the use of different types of electrical equipment and statutory conditions for their use. Various protective devices to be provided in switch gears and their proper maintenance. Different types of cables, their applicability. Precautionary measures in their use.

29. Earthing of electrical machines and jointing and compounding of cable joints. Earthing, protection/prevention against lightning and static current. Important aspects of sub-station/switch station.

Diesel generating sets and their proper maintenance. Electrical measuring and testing equipment-their availability & use.

(Cir. Legis. 3/1990)

Rule 30

Drinking water bottles for underground workers—It is considered that the best way to comply with these provisions is to provide 5-6 lbs. water bottles to each worker employed underground. Arrangement should exist near the opening of the mine for filling these bottles with wholesome drinking water. Each person should be made to carry his own bottle when he goes underground.

(Cir. 12/1956)

2. Quantity of drinking water—As you are aware the present Mines Rules specify the minimum quantity of drinking water that shall be provided in a mine or part thereof on a scale of 2 litres for every person employed at any one time. The above provision shall be strictly complied with.

In mines where environmental conditions are not favourable and workers are allowed to work with high wet-bulb temperature, strain due to heat stress is quite considerable but there is evidence of substantial reduction of strain with good fluid replacement. The highest sweat loss observed was about 3 litres and to compensate this loss as also the loss of fluid through other channels, Technical Committee on Fatigue of Mine workers recommended that wholesome and cooled water at the scale of 3 litres for every person employed in a mine shall be provided.

Therefore in the light of above recommendation you are advised to increase the quantity of supply of wholesome and cooled drinking water to 3 litres per person employed in a mine wherever the wet bulb temperature exceeds 30°C.

(Cir. Welfare 1/1978)

Rule 37

Approval of chemical closets as underground latrines—Chemical Closets complying with the standards laid down in the Appendices I and II have been approved by the D.G.M.S.

APPENDIX-I

The Portable Closet

1. General—The chemical closet shall be so designed and constructed that when employed with any chemical or chemicals provided for in the Appendix II, it shall, without ventilation, be capable of containing the sewage (solid and liquid) in such a manner as to be inoffensive.

2. Material—(a) The container shall be made of non-absorbent material either not affected by or adequately protected (both internally and externally) from the corrosive action of sewage or any of the chemical fluids used in it, and shall be of smooth finish.

If an outer case is provided to house the container this too shall be of non-absorbent material with a corrosion-resistant finish both internally and externally.

(b) Stands (with or without covers) shall be of suitable hardwood or plastic material.

(c) Hinging and attachment devices shall be of corrosion resistant metal or of plastic material (strengthened if necessary by re-inforcement) both of which shall be resistant to the action of sewage or the chemical fluid used.

3. Sewage container—(a) Portable chemical closets shall be so constructed that:

(i) All solid and liquid sewage is directed into the sewage container. (ii) The sewage container is readily removable.

(b) The sewage container, whether a separate unit or forming the case of the appliance, shall be provided with a handle or handles or other suitable means of carrying in the container for emptying purposes without undue risk of spilling the contents. Handles shall be so disposed as not to be fouled by the contents of the container.

(c) The total capacity of the sewage container shall be not greater than 30 litres including sewage, a charge of chemical water or other necessary diluent.

(d) To ensure adequate cleansing, the sewage container shall have a smooth interior surface and shall be free from features likely to obstruct thorough cleaning. Any swaging used to strengthen the container or an outer case shall be external.

4. The closet—(a) The complete portable closet shall be constructed of materials satisfying the requirements of clause 2 above. Galvanizing if employed, shall be effected after manufacture.

(b) The minimum gauge for steel sheet, if used, shall be 0.63mm (34BG) and any other suitable material that may be used, shall provide an article of at least equivalent strength. The complete appliance shall be capable of supporting a test load of 125 kg (evenly distributed over the seat) without permanent deformation.

(c) The total height to the top face of the seat excluding any cover, shall be not more than 45 cm.

(d) The opening of the seat shall be not less than 30 cm long and not less than 20 cm or more than 25 cm at the widest point.

5. Chemical Fluid—(a) Only chemical fluid of the type laid down in Appendix II shall be used in the closet.

(b) Suitable permanent indication about the type of chemical fluid to be used shall also be given on the body of the closet.

APPENDIX-II

Chemical Fluid for Use in the Portable Closet

1. The Diluted Fluid—(a) The diluted fluid (i.e. the dilution, dispersion, or solution prepared according to the instructions of manufacturer) shall be such as to effectively deodorise excreta immediately. It shall maintain such deodorant action during any further dilution up to the minimum concentration specified by the manufacturer and for a period of not less than seven days from the charging of the closet.

(b) The colour of the oil seal or of the diluted fluid shall, at all stages of usage, be such that the other contents of the closet are obscured.

(c) The diluted fluid shall be free from objectionable odour.

(d) The diluted fluid shall be non-injurious to skin and mucous membranes.

(e) The diluted fluid shall prevent the formation of obnoxious or explosive gases from the excreta.

(f) The diluted fluid shall be such as to allow easy cleaning of the closet after emptying.

2. The Fluid—(a) The fluid should have adequate disinfecting properties. For every fluid recommended for use, the maximum permissible degree of dilution shall be indicated by the supplier.

(b) The fluid shall not cease to comply with the above requirements after storage for a period of at least twelve months at temperature between 20° and 50°C.

(c) The fluid shall be such that any separation which occurs on standing can be dispersed to give homogeneous mixture by gentle shaking.

(d) The fluid shall not have a flash point lower than 65°C.

(Cir. 47/1960)

Rule 38

Need for improved sanitation u.g.—In general, it has been observed that sanitary conditions in underground workings are very unsatisfactory and unhealthy.

The requirement of a healthy environment in underground workings need no emphasis; but little attention is paid in this regard.

Latrines should be as far as possible be provided at return side of each district. The latrines may either be of the chemical closet type or of conventional service type with adequate arrangement for collection and disposal of solid fluid excreta.

(Cir. 13/1970)

Rule 40

Provision of Ambulance Van—According to Rule 40(2) of the Mines [Second Amendment Rules, 1965, unless otherwise approved by an order in writing of the Chief Inspector (Director-General of Mines Safety) or an Inspector (Deputy Director of Mines Safety)] and subject to such conditions as may be specified therein, the arrangements for the purpose of speedy removal from the mine of persons who suffer bodily injury or become ill, to a hospital or dispensary shall be by means of a proper Ambulance Van.

The arrangements for Ambulance Van may be made providing an Ambulance Van at the mine itself, or for a group of mines either collectively or through a Central Agency like Coal/Mica Mines Welfare Fund Organisation, State Govt. Agency, St. John Ambulance Association etc. In each case, however, it should be ensured that the Ambulance Van is available at the mine site as early as possible and in any case within one hour of its requisition in ordinary cases. When a person must be removed to the hospital in an emergency, and an Ambulance Van cannot be had immediately, alternative means of transport which enables conveyance of a person should be made to transport the person in a supine condition on a stretcher.

Thus normally there should be no occasion for seeking an exemption from the requirements of Rule 40(2) stated above. In exceptional cases, however means of transport other than Ambulance Van may be permitted e.g. when there are no roads connecting hospital or when a small mine (here small mine means a second class mine) is located in an isolated place and it would not be economically feasible for it to maintain a van for itself alone. In these cases, applications for exemption will be examined on the merits of each case giving due consideration to the type of alternative means or transport proposal to be provided.

(Cir. 38/1967)

Rule 42

1. Training in First-Aid—First-aid training has been accepted as one of the best and most effective measures for promoting safety consciousness amongst mine workers. The First Safety in Mines Conference (1958-59) had, therefore, recommended that first-aid training amongst mine workers should be intensified. The ILO experts in Mining Safety who were in

India for some time in 1960-61 for examining the position regarding safety in Indian Mines have also recommended that "as many underground workers as possible and all officials should hold first-aid certificates of competency. Apart from the value of such training in case of accidents it has the effect of inculcating safety-mindedness and in this way contributes considerably to the promotion of safety."

Every mine official should be trained in first-aid and should see that his first-aid certificate is revalidated whenever necessary. In addition, as many mine workers as possible should be given training in "FIRST-AID"

(Cir. 14/1962)

2. First-Aid Services in Mines—1. The importance of prompt and efficient first-aid service in a hazardous industry like mining is too obvious to be emphasized. Besides, elaborate provisions on the subject already exist in the Mines Rules, 1955 which should not leave any doubt in any quarter about the vital need for rendering immediate succour to the injured persons at the site of accidents.

2. Nearly 3000 serious accidents and about 30/40,000 minor accidents are reported in the mining industry every year. There is a strong feeling in medical quarters that several of these minor injuries could be prevented from turning into serious and likewise some of the spot serious injuries could be prevented from taking a turn for the worse if the quality of first-aid service rendered to the injured person at the site of accident is improved,

3. What prompts an individual mine worker or a supervisor or an official to go in for a first-aid certificate is in many cases not his genuine desire to qualify as a first-aiders but to appear in some of the examinations conducted by the Board of Mining Examinations, for which possession of a first-aid certificate is essential. And, in his efforts to obtain the First-aid certificate not much help is given by the Industry with the result he is driven to the nearest private medical practitioner. In such a situation it is not surprising that the acquisition of a certificate gains an upper hand over the development of the required skill.

4. In my opinion a stage has now reached when the initiative to train first-aiders, providing facilities to appear at the examinations, giving them refresher training, etc., has to come from the Industry. Fortunately, during the last few years the Industry has set-up a number of training centres (Unit, Group, Vestibule etc.) where training in first-aid can also be provided with minor adjustments. The additional facilities for the purpose of imparting first-aid training should include models, charts, skeletons etc. The Medical officer-in-charge of the mine should draw up a suitable training programme for the prospective candidates and he should taken an active part in the whole exercise. The Medical Officer attached to mines may also be made responsible for the selection of first-aid stations at various workplaces as well as to ensure that these are always equipped with proper medicines/appliances.

5. The Mines Rules also stipulate that for the speedy removal of injured persons from mine to hospital Ambulance Vans shall be provided. My attention has been drawn to the fact that in several cases this vital facility is not readily available at all times. There are reports that the Ambulance Vans are also utilised for purposes other than shifting injured persons to hospitals. I am also told that such Ambulance Vans, where available, are not equipped with life saving medicines and equipment such as oxygen cylinders, etc. This is another area where considerable attention would have to be paid by the Industry to improve the emergency service.

6. I am confident that once the desire of the top management to put the first-aid service in proper footing is transmitted down the line, the Medical Officers at the Company, Area and Unit levels would be able to change the complexion of the service within a period of six

months to one year. The Industrial Hygiene Wing of the Directorate is prepared to give every help to the Industry in streamlining first aid service in the mining industry.

(Cir. Genl. 2/1979)

3. Booklet on "First-Aid in Coal Mines"—Copies of the booklet "First-Aid in Coal Mines" of the St. John Ambulance Association (India) in English are available at 80 p. each (packing and forwarding charges extra) from the following address:

The Stores Officer

St. John Ambulance Stores Depot

1, Red Cross Road

New Delhi.

The booklet is also under translation into Hindi and Bengali, and the Association expect to place copies of the booklet in these languages for sale in due course.

Though the title of the booklet refers to Coal Mines, the booklet contains useful information about rendering first-aid in mines of all types and would be found useful by all means and all persons connected with or training for first-aid in mines.

(Cir. 14/1961)

4. Training of First-Aiders—As per Rule 42 of the Mines Rules, 1955 Owner, Agent or Manager of mine are required to see that every first-aid station provided under the rules is placed, during every working shift, in-charge of a person who is either a qualified nurse, dresser, compounder- cum-dresser, medical practitioner or a person who holds a valid first-aid certificate of the standard of St. John's Ambulance Association (India). It is also the duty of the owner, agent or manager of a mine, under Rule 40(1) of the said Rules, to see that adequate and suitable arrangements are made for the training of persons in first-aid.

The importance to rendering correct first-aid to the injured in time cannot be over emphasised, and the object to the aforesaid provisions is to achieve this end.

Some of the valid first-aid certificate holders on being questioned on simple first-aid problems while appearing at the examination conducted under the Regulations, have failed to reply satisfactorily. A remedy, evidently, lies in improving the quality of training imparted to a candidate before sending him for the first-aid examination, and I trust that such training will be entrusted to a responsible superior official of the mine.

To render correct first-aid is an acquired skill and if a first-aider is not kept in practice by arranging refresher training he is apt to fumble at the critical moment. Therefore, it is essential that the managements are satisfied with the practical ability of a first-aid certificate holder, before giving him the charge of a first-aid station in a mine.

(Cir. 38/1968)

5. Refresher training of persons holding First-Aid Certificate—Refresher training of the persons holding first-aid certificate, in order to keep them in practice to render correct first-aid at the time of need, can be conveniently done by the qualified Medical Officer at the Vocational Training Centre by including it in the quarterly programmes of training of the various courses. This will also help the first-aiders posted with up-to-date developments in the knowledge of and in the practical art of rendering first-aid.

(Cir. 33/1969)

Rule 44

1. Resuscitators—At times situations arise in mines when artificial respiration is required to be rendered to persons suffering from asphyxia due to electric shock, gas poisoning etc. Resuscitators using the principles of mouth to mouth respiration introduced by the following Companies have been found suitable for use in First-Aid Stations and First-Aid Rooms in mines:—

(1) Ary Vive Resuscitators manufactured by M/s Indian Oxygen Ltd., Oxygen House, P34, Taratala Road, Calcutta-53.

(2) UAF Resuscitator manufactured by M/s Industrial Medical Engineers, 101, Darya Ganj, Delhi-6.

(Cir. 38/1969)

2. Active immunisation with tetanus toxoid—Minor injury sustained during mining operations ended in death due to development of tetanus as complication; most of these cases had the usual prophylactic dose of antitetanic serum. Were these persons actively immunised against tetanus they would not have died due to the injuries and valuable lives could have been saved.

It is learnt that active immunisation with tetanus toxoid gives far better immunity than the temporary, questionable passive immunity conferred by the anti-tetanic serum administered immediately after the injury. Besides, it is believed that the second or subsequent injections of prophylactic anti-tetanic serum apart from the potential risk of anaphylaxis, is useless. It is understood that active immunisation against tetanus is practiced in the Army with excellent results.

Therefore a change is necessary in the preventive measures so far adopted for the miners against tetanus. All persons employed in the mines shall be actively immunised with tetanus toxoid.

(Cir. 34/1973)

Rule 45 A

1. Technical instruction regarding active immunisation for prevention of Tetanus—In continuation to Circular 34 of 1973, it is informal that the dose schedule of active immunisation with tetanus toxoid could be as follows:—

(1) For primary immunisation of persons who were not previously actively immunised; two doses of tetanus toxoid of one millilitre by intramuscular or sub-cutaneous injection at an interval of six weeks. A third dose of tetanus toxoid of one millilitre between six to twelve months.

(2) For persons previously immunised with tetanus toxoid with three doses; one booster dose of tetanus toxoid of one millilitre every five years.

(3) On injury if a person was actively immunised according to the above schedule one booster dose of tetanus toxoid of one millilitre immediately. If the person was not actively immunised 1500 units of antitetanic serum immediately followed by active immunisation according to the above schedule.

In addition to the above measures of immunisation proper surgical toilet of wound, with administration of local or systemic penicillin should also be resorted to.

(Cir. 10/1974)

2. Record of Blood Grouping—There is need for prompt medical care in case of accidents. As you are aware, in quite a number of cases of injuries, there is considerable loss of blood and timely blood transfusion is necessary. To do so however, the blood group of the injured persons is required to be ascertained and if this is not readily known, considerable time is wasted first in checking the blood group of the injured persons and secondly in checking for the blood group of donors. All this could be avoided if the blood group of all persons employed in the mine is checked and the result kept for quick reference so that in case of necessary, timely blood transfusion of the correct type can be arranged. This would also help in quickly calling for donors of particular blood group more so when the blood group

required in uncommon. Perhaps such a system is already prevalent in some mines, as is the case at the gold mines of Bharat Gold Mines Ltd. at Kolar.

It is requested that immediate action may be taken on the above suggestion. (Cir. Genl. 3/1957)

3. Issue of Identity Cards to mine workers—The need and importance of issue of identity cards to workers is obvious for any industry and specially so in a statutorily regulated industry like mining. Besides establishing identity of a worker thus serving to avoid impersonation and malpractices, an identity card can also be used as a ready record showing attendance of the worker, leave due to him with leave payments account, as also for indicating dates of special issue of protective equipment like safety helmets and protective footwear as well as uniforms if any, supplied etc.

The matter was discussed at a meeting of the Standing Safety Advisory Committee when it was unanimously agreed that identity cards should be issued to all workers employed in mines and for this purpose there should be necessary statutory backing. The recently concluded Third Conference on Safety in Mines held in Calcutta endorsed this view and recommended that pending enactment of suitable legislation in due course, all concerned should adopt this useful measure.

All are requested to implement the above recommendations in the mines under your control under intimation to the concerned Joint Director of Mines Safety as well as this office.

(Cir. 50/1973)

Rule 62

Rest shelters—Rest shelters are the only place which afford protection from sun and rain and where the workers can take food and rest. It is therefore considered that a shelter should be provided at every mine even if the employment is less than 50. However in such mines the construction of Shelters need not conform to the standards laid down by the Directorate. A shelter constructed out of the locally available materials will serve the purpose provided it affords adequate shelter against sun and rain and is well lighted and ventilated.

At the mines employing more than 50 persons the rest shelters shall continue to be constructed in accordance with the design approved by this Directorate.

(Cir. 25/1972)

Rule 63

Temporary Rest Shelters—Pucca shelters should be built to approved design (Drawing No. MR-63A/1). Variations may be permitted if the standard of facilities is not less and the floor area is adequate.

It may however not be necessary to provide such a pucca shelter at places where the work going on is of a temporary nature. In particular in non-coal mines where the mineral deposit is of a scattered nature the position of the mining face changes very frequently. In such cases it is sufficient if temporary rest shelter is provided at a suitable place near working place. The temporary shelter should comply with the model design (Drawing No. MR-62/A2). The hatched lines in this drawing indicate that wooden scantlings have been used in the structure. The design may of course be altered by JDMS to suit local conditions.

(DGMS instructions dated 8th May 1957 and 13th November 1957).

Rule 64

1. Mobile Canteens—The Working Group constituted by the Ministry of Labour and Employment to enquire into the compliance at mines of welfare provisions under the Mines Act recommended that in mines having extensive opencast and surface workings with

scattered employment it may be advisable to have besides a suitable canteen at a central place, a number of mobile canteen vans to serve persons employed at the scattered points.

(Cir. 22/1959)

2. Sale of Snacks at Canteens—The Working Group constituted by the Ministry of Labour and Employment to enquire into the compliance at mines of welfare provisions under the Mines Act recommended that snacks packed in plastic or other suitable envelopes may be made available for sale at canteens for the use of underground workmen.

(Cir. 21/1959)

3. Design of Canteens—Four designs of canteen (Drawing Nos. MR/65A/1), MR/64A/2, MR-64A-3 and MR-64A-4, having a seating capacity of 160, 80, 50 and 25 respectively have been approved (Variations in the designs may be permitted by the DGMS provided the standard of facilities provided is not less and the floor area is adequate).

The size of a canteen to be provided in a particular mine will be determined by the JDMS on the basis of the largest number of persons employed on any shift in the mine.

(DGMS Instructions dt. 21.6.57 & 8.1.1958)

4. Working hours of mine canteens—Attention is invited to the provisions of Rule 64(1) of the Mines Rules 1955 under which, whenever required by Chief Inspector or an Inspector, a canteen shall be provided and maintained in or adjacent to the precincts of a mine wherein more than 250 persons are ordinarily employed. Such facilities are to be provided for all persons employed in the mine. The canteen should thus remain open throughout each shift wherein persons are employed at the mine.

It is therefore requested to comply with the requirement of the law as indicated above.

(Cir. Welfare 1/1981)

5. Management of canteens—It has been brought to the notice of the Govt. of India that at some mines canteens are not being run departmentally but through contractors. This practice is not in accordance with the provisions of Rule 68 of Mines Rules 1955, which clearly specifies "that the owner, agent or manager shall appoint supervisory and other staff sufficient for the proper working of the canteen".

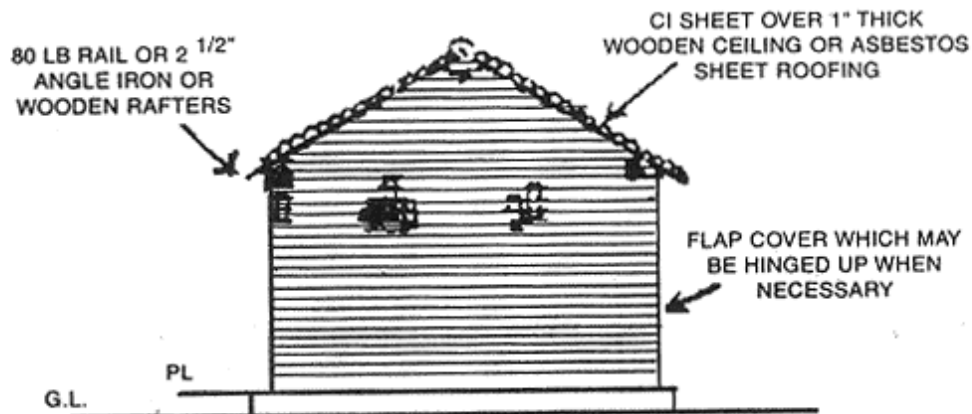
This decision was also agreed to at the Eighth Session of the Industrial / Committee on Coal Mines.

(Cir. 21/1961)

TEMPORARY REST SHELTER

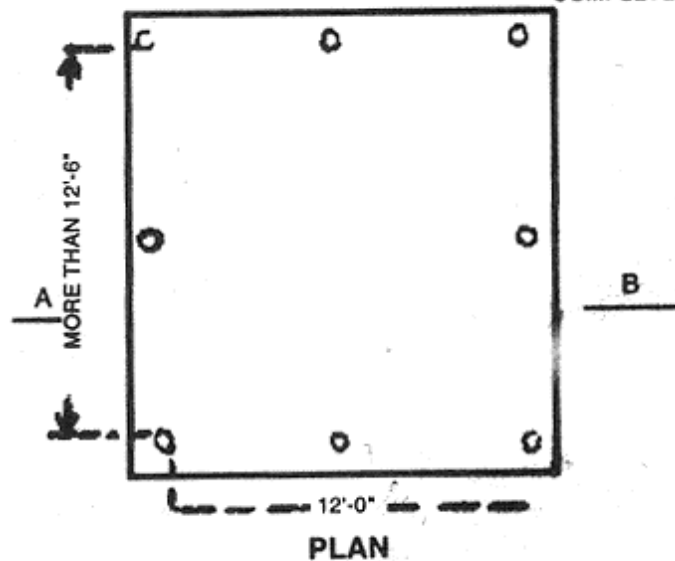
(Drawing No. MR 63A/2)

WHERE THE RATE OF ADVANCE OF FACES IS HIGH, TEMPORARY REST SHELTERS TO THIS DESIGN MAY BE PROVIDED NEAR THE FACES (IN ADDITION TO PUCCA SHELTERS BEHIND THE FACES) AND MAY BE ADVANCED OCCASIONALLY WITH THE FACES. SUCH SHELTERS MAY ALSO BE ERECTED WHERE THE LIFE OF MINE IS SMALL



SECTION ON A-B

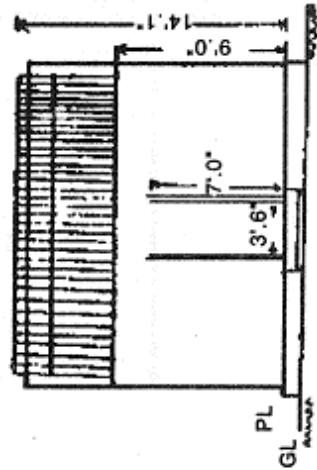
ONE SIDE OF THE SHELTER WHICH IS NOT FACING THE WORKING FACE MAY BE KEPT OPEN COMPLETELY



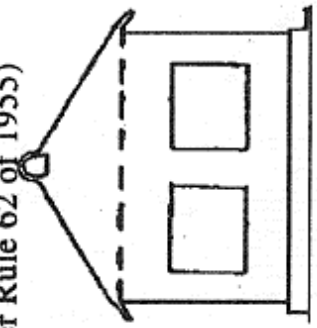
PLAN

Drawing No. MR 63A/1
(Scale 1" = 8')

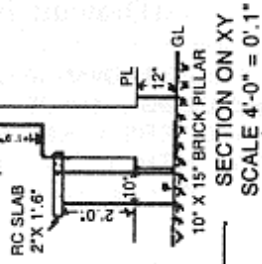
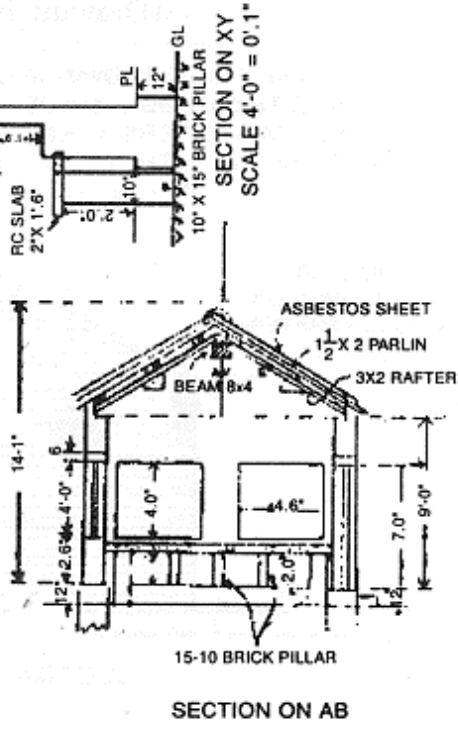
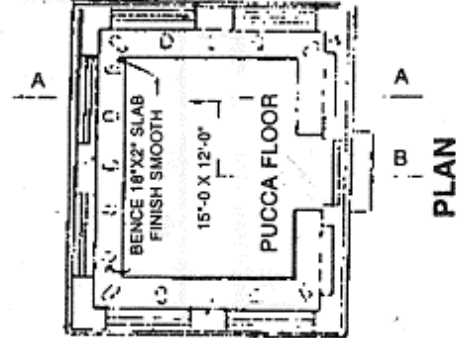
PUCCA SHELTER Near Depot & Quarry Working (Under Rule 62 of 1955)



FRONT VIEW

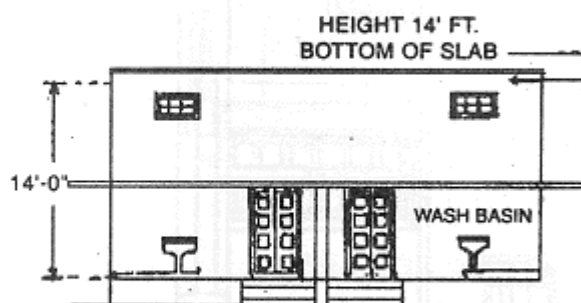


SIDE VIEW

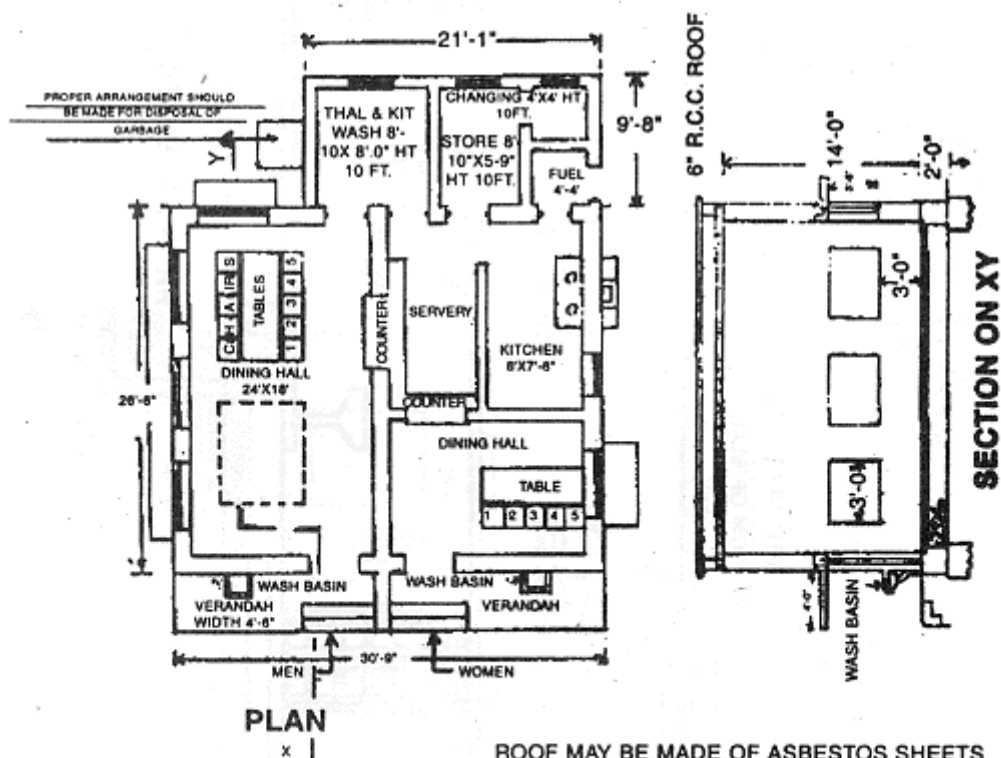


CANTEEN FOR WORKERS

Plinth Area 1140 Sq. Ft.

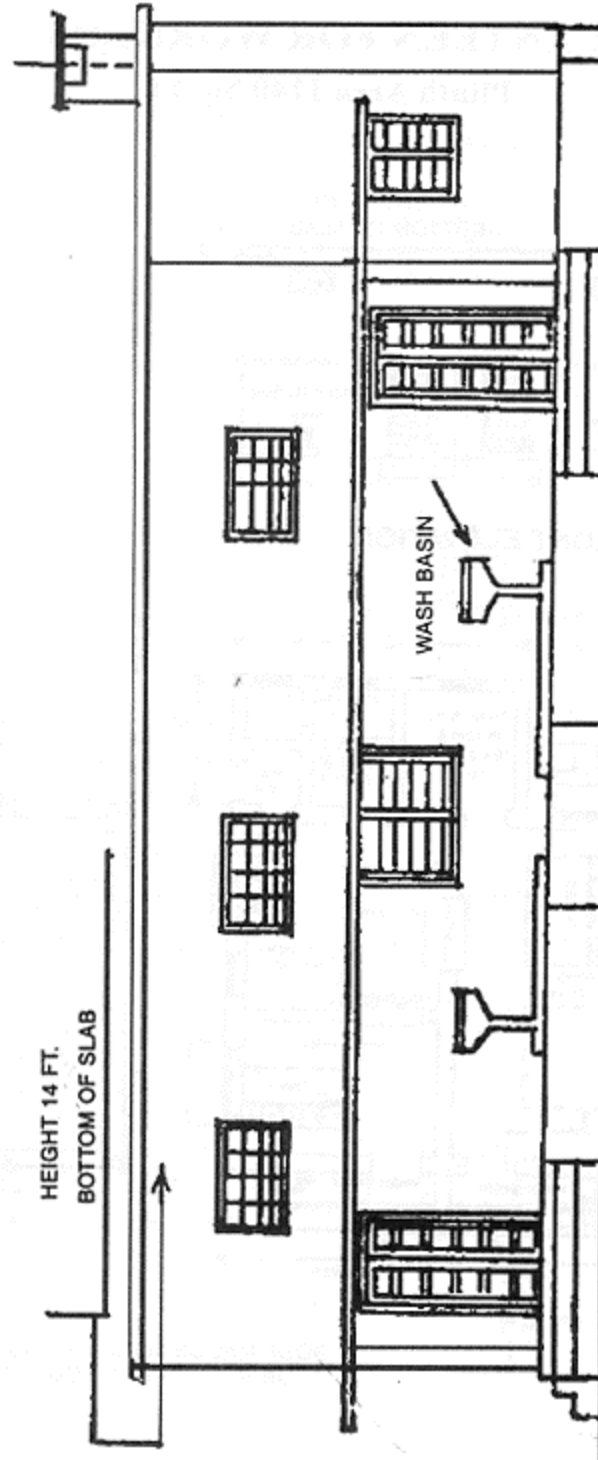


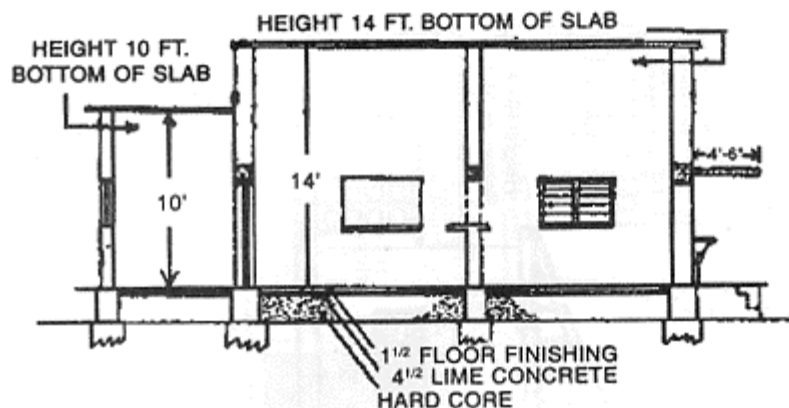
FRONT ELEVATION



CANTEEN FOR WORKERS

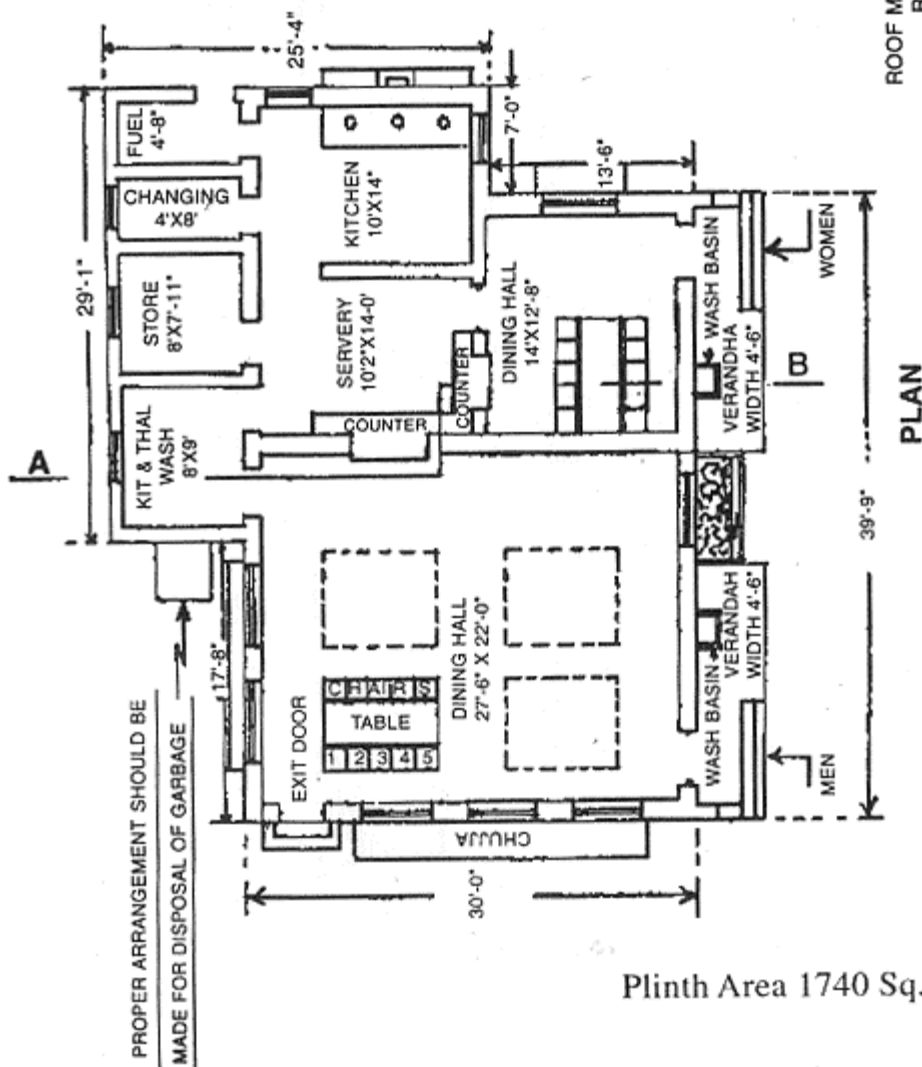
Plinth Area 1740 Sq. Ft.





SECTION ON AB

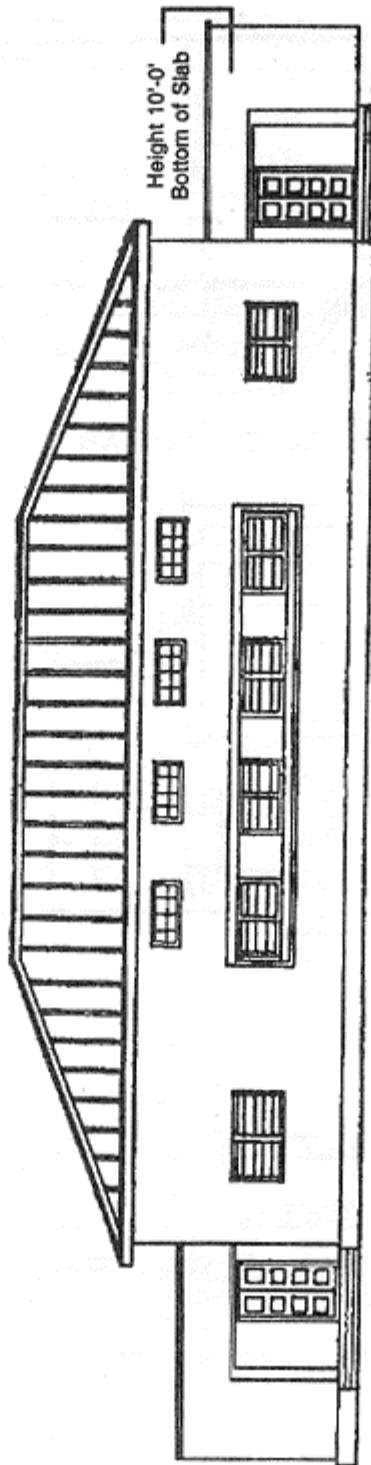
ROOF MAY BE MADE OF ASBESTOS SHEETS OR
REINFORCED CEMENT CONCRETE



Plinth Area 1740 Sq. Ft.

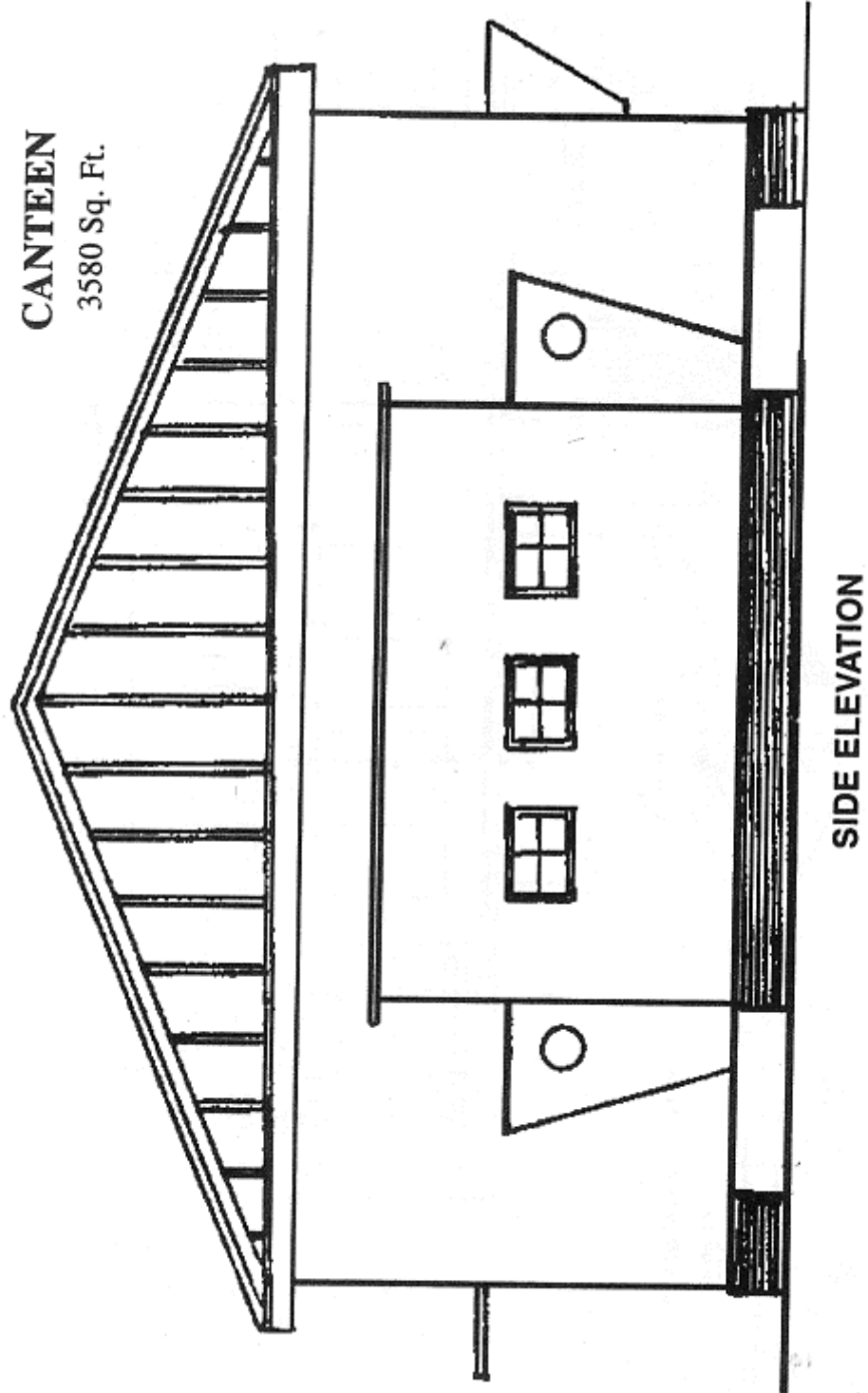
CANTEEN FOR WORKERS

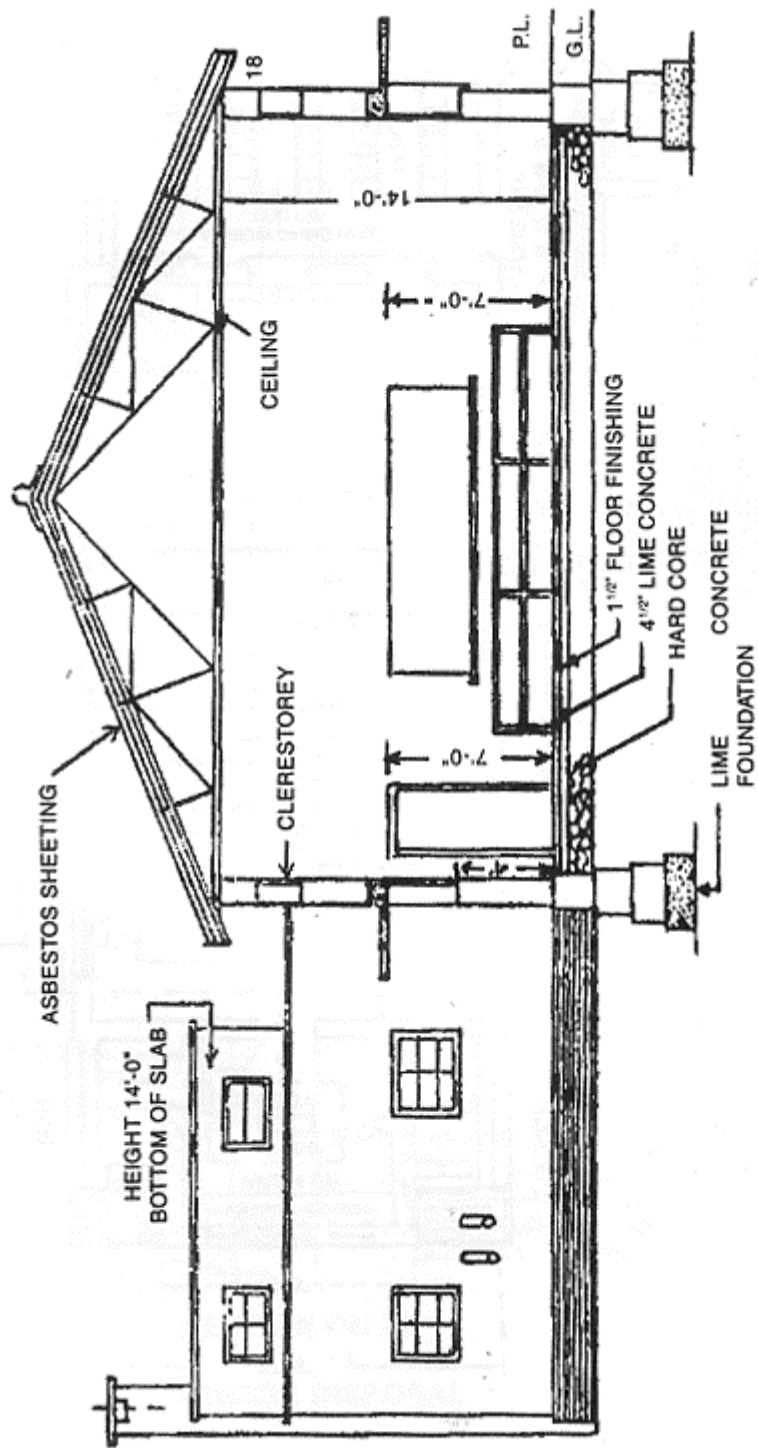
Plinth Area 3580 Sq. Ft.



Height 10'-0"
Bottom of Slab

FRONT ELEVATION

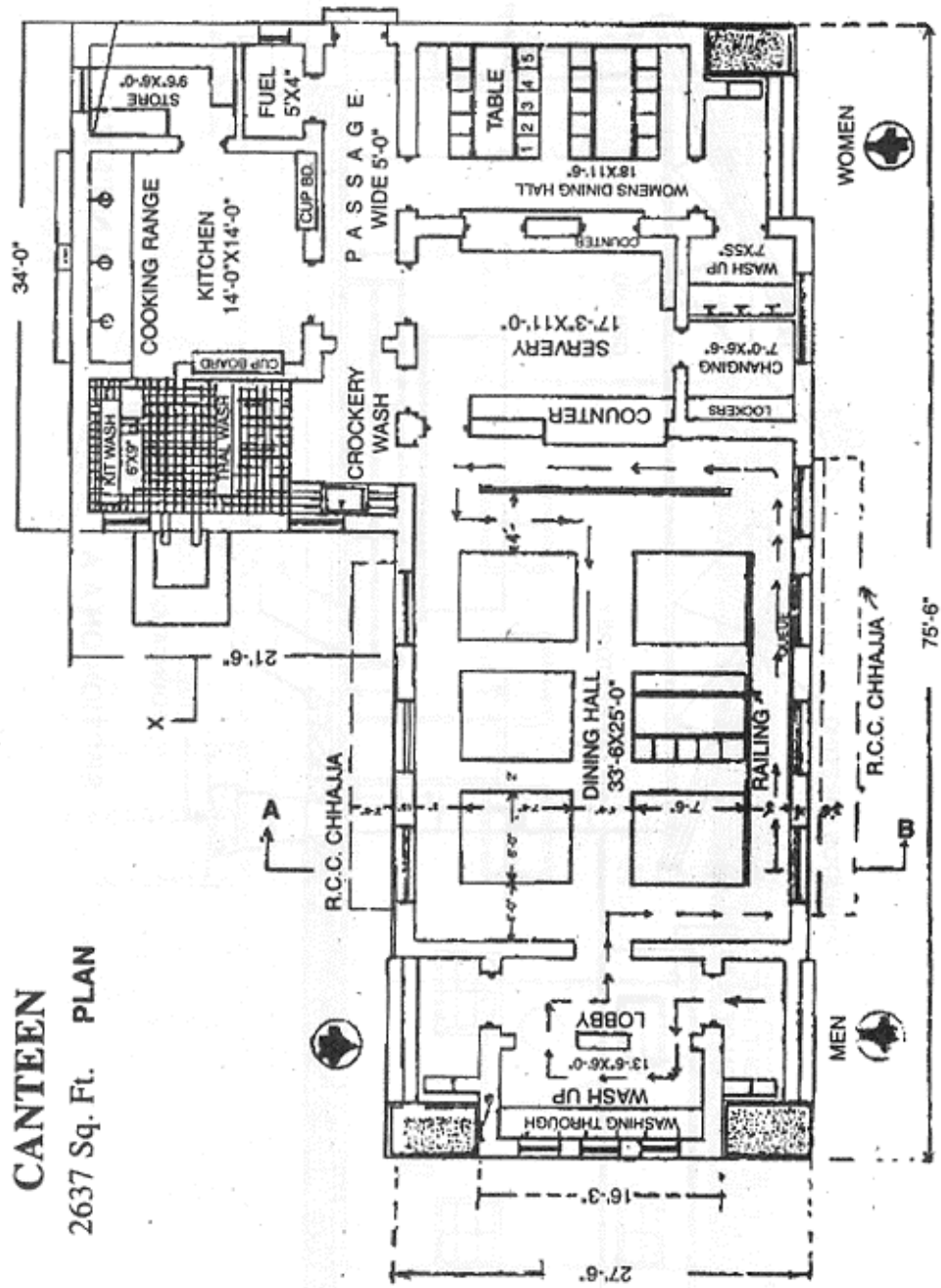


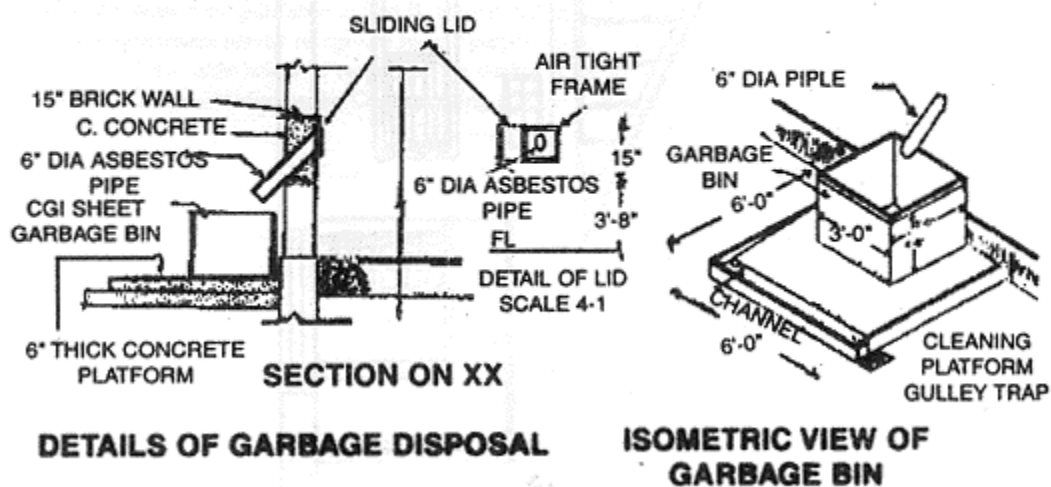
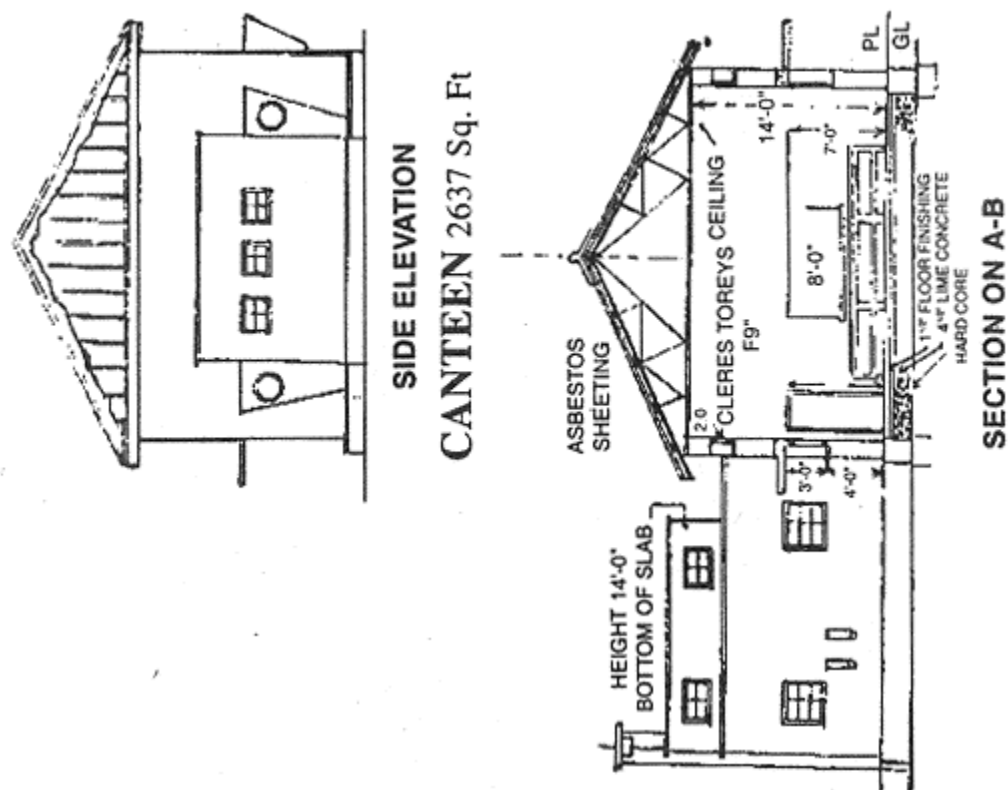


CANTEEN

3580 Sq. Ft.

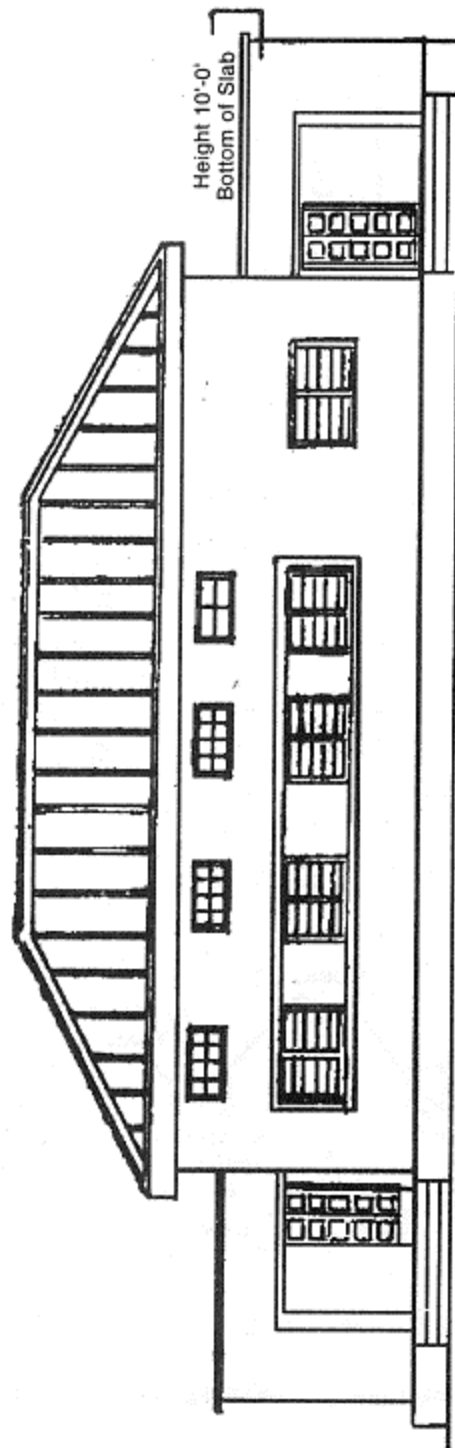
SECTION ON A A





CANTEEN

2637 Sq. Ft.



FRONT ELEVATION

Rule 70

Prices to be charged in a canteen—Rule 70 of the Mines Rules provides that "food, drink and other items served in a canteen shall be sold on a non-profit basis". In this connection, attention of the management of all mines is drawn to the following ruling of Labour

Appellate Tribunal, Calcutta: "Expenditure on the following items which are not to be taken into account in fixing the cost of meals, should be charged to the employer:

- (a) the cost of utensils including cooking vessels, plates, glasses and other articles which would be necessary to serve the meals to the workmen;
- (b) the cost of furniture;
- (c) the cost of coal, fuel and electricity; and
- (d) the salaries of the cook and of the canteen's staff.

The management of all mines are, therefore, advised that, in calculating the prices of food, drink and other items served in the canteens, the expenditure incurred on items (a) to (d) above should not be taken into consideration. This decision also was agreed to at the Eight Session of the Industrial Committee of Coal Mines.

(Cir. 21/1961)

Rule 72

1. Approved qualifications of Welfare Officers—Qualifications of Welfare Officers approved as per Rule 72 of Mines Rules 1955 and published in Gazette are given below:—
Gazette of India, Part-11, Section 3(ii), dated 8th June 1985 Govt. of India/Ministry of Labour.

Dated New Delhi 28th May'85

Notification

S.O. 2712. In pursuance of Clause (1) of sub-rule (2) of rule 72 of the Mines Rules 1955 and in supersession of the notification of the Govt. of India Ministry of Labour and Employment G.S.R. 547 dt 4th May 1960 published in part U, section 3(i) of the Gazette of India dt. 11th May 1960, the Central Government hereby recognises for the purpose of the above rule, the institutions mentioned in Column I of the table below in respect of the degree or diploma in Social Science, Social Work or Labour Welfare mentioned in the Corresponding entry in Column n thereof.

TABLE

	I	II
1	Any University in India established by law	Any degree or post-graduate diploma bylaw, in Social Sciences, including any degree or post graduate diploma in Sociology or Social Welfare/ Work/Service/Science Techniques or Labour Laws/Welfare or Industrial Relations and Personnel Management.
2.	Labour Directorate, Government of West Bengal.	Certificate Course in labour welfare
3	Indian Institute of Technology, Kharagpur.	Diploma in industrial psychology and Industrial relations
4	(i) P.S.G. School of Social Work, Coimbatore. (ii) National Institute of Social Sciences, Bangalore; and (iii) Madras School of Social Work. Kashi Vidyapeth, Bcnaras.	Diploma in in social service administration

5	Kashi Vidyapeeth Banaras	Degree of matter of applied sociology
6	Institute for Labour Welfare Workers (Formerly School for Training of Labour Welfare Workers), Bombay.	Diploma in labour welfare (2 year course)
7	Xavier's Labour Relations Institute, Jamshedpur, Bihar.	Diploma in industrial relation and welfare
8	Indian Institute of Social Order, Poona.	(i) Post graduate diploma in social science, conferred at St. Xavier' (ii) Post graduate diploma in Social service conferred at Institute of Social science, Loyal college madras. (iii) Post graduate diploma in Social Service conferred at St. Alysus College, Manglore.
	Tata Institute of Social Science, Bombay.	Diploma in Social Science Administration
	Institute of Industrial Relations and Personnel Management, New Delhi under the auspices of National Labour Law Association.	Post graduate diploma in industrial relation and personal management.

(Cir.Genl. 1/1986)

2. **Appointment of "Women Welfare Officers"**—The Estimates Committee (1959-60) on the Ministry of Labour & Employment, in their 84th report have recommended appointment of Women Welfare Officers in mines employing a large proportion of women workers.

(Cir. 34/1960)

3. **Welfare Officers to submit annual report**—It is the statutory duty of each Welfare Officer to forward through the manager of the mine, at the end of every year, a summary of his work done during the year of which he is required to keep a record. The summary of work should reach the Officer of the Director General of Mines Safety not later than 31st January of the following year.

(Cir. 52/1960)

Rule 74

Consulting D.G.M.S. before discharge/dismissal of a Welfare Officer—

In the recent past some Welfare Officers, who had satisfactorily completed probationary period of six months, were discharged or dismissed from service without consulting the Director General of Mines Safety. Rule 74(2) of the Mines Rules, 1955 makes it obligatory on the part of the owner, agent or manager of a mine to consult the Director General of Mines Safety before he discharges or dismisses a Welfare Officer. This is being brought to your notice with a view to ensure proper compliance with the statutory provisions in future.

(Cir. 37/1968)

Rule 75

1. **Proper maintenance of Attendance Register at mines**—At the Second Safety Conference held at Calcutta on 9th, 10th July, 1966, attention was drawn to the findings of two Courts of Enquiry that attendance registers were not being properly maintained by mine managements. The Conference had recommended that all possible steps should be taken to improve this state of affairs.

The importance of proper maintenance of attendance in the prescribed manner needs no emphasis from the stand point of safety of workers, as it is necessary to know the name (and number) of persons working in a mine at any time; in fact, this becomes of vital importance at the time of an emergency at the mine.

It is the statutory responsibility of every mine management to ensure that the attendance registers are properly maintained. Perhaps incorrect attendance is generally the result of failure of the attendance clerks to do their work properly. In many cases, this is done to get wages paid for work not done, and, therefore, generally speaking, in their own interest (mainly financial) the managements are keen to see that attendance records are properly kept. Nevertheless, apart from taking steps to ensure that the attendance of every person is recorded at the entrance or entrances to the mine at the time when a person against whose name the entry is made enters or leaves the mine, there is a need to institute a system of check(s) to make sure that the entries made in the attendance register tally with actual number of persons at work at any time. For this purpose, the following measures should be adopted in addition to the check provided by the cap lamp issue system:

(1) Physical verification—Verification of the entries in the attendance registers should be occasionally done with the actual number of persons working in the mine at the time and the results thereof recorded in the attendance register.

(2) Token system—A token system should be instituted in every mine whereby, on employment, every worker is given a numbered token as a mark of his identity. Where possible, a closed circuit should be established between the lamp cabin and the entrance so that once a worker is issued a cap lamp, he cannot proceed anywhere but to the mine entrance via the attendance cabin window. After taking his lamp the worker should drop his token in a box kept for the purpose at the cabin window. The attendance clerk could then check his register against the 'dropped' tokens after which the tokens could be put at relevant places on the lamp racks, (the boxes may be replaced at every 15 or 30 minutes interval to provide a time measure), on his return to the surface, the worker could collect his token from the lamp racks after returning his lamp.

Where such a closed circuit is not possible the worker may collect his lamp from the lamp cabin and then proceed to the mine entrance where he may drop his token in a box kept for the purpose. The tokens so collected would provide a check for the attendance clerk in the manner as indicated above. After this check, however, the tokens may be put on a special token board provided at the mine entrance, so that a worker could collect the same on his return to the surface. He could then proceed to the lamp cabin to return the lamp.

Alternatively, a two-token system (the two tokens for one worker to be of different shapes but to carry the same number) may be instituted, whereby a lamp is issued against tokens of one shape and the tokens of the other shape are used to get recorded the entrance into and return from the mine of the worker concerned.

Either one-token or two-token system as described above, or any other improved system may be adopted in consultation with this Directorate.

I shall be pleased if the measures as suggested above are introduced at your mine at the earliest under intimation to the concerned J.D.M.S.

(Cir. 61/1967)

2. Register keepers to sign the registers—In forms B, C, D, E, F, G, H and I of the First Schedule of the Mines Rules, 1955, no column has been provided for the signature of the Register Keeper: whereas in the other forms a column for the signature of the Register Keeper has been provided. In order to authenticate the entries made in the Registers it is essential that the person who maintains the register signs it. The absence of a specific column for such signature in the Register or the form should not be interpreted to mean that such

signatures are not required. Therefore, it shall be ensured that all the registers, records etc. required to be maintained under the Mines Act, etc. are duly signed by the keeper and countersigned by the Manager.

(Cir. 9/1971)

Rule 78

1. Attendance of Labour Employed by Contractor—It has been noticed at some mines that entries in the attendance registers are not made in respect of the labour employed by the contractors.

Section 48(4) of the Mines Act, 1952, reads—"For every mine, other than a mine which is exempted by the Central Government by general or special order, there shall be kept in the prescribed form and place separate registers showing in respect of each person employed in the mine (a) below ground, (b) in opencast working, and (c) above ground—

(a) the name of the employee,

(b) the nature of his employment,

(c) where work is carried on by a system of relays, the relay to which he belongs and the hours of relay, that it is to say, the period of work fixed for him."

Under Mines Rule 78, the forms of register and the procedure of entries are prescribed.

If attendance of the labour employed by the contractors is not recorded, it is a contravention of the provisions of the Mines Act, 1952 and the Mines Rules» 1955. It is therefore necessary that attendance of all work persons including those employed by the contractors should be recorded in the prescribed attendance registers.

(Cir. 52/1965)

2. Definition of 'absence'—Absence should include all cases in which a person is 'scheduled to work' or is expected to turn up for work, but does not. All permanent employees are to be treated as 'scheduled to work'. So far as temporary or casual employees are concerned, a person who attended work during the preceding week should be considered as scheduled to work, during the week under consideration unless (i) he has reported his intention to quit, or (ii) his services have been terminated by the management, or (iii) he does not turn up for work during the whole week. A person who has not worked during the preceding week, should be considered as 'scheduled to work* only from the day on which he joins work during the week under consideration. Absence due to strike, lock-out, lay-off or maternity leave should not be included as absences.

(Cir. 4/1955)

3. Timely discovery of accident to workers—An accident to a mine worker occurred in the following manner—Two attendants were deputed to clear the friction roller of a conveyor installation situated 15 metres above the ground level. The said conveyor was delivering crushed material to two bays below through & tripper trolley mounted on rails. The tripper trolley had chute on both sides to deliver the material through a small opening, about 50 centimetres wide provided along the walkways. Adequate fencing was provided along the sides of walkways. While one worker went away to drink water, the second attendant, engaged in cleaning a roller from the walkway, presumably crossed the fence. In balancing himself over the gap, he apparently lost balance and fell through the opening on the limestone heap about 12 metres below. The only other worker being away to take water, nobody observed this fall. The accident occurred at about 21.00 hours. The injured worker remained unconscious till about the early hours of next day. His attempts to attract the attention of other workers succeeded only at about 09.00 hrs. next day when he was rescued. It was good fortune that the injuries sustained by the injured worker did not prove fatal though he remained exposed to cold weather and unattended for 12 hours.

The above accident however is a sad commentary on the attention paid to return of workers at the end of the shift. In the case under reference, though the injured worker was not marked out, neither the attendance keeper nor official bothered about him. The co-worker was equally callous in not trying to find the whereabouts of his colleague on finding him absent at the place of work on his return after drinking water. He simply presumed that his colleague must have gone home. This accident thus raised two basic points viz., (1) the role of co-workers and (2) duty of the attendance clerk on the subject of missing workers.

Provision exists in the regulation against persons working alone in any remote part of the mine where, if any accident occurs, he will not be soon discovered or assisted. The spirit of this Regulation was obviously violated by the colleague of the injured worker. His action speaks of gross indifference to the safety of his colleague. The attendance clerk also did not report the matter of injured person failing to report at the end of the shift. This may well be the situation in many mines and the above accident reflects how this is fraught with danger.

Adequate steps to ensure that strict watch is kept on the return of every worker at the end of a shift shall be taken. The cases of all persons not marked out should be brought immediately to the notice of the senior officials preferably in writing by the attendance clerk. On receipt of any such report, management should immediately initiate a search for the missing person and such a search should continue till the missing person is located. Instructions should also be issued to all workers that whenever they are working in pair, each worker should make particular note of the safe return of the other at the end of the shift. Any disappearance from the place of work not properly accounted for should be immediately brought to the notice of officials. Where workers are employed in groups of more than two, the leader of the group should ensure compliance with the above directive.

(Cir. 39/1971)

Rule 81

Kit for determination of blood alcohol concentration—Often during the course of our enquiries it comes out that employees have gone on duty after they had drunk alcohol mostly country liquor etc. As you are aware, Rule 81(2) of the Mines Rules 1955, which is quoted below, prohibits persons to be employed in a mine in a state of intoxication or drunkenness:

(2) No person shall, during the course of his employment in or about a mine, possess, carry or consume any intoxicating drink or drug or remain in a state of intoxication or drunkenness ."

While realising that it is more a matter of self discipline amongst the employees which can be tackled by imparting education, training etc., it may be worthwhile to adopt a modern testing aid, so as to bring fear on them of occasional checking and for taking necessary preventive measures.

In Federal Republic of Germany, "ALCOTEST CH237" as developed by Drägerwerk, AG Lubeck, is being used by the Police extensively to determine blood alcohol concentration amongst motor car drivers. This aid permits determination of whether or not the blood alcohol concentration exceeds a legally defined limit and conclusion as to the alcohol content of the blood can be drawn from the alcohol Content of an expired air sample of the person. Should the ALCOTEST prove positive, a blood test must be made for legal purposes.

ALCOTEST is a very light apparatus, 14 mm x 10 mm, and may be accommodated in the pocket very conveniently for the purpose of surprise checks. ALCOTEST has tubes which are sealed at both ends and each contains a yellow reagent which changes colour to green in the presence of alcohol vapour.

It is suggested that the same may be obtained and kept at each mine for surprise checks amongst employees in the night shifts.

The agency of Dragerwerk in India is with M/s Joseph Leslie Agencies (P)Ltd., Post Box. No. 130, Apollo Street, Bombay-400 061 who may be contacted for the same.

(Cir. Genl. 4/1976)

Rule 82

1. Case of Pneumoconiosis or Silicosis to be reported—Any case of Coal Miner's Pneumoconiosis or Silicosis diagnosed by any medical practitioner employed in your mine may be notified to this Directorate.

(Cir. 76/1973)

2. Training of doctors in mining diseases—Occupational Health Services cannot develop extensively, receive adequate recognition or be an effective instrument without the competent, if possible, specialised personnel.

There is hardly any mining operation in which dust is not produced and prolonged work in dusty milieu causes diseases like Silicosis, Coal Miner's Pneumoconiosis, Asbestosis and Manganese intoxication etc.

Certain occupational diseases referred above, if contracted during employment in the mines, are compensable under the Workmen's Compensation Act, 1923, read with the mines Act, 1952. Pneumoconiosis Medical Board is working since 1967 but hardly any case is being referred to this Directorate for assessment though incidences of such diseases may be anywhere between 10—30 per cent. Above all miners cannot escape some degree of Silicosis etc. during daily work which may cause serious disability and even death at times; most of the cases go undiagnosed and without any compensation due to lack of expertise in the field.

Managements have already been addressed sometime back. All managements are again requested to get some of the doctors trained in specialised courses in occupational health specially in relation to mining diseases mentioned above.

(Cir. Welfare 1/1975)

THE MINES RESCUE RULES, 1985

Rule 19

1. Rescue-trained personnel : fitness for refresher training and availability in emergency—

A number of persons who undergo refresher course training at the Rescue Stations do so after attending a full night shift's duty. On some occasions such persons show signs of physical distress soon after putting on the Proto apparatus. This is not surprising.

It is desirable that the persons who have to undergo a refresher rescue training should not be put on a night shift at least on the day previous the date on which they have been directed to report to a rescue station for such training. There should normally be no difficulty in arranging the shift duty of the personnel concerned suitably as at least seven days prior notice is sent to their colliery in this regard.

Further in times of an emergency even though some collieries had been alerted in time by a rescue station, the rescue trained persons did not respond to the call quickly enough due to the excuse about non-availability of transport from the mine to the place of reporting. Mine managements concerned should see that reasonable facilities for the transport of the rescue-trained persons are provided immediately to enable them to attend on emergency call promptly.

(Cir. 60/1965)

2. Arrangements for summoning rescue trained persons—The following arrangements have been approved by the DGMS for summoning colliery rescue workers immediately when their services are required:—

(1) Siren, Hester, Buzzer or Bell with audibility within a radius of 1/4 mile, or more if the rescue workers reside in houses situated further away.

(2) Special electric call bells fitted in the houses of rescue workers with a master switch in the attendance room/colliery office.

If any other means of summoning the rescue workers are to be provided, an application for approval of the arrangement should be submitted to the DGMS.

(Cir. 66/1966)

3. Engagement on rescue work—Rescue trained field volunteers attached to collieries are sent for refresher practices and participation in recovery operations immediately after completion of their duties at the mines. This leads to dangers to the field volunteers while working with breathing apparatus.

All concerned shall take immediate action so that the field volunteers engaged in collieries are not deputed to participate in any recovery operations or refresher practices till after expiry of at least a period of 12 hours from completion of their duties at the mines.

Rule 24

Conduct of Rescue/Recovery operations in an emergency—One of the recommendations made in report of enquiry into the Sudamdih Colliery Accident (4.10.1976) under Sec. 64 of the Mines Act. 1952 by Shri H.C. Sarin was as follows:—

"There are no clear instructions laying down the authority which should take control of rescue and recovery operations in an emergency. In practice at present the DGMS is expected to exercise the control. It would be preferable to give this responsibility to a group consisting of a senior official of the management, a representative each from DGMS, Rescue Station, and of the recognised union of the workers. This group should take decisions and direct operations from the control room. To start with it should be recognised that the management (the seniormost officer present at the mine) would have to and must take decisions."

It is, therefore, suggested that in future in an emergency in a coal mine involving Rescue/Recovery operations, a Committee consisting of a Senior Official of the management, a representative each from DGMS, Mines Rescue Station under whose jurisdiction the mine falls, and the recognised union of the workers may be immediately constituted who should take decisions and direct operations from the control room at the mine. Till such a committee is constituted, the seniormost mine official should, in consultation with the Rescue Station Officer present at the mine, take whatever action is necessary. Initiation of action should in no case be held up just because an officer of this Directorate is not present at the spot.

It may be emphasised that the above procedure relates to emergency at the mine and not in respect of "planned" recovery operations.

(Cir. Genl. 1/1979)

DGMS

THE MINES VOCATIONAL TRAINING RULES, 1966

Vocational Training Rules framed under Section 58 of the Mines Act, 1952 are applicable to all mines have been published in Gazette of India in Part II Section 3 sub-section (i) dated 2.4.66 under notification No. G.S.R. 473.

General—The rules envisage a uniform standard of instruction to all workers through a course of lectures and demonstrations to be given by competent instructors at the Vocational Training Centres to be set up within the industry. The provision of the training centres and of the related instruction has been made the responsibility of the management of mines who will have to bear the entire cost of the scheme etc. For new entrants to the industry a basic course of 6-day institutional instruction is to be followed by further training at the place of work in individual mines, under the close personal supervision of experienced workmen (trainers) to be chosen from amongst each categories of workers. It is to be noted that this scheme does not apply to the various category of supervisory officials and apprentices undergoing an approved course of training at mines.

The following are the important provisions of the scheme.

(1) Vocational Training Centres : These centers are to be located and maintained by the various mine managements at convenient points accessible to all workers both employed and to be newly employed. A common training centre may be permitted by the Director General of Mines Safety for any group of two or more mines (under the same management or even different managements) if they are so situated as to be convenient for such instruction. Every such centre should be placed under the charge of a whole/part- time training officer duly qualified and assisted by competent Instructors and other staff. Necessary equipment including audiovisual aids and other facilities for the various courses of instruction are to be provided at the training centers.

(2) Basic/Initial Training Courses : Apart from a 6-day course of lectures and demonstrations at the above centres for all new entrants, a scheme of practical (on-the job) training, under close personal supervision of competent trainers is envisaged to be imparted at the place of work in the mines. These 'trainers' are to be carefully selected from skilled workmen and themselves given a course of 6 safety lectures, specially designed for the purpose, before new entrants are placed under their charge. In the case of underground workers this 'on-the-job' training would extend over a period of 12 days.

Also an additional course of training for 6 days is to be given at these centers to such of the workers who are to be employed in gassy mines.

(3) Refresher Courses and Special Training Courses : A course of off-time refresher training is envisaged for (a) all categories of present workers such as those engaged in shot-firing blasting operations and gas-testing personnel. Also timber mistries newly employed in mines are to be given a special course of whole-time instruction for a week. At least one-fifth of the persons employed at each mine are to be trained in the above refresher course every year.

(4) Training Records and Reports : A record of all Vocational Training given to each worker of the different categories is to be maintained, and every training officer is required to furnish weekly reports of trainees to the management of the respective mines. He is also required to keep a record of his work at the end of each year to the Director-General of Mines Safety.

(5) Status of Trainee & Training Allowance : During the period of training, every new entrant is to be treated as a regular employee and, in the event of unsatisfactory progress or performance at the training centre as may be judged by the Training Officer, he may be either discharged or sent for further training. Each new entrant under the basic training scheme is to be paid by the management a maximum allowance of Rs. 1.50 p. (all inclusive) per day. Each person undergoing course of refresher training is to be paid at the rate of 0.50 paisa per lecture attended by him,

(6) Every person who has successfully completed a course of basic training is to be granted a certificate duly endorsed by the mine management and will then become eligible for employment in any vacancy to the category for which he has been trained. Similar certificate are to be granted to all other persons who have undergone a refresher or other special courses of training under these rules. These certificates are to be retained by the management so long as the holder thereof is so employed and are to be returned to him on the termination of his service.

(7) The details of the necessary training staff etc. to be provided at the various V.T. Centres will depend upon the number and the Categories of the employees to be trained at each centre, and to be worked out separately.

Enforcement of the Scheme—The syllabii for the training of various categories of workers have been prepared with due care taking into requirement the present needs of the industry as a whole and it is hoped that in the common interests Of safety and productivity the managements of mines will immediately set up the necessary training centers for the implementation of the various provisions of the scheme. For ensuring that the training imparted at the various training centres is of a uniform and desired standard throughout the country, periodical inspections will be made by officers of the Directorate-General Safety of Mines and other necessary steps taken for the achievement of the training objectives.

The above summary is not at all exhaustive and is meant only for general guidance. A careful study of the full text of the rules published in the Gazette should be made. A copy of Rules may be obtained from the Manager of Publications, Govt. of India Publicity Branch, Civil Lines, Delhi-8.

(Cir. 18/1966)

Rule 1

Notification regarding the application of Vocational Training Rules in respect of coal mines situated in the states of Bihar and West Bengal— "S.O. 2104—In exercise of the powers conferred by sub-rule (3) of rule 1 of the Mines Vocational Training Rules, 1966, the Central Government hereby appoints the 1st day of August. 1966, as the date on which the provision of the said rules, except rule 9, shall come into force in respect of the coal mines situated in the States of Bihar and West Bengal."

Immediate steps should be taken to set up the training centres on the lines outlined in the relevant provisions of these rules with necessary equipment and staff. The setting up of three types of Training Centres (Vestibule, Group & Unit) is envisaged according to. size, number of persons employed and location of the various mines and the prior approval of the Director-General of Mines Safety has to be obtained in the case of setting up of common training centres to serve two or more mines.

(Cir. 54/1966)

A Summary on the Training Scheme (Mines Vocational Training Rules, 1966)

Sl. No.	Category of workers	Ref. to rule & schedule	*No. of days lectures at V.T.	Remarks
1	2	3	4	5
A.	Initial/Basic Course			
I.	All new entrants for employment in work	Rule 6		For underground workers an additional course of "on-the-job" training for 12 days under direct personal supervision of 'trainers'.
	(a) above ground/open cast workings;	Sen. I	6 days (wholetime)	Also workers to undergo relevant courses for change in place of employment
	(b) below ground in gassy non-mines; and	Sch. II	6 days (wholetime)	
	(c) below ground in mines	Sch. II & III	12 days (wholetime)	
B.	Refresher Course			
1.	Re-employed workers after break of service of one year or more;	Rule 8		
	(a) On surface & opencast workers-	Sch. IV (1)	3 lectures	Training within one month for re-employment.
	(b) for underground workers in gassy mines.	Sch. IV(1) + IV(2)+IV(3)	3+3+6 = 15 lectures	
	(c) for underground workers in non-gassy	Sch. IV(1) + IV(2)	3+6=9 lectures	
2	Already employed workers in gassy mines i.e. category (b) above.	Rule 10 Sch. IV(3)	6 lectures	All persons to be trained during the 1st year.
3	Already employed workers categories (a) & (c) as above.	Rule 9 Sch. IV(1) & IV(2)	3+6=9 lectures	At least 1/5th of the total number of person in each category be trained each year.
C	Development Course			
1	All workers- employed in handling explosives and also those with a break of service of 6 months or more.	Rule 13 & 16 Sch. VI	6 lectures	All persons to be trained during the 1st year. For opencast metalliferous mine workers, a course of 4 lectures only.

2	All potential shot-firers before appearing for competency examination as newly appointed shotfirers who have not undergone this course of training or with a break of service exceeding 6 months.	Rule 14 Sch. VII	12 lectures	Training to be completed within one month of e m p l o y m e n t / r e employment
3.	Timber Mistries (a) to be newly employed from categories of timbermen. (b) to be re-employed after a break of service exceeding 6 month.	Rule 12 Sch. V	6 days (whole time)	Training to be completed before appointment as Timber Mistry,
4	Competency certificate holders in gas testing and candidates for the said certificates.	Rule 17 Sch VIII	6 lectures	Instruction course to be covered every year.

*Lectures of duration of not less than 2 hours are to be given at V.T. Centres either before or after normal working hours, as may be convenient.

2. Notification regarding the application of these Rules in respect of The coal mines situated in areas other than the States of Bihar and West Bengal and also in respect of the Oil Mines—S.O. 2820 In exercise of the powers conferred by sub-rule (3) of rule I of the Mines Vocational Training Rules, 1966, the Central Government hereby appoints the 1st day of November, 1966 as the date on which the provisions of said rules, except rule 9, shall come into force in respect of the coal mines situated in areas other than the states of Bihar and West Bengal and in respect of the Oil Mines.

(Cir. 80/1966)

3. Notification regarding the application of these Rules in respect of the Copper Mines, Gold Mines, Iron Ore Mines and Manganese Mines—S.O. 3360 In exercise of the powers conferred by sub-rule (3) of rule 1 of the Mines Vocational Training Rules, 1966, the Central Government hereby appoints the 1st day of December, 1966 as the date on which the provisions of the said rules, except rule 9, shall come into force in respect of the copper mines, gold mines, iron ore mines and manganese mines.

(Cir. 83/1966)

4. Notification regarding the application of these Rules in respect of the Limestone Mines and Mica Mines—S.O. 3493 In exercise of the powers conferred by sub-rule (3) of rule 1 of the Mines Vocational Training Rules, 1966 the Central Government hereby appoints the 1st day of January, 1967 at the date on which the provisions of the said rules, except rule 9, shall come into force in respect of the limestone mines and mica mines.

(Cir. 3/1967)

5. Notification regarding the application of Vocational Training Rules in respect of all mines other than Coal, Oil, Copper, Gold, Iron Ore, Manganese, Limestone and Mica Mines with this Notification mines of all minerals have been brought within the scope of the above rules—S.O. 2453 dated 17.7.67, in exercise of the powers conferred by sub-rule (3) of rule 1 of the Mines Vocational Training Rule, 1966, the Central Government hereby appoints the 1st day of Aug. 1967 as the date on which the provisions of the said rules, except rule 9, shall come into force in respect of all mines, other than coal, oil, copper, gold, iron ore, manganese, limestone and mica mines.

(Cir. 50/1967)

Rules 6 & 7

1. Vocational training of workers—Mines Vocational Training Rules 1966 came into force over 6 years ago, only about 10-20% of the workers have been imparted the statutory training in about 275 training centres that have been set up so far in the entire mining industries. The progress of the training scheme and implementation of the law is, undoubtedly slow. Moreover, the quality of training imparted at the centres generally leaves much to be desired. It is therefore, not surprising that there has not so far been any appreciable impact of vocational training in our mines. This is an unsatisfactory position.

Consideration needs, therefore, be given to initiating suitable steps for remedying the position, so that the whole Vocational Training Scheme proceeds and develops on sound and healthy lines. The principles on which the Vocational Training of workers should be further developed may in the interest of both efficiency and safety be recommended as follows for guidance:

(A) The mining industry should shoulder the responsibility that its labour force has sufficient opportunity to gain a knowledge of basic skills required to perform various tasks and at the same time:—

(B) The industry should take adequate measures to provide the workers with sufficient preliminary training to ensure them to appreciate hazards of mining in general and those of underground work (where required) in particular, so as to avoid as far as possible exposing themselves to dangerous situations.

In pursuance of the above principles, though the syllabus had been revised recently to include development of skills and efficiency of workers, still the position has not shown much improvement presumably due to lack of sufficient interest on the part of the management at some stage. The main reasons for this position may, however, be attributed of the following factors, amongst others:

1. The old employees who are required to undergo a course of refresher training have to take this training outside their normal working hours and the monetary benefits offered to them for the same are perhaps unattractive (such a person is paid an allowance of only 50 paise per lecture attended by him).

2. The training centres are not adequately staffed and equipped with proper training devices and aids.

While taking stock of the position, the recently concluded Third Conference on Safety in Mines (Calcutta: 14-15 July, 1973) has recommended, as an immediate measure, that:

"To ensure proper training of workers and implementation of Vocational Training Rules, the training should be imparted during working hours."

While it is proposed to amend the Mines Vocational Training Rules in this regard in due course, it would be appreciated if suitable action is taken by you to implement the above

recommendation of the Third Safety Conference in the meantime. You are also requested to keep the concerned Joint Director informed about the progress of Vocational Training of the workers employed at the mine(s) under your control by sending to him a monthly progress report. A copy of the same may kindly be endorsed to the Joint Director of Mines Safety (Vocational Training), Directorate General of Mines Safety, Dhanbad as well.

(Cir. 55/1973)

2. Training of new persons—It is necessary that every new person (other than a person who has held any such previous employment) shall be given initial training as prescribed in Schedules I, II and III, whichever is applicable, before employment in the mines. The intention of the provision is to make new workers aware of the various dangers involved in different types of works and to make them safety conscious from the very beginning of employment.

It has been observed during inspection by officers of this Directorate that new persons continue to be employed without giving them initial training in contravention of Rules 6 & 7 of the Mines Vocational Training Rules, 1966. The training rules will be frustrated if this practice is not stopped forthwith.

(Cir. 34/1970)

Rules

1. Standard and training duration for different category of mines workers under Mine Vocational Training Rules—Although according to the provisions of the Mines Vocational Training Rules, 1966 it is obligatory to maintain a uniform standard of training in respect of same category of workers in different mines it is observed from the reports/returns received from different Training Centres that no care is being taken to maintain such uniformity in the standards.

In many training centres while Full-day release system of training as recommended in D.G. (Legis) Cir No. 4 of 1975 has been implemented, some centres are not only continuing the old practice of imparting training either before or after the normal working hours but also are following the system of training for 2 hours a day for the number of days indicated in the old training Schedules (before revision) resulting in a gross disparity in the training duration. You will appreciate that it is very much necessary to maintain a uniform standard of training duration and to adopt a standard curriculum for training of different categories of workers irrespective of the system of training adopted.

It is therefore clarified that the standard training duration for different categories of workers will be the number of days indicated in the Revised Training Schedules read with D.G. (Legis) Cir. No. 4 of 1975, where each day consists of 8 hours training. Therefore in a system of training other than the Full-day Release System the total number of hours of training to any specified category of workers shall in no case be less than the total number of hours of training under Full-day Release System if it were followed.

All training centres who have not yet adopted the Full-day Release System shall follow the procedure indicated above. Any departure from the above principle will not only be treated as an irregularity but also the workers so trained may not be considered as "trained under the Mines Vocational Training Rules" in which case will be obligatory on the part of the management to impart such workers complete training afresh.

(Cir. Legis. 2/1976)

Rule 9

1. Mines Vocational Training Rules, 1966—Application of Rule 9 for Refresher Training—With the following notifications it is obligatory to give refresher training to all the

present workers employed in the mines in accordance with the relevant schedule under the said rule.

*S.O. 2526 dated 13/6/69. In exercise of the power conferred by sub-rule (3) of rule 1 of the Mines Vocational Training Rules, 1966 the Central Government hereby appoints the 1st day of September, 1969, as the date on which the provisions of rule 9 shall come into force in respect of all categories of persons employed in mines other than those who were employed in mines for a period not exceeding one year on the 1st June, 1968.

A summary of the scheme briefly outlining the various courses and other information have already been circulated. With this notification at least one fifth of the persons employed at each mine are to be given a course of refresher training as per rule 9 and prescribed in Schedule IV every year with effect from 1.9.69.

For ensuring that the above courses of training are imparted on right lines and of the desired standard, a Joint Director of Mines Safety has been especially placed at Headquarters with three other officers placed at each of the zones. Should any serious doubt or other difficulties arise in the implementation of the scheme aforesaid officers shall be contacted for necessary assistance and guidance.

(Cir. 27/1969)

It is clarified that every person in employment in a mine shall undergo refresher training as specified in rule 8 and shall continue to undergo such refresher training periodically once in every five years from the date of his last such training.

(Cir. 45/1971)

2. Refresher training of persons holding First-Aid certificate—Please refer to the Circular No. 38 of 1968 dated 18/11/68 wherein you have been asked to take action for refresher training of the persons holding first-aid certificate can be conveniently done by the qualified Medical Officer at your V.T. Centre by including in the quarterly programmes of training of the various courses. This will also help the first-aiders posted with the up- to-date developments in the knowledge of and in the practical art of rendering first-aid.

(Cir. 33/1969)

Rule 17

Training of Shotfirers, Mining Sirdars, Overmen, Machine Operators, Timber Mistries etc. in Gas-testing—Training in gas-testing should be imparted to all Shotfirers, Mining Sirdars, Overmen, Machine Operators, Electricians, Timber Mistries etc. in the Training Centre of the Colliery, without fail, at least once in every year. Arrangements necessary for the purpose shall be provided.

(Cir. 28/1972)

Rule 18

Types of Vocational Training Centres		
A.	Vestibule Training Centre: (Large) & (Management wise)	To serve a group of coal mines belonging to the same management with a total employment of 10,000 workers or above.
B.	Group Training Centre: (Medium) & (Area wise)	To serve a group of coal mines belonging to the management or different managements with a total employment of at least 2500 workers.

C.	Unit training Centre : (Small) & (Unit wise)	To serve a unit (individual) coal mine employing over 800 workers.

N.B.: 1. Units employing less than 8,00 workers to associate with Vestibule or Group Training Centres (A or B).

2. An approved sub-training center can function as an offshoot/branch of a vestibule/group training centre for the purpose of covering refresher courses only for present workers.

Rules 18 & 19

Improvement of standard of vocational training centre and training imparted—During different inspections of Training Centres, it has been observed that the centres lacked in following respects:—

1. Accommodation provided in most of the centres was not adequate.
2. Training shed/Training gallery for imparting practical training to the worker-trainees and for holding demonstrations were not provided.
3. Excepting a few centres, others had not prepared lessons on the prescribed talks under different schedules.
4. Models, charts, equipment etc. in most of the centres were inadequate.
5. Arrangement for demonstration and behaviour of inflammable and other mine gases in most of the centres were not satisfactory.
6. Performance of instructional officers and staff in most of the centres was not satisfactory.
7. All the workers trained under different schedules till date were not awarded certificates.
8. Most of the instructors, who are working in training did not receive any training for working as instructors.

Improvement of the standard of training centres and of training imparted is very essential for achieving higher safety standard and productivity.

(Cir. 37/1971)

Rule 19

Details of Class-room, Training Gallery/Workshop, Furniture, Equipment, Tools, Fixtures, Supplies at V.T. Centres—Particulars of class-room, furniture, equipment, tools etc. to be provided at various Training Centres are given below:—

A. Building Accommodation etc.

1. (a) A lecture hall (b) gas-testing room (c) office room (d) store room (e) veranda (and Toilet)
2. (a) Training gallery/(Vestibule centres)
(b) Workshed for demonstration (other centres).

B. Furniture

1. Tables & chairs for instructional & other staff.
2. Desks/benches/stools for trainees.
3. Almirahs & filing cabinet for keeping training records.
4. Typewriter, duplicator etc.
5. Book case/shelves for storing books and magazines.
6. Clock, waste paper basket.
7. Fixture for safety helmet, safety lamp & workers' uniform.

C. Training

Aids : 1. Equipment at Training Centre

- (a) Notice/Bulletin Board.
- (b) Black Board.
- (c) Sound Projector Epidiascope, Slide/Film Projector.
- (d) Wall charts on the following subjects:
Industrial safety, first-aid, elementary mechanical principles, shot firing practice, ventilation, roof and other supports, safety devices on haulage and winding machinery etc.
- (e) Gas-testing equipment, relevant charts of gas caps and flames safety lamps.
- (f) Models (working, cut-away etc.)
- (g) Safety & other posters; flip charts, flash cards, graphs, pictorial diagrams; photographs.
- (h) Films and film strips.
- (i) Miner's protective equipment (goggles, gloves safety-belts, respirators, gas masks etc.)
- (j) First-aid equipment.

2. Mech. appliances and hand tools

- (a) Safety devices such as Sylvesters, re-railers, R. switches, drags; Attachment for wire ropes such as coupling chains, hooks, and other devices, miner's hand tools, such as pick, hammer, shovel, crowbar, and hand tools employed in timbering & other support work, track laying, pipe fitting, and tools appliances and accessories for the drilling of the shot holes and for shotfiring/blasting operations.

3. Reference materials

- (a) Manufacturers' materials such as, samples of different types of wire ropes, electrical conductors, and mining cables, ventilation devices, such as, ventilation-tubes, hoses, brattice cloth & instruments and fire fighting equipment.
- (b) Reference books, catalogues and related magazines.

4. Supplies

(a) Class room

Black board, Chalk, stationery articles, forms & registers, work-books. A set of stencil for lettering and brushes and paints, writing slates & pencils.

(b) Training gallery/work-shed

Materials, such as limber and/or steel supports, lids, wedges etc. tram lines, with necessary stores such as, fish-plates, bolts, dognails, sleepers etc. Tubes/bandies for manipulation, Fittings such as doors, regulators & other devices for ventilation, control of fire etc.

Qualification experience and etc. required of instructional and other staff required at various Training Centres:

1. Training Officer: Holder of 1st/2nd Class Certificate of Competency with at least 5 years of experience in mines.
2. Instructor: At least Matriculate of over 30 years of age with overman/foreman Certificate, with 5 years of experience in mines.
3. Training Supervisor: Experienced overman/foreman for supervision of 'on the job training'.
4. Timber Mistry/Mech. Fitter: Experienced workman for demonstration work.
5. Trainers (workmen-supervisors) experienced workmen for 'on the job' instruction.
6. Cashier/Clerk.
7. Mazdoor.

N.B.: 1. Training Officers, Instructors & Training Supervisors are required to undergo a course of fulltime instruction and training at appropriate centres as approved by the D.G.M.S.

2. Trainers are required to undergo a course of off time instruction for 6 days at V.T. Centres as approved by D.G.M.S. (Rule 23).

Rule 18 & 19

Revised Training Schedules and introduction of Full-day Release Training System— Under the Mines Vocational Training Rules—

1. Revised Schedules of Training :

The Mines Vocational Training Rules first came into existence in 1966 with the objective of imparting training about 'Safety' to all mine workers. The Industry could not be satisfied with this and very soon raised demand for making the 'Training' to be job oriented. After discussion at length the Government acceded to the demand. The schedules of Training under the Mines Vocational Training Rules were revised with a view to make these 'Need based and job-oriented' for improvement of knowledge, skill and correct job-procedure. These Schedules of training are now applicable to all mines and are in force from 1.1.72. All workers, tradesmen, craftsmen, operators, supervisory officials etc. employed or to be employed in mine or mines are to be imparted training suitable to their vocation with a view to achieve improved knowledge, skill and correct job-procedure.

2. Training Procedure:

For imparting training, workers of the same category are to be formed into batches not exceeding 20, and should be sent to the Training Centre established for the purpose. In the Training Centre each day there should be two sessions, each of about 3 hours duration to include theoretical talk, demonstration and practice. Each day's curriculum should consist of theoretical talk to be followed by demonstration of the matter covered in theoretical talk, which is in turn to be supported by practice of the same by trainee in the workshed or Training shed attached to the

Training Centre. Practice should continue till each trainee learns the correct technique. If necessary the talk is to be repeated and continued.

The Training Manager should plan, prepare schemes for training of workers etc. and execute the same. He shall also ascertain the need of training for each category/class of trades, prepare with his assistants lesson plans, supervise the training and finally shall test the trainees and award them certificates if they are found up to the required standard. He should also follow up the trainees.

The Training Manager/Officer, has to send regularly reports etc. to the Directorate-General of Mines Safety and to other authorities as directed from time to time viz. (i) Quarterly Programme of training (ii) Quarterly Progress report of training, (iii) Monthly performance report of trainees.

3. Programmes of Courses to be conducted in the Training Centre:

- (i) (a) For all workers who are already employed and working Refresher Courses for different trades crafts operatives are to be conducted to suit their training needs. Under this programme each employee/worker shall be trained at least once in every five years.
- (b) Whenever job/vocation of a person/worker is changed he is to be imparted training (Refresher) suitable to his new job/assignment prior to his such employment.
- (ii) (a) All new workers in different trades, crafts etc. to be employed are to be imparted Basic/Initial or pre-employment training suitable to his job prior to such employment.
- (b) Whenever any new technique/operation or machine is introduced workers, tradesmen, craftsmen, operators connected with the technique, operation or machine are to be trained in their new job requirements prior to such engagement or employment.
- (iii) For development of workers in different position/vocations necessary for immediate future courses suiting the future needs of the mine shall be conducted regularly. Persons from workers already working as well as new entrants selected for the purpose may join this type of courses.
- (iv) Special Courses for workers supervisory staff officials etc. to be imparted training to acquaint them with the special objectives necessary for immediate or future needs.

4. Training Centres:

Training to mine workers is to be imparted in Training Centre established and operated at each mine by mine managements. However a Common Training Centre may be established and operated by mine management for a group of mines with prior permission or approval of Director-General of Mines Safety. Each Training Centre should have adequate accommodation officers and staff furniture aids and models and a workshed/training shed as detailed below:

- (i) Accommodation for model room, lecture room, discussion hall, gas demonstration room, office, record room, laboratory, canteen/kitchen, toilets, training officers' room, instructors' room, library etc.
- (ii) Officer & Staff consisting to Training Manager/Officer, Instructor (Mining, Electrical, Mechanical), Scientific Assistant, Demonstrator/Trainers, Clerks, Laboratory Assistant, Laboratory Boy, Modeller, Fabricator, Peon, Carpenter, Watchman, Guard etc.
- (iii) Workshed/Training shed consisting of different shops such as Support shed. Mechanical shop. Electrical shop, etc. with necessary machines, equipments, implements etc. used in the mine workings for demonstration and practice.
- (iv) Models, Aids & equipments, furniture as per D.G.M.S. Circular.
- (v) Records, Office equipments. Laboratory facilities. Gas supply system and other accessories as directed from time to time.

5. Full day Release System of Training:

As per recommendation of the 3rd Safety in Mines Conference in respect of Vocational Training accepted by the industry 'Training' should be imparted during the normal working hours. For the

purpose 'Full-day release system' is to be followed. A group or batch of workers belonging to the same trade, class or category should be released from normal work and directed to attend training centre for the required number of days necessary to complete the course of training. Workers would be paid full wages for the period attending the Training Centre for such training.

A chart showing the duration of training for different categories under 'Full-day release system' is enclosed for guidance. The duration of each Trade/Category has been fixed under the assumption that the trainees have acquired basic knowledge about the trade/job and improvement intended is limited to revision of attitude, correction of ideas, and adoption of job-procedure in proper sequence. The duration suggested will therefore increase in case of new workers or workers deputed in new job/trades.

The above is meant only for general guidance for implementation. The Training Schedules for various categories have been prepared with due care of the needs of the Industry as a whole for improvement of safety and productivity. It is hoped that managements will immediately set up necessary Training Centres with adequate Officials, Staff, Accommodation, Aids, Equipments and Models and start imparting training to the workers, officials etc. for 'Full-day release system' if not already done.

A detailed report of compliance is requested immediately.

DURATION OF TRAINING: FOR DIFFERENT CATEGORIES				
	Days for D Theoretical Talk	Days for Job Training	Days for Special points	Days Total
1. Track layers	5	5	2	12
2. Ventilation bratticing gang	5	2	2	9
3. Fan attendants	5	2	2	9
4. Installation-maintenance of machinery	5	5	2	12
5. General mazdoor	5	5	2	12
6. Tyndals	5	11	2	18
7. Coal cutting & drilling crew	5	11	2	18
8. Haulage/Conveyor attendants	5	5	2	12
9. Cleaning/Wetting/Stone dusting/stone dust barrier watering gang	5	5	2	12
10. Stowing	5	5	2	12
11. Pick miner	5	5	2	12
12. Trammer	5	5	2	12
13. Loader	5	5	2	12
14. Crane Operator	5	5	2	12
15. Drill Operator	5	11	2	18
16. Loco driver	5	11	2	18
17. Dozer/Pay Loader	5	16	3	24
18. Dumper operator	5	16	3	24

19. Shovel operator	5	16	3	24
20. Store/material handling	5	5	2	12
21. Welder/gas cutler	5	16	3	24
22 Fitter helper	5	11	2	18
23. Fitter/Electricians etc.	7	16	3	26

*It presumes that the trainees has already some basic idea of things and are working. The improvement intended in level of performance is limited to correction of existing ideas about work, adoption of correct job procedure

(Cir. Legis. 4/1975)

DGMS

**NATIONAL
TRIPARTITE WORKSHOP
ON REVISED MODULES
FOR VOCATIONAL TRAINING
IN MINES**

**ON 7TH & 8TH JANUARY, 1999
AT
DIRECTORATE-GENERAL OF
MINES SAFETY,
DHANBAD.**

**SCHEDULES
FOR TRAINING OF WORKERS IN
METALLIFEROUS MINES**

TRAINING MODULE FOR OPENCAST WORKERS

PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 11 Days	5 Days
On the job practical training	: 06 Days	3 Days
Feed back / Test	: 01 Days	1 Days

Theory

1.
 - (i) Different types of mines, general idea of opencast and below ground mining.
 - (ii) General idea about Ore bodies, materialization, types of rocks, geological disturbances etc.
 - (iii) Visit to model room.
2.
 - (i) Mining terms used in opencast mining. Benches (Width, height etc.) haul roads (width gradient), stability of slopes, dangers from high side, over hang. Under cut etc.
 - (ii) HEMM- different types and safety in their use.
 - (iii) Field visits – HEMM.
 - (iv) Traffic Rules, codes of practices in specific areas of mine, movement of men in opencast mines.
 - (v) Personal protective equipment specific to opencast mines and their use.
3.
 - (i) Shovel operations – safety in use.
 - (ii) Wheeled trackless transportation machinery – safety in use dangers while reversing
 - (iii) Drilling – shallow and deep holes, use of different types of drills – safety in use, air compressors, dust extractors and their use.
 - (iv) Field visits related to above.
 - (v) Concepts of portable and transportable machinery's – including cable handling.
4.
 - (i) Provisions of law regarding deep and shallow hole blasting, transport and storage of explosives.
 - (ii) Blasting practices, taking shelter, danger zone and special precautions related to blasting, fly-rocks and vibrations.
 - (iii) Field visit – demonstration of charging explosives and blasting practice in opencast mines.
5.
 - (i) Provision of fences at different places. Problem of fire in opencast Workings – insitu, equipment, and stockyard – fire fighting Organisation and equipment.

- (ii) Provisions of statute regarding lighting in opencast mines.
 - (iii) Dust, noise and vibration – sources and measures to minimise.
 - (iv) Field visits.
 - (v) Safety at overburden dumps etc.
- 6.
- (i) Safety of persons employed in workshops, safety while working on maintenance of HEMM – special emphasis on wheels and tyres while testing., inflating etc.
 - (ii) Emergency Organisation.
 - (iii) Electrical equipment in opencast mines – safety in use.
 - (iv) Types of accidents in opencast mines and precautions to avoid such accidents.
 - (v) Visit to opencast pits & installations (List at Annexure – II)

ON THE JOB PRACTICAL TRAINING

- (i) Electrical repairing helper
- (ii) Mechanical fitter helper
- (iii) Dumper operator helper
- (iv) Shovel operator helper
- (v) Heavy blasting gang
- (vi) Blast hole drilling

TRAINING MODULE FOR DRILLERS

PROPOSED COURSE CONTENT

Theoretical class room training	: 10 Days	5 Days
On the job practical training	: 24 Days	6 Days
Feed back / Test	: 4 Days	1 Days

1. Different types of drills.
2. Blast hole drills used in Opencast Mines.
3. Specifications and general details of drills.
4. Instrument panel and control of drills.
5. Practical demonstrations.
6. Lubrication of drills.
7. Electrical drills fundamental.
8. Diesel drills fundamental.
9. Construction and operation of different assemblies and sub-assemblies.
 - (a) Operator's cabin
 - (b) Mast
 - (c) Under carriage
 - (d) Compressors
 - (e) Hydraulic Systems
 - (f) Other Mechanical parts
- 10 Different types of drill bits, their uses, common terminology vis- a-vis drilling.
- 11 Drilling pattern, sequence of operations.
- 12 Basic safety measures in drilling operations
- 13 Constrains / hazards while drill machine is in operation.
- 14 Safety during drilling, marching and other operations.
- 15 Routine checks, before starting and during operation of the machines.
- 16 Failure analysis / trouble shooting, reporting / log book writting.
- 17 Concepts of maintenance.
- 18 Fire-fighting.
- 19 Steps during emergency such as fire, accident, major failure etc.,
- 20 Evaluation and tests.

TRAINING MODULE FOR BLASTING CREW PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 10 Days	5 Days
On the job practical training	: 24 Days	6 Days
Feed back / Test	: 02 Days	1 Days

1. Introduction to Drilling & Blasting.
2. Types of explosives, detonators, fuses and their use.
3. Requirement of men, machinery & material for drilling and blasting.
4. Duties and responsibilities of persons with reference to drilling & blasting.
5. Free face and its importance.
6. Precautions taken before and during drilling operation. Marching of drills.
7. Visit to magazine, and acquaintance with issue and return procedure of explosives.
8. Precautions to be taken while drilling near bench edges, steep slopes, overhead power lines.
9. Dangers associated with the prime mover power in drill machines.
10. Drill accessories and their safe use.
11. Drilling log.
12. Code of practice for safe handling, transport and use of explosives.
13. Calculation of explosive requirements.
14. Requisition slip, issue and return records.
15. Practical demonstration of testing of detonators, priming a cartridge and charging a hole.
16. Burden and spacing of holes. Fragmentation and ground vibration.
17. Blasting tools, accessories and equipment their safe handling. Blasting circuit and its checking.
18. Environmental effects of blasting Ground vibration and flying fragments. Need to control and precautions to be taken. Muffle blasting.
19. Misfire sockets and blown-outs, dealing with misfires.
20. Writing of reports/maintenance of statutory records.
21. Danger zone. Effect of blasting and precautions to avoid danger to men and machines within danger zone.
22. Checking and clearing of choked holes before charging/loading.
23. Blasting shelter, practical demonstration of taking shelter before blasting.
24. Inspection, re-deployment of machines and resumption of work after blasting.
25. Use of LOX, ANFO Blasting by bulk loading system, etc.,
26. Charging of hole in watery strata, hot strata and in bad weather.
27. Case study and discussion on accidents due to use of explosive.
28. Writing of drilling and blasting reports.
29. Discussion and evaluation.

TRAINING MODULE FOR DUMPER OPERATORS

PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 15 Days	5 Days
On the job practical training	: 48 Days	6 Days
Feed back / Test	: 02 Days	1 Days

1. Introduction to dump trucks, different types of dumpers, Service capacities.
2. Introduction to engine, transmission, their use and function.
3. Different types of steering, mechanism, emergency steering function.
4. Service brakes and parking brakes, care of tyres, motors, torque converters etc.
5. Instrument panel, location and operation.
6. Safe reading range of meter and gauges.
7. Practical demonstration.
8. Control lever, switches and their operations, warning lamps.
9. General Safety Rules, vis-a-vis loading, dumping, stocking and parking.
10. Pre-operation checks, practical demonstrations.
11. Operational instruction, starting and stopping of engine, gear range selection, concept of automatic transmission, up-shifting, downshifting, using retarder brake.
12. Care of maintenance of prime mover system.
13. Dry and slippery road controls.
14. Statutory provisions regarding haul road, benches etc.
15. Electrical systems of dumpers.
16. Different types of engine operation and trouble shooting/failure analysis.
17. Practical demonstration.
18. Operation of dumper loading, hauling, dumping.
19. Reporting and log book writing.
20. Precautions from fire, fire-fighting.
21. Steps during emergency such as fire, accident, major failure.
22. Operation practice along with instructor.
23. Operation practice along with instructor feed back and evaluation.

TRAINING MODULE FOR SHOVEL OPERATORS

PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 15 Days	5 Days
On the job practical training	: 48 Days	6 Days
Feed back / Test	: 02 Days	1 Days

1. Introduction of various types of shovels.
2. Visit to project.
3. Salient features of shovels, technical data and their specifications.
4. Introduction of instrument panels, controls and their operations
5. Visit to project and identification of different controls and their operations.
6. Functions of various components and controls.
7. Introduction of various components and controls in the field.
8. Lubricants maintenance and maintenance schedule.
9. Study of various functions.
 - a) Hoist system
 - b) Crowd system
 - c) Swing system
 - d) Propel system
 - e) Air system
 - f) Electrical system
 - g) Power train and other attachment
1. Operation techniques, starting, stopping and operation.
2. Safety precautions
3. Operation safety.
4. General safety
5. Electrical safety.
6. Introduction to code of practice.
7. Fire-fighting
8. Introduction to fire alarm.
9. Mock rehearsal.
10. Tips of first aid
11. Maintenance of records and economics of workings.

TRAINING MODULE FOR DOZER OPERATORS PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical classroom training :	12Days	5 Days
On the job practical training :	40 Days	6 Days
Feed back / test :	2 Days	1 Days

1. Introduction of Dozer.
2. Construction and function of engine.
3. Transmission.
4. Steering, brake and final drive.
5. Field visits.
6. Study of instrument panel and control.
7. Study of instrument panel and control.
8. Demonstration in the field and introduction to different controls & instrument panel
9. Engine.
 - ❖ Engine air system
 - ❖ Lubrication system
 - ❖ Cooling system
 - ❖ Oil system
 - ❖ Hydraulic system
 - ❖ Transmission system
 - ❖ Brake system
 - ❖ Steering system
10. Machine operations.
 - ❖ Check before starting
 - ❖ Engine handling before starting
 - ❖ Check after start
 - ❖ Stopping the engine
 - ❖ Starting machine travel
 - ❖ Gear shifting
 - ❖ Turning
 - ❖ Stopping the machine
 - ❖ Precautions in machine operation
 - ❖ Start up of the engine in the cold weather
 - ❖ Caution after completion of work
11. Dozer work
 - ❖ Cutting work
 - ❖ Smoothing

- ❖ Dozing
 - ❖ Filling
 - ❖ Operation of tilt Dozer
 - ❖ Adjustment of tilt angle
 - ❖ Tips for longer under carriage life
12. Safety rules
- ❖ Operation (general)
 - ❖ Before starting
 - ❖ After starting
 - ❖ During operation
 - ❖ Parking
13. Maintenance
- ❖ Precautions for maintenance → Maintenance schedules
 - ❖ Trouble shooting
14. Evaluation and test.

TRAINING MODULE FOR FITTERS / MECHANICS PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 22 Days	5 Days
On the job practical training	: 48 Days	6 Days
Feed back / Test	: 02 Days	1 Days

1. Introduction to various types of HEMM and other machines used in Opencast mines,
2. Familiarization with different types of tools and their use.
3. Measuring instruments, working calculations basics, unit, area, volume, temperature.
4. Drawing: Free hand sketching and blue print reading/interpreting.
5. Safety in workshop.
6. Visit to workshop.
7. Various types of fasteners, studs, nuts & bolts, various types of threads. Types of gears, their usage, various types of locking arrangements, seals, etc.
8. Fits, tolerance and allowance.
9. Various types of fasteners, studs, nuts & bolts, various types of threads. Types of gears, their usage, various types of locking arrangements, seals, etc.
10. Types of bearings used in machines, causes of premature failure, preventive maintenance, assembly techniques.
11. Couplings and alignment.
12. Rigging, ropes, slings, knots and hitches, lifting devices.
13. General safety rules, safety while lifting tools, tackles, machine parts etc.
14. Safety while using tools, safe working conditions.
15. Operational and electrical safety.
16. Guards for moving parts of machinery.

17. Practical demonstrations.
18. Dangers from fire, different types of fire-extinguishers, fire-fighting techniques.
19. Automatic fire alarms and extinguishing systems.
20. General idea about daily and scheduled maintenance, preventive maintenance, check lists.
21. Tyres, causes of failure, upkeep, care and maintenance, safety precautions related to these.
22. Air systems, compressors and their use, pneumatic controls.
23. Hydraulic systems, types of pumps, control valves and their adjustments.
24. Steering systems, various linkages and controls, emergency operations.
25. Concept of auto- electrical.
26. Concept of crawlers.
27. Practical demonstrations.
28. Safety precautions during maintenance and operation of different machines.
29. Personal protective equipment and their use.
30. Different types of accidents in Opencast mines and their prevention.
31. Evaluation and test.

DGMS

TRAINING MODULE FOR ELECTRICIANS

PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 48 Days	5 Days
On the job practical training	: 46 Days	6 Days
Feed back / Test	: 02 Days	1 Days

1. Introduction to various types of HEMM and other machines used in Open cast mines.
2. Familiarization with electrical tools, symbols and abbreviations.
3. Measuring instruments, various laws of resistance, current, voltage, electro-magnetism and frequency.
4. Various types of motors (AC & DC) and their uses.
5. Various types of transformers, cooling of transformers, transformers oil, protective devices and the common causes of trouble.
6. Cables and conductors, their classification, construction, insulation types.
7. Location of faults in cables.
8. Circuit breakers, their types and causes of faults.
9. Fuse, their classifications and their requirement in electrical circuits.
10. Cable jointing, soldering, insulating etc.
11. Generators, their classification, characteristics.
12. Common causes of troubles in generators.
13. Transmission and distribution systems, different types and their uses.
14. Earthing, its purpose and various methods of earthing.
15. Sub-stations, their specifications, various methods of earthing.
16. Electrical circuit diagram of various HEMM and their study.
17. Electronics in control system and their types.
18. Details of diodes, transistors, thyristors, and their checking.
19. Indian Electrical Rules and the applicable chapters for mines.
20. Duties and responsibilities of Electricians.
21. General idea about daily and scheduled maintenance, preventive maintenance, check lists.
22. General safety rules, safety of persons working in electrical maintenance.
23. Safety while using tools, safe working conditions.
24. Operational and electrical safety.
25. Working with high-tension and extra high-tension voltages, special precautions to be taken.
26. Electric shock, its causes, effect and first aid.
27. Fire fighting appliances and techniques to deal with electrical fires.
28. Different types of accidents in opencast mines and their prevention.
29. Evaluation and test.

TRAINING MODULE FOR AUTO-ELECTRICIANS

PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training	: 22 Days	5 Days
On the job practical training	: 48 Days	6 Days
Feed back / Test	: 02 Days	1 Days

1. Introduction to various types of transportation machinery used in Opencast mines.
2. Familiarization with electrical tools, symbols and abbreviations.
3. Measuring instruments, various laws of resistance, current, voltage, electro-magnetism and frequency.
4. Various types of motors (AC & DC) and their uses.
5. Various types of transformers, cooling of transformers, transformers oil, protective devices and the common causes of trouble.
6. Battery and dynamo.
7. Fundamental construction, active substance, preparation of electrolyte.
8. Capacity of battery, care of battery, handling, effect of temperature of specific gravity, overcharging, sulphation, testing, method of charging, danger due to bursting.
9. Principle of generator, general description of dynamo, routine maintenance, inspection and repair, testing of dynamo.
10. Self starter, principle of motor, general description maintenance, dismantling procedure, inspection and repair, testing.
11. Principle alternator, general description, maintenance, dismantling procedure, inspection, repair and testing.
12. Control box, general description, principle of operation, routine maintenance, adjustment of air gap setting, electrical setting, general precautions.
13. Electronics, semi-conductor material, diodes, transistors, single and three phase rectification, five stars, checking method of diodes, transistors and their application in HEMM.
14. Lamp and accessories (electrical horn, wiper and flasher).
15. Audio-visuals reversing alarm, its maintenance and repair.
16. Instruments, fuel gauge, temperature gauge etc.
17. Study of various auto-electrical system used in different HEMM circuits with accessories.
18. Safety and safety devices incorporated in different equipment.
19. Study of statutory requirements.

TRAINING MODULE FOR SUBORDINATE SUPERVISORY OFFICIALS PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training :	10 Days	5 Days
On the job practical training :	07 Days	3 Days
Feed back/test :	01 Days	1 Days

1. General idea about the mine, geology.
2. Management's safety policy.
3. Internal Safety policy.
4. Safety and productivity.
5. Common causes of accidents and preventive measures.
6. Cost of accidents, inquiry into accidents and dangerous occurrences.
7. Workmen's Inspectors - role and function.
8. Safety committee - role and function.
9. Duties and responsibilities of supervisors.
10. Mining methods.
11. Leadership, communication skills.
12. Examination of work place, travelling roadways, disused workings.
13. Mine environment and gasses.
14. Emergency Organisation. Rescue and recovery of accident victims.
15. Emergency action plan for inundation and fire.
16. Mine plans / sections.
17. Survey methods and instruments.
18. Method of working (mine specific).
19. Traffic rules / procedures.
20. Occupational diseases and preventive measures.
21. Ore handling / beneficiation plants (mine specific).
22. Machines (Mine specific).
23. Mobile / overhead cranes.
24. Safe codes of practice of respective machines.
25. Electrical layout plans.
26. Safe workshop practices.
27. Audio-visual demonstration of safety policy, mining methods, machine operations etc.
28. Evaluation and test.

TRAINING MODULE FOR ELECTRICAL SUPERVISORS

PROPOSED COURSE CONTENT

	<u>Initial</u>	<u>Refresher</u>
Theoretical class room training :	10 Days	5 Days
On the job practical training :	07 Days	3 Days
Feed back/test :	01 Days	1 Days

1. Electrical Layout – Symbol, layout plans, single line diagram, wiring diagram.
2. Basic knowledge – AC & DC, relation voltage, current, power and common units in use, power factor, OHM's law resistance, reactance, impedance, percentage impedance etc.,
3. Calculation – Load calculation, voltage drop, power factor, electrical tariff, basic knowledge on calculating requirements of transformers, motor, cable, switchgears ratings.
4. Transformer – Principle of transformer fixtures, types of transformers, selection criteria methods of cooling, oil filtration, drying out, dielectric strength, transformer testing failures and causes, parallel operation, regulation, tap changing commissioning tests, maintenance and repairs, mechanical electrical interlocks, protective devices like earth leakage, overload short circuit under voltage, single phasing etc.,
5. Breakers – Function, operation, types and their application, operating mechanism, current rating, rupturing capacity, breaker maintenance, failures and their causes commissioning procedures.
6. Isolators- Types, maintenance, interlocking etc
7. DG Sets – Layout, safety aspect, earthing paralleling etc
8. Cables – Types selection, laying, joining, maintenance, fault localization etc.
9. Electric motors – Types of motors in different locations and drivers, selection of motors, installation, maintenance, starters – DOL, star-delta, auto transformer, Starting of slip ring motors, Direct current motors and its applications, maintenance and repairs.
10. Earthing – Purpose, system and equipment earthing, resistance, use of earth meggers pit-type and construction. Acceptable value of earth resistance, use of earth meggers, neutral, body and lighting arrestors earthing. Direct, restricted and floating neutral systems.
11. Capacitors – Types, selection and their protection. Connection to busbar and motors, maintenance.
12. Maintenance – Installation, servicing, inspection, testing and fault location in electrical equipments, cables overhead lines etc.,
13. Reports and Records – Maintenance of electrical plans, log books, IR. Earth resistance, relay testing and maintenance records, reporting g an

electrical accident, submission of notices for MV installation, draft preparation for application for HT installation, annual returns etc.

14. Safety – Important provisions of Indian Electricity Rules, 1956. Duties and responsibility, permit to work system of taking line clearance and taking it back., first aid, artificial respiration and shock treatment, fire fighting equipments – their operation, maintenance and refilling. General safety rules, safety of persons working in electrical maintenance safety while using tools, safe working conditions.
15. Maintenance – Daily, weekly, monthly, quarterly, half yearly and annual i.e scheduled maintenance, preventive maintenance checking, check lists and record keeping.
16. Introduction of various types of HEMM & other machineries used in opencast mines, their selection and maintenance.

DGMS

MINES CRECHE RULES, 1966

Rule 11

Appointment of Creche-in-Charge—Under the proviso of Rule 11(1) of the Mines Creche Rules 1966, only women who have undergone training as a crechenurse in Institutions approved by the Central Government are eligible for appointment as a Creche-in-Charge. I am to inform you that women trained in General Nursing and Midwifery are eligible for appointment as Creche-in-Charge.

(Cir. 34/1972)

Competent Authority under Mines Creche Rules—The following persons, who are also Inspectors of Mines under section (5)(1) of the Mines Act, 1952 are authorised to generally exercise their powers and perform all the functions of Competent Authority under The Mines Creche Rules, 1966 within the area or areas in which they exercise their powers in terms of sec. 6(3) of the Mines Act, 1952:—

1. Additional Chief Inspector of Mines, now designated as Deputy Director-General of Mines Safety.
2. All Deputy Chief Inspectors of Mines, now designated as Directors of Mines Safety.
3. All Regional Inspectors of Mines, now designated as Jt. Directors of Mines Safety.

(No. 4(2) 70-Genl/21807 G)

THE MATERNITY BENEFIT ACT, 1961

Sec. 8

Maternity benefit—As per sec. 8 of the Maternity Benefit Act, 1961, a woman entitled to maternity benefit is entitled to receive from her employer a medical bonus of two hundred fifty rupees only if no pre-natal confinement and post-natal care is provided for by the employer free of charge.

(Cir. 20/1965)

THE MATERNITY BENEFIT (MINES) RULES, 1963

Rule 15

Posting of abstract of Maternity Benefit Act 1961 & rules—The Abstract of the Maternity Benefit Act, 1961 and the rules made there under (in the language or languages of the locality in which the mine is situated) required to be exhibited under section 19 of the Act in Form K of the Maternity Benefit (Mines) Rules, 1963 shall be posted outside the office of the mine in a clear and legible condition.

(Cir. 53/1967)

THE INDIAN ELECTRICITY RULES 1956

Stone quarries are 'mines'—Since some of the owners of Stone Quarries in Bombay have objected to the inspection of their Quarries and the Electrical installations thereat by the Deputy Director of Mines Safety (Electrical) on the ground that he has no power or jurisdiction to inspect the said electrical installations, and that the Electrical Inspectors of the State Government have been inspecting them, it has become necessary to issue the following clarification in the matter:—

As per the definition of 'Mine' given under Section 2(1) (J) (vi), all "Machinery and works" (which expression includes pumps, air compressors, electrical installations and equipment) lying in or adjacent to and belonging to a mine, come within the purview of the Mines Act. Though Stone Crushing plants forming part of mines (Stone Quarries) in Greater Bombay wherein ten or more persons are employed, have been exempted from the provisions of the Mines Act, 1952 by a Notification S.O. 3699 dated 22.11.1965 (as amended from time to time) all such other Stone Crushing Plants situated elsewhere and all Stone Quarries including those in Greater Bombay, do come within the purview of the Mines Act and hence all of the machinery, electrical installations and equipment lying in or adjacent to such crushing plants and Stone Quarries also come within the purview of the said Act.

The Electrical Inspectors of Mines [Since designated as Dy. Director of Mines Safety (Electrical)] have been appointed as "Electrical Inspectors" under Section 36(1) of the Indian Electricity Act by the Central Government which is the appropriate Government in relation to Mines and Oil fields etc., to exercise the powers and perform the functions of an "Electrical Inspector" in relation to Mines falling within their respective jurisdictions. Consequently the Electrical Inspectors appointed by the State Government which is not the appropriate Government in relation to Mines, shall cease to have any jurisdiction over the electrical installations and equipment lying in or adjacent to a mine or Stone Quarry.

You may please therefore note that the Dy. Director of Mines Safety (Electrical) of the concerned area has exclusive jurisdiction and power to inspect the Electrical installations and equipment lying in or adjacent to a mine or part thereof, and that the Electrical Inspectors appointed by the State Government have no jurisdiction over such installations and that obstructing the Dy. Director of Mines Safety (Electrical) in discharge of his duties or objecting to his inspection of such electrical installations and equipment amounts to an offence punishable both under the Mines Act, 1952 as well as under the Electricity Act.

(Cir. Legis. Electrical. 1/1977)

Rule 4

Electrical accidents in residential areas—For the general information of the managements of all mines and for removing doubts whether the residential areas, pertaining to a mine, if fed from a Power Station or sub-station situated in or around a mine and forming part thereof, come within the jurisdiction of Electrical Inspectors of Mines, Govt. of India, or they come within the jurisdiction of the Electrical Inspectors of the concerned State Govts. the following clarification is issued after duly consulting the Central Electricity Board, in the matter:

(1) If any power station/sub-station/switch station which supply electricity mainly for the purpose of working a mine or a number of mines under the same management, also supplies electricity to the residential areas of the mine or mines referred to, the supply to the residential areas shall be given from a separate control gear and only that portion from such control gear to

the residential areas, shall fall within the jurisdiction of the Electrical Inspector of the concerned State.

(2) Whereas, if the supply of electricity at a mine is obtained from a power station/sub-station/switch station which supplies electricity, besides the mine, to other places as well, only that portion from the switch gear or gears which are feeding the mines shall fall within the jurisdiction of the Electrical Inspector of Mines, Govt. of India.

(3) In cases falling under clause (1) above, the power station/sub-station/switch station shall fall within the jurisdiction of the Electrical Inspector of Mines, Govt. of India whereas, in cases falling under clause (2) above, such stations shall fall within the jurisdiction of the Electrical Inspectors of the concerned State.

(Cir. 29/1972)

Above circular laid down that lighting installations including overhead lines for the purpose of non-mining operation such as quarters, etc. shall come within the purview of inspection of the Electrical inspectorate of the State Government concerned. It is, however, being noticed that inspite of the aforesaid Circular notices of accident pertaining to lighting lines are still being forwarded to the Electrical Inspector of Mines (Now Deputy Director of Mines Safety, Electrical). Therefore, in future such notices must be sent to the Electrical Inspector of the State Government concerned. A copy, however, may be sent to the Deputy Director of Mines Safety, Electrical or to the Joint Director of Mines Safety concerned for information only.

(Cir. 23/1973)

Rule 32

1. Accidents due to shock by electricity—Recently there was a fatal accident in one of the mines when an electric fitter received shock while changing a bulb. The electrical fitter had been deputed to replace a fused bulb on the surface overhead line pole near the incline haulage. He had got the local control switch of the overhead lighting put off earlier and noticing that the lights on the other poles had switched off, he climbed the ladder with a new bulb in his pocket. While trying to unscrew the broken bulb, he received an electric shock, fell down from the ladder and died soon afterwards.

An enquiry into the accident revealed that the lighting line in question was at 220 Volts between a phase wire and a neutral wire of a 3 phase system with an earthed neutral. At the first pole of the lighting overhead line there was a local 10 ampere single pole tumbler switch from which the lights were controlled. The investigation showed that the local control switch was connected to control the neutral conductor with the live phase conductor being taken direct to the lamps. This arrangement was defective in that although the switch would control the lights alright but the lamp filaments would remain at a potential of 220 volts even when the switch was in the 'off' position. It is precisely because of this danger the Rule 32(2) of the Indian Electricity Rules provides that—

"No cutout link or switch other than a linked switch arranged to operate simultaneously on the earthed or earthed neutral conductor and live conductors shall be inserted or remain inserted in a earthed or earthed neutral conductor of a multi-wire system or in any conductor connected thereto with the following exceptions:

(a) A link for testing purposes, or

(b) A switch for use in controlling a generator or transformer."

The accident would also have been averted, if the provisions of Rule 36 had been complied with. This rule is quoted below:

"Handling of electric supply lines and apparatus—

(1) Before any conductor or apparatus is handled, adequate precautions shall be taken, by earthing or other suitable means to discharge electrically such conductor or apparatus, and any adjacent conductor or apparatus from being accidentally or inadvertently electrically charged when persons are working thereon.

Provided that this sub-rule shall not apply to the cleaning of commutators and slip-rings working at low or medium voltage."

The above incident is typical of the accidents that occur in a number of mines. Immediate action should be taken to ensure that proper precautions are taken to avoid such accidents.

(Cir. 55/1963)

2. Insulation resistance of cables—In order to assess the possible dangers of electric shock and fire and explosion hazard especially in gassy mines, from the use of cables with low insulating properties a survey of the insulation resistance of circuit cables had been undertaken recently in a large number of mines. The results were alarming. In almost every mine insulation resistances of different cables varied considerably over a wide range. On the lower side values below 10 kilo Ohms have been noted while on the higher side the same went up to several mega Ohms. It will be appreciated that the use of cables with insulation as low as 10 kilo Ohms or lower is attended with serious dangers of electric shock, fire and also explosions.

The matter has been examined by this directorate in consultation with the Engineers of the Mining Industry and it has been considered necessary to fix the lower limit of insulation resistance of all power cables. It is advisable that while effort must be made to maintain the insulation resistance of a medium pressure power cable to values over 1 mega Ohm and those of high pressure cables to values over 10 mega Ohm in no case the values of insulation resistance shall fall below those as obtained from the following empirical formula:

$$I = V/(1000 + H.P.)$$

where, I stands for insulation resistance in mega Ohm, V for the voltage of supply, and H.P. for the Horse Power or load catered by the cable.

All reasonable steps shall be taken to check up the insulation resistance of all power cables in use. Any cable which is found to be having lower insulation resistance than that obtained by the above formula should be suspended from use forthwith. If the low value of insulation resistance is due to a defective joint, the cable may be energised only after rectification of the defect and ensuring the recommended resistance values.

(Cir. 31/1972)

Rule 36

1. Distance of light Fittings from live conductors—Recently there was an accident in one of the mines when an electrician while replacing a street light bulb on a live 230 volt overhead line received electric shock, fell down the post and sustained fatal injuries. An enquiry into the accident revealed that had the electrician safeguarded himself against the danger from live overhead conductor by taking the elementary precautions as laid down in Rule 36(1) of the Indian Electricity Rules, the accident might not have occurred.

It was also revealed during the course of the enquiry that the street light fixtures had been installed on the posts above the live bare conductors. This is a very unsafe practice. With such an arrangement a worker engaged on replacement of bulbs has to go across the live conductors thereby exposing himself to avoidable risk. It is desirable that light fittings should normally be installed at least one metre below the bottom-most conductor so that a person cannot come near to the conductors even inadvertently.

It is advised that the overhead light fittings should be checked and if any of them is found to be located above the conductors, steps should be taken to shift it to a point at least one metre below the live conductors.

(Cir. 28/1967)

2. Accidents on overhead lines and sub-station structures—Overhead lines and sub-station structures continue to claim precious lives of skilled and semi-skilled personnel in the mining industry.

In two separate accidents, in the recent past, two skilled person went atop overhead line supports after the supply was stated to have been switched-off. As they commenced work and came in contact with bare conductors of the overhead line, they received shock and fell down and sustained serious injuries. One of them later died in hospital. These accidents could have been prevented had the overhead line conductors been discharged and earthed before commencing work as required under Rule 36(1) of Indian Electricity Rules, 1956. The simple precaution not only dissipates residual energy in the system to ground but also draws the attention of work persons if the system remains live inadvertently. It also eliminates the possibility of shocks from induced voltages and accidental charging of lines from either end while work is in progress.

The above incidences apparently underscore the need for improved safety management while at work on over-head line system.

The attention of electric engineering staff may be drawn to the aforesaid accidents and it may be ensured that work on overhead line conductors and other electricals is taken up only after they have been discharged and effectively earthed. This elementary precaution will go a long way in preventing such tragic accidents which have been occurring with disquieting regularity year after year.

(Cir. Tech. 3/1989)

Rule 60

1. Electrical testing equipment for mines—Regular use of suitable testing equipment and instruments is an important means of ensuring proper maintenance and safe working of electric equipment and apparatus installed at mines. It is surprising that at some of the mines even a simple device like Megger type insulation testing equipment is not readily available and engineering staff go about carrying out installation work etc. by trial and error methods.

Needless to say it is very necessary to ensure that certain minimum items of essential testing and checking equipment are provided at every mine with the Colliery Engineer. A testing schedule should also be prepared by the Engineering Division laying down procedure for periodic testing of different items of electrical equipment/apparatus and recording of results thereof in a register specially kept for the purpose.

Apart from the instruments to be kept at Colliery level, certain other instruments which are used less frequently but are essential for safety could be kept at the Area level. A list of the important instruments that ought to be provided at Colliery level and Area level are appended for guidance.

Appendix

List of testing instruments to be provided in mines

A. At colliery level

1. 'Megger' type insulation tester up to 1000 volts;
2. Tonga Meter; and

3. Volt Meter.

B. At Area level

1. H.T. Megger up to 5000 volts;
2. Earth Leakage Relay Testing Set;
3. Earth Resistance Testing Set;
4. Relay Testing Set;
5. Volt meters and Ammeters of different ranges;
6. Transformer Oil Testing Equipment; and
7. Cable Fault Locator.

(Cir. 67/1973 & Cir. 47/1974)

2. Use of Megger in the underground workings of coal mines—An insulation resistance tester is a necessary instrument for the electricians both for underground and surface testing. The usual method of making an insulation test is for the electrician's assistant to turn the generator handle at speed while the electrician holds the test leads and makes a flicking contact between the conductors, covering of cable.

It is not always appreciated that although the insulation tester instrument may have been tested and certified intrinsically safe as an instrument, the 'flicking' test of conductors in a cable may result in open sparking of an incentive nature—capable of igniting firedamp. Too much emphasis cannot be placed on the necessity, when using the tester underground, for securely connecting the instrument leads to the conductors of the apparatus or cable under test. This procedure should be carried out before the generator is started and the generator should be brought to rest before the leads are again disconnected. Every precaution should be taken to avoid open sparking when the test is so made.

(Cir. Tech. 7/1980)

3. Defective design of an Ammeter—At one of the mines an ammeter Model 6/1968/Grade (I.O.)I.S.: 1248-58/Grade "In" B.S. 89-54) manufactured by M/s. Eastern Implex Corporation, Delhi was in use with a 440 volts main oil circuit breaker in a sub-station. After a power failure for a short-while, when the main switch was being closed by an electrician, a heavy flash occurred in the said ammeter and the electrician thereby received serious bum injury in his eyes. On an enquiry the cause of the flash was found to be due to a defective design of the ammeter.

It is, therefore, felt that if the ammeter of this description is being used in any mine, due precaution shall be taken to ensure that similar undesirable consequence may not occur during the course of its use. It is recommended that if the ammeter of the aforesaid model is intended to be kept. in use the ammeter must be examined once in every 7 days to ensure that:

1. The moving needle of the ammeter does not come in contact with the metal dial at the extreme end positions.
2. The insulation of the ammeter is not less than 1 Meg. Ohm.

(Cir. 34/1969)

Rule 77

Clearance aboveground of the lowest conductor—Indian Electricity Rules specifies the minimum clearance that should be provided between the ground and any conductor of an overhead line including service lines, according to the place of installation of such conductors and for different transmission voltages.

It has been noticed that the formation of coal depots and dumps of boiler ash and debris on the premises of a mine frequently render the nearby conductors of overhead transmission and

distribution lines dangerously accessible. Such situations have already been responsible for a number of accidents to persons due to shock by inadvertent contact with the live conductors. Recently also there was a similar incident in a mine when a trammer while tipping coal in a depot with a shovel got a flash from 33 K.V. transmission line passing nearby causing a severe shock.

It is, therefore, necessary that the stipulated minimum clearances with the overhead line conductors should be maintained when such lines passing through the property of a mine, and no coal depots, and dumps of ash and debris or any other material should be made in the vicinity of the overhead lines which may result in reduction of the prescribed minimum clearances from the ground. Where such a dangerous situation has already been created, immediate action should be taken to restore the clearance laid down under Rule 77 of the Indian Electricity Rules.

(Cir. 44/1965)

Rules 79-80

Accident due to shock by electricity : maintenance of clearances—Recently there was an accident in one of the mines when the servant of a bungalow received a serious electrical shock by coming in contact with an overhead line conductor while cleaning water tank on roof of the bungalow.

An inquiry into the accident revealed that after cleaning the overhead tank the servant slipped while descending from roof, and in order to arrest his fall, he tried to hold the live service wire running above and near the corner of the tank. The servant raised an alarm and a person in the vicinity switched off the power supply. Although he fell down to the ground, fortunately he escaped with only minor bum injuries.

The bare live conductor with which the servant had come into contact, formed a service connection to the premises. The service line was about 30 ft. long being fed from a central distribution post in the yard. It consisted of 3 wires, in delta formation, earth wire forming the apex and the neutral and phase forming the base comers. The service was provided with earthed guarding (also of delta formation) at frequent intervals. The vertical heights of the bottommost conductor were 10 ft. and 6 ft. from the roof of the premises and top of the water tank respectively. One of the conductors—incidentally the power conductor—was vertically above the tank running at about 9 inches from the tank corner.

As the clearance from any accessible point of the building as per rule 79 of Indian Electricity Rules, 1956 (which lays down clearance from building of low and medium voltage lines and service lines) should be 8 ft., the bare wire service line was in default of this provision as the vertical clearance from top of the tank was only 6 ft.

During the inquiry it was stated that the service line was initially erected in accordance with the provisions of the Indian Electricity Rules, 1956 but when the tank was constructed at a later date, the required modifications in the service line were lost sight of. In this connection Rule 82(1), which is relevant, is reproduced below:

"If at any time subsequent to the erection of any overhead line (whether covered with insulating material or bare), any person proposes to erect a new building or structure, or to make in or upon any building or structure any permanent or temporary addition or alteration, he and the contractor he employs to carry out the erection, addition or alteration shall if such building, structure, addition or alteration would, during or after construction result in contravention of provisions of rule 79, or 80, give notice in writing of his intention to the supplier, and to an Inspector and shall furnish therewith a scale drawing showing the proposed building, structure, addition or alteration and scaffolding required during its construction."

It is, therefore, reminded that the conductors of every overhead transmission line should be maintained at safe distances horizontally as well as vertically from every part of building or

structures and that no construction of a building or structure near any existing overhead transmission line or in close proximity to the same be undertaken without giving prior notice (with a scale drawing) to the Electrical Inspector of Mines in accordance with Rule 82(1).

(Cir. 28/1964)

Rule 122

1. Jointing of High VoltageCables—1. Managements are aware that the Indian Electricity Rules 1956 now permit transmission of energy at voltage not exceeding 11000 volts and its use at voltage not exceeding 6600 volts in mines.

2. The use of high voltage cables in coal mines consequently to deployment of higher horsepower machines is consistently on the increase. The cables need greater care and vigilance in respect of their installation and maintenance.

3. One of the important design features of high voltage cables as against medium voltage cables is the provision of screening immediately over the power conductors as well as the conductor insulation. The table shows the requirement of screening for paper, poly venyle chloride (PVC) and cross-linked polyethylene (XLPE) insulated cables for 3300 volts and above, as per relevant Indian Standard Specifications.

4. Jointing of high voltage cables provided with core screening requires skill and expertise. The semi-conductive (non-metallic) core screening is required to be scraped over certain length of the core and the exposed core insulation thoroughly washed and taped. The joint is then sealed by high voltage filling compound, compatible with insulating material of the cable used.

5. There was a dangerous occurrence in the recent past wherein improperly made 6.35/1 KV PVC insulated cable joints in one of the mines burst and damaged the cable connectors. The joints had been without the removal of outer semi-conductive screening. Further the joints were sealed by hot pouring compound, transported from surface to underground site, in an open bucket. The possibility of contamination of compound with water dripping from roof could not be ruled out. The cable was energised without sealing the joints and later after sealing them over though the insulation resistance tested by a high voltage insulation tester was not satisfactory. In both cases, the joints failed soon after energisation of cable. Cable joints were subsequently got made under the guidance and supervision of a cable jointer deputed by the cable manufacturer. Some of staff from the mine have also been trained at the cable manufacturer's works and are now able to make joints on high voltage cables confidently.

6. Attention of all those connected with cable installation and maintenance works should be drawn to the aforesaid incident and action initialed to get such personnel trained in the technique of jointing high voltage cables. Such facilities •are available with most of reputed cable manufacturers.

Annexure

Table showing provision of conductor and core screening for paper, PVC and XLPE insulated cable for working voltages of 3.3 KV and above as per Indian Standard Specifications.

Sl. No.	IS Specification	Voltage Grade Conductor Screening and its Type	Core Screening and its type
1.	IS 692-1973 Paper	12.7/22 KV	6.3/11 KV and above for single core and

	insulated cable	above conduct! metallic)	12.7/22 KV and above for 3 core, semi conductive (non-metallic or conductive metals nonmagnetic).
2	IS 1554-PartII 1970 PVC insulated cable	3.9/3.3 above semi conductive (Non-metallic)	6.3/11 KV and above conductive metallic, nonmagnetic) even semi- conductive (non-metallic).
3.	IS709- PartII1973 XLPE insulated cable.	3.3/3.3 above semi conductive (non-metallic)	3.3/3.3 KV and above conductive (metallic, nonmagnetic) over semi conductive (non-metallic).

(Cir. Tech. 2/1989)

2. Installation of power cables underground—In a coal mine serious damage was caused to a power cable underground. An enquiry into the incident revealed that a loaded tub on getting derailed had hit the cable, completely crushing the insulations and the sheath, and had resulted in a heavy flash. The cable had not been efficiently protected against mechanical damage as envisaged in Rule 122(a) of the Indian Electricity Rules, 1956. In view of the danger to the cables along haulage roads from run-away of tub derailments etc., there is always a possibility of the cable being damaged. Such an occurrence may lead to a serious situation particularly in a gassy and dusty mine.

It is, therefore, desirable that the installation of power cables along haulage roadways should be generally avoided. The cables should be installed along traveling or other roadways where roof and sides are adequately supported and there is good ventilation.

Wherever cables are installed, they should be so placed and secured as to ensure maximum protection against mechanical damage of all kinds, and particularly that due to their own weight, bending or twisting, traffic and ground movements. Damage to cables or crushing at points of their support should also be avoided. The supports for the cables should be spaced sufficiently close to prevent sagging.

(Cir. 15/1965)

3. Use of aluminium conductors/cables in metalliferous mines—

Aluminium conductors cables have been used in mines injudiciously resulting in fatal electrical accidents. Therefore if aluminium conductor cables are desired to be installed in any galleries of metalliferous mine such use shall be limited to only in the locations where the cables are of a permanent nature and require least disturbance by being shifted and re-installed. It may, thus, be seen that use of these cables is admissible only for permanent feeder cables in shafts and on roadways of metalliferous mines and nowhere else. In every other location where the equipment has to be shifted from place to place only copper conductor cables shall be used.

(Cir. 33/1972)

Rule 126

1. Carrying out alterations/modifications in FLP apparatus is a dangerous practice—

In a number of mines alterations and modifications in gate-end boxes and drill panels are being done with indigenous components of different capacity and grade disturbing at times the circuit constants and designed rating of the flameproof apparatus. This is considered to be very dangerous practice and must be stopped forthwith.

(Cir. 64/1973)

2. Use of flameproof apparatus in gassy mines—Attention is invited to Circular No. 30 of 1961 and Circular No. 51 of 1962 issued by this Directorate indicating the circumstances and the conditions on which exemptions from Rule 126 of the Indian Electricity Rules, 1956 may be granted permitting use of non-flameproof apparatus in gassy mines.

All mines are now being treated as 'gassy' and the coal seams have been classified in three degrees according to degree of gassiness. Specific requirements with regard to use of flameproof apparatus in First, Second and Third degree gassy seams are reproduced below for ready reference.

First Degree seam—"In a gallery which has been or is being driven beyond the immediate out by ventilation connection, only flameproof electric apparatus equipment shall be used."

Second Degree seam—"In every gallery or face whether working or discontinued, and at every place where the percentage of inflammable gas in the general body of air exceeds 0.2, only flameproof electric apparatus and equipment shall be used."

Provided that the Director-General of Mines Safety may by an order in writing, require the use of flameproof apparatus and equipment at any other place in the workings."

Third Degree seam—"Only flameproof electric apparatus and equipment shall be used belowground unless otherwise provided for under the Indian Electricity Rules, 1956."

Thus—(i) In Third Degree seams, flameproof apparatus is to be used within 270 m. (900 ft.) of the working faces, and at all other places where the percentage of CH₄ in the general body of air exceed 0.5. Permission for the use of non-flameproof apparatus will continue to be regulated on the lines indicated in Circular No. 30 of 1961 and 51 of 1962. This would mean that depending on the merits of a case, non-flameproof apparatus may be installed (with prior approval) in Degree III seams within 270 m (900 ft.) of working faces and sealed off goaf edges on certain conditions, but in no case non-flameproof apparatus shall be installed within 90 m (300 ft.) of such places.

(ii) In Second Degree seams, flameproof apparatus is to be installed in every working face whether in a development or depillaring area, in every discontinued gallery, and at all other places where the percentage of CH₄ in general body air exceeds 0.2. Flameproof apparatus is to be used at any other place also if so required by the Director-General of Mines Safety. It would appear that in Second Degree seams, non-flameproof apparatus could be installed within 90 m (300 ft.) of the working faces. Since in some such seams there is active emission of gas at the faces and yet the total make of gas is very small, it appears advisable that only flameproof apparatus should be used in these seams within 90 m (300 ft.) of any working face and sealed off areas.

(iii) In First Degree seams, the present requirement, according to which flameproof apparatus is to be used in every gallery driven beyond the (immediate out by) ventilation connection, appears to be adequate for the present. It is, however, recommended that in such seams also whenever any new equipment like auxiliary fans, pumps etc. is installed or replaced within 90 m (300 ft.) of working place or sealed off area, it should be only of flameproof design whenever the equipment is available from indigenous sources. The idea is that First Degree seams should also in course of time, replace, in the interest of safety the non-flameproof

apparatus installed at all those places at which flameproof apparatus is now required for Second Degree seams [See para (ii) above].

(Cir. 60/1967)

3. Requirements of flameproof equipment—Attention is invited to circular 60 of 1967 wherein the general policy with regard to use of FLP equipment had been indicated. Keeping the above in view, managements are requested to intimate the requirements of the flameproof switchgear and equipment as well as intrinsically safe apparatus required either for immediate replacement of the existing non-flameproof apparatus or which are likely to be installed during the next three years. While giving the information particulars of the apparatus along with its specification may also be furnished.

(Cir. 77/1967)

4. Requirement regarding electrical apparatus in mines where fire exists in a seam of Degree I gassiness— Occurrence of fire in some of the Degree I gassy seams has indicated that concentration of inflammable gas in the vicinity of fire areas may sometimes be such as to be comparable to that in case of a Degree II gassy seam. If such a condition of gassiness is created by virtue of fire, use of non-flameproof electrical equipment close to the firey area is not admissible. Therefore whenever there is fire in a Degree I gassy seam, accumulation of gas at the sites of electrical equipment near the fire area shall be systematically checked and if an accumulation in the general body of air close to the non flameproof equipment is found to exceed 0.5%, all non-flameproof equipment shall be forthwith disconnected from supply. All flameproof electrical installations shall be used in such areas in compliance with Rule 126 of the Indian Electricity Rules, 1956. Needless to say, supply of current to cables and apparatus in the fire area and its immediate vicinity should be cut off whenever occurrence of fire is detected in any seam.

(Cir. 38/1973)

5. Use of coal drills with disturbed flameproof features in Degree II and III gassy mines— A number of coal drills with disturbed flameproof features are in use at the face in Degree II and III gassy mines. Such defective drills shall be immediately withdrawn from use from Degree II and III gassy mines.

In case such drills are repaired at the mine, by replacement with indigenous components forming a part of the FLP enclosure, the drill shall be tested at C.M.R.S., for flameproof characteristic before using it in Degree II and III mines. The results of such tests shall be communicated to the respective Directors of Mines Safety.

(Cir. 32/1973)

6. Dangers from use of flameproof oil immersed equipment in underground coal mines—It has been recognised quite sometime back that there is grave danger in the use of oil immersed equipment in the coal mines particularly in situations where presence of inflammable gas might be anticipated. This applies even to oil immersed equipment which have been certified as flameproof in the past under the older specifications for flameproof enclosures.

Referring to the Specification of flameproof enclosure of our country i.e., IS 2148 first published in 1962 and then revised in 1968, it may be seen that in the revised specification the oil immersed equipment have been deleted from the consideration of this standard. To the best of my information other advanced countries have also recognised the danger from the use of oil immersed equipment based on the fact that ionization of hydrogen inside the oil immersed equipment can be possible and the statistical safe gap for hydrogen could not as yet be

Standardised. I have been seriously thinking over the situation from the standpoint of safety and I am now constrained to issue the following directives :

(i) Oil immersed equipment in by of the last ventilating connection and at any place ventilated by return air in mines of all degrees of gassiness shall be withdrawn within a month from the issue date of the circular.

(ii) Their use in situations other than those mentioned in (i) above may continue for another one year subject to the conditions stipulated below and it is intended that during this period all efforts shall be made to withdraw oil immersed equipment falling within 270 metres of all coal faces and from any sites ventilated by return air.

The use of the oil immersed circuit breakers and starters shall be restricted as follows :

(a) In Degree I gassy mines they may be used at any place except inbye of the last ventilating connection;

(b) In Degree II gassy mines they may be used in intake airways only, but out bye of the last ventilating connection;

(c) In Degree III gassy mines they may not be used within 90 metres of working face and at any place ventilated by return air.

It is, therefore, requested that all-round effort be exercised to control the use of the oil immersed equipment in the gassy coal mines as stipulated above.

It is however, implied that while using an oil immersed equipment, careful supervision shall be provided to ascertain that oil level in the equipment is always maintained up to the mark and the quality of the oil, its cleanliness and dielectric properties are of high and acceptable quality.

(Cir-Tech. 12/1975)

Note : See also Circulars under Reg. 181.

7. Pilot earth core protection—Recently there was an incident of open sparking from a 550 volts flexible trailing cable connected to a coal-cutter at a development face in a Degree III gassy mine resulting in serious bum injury to an electric helper.

I An enquiry into the causes of this accident, which should be taken as a potentially dangerous incident, revealed inter-alia that while an electrical helper withdrew the plug from the coal-cutter and thereafter dismantled the same, there was a severe spark emanating from the bare terminals of the cable leads. Incidentally, the gate-end circuit from which the coal-cutter was being worked was designed for remote control operation with the inherent technique of protection called "Pilot-earth core protection". It was learnt in course of the enquiry that due to wrong adjustment in the circuitry associated with the gate-end box, the coal-cutter was actually working at the time of the incident on local control that is to say making the earth pilot protection defunct. Had the coal-cutter worked on remote control i.e. the pilot current made to complete the return path through the rectifier placed in the controller of the coal-cutter the possibilities of such incident could have been totally eliminated.

In view of what has been stated above, it is advised that wherever such gate-end boxes as are designed to work on remote control including inter-alia pilot earth protection in the circuits thereof is used with portable/transportable equipment at or near face shall be checked thoroughly by the Electrical Supervisor to ascertain that connections/adjustments in the gate-end box have been such as to render the equipment connected thereto being operated on remote control under the coverage of pilot-earth protection. The Electrical Supervisor shall enter the results of his

examination and a brief account of corrective measures taken, if any, in the matter in a bound-paged book maintained for that purpose. The book shall be checked by the Engineer and the Manager of the mine who shall countersign the book and date the same.

(Cir. Tech. 14/1977)

8. Installation of power cables belowground—Installation of power cables along haulage roadways should be generally avoided. The cables should be installed along traveling or other roadways where roof and sides are adequately supported, and there is good ventilation.

Wherever cables are installed, they should be so placed and secured so as to ensure maximum protection against mechanical damage of all kinds, and particularly that due to their own weight, bending or twisting, traffic and ground movements. Damage to cables or crushing at points of their support should also be avoided. The support for the cables should be spaced sufficiently close to prevent dangerous sagging.

(Cir. 15/1965)

9. Maintenance of Flameproof Equipment— It has been very frequently observed that flameproof electrical equipment are so handled and worked that their flameproof features are seriously disturbed. The following reasons appear to be largely responsible for such defective maintenance :—

- (a) Lack of knowledge, skill and responsibility on the part of the electrical personnel engaged in the duties of maintenance of flameproof equipment;
- (b) Use of improper tools;
- (c) tampering with protective features;
- (d) Careless and improper assembly of the equipment after undertaking any repair or adjustment work;
- (e) Use of improper spares.

In order to achieve the desired results in obtaining efficient maintenance of the flameproof equipment, it is essential that the personnel handling such equipment shall receive suitable training in a proper training centre. This may require its own time, though we are making out efforts for opening up such centres as early as possible. National Council for Safety in Mines has already been requested to move in this line.

While definite results may be obtained when the proper training centres start functioning yet if suitable instructions are circulated to the personnel handling flameproof equipment it may also prove beneficial. It is, therefore, requested that the following precautionary measures be strictly adhered to by the personnel responsible for handling flameproof equipment.

Instructions	Responsibility	Records
1. After every removal of covers, doors, oil tank, etc. it must be ensured that their replacement has been adequate. The adequacy will be ensured only by proper cleaning of the joint faces, removal of dirt from blind holes and packing	This will be a day-to-day responsibility of the shift electrician, but must be checked at least once a week by the Electrical Supervisor and at least once a month by the Engineer.	In Register maintained for FLP equipment every such work done by the electrician shall be recorded with the description of the work, apparatus on which the work has

putting back all the bolts and nuts in position suitably tightening them.		been done and the date of performance.
2. The force used when tightening up should not be more than necessary to ensure that no appreciable gap exists at the flanges and no risk of loosening by vibration is incurred. It may be noted that any normal man can fracture a bolt by applying excessive force. In order to achieve desired result every bolt and nut should be wiped clean whenever opened and in the event they are dry a light application of vaze-line or petroleum jelly .should be desirable.	Electrician, Electrical Supervisor and Engineer.	Yes
3. If a broken stud has to be removed from a blind hole, great care shall be undertaken to avoid damaging the hole or drilling into the flameproof enclosure.	Electrical Supervisor and Engineer.	Every instance shall be recorded.
4. Broken or missing bolts or set screws should be replaced by others of correct diameter, thread, length, type of head and quality of steel.	Electrical Supervisor, and Engineer.	-do-
5. Shrouds used to guard bolt heads and nuts should be kept free from dirt and in no circumstances should these shrouds be damaged or removed.	Daily by the Electrician, weekly by the Electrical Supervisor and monthly by the Engineer.	Damages shall be recorded.
6. Every terminal box should be kept free from	Electrician and	Suitable entry in the Register for Such

coal-dust and moisture. Cleaning and wiping of the same are essential whenever they are required to be opened from time to time. Such cleaning is recommended at least once a week.	Electrical Supervisor.	cleaning jobs.
7. Armour glands should be checked to ensure that the armouring is firmly gripped. Cleaning of the armours at the time of installation and during maintenance is considered essential.	Daily by the Electrician and monthly by the Electrical Supervisor.	To be recorded for all new installations.
8. Cast metal castings should be examined for fractures and crack and the welded joints of the fabricated casings should also be checked. This is an essential check during initial installation and during every shifting and after any abnormal occurrence such as a roof fall in the vicinity of the equipment.	Electrical Supervisor and Engineer.	To be recorded.
9. The clearance of shaft glands of the fixed or labyrinth type should be checked whenever the motor to which they are fitted is dismantled, and the clearance of all joints should be checked each time they are replaced but at least once a year.	Electrical Supervisor and Engineer.	To be recorded.
10. The bearing of switch spindles etc. should be regularly inspected and lubricated.	Daily by the Electrician weekly by the Electrical Supervisor and monthly by the Engineer.	To be recorded.

11. The level of oil in the oil immersed apparatus should be checked at frequent intervals. Instances of fire are known due to low oil level particularly in oil immersed resistances.	Electrical Supervisor and Engineer.	Checks with topping up shall be recorded.
12. Interlocks are often aged and should be given fail treatment and frequently examined for broken and bent parts.	Weekly by the Electrician.	He should repair or report for action.
13. Plug and socket connectors and couplers should be examined to ensure that all the components are in their places and parts are tightly screwed up and there is no sign of over heating.	Daily by the Electrician, weekly by the Electrical Supervisor, and monthly by the Engineer.	To be recorded.
14. The level of compound in sealing boxes etc., should be checked regularly and particularly in hot situation where the compound tends to flow through badly packed joints.	Daily by the Electrician, weekly by the Electrical Supervisor and monthly by the Engineer.	To be recorded.
15. Cracked or broken glass windows or well-glasses should be promptly replaced by fresh approved glasses complete with retaining rings and it shall be ensured that no equipment with such broken glass is kept alive.	Electrician, Electrical Supervisor and Engineer.	To be recorded.

16. Every flange joint be checked with fillers as a matter of routine.	Weekly by the Electrical Supervisor and monthly by the Engineer.	Clearance shall be recorded.
17. It is very necessary to ensure correct setting and checking of over load and earth leakage trips.	Electrician, Electrical Supervisor and Engineer,	Settings shall be recorded.
18. The design of flameproof enclosure must not be altered in any way. It is not permissible, for example, to drill any new holes and carry out any welding or machining in the FLP casing.	-do-	-do-
19. Any replacement of parts upon which the FLP quality of the enclosure depends must be obtained from the manufacturer. It is not permissible to use a part made at site or by any other manufacturer in all normal circumstances.	Electrician, Electrical Supervisor and Engineer.	Settings shall be recorded.
20. It must be scrupulously ensured that no cover of a live flameproof apparatus is opened at any time for whatsoever purposes such as setting, adjustment etc. It may be recalled that the explosion at Jitpur Colliery which took 48 lives on 18.3.1973 was due to		

making adjustment while the equipment was live.		

Rule 131

1. Overheating of electrical equipment—Fatal electrical accidents have occurred in the mines from the use of electrical equipment due to overheating and ultimate bursting of the same. Though overheating was caused either due to a defect in the equipment or using the same in an irregular manner, the bursting took place only after a prolonged overheating was permitted. It will, therefore, be readily appreciated that if the equipment could be shut down during the period of overheating the accident would not take place.

As heating of the equipment can be easily felt by any operator of the machinery it is essential that the attendants shall be directed to take care of the overheating by feeling with usual precautions, the equipment from time to time and in the event the same would appear considerably hot, he should immediately stop the equipment and report the matter to the Electrical Supervisor or Engineer for further action.

(Cir. 30/1972)

2. Notice of power shutdown—In an incident at one of the mines electric energy was cut off as the result of which 96 miners of the night shift could not come out at the end of their shift and had to remain underground for over 17 hours till the power supply was resumed.

An enquiry into the incident revealed that although prior notice of the power shut down had been received from the power house it was not put up to the manager by his office, with the result that suitable action could not be taken to withdraw work-persons from the mine before the shut down. Necessary orders may therefore be issued to the staff concerned that whenever such an important notice is served in the mine office, it should be put up to the manager immediately for instructions.

(Cir. 13/1965)

3. Frequent load-shedding in mines—Due to frequent load-sheddings in the coal mines of Jharia Coalfield serious difficulties are being faced by the industry in running the mines continuously. Inasmuch as such load-shedding have an adverse effect on ventilation pumping as well as winding operations etc. and consequently upon production, they also constitute a serious safety problem. During meetings held in this Directorate with the Power Supply Companies and representatives of mine managements, it transpired, that if 20% relief was assured during the peak-load periods, it may be possible for the supply companies to ensure uninterrupted supply of power to the consumers. It is also understood that efforts are being made to increase the generation of electricity by improving the performance of existing generators as well as by the installation of new generating units, as a long term solution. As a short term remedy, and to achieve the 20% reduction in the total power consumption in mines, the following measures are recommended:

1. To flatten the peak-loads (everyday during the periods of 10.00-13.00 and 18.00-22.00 hours by restricting pumping operations during these periods; intermediate and main pumps may be run during non-peak hours; and

2. To stagger the running hours of all machinery.

Above suggestion shall be given effect to at the earliest. If possible, an attempt may also be made to reduce the daily off take by staggering the rest days.

(Cir. 39/1972)

4. Grant of an Essentiality Certificate for cable with copper conductors—

While applying for an essentiality certificate for mining cables with copper conductors it is requested that the enclosed proforma be filled in and sent to this Directorate along with the application to expedite issue of such a certificate. A copy of the application and the proforma should be sent to the Deputy Director of Mines Safety (Electrical) of the Electrical Circle concerned as well.

Proforma for obtaining Essentiality Certificate from the D.G.M.S. for Cables
with Copper Conductors

1. Particulars of mine:

- (a) Name and address of Mine:
- (b) Quarry pit for which the cable is required:
- (c) Degree of Gassiness (for underground mines only):
- (d) Present rate of production:
- (e) Life of the mine (estimated):

2. Particulars of the cables required:

Sl. No.	Type size	Volts	Length in metres	Finish of each	Total Size
(1)					
(2)					
etc					

3. Length of stock and type and size of cables required:

4. A mine plan indicating:

- (a) Existing cables marking (sizes, types and lengths by suitable notation).
- (b) Cables required marking sizes, etc. as in (a) and in different colours.

5. Reasons for present purchase:

- (a) Whether for development or replacement of old cables;
- (b) When the new cable is to replace old one, state the date of purchase of the old cable and reasons for replacement; and
- (c) When the new cable is meant for development expansion work give details of the scheme.

6. State:

- (a) The name of the manufacturer on whom order has been placed/proposed to be placed; and
- (b) The likely date of delivery.

7. Any other relevant information justifying to the grant of Essentiality Certificate.

Signature of Owner/Agent/Manager
(Cir. 48/1972)

OIL MINES REGULATIONS 1984

Reg. 66

Use of cell operated wrist watches in oil mines—Nickel cadmium watches are now readily available in the country. A number of persons employed in the oil industry wear them while at work.

In the absence of certification by the manufacturer and precise information regarding the current in the circuit and the temperature rise of components in the watch, it is difficult to establish if they are inherently or intrinsically safe. Further, test results on any one type of watches may not hold good on other type available in the market.

An open spark in the watch could cause ignition of inflammable gas under certain condition of connection. As such persons employed in oil mines shall be advised not to wear or carry electronic watches in hazardous areas while on duty.

(Cir. Tech. 2/1987)

Reg. 68

Serious accident due to outbreak of fire near a gas line of Oil India Ltd. on 2nd March, 1964—There was a serious accident due to out-break of fire near gas line of M/s. Oil India Ltd. when two persons got serious injuries.

The gas pipe line had been laid along a public road. A public bus with about 35 passengers was coming from Dibrugarh when it had a break-down at about 17.45 hours. The bus conductor lighted a candle and while he was going towards the engine, there was a big blaze. Natural gas, leaking from the pipe line running along the public road had caught fire. Two of the passengers who happened to be very near to the source of leakage received serious bum injuries. Fortunately the other 33 passengers were away from the point of leakage of gas and did not receive any injury.

The following precautions are recommended with regard to the lay of pipe lines conveying oil, gas or other inflammable material.

1. Where pipe ranges are laid along the railway or public road, acquired land, they shall be run near the extreme edge of such land.
2. As far as practicable, a pipe line shall not be laid within 15 m of any dwelling. If subsequently dwellings are found to have grown within this distance, the management shall either get the dwellings vacated or shift the pipe line.
3. The pipe lines shall be buried at least one metre below the ground. Where this is not practicable and the pipe line has been laid within 15 m of any dwelling, railway or public road, substantial guard-rails shall be provided along-side so that in the event a heavy vehicle going out of control it will not damage the pipe line.

(Cir. 33/1965)

Reg. 69

Guidelines for use of flame or electric welding or repairing apparatus in oil mines—In recent times a number of fires resulted due to welding operations at drilling and production installations. Oxy-acetelene or electric cutting and welding are not only fire hazards in oil mines but can also be source of health hazard due to toxic fumes or radiation. It is therefore essential that adequate precautions are taken and accordingly the guidelines given in Appendix are issued. This is to request you to ensure that oxy-acetylene and electric cutting and welding operations are carried out in accordance with these guidance notes.

(Cir. Tech. 9/1982}

APPENDIX**GUIDELINES FOR USE OF FLAME OR ELECTRIC WELDING OR REPAIRING
APPARATUS IN OIL MINES (ON SHORE)***1.0 Introductory*

Welding operation at drilling and production installations of oilfields can cause fire and health hazards unless adequate precautions are taken. These guidelines contain safeguards that should be adopted whenever flame or electric welding and cutting operations are undertaken in oil mines.

2.0 Welders
Only qualified welders, duly authorised by manager should be deputed for welding jobs.

3.0 Written Permit

Before any welding or cutting work is undertaken at any installation, it should be carefully inspected by the Engineer in-charge of the installation and he shall issue a written permit specifying therein the precautions to be observed and the procedure to be followed for carrying out the work. Copies of all written permits shall be entered in a bound-paged book kept for the purpose.

4.0 Test for inflammable vapour
No welding or cutting work shall be undertaken at any installation unless it has first been made safe and certified by a competent person appointed by the manager after testing with an approved gas testing apparatus to be safe and free from inflammable vapours, gas or liquids and is maintained in such condition, so long as the work is in progress. Copies of all such certificates shall be recorded in a bound paged book kept for the purpose.

5.0 Warning Signs

In the immediate vicinity of the place where welding or cutting is undertaken, DANGER placards should be placed; CAUTION placards should be placed in such outlying areas as appear necessary.

6.0 Precautions against fire
6.1 All oils, oil-soaked earth, flammable substances should be removed from within and around the working area,

6.2 Matches, lighters, smoking apparatus and any other source capable of igniting inflammable vapour should not be permitted in the working area.

6.3 Adequate precautions should be taken to prevent fires being started by sparks, slag or hot metal.

6.4 At places where welding machines are operated by internal combustion engines, adequate ventilation should be provided to dilute the exhaust gases and the exhaust system should be provided with a suitable flame arrester to prevent emission of flame or sparks or discharge of heated particles.

7.0 Fire Fighting Equipment

An adequate number of portable fire extinguishers capable of extinguishing oil fires should be kept ready for immediate use at places where welding is done. Welders and their helpers should be conversant with the use of such fire extinguishers.

8.0 Personal Protective Equipment

Welders should wear fire-resistant protective clothing and equipment such as fire-resistant gloves, aprons, helmets and goggles with suitable filter lenses.

Where toxic or harmful fumes are likely to be produced as a result of welding, workers should be protected by respiratory protective equipment.

Where persons other than the welders are likely to be exposed to harmful radiations or sparks from electric arc welding they should be protected by screens or other effective means.

9.0 Welding in confined spaces

When welding and cutting operations are being carried out in a confined space, adequate ventilation by mechanical means should be constantly provided to prevent accumulation of flammable vapours.

70.0 Welding on piping

Before welding or cutting on piping which contained a flammable liquid or gas, the pipe should be disconnected or blinded. A closed valve should not be considered as a positive block. It is desirable to isolate, drain and purge the pipeline with inert gas or fill it with water before undertaking hot work.

Where vapour seals or plugs are utilised to prevent the escape of vapour from a pipeline, some positive method of venting or monitoring should be used to ensure against a pressure build-up in the line while hot work is in progress.

11.0 Supervision

The Engineer in-charge mentioned at para 3.0 shall see that welding operations are carried out strictly in accordance with the written permit and the guidelines given above.

Reg. 75

GUIDELINES FOR USE OF ELECTRICAL EQUIPMENT IN HAZARDOUS AREAS IN OIL MINES

1.0 Introductory

These guidelines aim at proper application of electrical equipment to avoid ignition of flammable vapours or gases in oilfields.

2.0 General Observations

The following factors have been kept in view in framing these guidelines.

2.1 In an oilfield there is a possibility of accidental release of flammable liquid and natural gas, which will give rise to the presence of hazardous atmosphere, as defined later, at the following locations:

2.1.1 Drilling well consisting of well head, mud tank, mud trench, mud pumps, shale shaker, desander-desilter and degasser.

2.1.2 Producing oil and gas wells.

2.1.3 Group Gathering or Oil Collecting Stations or production- separation installations.

2.1.4 Flammable liquid storage tanks.

2.1.5 Gas Compressors and pumps, handling flammable liquids & gases.

2.2 Gases encountered at the aforementioned locations are sometimes heavier than air and when escaping into atmosphere will tend to spread outwards and downwards.

2.3 A mild air current may serve to extend the hazardous area in those directions of which gases might normally be carried; whereas a strong current of air may so accelerate the dispersion of gases that the extent of potentially hazardous areas would be greatly reduced.

2.4 In oilfield, ventilating conditions are generally favourable; most of the installations and well sites are in the open air, hence the extent of hazardous areas in many cases can be reduced.

2.5 In case of enclosed premises, the degree or probability of the presence of a hazardous atmosphere is more, as rapid dispersal of hazardous atmosphere cannot be expected due to lack of ventilation.

2.6 Standard of maintenance of equipment, operation and supervision influence the degree of probability of the presence of hazardous atmosphere at any installation.

2.7 The amount of special electrical equipment can be reduced by installing much of the equipment in less hazardous or safe areas, as far as practicable.

2.8 Persistent risk points—Examples of such sources of hazard are as follows:

2.8.1 Interior of pressure vessels and pipe containing gas air mixtures;

2.8.2 Free space above liquid level in tanks;

2.8.3 Free space immediately above open dipping, baths, etc.; and

2.8.4 The immediate vicinity of vapour exhausts and liquid outlets where these are designed to discharge as part of normal plant.

2.9 Occasional Risk Points—Examples of such sources of hazard are the immediate vicinity of mechanical glands and other localized spillage points and of vapour exhausts and liquid outlets designed to discharge only on plant malfunction.

2.10 Areas classified cover installed equipment under normal operations but in which abnormal conditions may exist for which there is practical protection to a degree commensurate with risk involved.

A possible catastrophe such as well blowout is not covered as it requires emergency measures at the time of occurrence. *3.0 Definitions*

3.1 Hazardous Atmosphere—An atmosphere containing any flammable gas or vapour in a concentration capable of ignition.

3.2 Hazardous Area—An area where during normal operations, a hazardous atmosphere is likely to occur in sufficient quantity to constitute a hazard.

3.3 Safe Area—An area no part of which lies within a hazardous area.

4.0 Classification of Hazardous Area: [See IS: 5572 (Part-1) 1978]

To determine the type of electrical installation appropriate to a particular situation, the areas have been divided into three main zones, namely. Zone 0, Zone 1 and Zone 2, according to the degree of probability of the presence of hazardous atmosphere.

4.1 Zone 0 Areas—An area in which hazardous atmosphere is continuously present shall fall under this category. This classification is applicable only where it is expected that hazardous atmosphere will exist continuously. In the petroleum industry such a condition is rarely encountered except in confined spaces, such as the vapour space of closed process vessels, storage tanks or closed containers.

Since a hazardous atmosphere exists continuously, any arc or spark resulting from a failure of electrical apparatus installed in a Zone 0 area would almost certainly lead to fire or explosion. Therefore, any installed electrical apparatus must afford a degree of protection as near as practicable to the absolute.

4.2 Zone 1 Areas—An area in which a hazardous atmosphere is likely to occur under normal operating conditions shall fall under this category. This classification is applied to areas in which a hazardous/atmosphere is likely to occur at any time and which, therefore, require the fullest practicable application of measures to prevent the occurrence of a hazardous electrical condition at any time and in any circumstances.

4.3 Zone 2 Areas—An area in which a hazardous atmosphere is likely to occur only under abnormal operating conditions shall fall under this category. This classification is applicable only where a fire or explosion hazard is unlikely and may be caused only by the simultaneous and improbable occurrence of an arc or spark resulting from an electrical failure and a hazardous atmosphere arising through failure of the conditions of control. It presupposes that any hazardous atmosphere resulting from an abnormal occurrence is rapidly dispersed so that possible contact with the electrical apparatus is of minimum duration. Any situation which allows a hazardous atmosphere to collect, such as pit or trench, although, it may be in the open are, shall in itself be classified as Zone 1 area, even though the surrounding area is classified as Zone 2.

5.0 Extent of Hazardous Area

5.1 Drilling Wells—Areas surrounding wells in the process of drilling or being serviced by drilling rigs should be classified as follows:

5.7.7 *Well head area*—(a) When the derrick is not enclosed and the substructure is open to ventilation, area above the ground level extending vertically 8 m above the well and horizontally 16 m in all directions from the well should be classified as Zone 2 area.

(b) When the derrick floor and substructure are enclosed, the entire enclosed substructure including cellars, pits, and sumps below the ground level should be classified as Zone 1 area but the area enclosed above the derrick floor should be classified as Zone 2 area.

(c) Any cellars, trenches, the pits belowground level and located in a Zone 2 area should be classified as Zone 1 area.

5.1.2 *Mud Tank/Channel*—(a) The area within a radius of not less than 8 m from a mud tank/channel located in the open air should be classified as Zone 2 area.

(b) The free space above the level of mud in tank/channel should be classified as Zone 1 area.

5.1.3 *Mud Pump*—The area surrounding a mud pump is unclassified unless it is located in an area that is classified because of some other installations.

5.1.4 *Shale Shaker*—(a) The area within a radius of not less than 4.5 m from the shale shaker located in the open air should be classified as Zone 1 area, while upto 8 m in all directions from the shale shaker should be classified as Zone 2 area.

(b) When the shale shaker is located in an enclosure, the area should be classified as Zone 1 to the extent of the enclosure.

5.1.5 *Degasser*—(a) The area surrounding a degasser is unclassified except for the vent, unless it is located in an area that is classified because of some other installation.

(b) The open end of the vent from the degasser should be not less than 4.5 m above ground level; the area within a radius of 1.5 m from the open end of the vent extending in all directions should be classified as Zone 1; the area between 1.5 m and 3.0 m of open end of vent should be classified as Zone 2.

5.1.6 *Desander-Desilter*—The area within a radius of not less than 4.5 m from the desander-desilter located in the open air should be classified as Zone 2 area.

5.1.7 *Effluent Pit/Open Sump*—The area within a radius of not less than 8 m. from an effluent pit/open sump which contains flammable liquid should be classified as Zone 2. The free space above the level of flammable liquid in the pit/sump should be classified as Zone 1.

5.2 Producing oil and Gas Wells.

5.2.7 *Flowing Well*—(a) Area around a flowing well without any cellar and located in open air is unclassified.

(b) Area around a flowing well located in open area with a cellar, extending vertically upto 60 cm above the ground level should be classified as Zone 2, the collar should be classified as Zone 1.

5.2.2 *Well under production test*—(a) The area within a radius of not less than 16 m horizontally and extending 8 m vertically above from an open discharge of petroleum bearing fluid from a well under production test, should be classified as Zone 1 area.

(b) The area within a radius of not less than 16 m. horizontally and 8 m. vertically from a well under production test in a closed system should be classified as Zone 2 area.

5.2.3 *Well-Pulling/Well Servicing Operation*—The area within a radius of not less than 16 m. in all directions from a well-pulling and other such well servicing operation should be classified as Zone 1 unless tests with explosimeter made every two-hours show that hazardous atmosphere does not exist, in which case the area may be classified as Zone 2.

5.3 Oil and Gas Processing and Storage Equipment

5J.7 *Manifold*—The area around a manifold located in open air on in a well ventilated shed is unclassified.

5.3.2 Oil-gas Separation Vessel/Protected Fired Vessel—(a) The area within a radius not less than 8 m of any oil-gas separation vessel or any fired vessel protected from being a source of ignition and located in open air or in a well ventilated shed, operated as a closed system to prevent in normal circumstances the omission or accumulation of hazardous atmosphere should be classified as Zone 2 area.

(b) Any cellars, trenches or pits below ground level and located in a Zone 2 area should be classified as Zone 1 area.

5.3.3 Gas Vent—(a) The open end of gas vent should be not less than 4.5 m above ground level.

(b) The area within a radius of 1.5 m from the open end of the vent extending in all directions should be classified as Zone 1; the area between 1.5 m and 3.0 m of open end should be classified as Zone 2 area.

5.3.4 Relief Valve—(a) The area within a radius of not less than 3 m of discharge of a relief valve, extending in all directions should be classified as a Zone 2 area.

(b) There should be no electrical equipment in direct path of discharge from a relief valve.

5.3.5 Pig Trap—The area within a radius of not less than 1.5 m of pig launching/receiving trap, extending in all directions should be classified as Zone 2 area.

5.3.6 Pump of Gas Compressor—(a) Where a pump handling flammable liquids or a natural gas compressor is located in open air or well ventilated shed without walls, the area extending 8 m vertically above the source of hazard and 16 m horizontally in all directions should be classified as Zone 2 area. Beyond 8 m in the horizontal plane, the vertical extent of the hazardous area may be reduced to 8 m above the ground level.

(b) Pits, sumps, trenches below the ground level should be classified as Zone 1 area.

(c) Where such a pump or compressor is located in an adequately ventilated building, the entire interior of such building should be classified as Zone 2 area.

5.3.7 Storage Tank—(a) In the case of floating roof tank, the space above the roof and within the shell of the tank should be classified as Zone 1 area. The area surrounding the tank within 3 m from the tank shell, ends or roof and inside the enclosure upto top level of the enclosure wall should be classified as Zone 2 area.

(b) In the case of fixed roof tank, the area surrounding the tank within 3 m from the tank shell, ends or roof and inside the enclosure upto top level of the enclosure wall should be classified as Zone 1 area.

6.0 Selection of electrical equipment of hazardous areas

Electrical equipment for Zone 0, Zone 1 and Zone 2 areas should be selected in accordance with guidance provided by Indian Standard IS: 5571-1979, the salient features of which are given in Appendix-I. In case of any doubt the matter should be referred to D.G.M.S. for decision.

7.0 Detection of hazardous atmosphere

Explosimeter or other suitable gas testing apparatus should be kept available for testing the presence of a hazardous atmosphere in reasonable proximity to any hazardous area. Competent persons should be trained in the use of such apparatus. **8.0 Maintenance, Repair & Test Work. in classified zones Permits—**

No maintenance, repair or test work of electrical equipment should be undertaken in any classified zone unless such area has first been made free from hazardous atmosphere and a permit for work in form given in Appendix-2 is issued by the Electrical Engineer-in-charge of the installation or an electrical supervisor.

9.0 General Precautions

9.1 Power and lighting circuits installed in classified zones around a well-head, which are not essential for drilling and well-servicing operations, should be capable of separate isolation.

9.2 Master switches for controlling supplies to drilling rigs or well-servicing equipment should be located outside hazardous area at easily accessible places; these switches should be remotely operated from the driller's console.

References:.

- (1) IS: 5572 (Part-1) 1978 Classification of hazardous areas (other than mines) for electrical installation.
- (2) IS: 5571-1979 Guide for selection of electrical equipment for hazardous areas.
- (3) API: BP 500B Classification of areas for electrical installations and drilling rigs and production facilities etc.
- (4) Electrical Safety Code Institute of Petroleum, U.K.
- (5) Petroleum Rules, 1976.

APPENDIX-I

(See para 6.0 of the Guidelines)

Selection of electrical equipment for hazardous areas shall generally be made in accordance with IS: 5571-1979 Indian Standard Guide for Selection of Electrical Equipment for Hazardous Areas, the salient provisions of which are given here.

1. Selection of Type of Protection

1.1 Unless otherwise specified for particular equipment Table-1 shall be followed in the selection of type of protection of the electrical equipment for different zones of hazardous areas.

1.2 Procedure for Selecting Electrical Equipment

1.2.1 In order that electrical apparatus which is suitably protected may be selected for use in a particular hazardous area, the following information is necessary:

- (a) The classification of the area that is the zone. [See IS: 5572 (Part-1) -1978]
- (b) The lowest values of ignition temperature of the gas or vapour involved if more than one combustible gas or vapour is present.
- (c) The characteristics of the gas or vapour involved in relation to:
 - (i) Ignition current or minimum ignition energy in the case of installation of intrinsically safe apparatus, or
 - (ii) Safe gap data in the case of installation of flame-proof enclosures.

1.2.2 The type of protection appropriate to the application should be selected according to the area classification as indicated in Table 2.

1.2.3 The maximum surface temperature of any unprotected surface of electrical equipment should not exceed the ignition temperature of the gas or vapour. For electrical apparatus ho margin of safety need be applied between maximum surface temperature and ignition temperature.

1.2.4 The permitted maximum surface temperatures have been classified as under:

Temperature Class	Maximum Surface Temperature
T	45°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

A reference ambient temperature of 40°C is normally assumed unless otherwise indicated on the apparatus.

When deciding the maximum surface temperature for apparatus. Or the suitability of available apparatus which is to operate in an area endangered by a particular combustible, the maximum surface temperature of the T class of the apparatus Should not exceed the ignition temperature of the gas or vapour.

1.3 Portable apparatus

1.3.1 *Portable hand lamps*—Portable hand-lamps (whether self-contained or mains operated) shall be either flameproof or intrinsically safe. Torches shall be intrinsically safe and shall conform to IS: 5780-1970. They shall be designed in such a manner that hot filament ignition problem is avoided.

1.3.2 Telephone and other communication equipment and allied instruments in both Zone 1 and Zone 2 areas these shall be either of the intrinsically safe type or flameproof or increased safety type with sparking parts enclosed in flameproof enclosure.

2.0 Installation requirements

2.1 Wiring Systems

2.1.1 Types of wiring and systems which may be used for installations in hazardous areas are:

(a) Cables drawn into screwed, solid drawn or seamless conduit, and

(b) Cables which are otherwise suitably protected against mechanical damage.

Requirements for the installation of power systems may not apply to the installation of apparatus and systems with type of protection '1'—intrinsic safety. For intrinsically safe circuits, there is normally no need to have special enclosures for the conductors. However, some protection will have to be afforded to such conductors primarily to prevent contact between conductors of intrinsically safe circuits and those of any other system, to avoid the possibility of arcing occurring at the point of contact or invasion of the intrinsically safe circuits by current arising from contact or electrostatic or electromagnetic induction. In addition, the conductors will have to be protected against mechanical damage.

The diameter of each strand of the conductor shall be not less than 0.300 mm. of copper or equivalent size of conductor specified in IS: 434 (Part-1) - 1964 or IS: 434 (Part-11) - 1964 in the case of aluminium conductor.

For (b) the following types of cables may be used in principle:

(i) Lead-sheathed and armoured cable;

(ii) Plastic or rubber-sheathed steel screen protected or armoured cable, with sheath overall;

(iii) Cable enclosed in a seamless aluminium sheath with or without armour, with an outer protective sheath;

(iv) Mineral insulated metal sheathed cable; and (v) Braided screen-protected flexible cables.

Unarmoured lead-covered cable is not acceptable. The sheath of a metal-sheathed cable should not be used as the neutral conductor.

2.2 Correctly designed terminations completed with armour clamps shall be provided for armoured cables. The armouring should be carried into the clamps to provide mechanical support to the cable and to ensure electrical continuity. Where such cable is lead covered and armoured, the lead sheath should be plumbed or mechanically gripped and sealed and the armouring should be carried over the lead joint.

2.3 Where circuits traverse a hazardous area in passing from one non-hazardous area to another, the wiring in the hazardous area should comply with the requirements of this standard.

2.4 Where practicable, contact, either deliberate or accidental, should be avoided between apparatus, conduit or cables, and any equipment or pipe work used for carrying combustible gases, vapours or liquids.

2.5 Where, owing to particular circumstances, contact between components referred to in 2.4 above is unavoidable, the armouring, conduit or sheathing of the cable should be bonded to the equipment or pipe work in such a manner and at such intervals as to ensure that under the worst fault conditions, the passage of any current will not give rise to incendive sparking or bring about a temperature rise approaching the ignition temperature of the combustible gas, vapour or liquid which may be present. Alternatively in the case of cable the insulation of the sheath may be sufficient to prevent danger.

2.6 Where cables or conduit pass through a floor, wall, partition or ceiling, the hole provided for them should be made good with cement or similar incombustible material to the full thickness of the floor, wall partition or ceiling, so that no space remains around the cable through which combustible gas liquid or vapour might spread. Alternatively cable glands may be used for this purpose.

2.7 Where trunking, duct, pipes or trenches are used to accommodate cables, precautions should be taken to prevent the passage of combustible gases, vapours or liquids from one area to another, and to prevent the collection of combustible gases, vapours or liquid in trenches. Such precautions may involve the sealing of trunking, dust and pipes, and the adequate ventilation or sand filling or trenches.

2.8 Where an overhead supply line is used for either power or telecommunication circuits, it should be terminated outside the hazardous area and be fitted at or near the terminal pole with an effective surge-protection apparatus. The cable used to connect the overhead line with the installation in the hazardous area should comply with the recommendations for wiring systems in hazardous areas. Conduit should not be used if it is likely to be subjected to vibration. The casing, armouring or sheathing should be electrically continuous and the end adjacent to the point of connection with the overhead line should be bonded to the earth electrode of the overhead line. In addition, the casing or sheathing should be electrically continuous and the end adjacent to the point of connection with the overhead line should be bonded to the earth electrode of the overhead line. In addition, the casing or sheathing should be independently earthed as near as possible to the junction of the cable with the installation and bonded to the earthing lead of any lightning-protective system associated with the hazardous area. If convenient, a common electrode may be used for this independent earth and for the lightning-protective system of the installation.

Where the overhead line supplying a building forming a hazardous area is supported by the building and the connecting cable to the installation consequently is short, the earth electrodes for the surge-protection apparatus on the overhead line may be used for earthing the cable sheath or casing and for any lightning- protective system associated with the hazardous area.

2.9 The wiring entry to the apparatus, direct or indirect should maintain the type of protection used.

2.10 Unused cable entries in electrical apparatus should be closed with plugs suitable for the type of protection used.

2.11 Factors affecting choice of wiring systems

2.11.1 Screwed steel conduit systems are satisfactory for many situations but should not be used where vibration might cause fracture or loosening of joints and where excessive stress may be imposed as a result of its rigidity or where corrosion or excessive internal condensation of moisture is likely to occur.

2.11.2 Lead-sheathed and armoured cables are suitable for underground installation. Steel-wire armour is preferred for underground use.

2.11.3 PVC-insulated and armoured cable, complying with IS:1554 (Part-1)

1967 with an extruded plastic outer sheath may be used for above ground or underground installation. Lead-sheathed cable should be used where spillages may affect integrity of the cable and/or allow migration of the liquid through the cable.

2.11.4 For telecommunication circuits, plastic-insulated and armoured telephone cables complying, where applicable, with the appropriate Indian Standard may be used.

2.12 Portable and Transportable Apparatus and its Connections:

2.12.1 Only certified portable electrical apparatus should be used in a hazardous area.

2.12.2 Apart from self-powered apparatus and from hand-lamps which shall meet the requirements of 2.12.3, earth-leakage protection, or earth monitoring, or both, should be included in the protection of the apparatus. Protection of the circulating-current type which automatically cuts off the supply in the event of the earth continuity conductor becoming disconnected, may, with advantage, be adopted as the earth-monitoring device.

2.12.3 Flameproof plugs and sockets should incorporate suitable electrical and/or mechanical means to prevent danger of ignition during the insertion **or** removal of the plug.

2.73 Flexible Cables

2.13.1 Flexible cables for portable and transportable apparatus may be protected by a polychloroprene, PVC or similar sheath, and may have an annular flexible metallic screen. Where necessary, an additional earth continuity conductor should be incorporated. It should be insulated to the same standards as the live conductors, and should be incorporated within the cable sheath. The earth continuity conductor and screen should be bonded to the appropriate metal-work of the apparatus and to the earthing pin of the plug.

For portable and transportable apparatus with rated voltages not exceeding 1000 V (not exceeding 750 V for earthed direct-current systems) the supply cables should be heavy-duty type. ,

For portable apparatus with rated current and voltage, not exceeding 1.6 A and 250 V respectively, medium-duty supply cables may be used. The conductors should be of copper having a minimum cross-sectional area of 1.5 mm².

NOTE—Flexible cables with aluminium conductors will not be permissible to be used in hazardous areas.

2.74 Automatic Electrical Protection

2.14.1 All circuits and apparatus in hazardous area should be provided with means to ensure disconnection quickly in the event of over-current, internal short-circuit or earth-fault conditions.

2.14.2 Protection and control apparatus shall be normally located in a non-hazardous area. Where its installations in a potentially hazardous area cannot be avoided, such apparatus should be provided with an appropriate type of protection.

2.15 Earthing and Bonding

2.15.1 Earthing should be in accordance with IS: 3043-1966. Efficient bonding should be installed where protection against stray currents or electrostatic charges is necessary.

TABLE 1: TYPES OF PROTECTION FOR DIFFERENT HAZARDOUS AREAS
(Clause 4.1)

Zone of Hazardous Area	Type of Protection
Zone 0	No electrical equipment should be allowed. When this is not practicable intrinsically safe electrical apparatus categories 'la' and 'lb' and associated circuits should be employed Type of protection '1'

Zone 1	Intrinsically safe circuits categories ('la' and 'lb') and associated apparatus— Type of protection '1'. Flameproof equipment—Type of protection 'd'. Pressurized enclosures— Type of protection 'p'. Sandfilled apparatus—Type of protection 'q', Oil- Immersed apparatus— -Type of protection 'o'. Such other apparatus as may be specially certified or assessed for use in Zone 1 areas.
Zone 2	Intrinsically safe circuits categories 'ia' and 'ib' and associated apparatus— Type of protection 'i'. Flameproof equipment—Type of protection 'e'. Pressurized enclosures— Type of protection 'p'. Sandfilled apparatus—Type of protection 'q', Oil- Immersed apparatus— -Type of protection 'o'. Non-sparking apparatus—Type of protection 'n'. NQTE: For outdoor installations, the apparatus with type of protection 'e' and type of protection 'n' should be used with enclosures providing at least the following degree of protection 'n'

- (a) IP55 where there are uninsulated conducting parts internally, and
(b) IP 44 for insulated parts.

APPENDIX-2

Name of Mine..... Owner.....
Manager.....

Permit for maintenance, repair or test work of electrical equipment in hazardous areas in oilfield

Shri..... and his co-workers named below are permitted
to undertake the jobs mentioned later at
.....on.....,.....from.....

TABLE-2 : FEATURES OF ELECTRICAL EQUIPMENT
(Clause 4.2.7)

Zone	Motors		Transformers & Capacitors		Lighting Fitting		Switchgear & Control gear		Re- marks
	Feature	Ref to IS	Feature	Ref to IS	Feature	Ref to IS	Feature	Ref to IS	
1	2	3	4	5	6	7	8	9	10
0	No motor — shall be used in this area.		No transformer or capacitor shall be used in this area.		No lighting fitting shall be used in this area.		No switchgear or control gear shall be used in Zone 0 areas. When this is not practicable intrinsically safe electrical apparatus and associated circuits shall be employed.		IS: 5780-1970*
1.	Motors with type of 1968* protection 'd' flameproof enclosure	IS: 2148.	All power and distribution transformers and capacitors shall be provided with type of protection 'd' enclosures.	IS: 2148.	—	—	—	—	—

1	2	3	4	5	6	7	8	9	10
			For control and instrumentation purposes, transformers and capacitors shall form part of intrinsically safe equipment of type protection 'i', category Ia or Ib.	IS: 5780-1970*	All lighting fitting shall be of flameproof construction. Unless lighting fittings are protected against mechanical damage by virtue of the area in which they are installed, suitable guard shall be provided. Pendant fittings shall be connected by means of cables in screened steel conduits. Suitable provision for permanent and effective bracing against lateral displacement shall be provided.	IS: 2148-1968*, IS: 2206 (Part-I) fuses and other controlling gear shall be provided with flameproof enclosures. In each case the enclosure together with the enclosed apparatus shall be approved as a complete assembly.	All switches, circuit breakers, fuses and other controlling gear shall be provided with flameproof enclosures. In each case the enclosure together with the enclosed apparatus shall be approved as a complete assembly.	IS: 2148-1968*	IS: 2148-1968*

1	2	3	4	5	6	7	8	10
2.	Motors IS: 2148- suitable for 1968* Zone I areas.	Transformers and capacitors suitable for Zone I areas.	—	Lighting IS: 6381- fittings for 1972* Zone I areas.	All switches, circuit breakers, fuses and other switchgear and controlgear in which arcing may occur under normal condition of operation shall be provided with flameproof enclosures unless the interruption of the current occurs within a chamber hermetically sealed against the entrance of gases and vapours, complying with test prescribed in Appendix A and the equipment is provided with a general purpose enclosure and also if the equipment is such that current interrupting contacts are oil immersed as per IS: 7693-1975 + enclosed break switches for lighting, etc. with flameproof breaking chamber, mercury in glass switches as per 5.3 of IS: 6381 - 1972 ++ and enclosed break micro switches.			

1	2	3	4	5	6	7	8	9	10
	Motors with type 'n' protection 'n' non-sparking type. The main features for this type of protection are stated in IS: 8289-1967*. However, all normally sparking parts, such as slippings and brushes shall be provided either with flameproof enclosures (Type of protection 'd') or with pressurized enclosures (Type of protection 'p')	IS: 8289-1976*+	Transformer and capacitors that are dry type or containing liquids that need not have any special enclosure provided that any switch or other sparking accessories incorporated on them complies with requirements of Zone 1 as oilfilled transformers shall satisfy the following requirements:	See Above Zone	Lighting IS: 6381-fittings suitable for use in Zone 2 areas type of protection 'c'				

1	2	3	4	5	6	7	8	9	10
	Motors with IS: 7389 - type of 1974* protection 'p' pressurised.		i) Cable boxes shall be suitable for the specified level of fault current & fault clearing time.						
			ii) Only off operated tap-changing equipment shall be provided with provision for locking.						
			iii) Auxiliary devices shall be either intrinsically safe or if they have sparking contacts, these shall be:	IS : 5780.					
							Where oil-filled transformers are used necessary precautions against spread of fire such as provision of partition walls, stated in IS: 1626-1961/I shall be complied with.		

1	2	3	4	5	6	7	8	9	10
	Motors IS: 7389-1974* provided with a combination of the above forms of protection, for example slip-ring motors in which the m a i n enclosures and windings are of type 'c' protection but the normally sparking parts, such as the sliprings and brush gear are in flameproof enclosure. type of protection 'd'.	IS: 7389-1974* a) in sealed flameproof or enclosures, IS hermetically : 2148-1968// b) under adequate head of oil, or c) of mercury in glass type with adequate mechanical protection, or d) of enclosed break type. These devices may also be either deleted or installed in a safe zone or in an area that has been rendered safe by pressurization.							

(name of installation).... on.....(date)...from.....to.....hours on condition that following safety measures are complied with:
Job list and work procedure in brief:

Safety measures to be taken:

1. Tests for presence of hazardous atmosphere shall be made with explosimeter at every.....hour interval.
2. No job shall be undertaken unless the area is made free from any hazardous atmosphere.
3. Dry-powder type fire extinguishers shall be kept available at the site.
4. The equipment should be effectively disconnected from the source of supply.
- 5.
- 6.
- 7.
- 8.

Names of co-workers:

- 1.
- 2.
- 3.
- 4.

Permit received

(Shri.....)

Electrical Engineer/Electrical Supervisor

Signature with date incharge

Designation:

Signature with date

2. Provision of lightning assestors in permanent installations—There was an incidence of fire at an oil collecting station in an oil field under the following circumstances:

There was thunderstorm with flashes of lightning in the locality. At this time the oil level in the oil tank stood at 2.6 metres. Excess gas from within the tank was being released though vents provided at the top of the tank. The gas consisted of a mixture of Propane, Butane and Pentane having a specific gravity of 1.3. Because of the higher density, the gas had a tendency to settle around the top of the tank and diffusion was slow. Suddenly the lightening struck at the top of the tank and the gas escaping through the vent was ignited. Soon the fire spread over a 3 m wide area around the vents. The flame was about 2.8 m high. Steps were taken to control the fire which was brought under control within about half an hour time.

During the enquiry into the cause of any circumstances leading to the fire it was observed that although the storage tanks were properly earthed, there were no lighting arresters provided within the installation area. Since there was no safe path provided in the area for diverting to earth any electrical surges due to lighting, it struck the 10 m high metallic storage tank standing in the open and ignited the gas.

In order to avoid such type of dangerous occurrences, at all permanent installations where natural gas is released or is likely to be released to the atmosphere in hazardous quantities suitable lightening arresters should be provided within the installation area to prevent danger due to lightening.

The permissions already granted under the Oil Mines Regulations, 1922 shall be deemed to have been modified to require the provision of such lightening arrestors.

(Cir. 24/1971)

3. Use of electrical equipment in hazardous areas in oil mines—Guideline for use of electrical equipment in hazardous areas in oil mines is enclosed for your information and necessary action.

The Indian Oil Mines Regulations 1933 are being revised and it is proposed to make the following provisions regarding use of electrical equipment in hazardous areas:

- (1) No electrical equipment including lighting apparatus shall be used in Zone '0' hazardous area.
- (2) In every Zone '1' hazardous area only intrinsically safe and flameproof electrical apparatus and equipment shall be used.
- (3) In every Zone '2' hazardous area only flameproof or increased safety or pressurised electrical apparatus and equipment or such other electrical equipment as may be approved by the Chief Inspector of Mines shall be used.

In the interest of safety, it is desirable that till such time that the Oil Mines Regulations are revised, these guidelines may be kept in view while using electrical equipment in hazardous areas in oil mines.

(Cir. Tech. 5/1983)

Reg. 81

Incidents related to over-travel of travelling block—1.0 In the recent past, a number of incidents occurred in which travelling block over-travelled thereby hitting either the crown block above or the rotary table below. Incidents of this type, apart from causing severe damage to equipment, are fraught with serious danger to persons working on and around the rotary table platform and thus are a matter of great concern.

2.0 Enquiries into the incidents aforesaid revealed that:—

- (a) The eddy current brake or the mechanical brake provided with draw-works did not function effectively.
- (b) The spline clutch was not properly engaged as well as the clutch lever was not kept in locked position.
- (c) At times-the operator failed, to operate safely due to lack of skill and experience.

3.0 In order to avoid such incidents, it is suggested that necessary steps be taken to comply fully with the provisions of Regulations 32(3), 32(4) and 81 of the Oil Mines Regulations, 1984.

It is also recommended that—

- (a) operators shall be well trained so that they acquire adequate operating skill.
- (b) any incident of over-travel shall be enquired into by the Safety Officer. The findings of enquiry shall be discussed at the meeting of Safety Committee and remedial measures taken to prevent recurrence of such incidents.
- (c) suitable maintenance schedule should be adopted in respect of draw works and other associated machinery. If necessary, assistance of the manufacturer may be taken in drawing up such a schedule.

(Cir. Tech. 4/1989)

General

1. Petroleum refineries at Noonmati, Gauhati & Barauni constitute a mine—S.0.1062—In exercise of the powers conferred by Section 82 of the Mines Act, 1952 (35 of 1952), the Central Government have decided that the crude oil pipe line including the Pumping Stations and Power Stations thereon from the oilfields of Naharkatia to the petroleum refineries at Noonmati, Gauhati and Barauni owned by M/s Oil India Limited is a mine within the meaning of the said Act.

(No. 6/1/66-M. 1 dt. 18.3.67)

2. Exemption from certain provisions of Mines Act—S.O. 4635—In exercise of the powers conferred by sub-section (1) of Section 83 of the Mines Act, 1952 (35 of 1952), the Central Government hereby exempts the persons employed by the Oil and Natural Gas Commission on drilling and production operations at Aliabet Island from the operation of the provisions of Chapter VI of the Mines Act, 1952 except Section 46 and Sections 40 to 48 (both inclusive) subject to the conditions, that the said persons—

- (i) shall not be employed for more than twelve hours on any day,
- (ii) shall not be employed for more than fifteen days at a stretch,
- (iii) shall, after they have worked for fifteen days at a stretch be granted rest for a period of not less than fifteen days.

(Dated 28.12.68)

3. Exemption from certain provisions of Mines Act—The Central Government hereby exempts the persons employed by the Oil and Natural Gas

Commissions exploration, drilling and production operations at Off-Shore Oil Exploration at Bombay High Structure from the operation of the provisions of Chapter VI of the Mines Act 1952 except Section 36 and Sections 40 to 43 (both inclusive) thereof, subject to the conditions, that the said persons—

- (i) shall not be employed for more than twelve hours on any day,
- (ii) shall not be employed for more than two weeks at a stretch,
- (iii) shall, after they have worked for two weeks at a stretch, be granted rest for a period of not less than fifteen days

(no. S. 29014/12/72M. 1. Dated 23.2.73)

4. The Oil Mines Regulations, 1984—1.0 This is to inform you that the Oil Mines Regulations, 1984 have replaced the Oil Mines Regulations, 1983 with effect from 20.10.1984, which were enacted only for a period of one year under section 60 of Mines Act, 1952. Government Notification No. GSR 743(E) dated 26.10.84 published in the Gazette of India Extra-Ordinary, Part-11 Section 3, Sub-section (i) dated 26.10.84 may be seen in this regard. The new regulations have been framed under Section 57 read with Section 59 of the Mines Act 1952.

2.0 Managements are advised to make yourself fully conversant with the provisions of the Oil Mines Regulations, 1984, and implement the same in the oil installations under their jurisdiction.

(Cir. Legis. 3/1984)

5. Use of manila ropes in drilling operations—Manila Ropes are being used for various purposes in drilling operations in the oil mines. While the sizes of such manila ropes intended for use may be selected by respective management giving due consideration to safety, it is recommended that the manila ropes used in drilling operation must confirm to BIS-1084 : 1994. It has been reported by Indian rope manufacturers association that some of the oil mines are not using ISI mark Manila Ropes. On this subject. Bureau of Indian Standards have also advised oil companies to procure and use Manila Ropes only from the manufacturers who possess BIS licence.

It is requested that in the interest of quality and safety all Manila Ropes used for drilling operations should strictly confirm to BIS-1084 : 1994; such ropes shall be preferably procured from BIS licensees only.

(Cir. Tech. 6/1996)

NOTIFICATIONS & CIRCULARS

Notifications – 1995

New Delhi, 19th June, 1995

GSR 315 – The following draft of certain regulations further to amend the Oil Mines Regulations, 1984, which the Central Government proposes to make, in exercise of the powers conferred by Section 57 of the Mines Act, 1952 (35 of 1952), is hereby published as required by sub-section (1) of section 59 of the said Act, for information of all persons or organizations likely to be affected thereby, and notice is hereby given that the said draft will be taken into consideration after the expiry of a period of three months from the date of Gazette containing the publication of this notification is made available to the public;

Any objections or suggestions which may be received from any person or organization with respect to the said draft before the period specified above will be considered by the Central Government.

The Oil Mines (Amendment) Regulations, 1994.

1.(1) These regulations may be called the Oil Mines (Amendment) Regulations, 1994.

(2) They shall come into force on the date of their final publication in the Official Gazette.

In regulation 2 of the Oil Mines Regulations, 1994 (hereinafter referred to as the said regulations), (1) after clause (47), the following clause shall be inserted, namely:

“(47A) “Major accident” means an occurrence including in particular, a major emission or fire or explosion from uncontrolled developments in the course of exploration, production, storage, handling or transportation of petroleum or machinery or owing to natural events leading to serious effects (both immediate and delayed as well as inside or outside the installation) likely to cause substantial loss of life or property;”

2. In clause (52) for the words “and fire officer”, the words, “fire officer and surveyor” shall be substituted.

3. In regulation 7 of the said regulations, in sub-regulation (1) in clause, after item (v), the following item shall be inserted, namely:

“(vv) a major uncontrolled emission of petroleum;”

4. In regulation 9 of the said regulations, after sub-regulation (2), the following sub-regulations shall be inserted namely:

“(3)(a) The Regional Inspector may, by an order in writing, require such additional details to be shown on the plans required to be maintained under these regulations or the preparation and maintenance of such other plans and sections on such scale and showing such details within such time as he may specify in the order.

(b) The Regional Inspector may, by an order in writing, require the owner, agent or manager to submit to him within such time such plans and sections, or tracings thereof, as he may specify in the order.

(c) All plans and sections required to be maintained under these regulations or any orders made thereunder as well as all field books and as well as all field books and other notes used in preparation of such plans and sections shall be kept available for inspection in the office at the mine and a list thereof shall be also kept maintained in a bound paged book kept for the purpose.”

5. After regulation 9 of the said regulations, the following regulation shall be inserted, namely:

“9A. Preparation of plans, etc. by surveyor – (1) Every plan or section required to be maintained under these regulations or any orders made thereunder shall be prepared by or under the personal supervision of a surveyor and shall carry thereof a certificate by him to the effect that the plan or section or part thereof is correct and shall be signed and dated by the surveyor and countersigned and dated by the manager on every occasion that the plan or section is brought upto date.

(2) Every racing of a plan or section or of any part thereof shall bear a reference to the original plan or section from which it was copied and shall be certified thereon by the surveyor to be a true copy of the original plan or section”.

6. In regulation 51 of the said regulations (1) for sub-regulation (1), the following sub-regulation shall be substituted, namely:

“(1) When it is intended to construct any new group gathering station or carry out material alterations at any group gathering station, the owner, agent or manager shall, not less than 90 days before such construction or alteration commences, to give notice of such intention in Form VI of First Schedule to the Chief Inspector, Regional Inspector and District Magistrate. Every such notice shall be accompanied by two copies of an upto date plan of the proposed site of the group gathering station showing the name and location of any other group gathering station and all pipe lines lying within a radius of 500 metres therefrom, the name of each well connected to the station, the extent of the land over which right of user has been established and any railway, public road, public works, building any other surface feature lying within 60 metres of such installation:

Provided that where it is essential to carry out immediate alterations at any group gathering station in the interest of safety of the mine or of the persons employed therein, the provisions of this regulation shall be deemed to have been complied with if the said notice is given to the Regional Inspector as soon as the work for such alteration is commenced.

Provided further that n respect of a group gathering station where the quantity of petroleum gases or liquid stored or handled at a time, exceeds 300 tonnes and 1,00,000 tonnes respectively, the notice under this sub-regulation shall also be accompanied by a Safety Report in Form VII of the First Schedule. Once atleast every three years thereafter, or earlier if any material alterations are proposed, the Safety Report shall be reviewed in due regard to new technical knowledge or the likely consequences of proposed alterations which might have affected or might not affect the particulars in the previous report relating the safety and hazard assessment and a copy thereof submitted to the Chief Inspector, Regional Inspector and District Magistrate:

Provided also that in case of an existing group gathering station the abovementioned copies of the plan and the details required to be furnished in the notice and wherever applicable, in the Safety Report shall be submitted within six months and five years respectively of the coming into force of this regulation to the Chief Inspector, Regional Inspector and District Magistrate.”

(2) After sub-regulation (2), the following sub-regulation shall be inserted, namely:

“(3) When the group gathering station has been commissioned, the owner, agent or manager shall forthwith communicate the actual date of commissioning to the Chief Inspector, Regional Inspector and District Magistrate.”

7. After regulation 51 of the said regulations, the following regulations shall be inserted namely:

“51A. Preparation of emergency plan for group gathering station –

- (1) The manager of every mine in which any group gathering station is in operation shall, within 90 days of the coming into force of these regulations and in the case of a new station atleast 90 days before the anticipated date of commissioning thereof, prepare and submit a copy of the emergency plan to the Regional Inspector and District Magistrate and also put into effect emergency plan specifying –
 - (a) the action to be taken in the event of any major accident, including when and how the said action is to be taken;
 - (b) duties and responsibilities of each key personnel including measures to be adopted to avert or minimize the consequences of the emergency;
 - (c) alarm and communication system including the system of notifying the concerned authorities;
 - (d) equipment plan, namely, make, type, capacity, location, eld or operations and operating procedure; and
 - (e) plan for training of personnel and for mock-drills.
- (2) The manager shall review and if considered necessary, modify the emergency plan periodically, and in particular before any material alteration is carried out, and submit a copy thereof to the Regional Inspector and District Magistrate.
- (3) The Regional Inspector, may, by an order in writing require, at any time, any alteration to be carried out in the emergency plan.”

8. In regulation 61 of the said regulations, (1) for sub-regulation (1), the following sub-regulation shall be substituted, namely:

“(1) No new pipeline shall be laid not shall any significant alteration be carried out in any existing pipeline or system of pipelines except with the permission in writing of the Regional Inspector and in accordance with such conditions as he may specify therein. Every application for permission under this sub-regulation shall be submitted in Form VIII of the First Schedule to the Regional Inspector and a copy thereof shall also be sent to the Chief Inspector and the District Magistrate. The application shall be accompanied by two copies of an upto date plan of the area where the pipeline is proposed to be laid showing the extent of land over which right of user has been established and route of the pipeline clearly indicating the districts and states through which the pipeline would pass;

Provided that in case of an existing pipeline or system or pipelines the aforementioned copies of plan and the particulars required to be furnished in the application shall be submitted to the Chief Inspector, Regional Inspector and District Magistrate within six months of the coming into force of these regulations”.

(2) After sub-regulation (2), the following sub-regulation shall be inserted, namely:

“(3) When the pipeline has been commissioned, the owner, agent or manager shall forthwith communicate the actual date of commissioning to the Chief Inspector, Regional Inspector and District Magistrate.”

9. In regulation 78 of the said regulation (1) in sub-regulation (1), for the words, "air, gas or steam" the words "air, gas, petroleum or steam" shall be substituted.

(2) In sub-regulation (2), for the words "air receiver" the words "air receiver or container or separator used for storage of petroleum or gas or steam under pressure" shall be substituted.

(3) For sub-regulation (3), the following sub-regulation shall be substituted, namely:

"(3) Before an air receiver or a container containing petroleum or gas or steam is cased in or put in commission, a competent persons shall subject it to a hydraulic test at a pressure atleast one and half times of the maximum permissible working pressure. A similar test shall be made after every renewal or repair and in any case at intervals of not more than five years or at such shorter intervals as may be required by the Regional Inspector. The results of every such test shall be recorded in a bound paged book kept for the purpose and shall be signed and dated by the competent person carrying out the test and countersigned and dated by the manager."

10.(1) In the First Schedule to the said regulation for Form IVA, the following form shall be substituted, namely:

"FORM IVA"
(See regulation 7)

Notice of accident/occurrence

From

To

1. The Chief Inspector of Mines, Dhanbad-826001.
2. The Regional Inspector of Mines _____ Region _____.
3. The District Magistrate.
4. The Electrical Inspector of Mines (in case of electrical accident only), Dhanbad.

Sir,

I have to furnish the following particulars of a fatal accident/serious accident/dangerous occurrence/major accident which occurred at..... mine of(owner).

1. Particulars of the mine :

Situation of Mine	Name and postal address of owner (Also state telephone and telex numbers)
Village	
Post Office	
Police Station	
District	
State	
Place and location in mine (site) of Accident/ occurrence:	
Nature of operation undertaken at the place of accident/occurrence	

2. Particulars of the accident/occurrence :

- (a) Date, shift and hours of accident/occurrence:
- (b) Classification of accident/occurrence(**):
- (c) Cause, circumstances and description of accident occurrence:
(if cause not established information to be sent as soon as possible)

3. Nature and extent of damage

	Within the Establishment	Outside the Establishment
(i) Number of persons:		
- exposed to the accident/occurrence		
- killed		
- seriously injured		
- effected by gas		
(ii) Particulars of material damage		
(iii) State whether the danger is still present/ no longer exists.		

4. Particulars of injuries etc.

Name of person(s) (in block letters)	Nature of employment	Age	Sex	Nature of injury and if fatal, cause of death
Killed:				
1.				
2.				
3.				
Injured:				
1.				
2.				
3.				

5. Measures taken or envisaged -

- (i) to alleviate the effects of the accident/occurrence
 - (i) short term
 - (ii) medium or long term
- (ii) to prevent recurrence of similar accident/occurrence:

5. Any other relevant information Particulars in respect of every person killed or injured, in form IVB are enclosed/shall be forwarded within a week.

Yours faithfully,
Signature
Designation: Owner/Agent/Manager
Date:

INSTRUCTIONS

(**) Under one or other of the following heads, namely:

1. (a) Explosion or ignition of inflammable gas or liquid.
(b) Blow out
(c) Out break of fire.
 2. Hazardous emission of petroleum
 3. In drilling/workover rig
 4. Suffocation by gases
 5. Explosives
 6. Machinery
 7. Electricity
 8. Miscellaneous.
- Attach separate sheet, where necessary".

(2) After Form V, the following forms shall be added, namely:

FORM-VI
(See regulation 51)

Notice of construction of or alteration in a group gathering station:

From

.....

To

- 1) The Chief Inspector of Mines, Dhanbad-826001
- 2) The Regional Inspector of Mines
- 3) The District Magistrate.....

Sir,

I hereby give notice of our intention to construct a new group gathering station/carry out alterations in..... group gathering station and furnish the following particulars in that behalf.

- (a) name and address of the mine to which the group gathering station belongs:
- (b) name and address of the owner:
- (c) name and full address of the site of group gathering station:
- (d) date on which it is intended to commence the activity (or in case of an existing station, date of commissioning thereof):
- (e) information relating to the site, namely:
 - (i) area of site covered by the group gathering station:
 - (ii) name, location and maximum quantity of petroleum (gas/liquid) likely to be on the site:
 - (iii) constructional details of the installation and description of the process of storage/handling of petroleum (in case of alteration details thereof):
- (f) organizational structure for the proposed activity and set up for ensuring occupational safety and health and for testing, maintenance and patrolling of the installations and safety gadgets:
- (g) information relating to the potential for major accidents (viz. fire, explosion, bursting or failure of equipment, hazardous escape and accumulation of flammable substances etc.) namely:
 - (i) identification of major accident hazard;
 - (ii) conditions or events which could be significant in causing a major accident;
 - (iii) brief description of the measures taken to prevent any major accident and to limit the consequences thereof;
 - (iv) area likely to be affected by any major accident and population distribution therein:
 - (v) maximum number of persons likely to be present at any time on the site and of whom the number likely to be exposed;
- (h) arrangement for training of persons working on site and equipment necessary to ensure their safety;
- (i) providing to persons off the site who are likely to be in an area liable to be affected by any major accident, with the information about the adopted nature of hazard and measures which should be in the event of an emergency arising therefrom;
- (j) any other relevant information:

Signature:

Designation : Owner/Agent/Management

Date:

FORM VII
(See Regulation 51)

SAFETY REPORT

From

.....

To

- 1) The Chief Inspector of Mines, Dhanbad-826001
- 2) The Regional Inspector of Mines
- 3) The District Magistrate.....

Sir,

I have to furnish the following particulars in respect of group gathering station:

1. The name and address of
 - (a) mine
 - (b) owner
 - (c) group gathering station
2. Description of the installation, namely:
 - (a) site
 - (b) construction design
 - (c) identification of hazardous areas and safety distances
 - (d) accessibility of plant
 - (e) maximum number of persons working on the site and particularly of those persons exposed to the hazard.
3. Description of the processes, namely:
 - (a) technical purpose of the activity
 - (b) basic principles of the technological process
 - (c) process and safety-related data for the individual process stages
 - (d) process description
 - (e) safety related types of utilities
4. Description of the hazardous substances namely:
 - (a) quantities, substance data, safety-related data, toxicological data and threshold values.
 - (b) The form in which the hazardous substance may occur on or into which it may be transformed in the event of the abnormal conditions.
 - (c) The degree of purity of the hazardous substance.
5. Information on the preliminary hazard analysis, namely:
 - (a) types of accident
 - (b) system elements or event that can lead to a major accident
 - (c) hazards
 - (d) safety-related components
6. Description of safety relevant units, amongst others:
 - (a) special design criteria
 - (b) controls and alarms
 - (c) special relief systems
 - (d) quick-acting valves
 - (e) collecting tanks/dump tank
 - (f) sprinkler system
 - (g) fire-fighting etc.
7. Information on the hazard assessment, namely:
 - (a) identification of hazards
 - (b) the causes of major accidents
 - (c) assessment of hazards according to their occurrence frequency

- (d) assessment of accident consequences
- (e) safety systems
- (f) known accident history
- 8. Description of information on organizational system used to carry on the activity safely, namely:
 - (a) maintenance and inspection schedules
 - (b) guidelines for the training of personnel
 - (c) allocation and delegation of duties for plant safety
 - (d) implementation of safety procedures.
- 9. Information on assessment of the consequences of major accidents, namely:
 - (a) assessment of the possible release of petroleum
 - (b) possible dispersion of released petroleum
 - (c) assessment of the effects of the releases (size of the affected area, health effects, property damage).
- 10. Information on the mitigation of major accidents, namely:
 - (a) fire brigade
 - (b) alarm system
 - (c) emergency plan containing system of organization used for fight the emergency, the alarm and the communication routes, guidelines for fighting the emergency, information about hazardous chemicals, examples of possible accident sequences
 - (d) coordination with the district emergency authority and its off-site emergency plan
 - (e) notification of the nature and scope of the hazard in the event of an accident
 - (f) antidotes, if any, in the event of a release of a hazardous chemical.
- 11. Any other information considered relevant.

Signature:

Designation: Owner/Agent/Manager

Date:

FORM-VIII
(See Regulation 61)

Permission for laying a new pipeline or making any significant alteration in existing pipeline

From

To

The Regional Inspector of Mines
..... Region, ...

Sir,

I hereby submit my application for permission for laying pipeline/carrying out significant alteration(s) in pipeline and furnish the following particulars in that behalf:

- (a) name and address of the mine to which the pipeline belongs
- (b) name and address of the owner
- (c) full postal address of the places where the pipeline would originate and terminate as also of the places from where the pipeline activities would be controlled
- (d) constructional details of proposed pipeline including all associated works and apparatus
- (e) diameter and length of the pipeline and maximum quantity of petroleum gas or liquid likely to be contained therein at any time and transported on any day
- (f) normal operating pressure and the pressure for which the pipeline is designed
- (g) anticipated date scheme of commissioning of the pipeline activity
- (h) organizational structure for the proposed activity and set up for ensuring occupational safety and health including testing, maintenance and patrolling of the pipeline and safety gadget
- (i) provision proposed to be made or steps proposed to be taken for –
 - (i) protection against uncontrolled escape of fluids from the pipeline

- (ii) prevention and control of fire or explosion or major emission of petroleum and limiting consequences thereof.
- (iii) providing to the persons working on the site with the information, training and equipment required to ensure their safety; and
- (iv) providing to persons off the site who are likely to be in an area liable to be affected by any major accident, with the information about the nature of hazard and measures which should be adopted in the event of an emergency arising therefrom.
- (j) any other relevant information.

Signature:

Designation: Owner/Agent/Manager

11. In Second Schedule to the said regulations, in the form for hot work permit, for the words and figure "(see regulation 70)", the words and figures "(see regulation 69)" shall be substituted.

[File No.S-65012/1/90-ISH.II]
RK Rang, Deputy Secretary.

New Delhi, the 28th September, 1995

S.O. 2794 – In exercise of the powers conferred by sub-section (1) of section 5 of the Mines Act, 1952 (35 of 1952) the Central Government hereby appoints Shri GL Kanta Rao as Inspector of Mines subordinate to the Chief Inspector of Mines, until further orders.

[No.A.12025/8/91-ISH.I/II]
Ms. Upma Srivastava, Under Secretary.

New Delhi, the 17th October, 1995

S.O. 841(E) – Whereas accidents have occurred in the collieries of Bharat Coking Coal Limited, more particularly, in the collieries of Gasitand, Bera, Katras Choitudih and South Gobindpur, in District Dhanbad of Bihar State, on 26th and 27th September, 1995, causing loss of lives;

And whereas the Central Government is of opinion that formal inquiry into the causes and the circumstances attending the accidents to be held;

Now, therefore, in exercise of the powers conferred by sub-section (1) of Section 24 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints, Justice SK Mukherjee, 1, Grand Trunk Road, Lukergunj, Allahabad-1 (UP), Retired Judge of the Patna High Court to hold such inquiry and present a report within a period of three months. The Central Government also appoints the following persons as assessors in holding of the inquiry, namely:

1. Prof. BK Mozumdar
Prof. Of Mining
Indian School of Mines
Dhanbad-826004 (Bihar)
2. Shri Rajinder Singh
General Secretary
Rashtriya Colliery Mazdoor Sangh
Dhori Area, 5, Chajju Bagh
Patna-800001

[File No.N-11015/1/95/ISH.II]
R.K. Saini, Joint Secretary.

Notifications – 1996

New Delhi, the 19th January, 1996

S.O. 57(E) – Whereas the Government of India in the Ministry of Labour, in their notification No.S.O. 841(E) dated 17.10.95 appointed Hon'ble Justice SK Mukherjee, 1, Grant Trunk Road, Lukergunj, Allahabad-1 (UP) formerly Judge of the Patna High Court to hold a formal inquiry into the causes and circumstances attending the accidents that occurred in the collieries of Bharat Coking Coal Limited more particularly in Gaslitand, Bera, Katras Choitudih and South Gobindpur, in District Dhanbad of Bihar State, on 26th and 27th September, 1995, causing loss of lives and present a report within a period of three months.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented;

Now, therefore, the Central Government do hereby extend this duration for a further period of six months from the date of issue of this notification; and, accordingly the period of appointment of Hon'ble Justice SK Mukherjee, to conduct the inquiry and present the report and the period of appointment of Prof. BK Mozumdar, Prof. Of Mining, Indian School of Mines, Dhanbad-826004 (Bihar) and Shri Rajinder Singh, General Secretary, Rashtriya Colliery Mazdoor Sangh, Dhori Area, 5, Chajju Bagh, Patna-800001, assessors is also extended for a further period of six months from the date of issue of this notification.

[File No.N-11015/1/95/ISH.II]
SK Sinha, Deputy Secretary.

New Delhi, the 20th February, 1996

No.A-32012/3/93/ISH.I – The President is pleased to appoint the following officers to the post of Deputy Director General of Mines Safety (Mining) in the Directorate General of Mines Safety, Dhanbad, with effect from the dates indicated against their names until further orders:

1. Shri V. Mahajan – 18.1.1994 (F/N)
2. Shri SC Batra - 17.1.1994 (F/N)

Ms. Upma Srivastava, Under Secretary

No.A-32012/2/95/ISH.II – The President is pleased to appoint Shri A. Bandhopadhyay, Director of Mines Safety (Electrical), to the post of Deputy Director General of Mines Safety (Electrical) in the Directorate General of Mines Safety, Dhanbad, in an officiating capacity w.e.f. the forenoon of 8th December, 1995, until further orders.

Ms. Upma Srivastava, Under Secretary

New Delhi, 22nd February, 1996

No.A-32012/1/94/ISH.I/II – The President is pleased to appoint the following officers to the post of Deputy Director General of Mines Safety (Mining) in the Directorate General of Mines Safety, Dhanbad, with effect from the dates indicated against their names until further orders:

1. Shri DN Prasad – 18.1.1994 (F/N)
2. Shri AK Dey - 18.12.95 (F/N)
3. Shri SN Padhi - 21.12.95 (F/N)
4. Shri RL Arora - 11.12.95 (F/N)
5. Shri PK Singh - 11.12.95 (F/N)

Ms. Upma Srivastava, Under Secretary

New Delhi, the 4th March, 1996

No.A-32012/4/95/ISH.I/II – The President is pleased to appoint Shri V. Mahajan, to the post of Director-General of Mines Safety in the Directorate-General of Mines Safety, Dhanbad with effect from the afternoon of 1st February, 1996, until further orders.

Ms. Upma Srivastava, Under Secretary

New Delhi, the 3rd July, 1996

S.O. 2199 – In exercise of the powers conferred by sub-section (1) of section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Subir Kumar Thakur as Inspector of Mines subordinate to the Chief Inspector of Mines, until further orders.

[No.A.12025/8/91-ISH.I/II]

Ms. Upma Srivastava, Under Secretary.

CIRCULARS - 1995

DGMS(Tech) Circular No.1 of 1995

Dhanbad, dated 17.2.95.

To
The Owners/Agent/Manager
of all opencast mines.

Sub: Danger due to lighting/storm during blasting operation in mines

Recently, three accidents took place due to premature blasting by lightning when persons were killed/injured/escaped while they were in the process of charging explosives/connecting detonators etc. The accidents occurred as mentioned below :

- (1) While nine deep holes and a number of secondary holes were being charged to be connected in series and fired, a lightning discharge due to thunder storm caused premature firing of the deep holes, killed three persons and inflicting serious bodily injuries to one.
- (2) While a Blaster was carrying 100 primed cartridges of explosives with electric detonators in a card board box on his shoulder, the cartridges exploded suddenly resulting in instant death of the Blaster.
- (3) While a Blaster and his helpers, after charging of the holes were about to take shelter, suddenly there was a lightning/thunder storm resulting in premature blast of the holes. Persons escaped unhurt.

Accidents due to above causes continue to occur despite very clear safety precautions laid down while granting permission under Regulation 106(2)(b) of Metalliferous Mines Regulations, 1961 and Regulation 98 of Coal Mines Regulations, 1957 and also Circulars issued by DGMS recommending additional precautions to prevent such accidents. These precautions in brief are given below :

- (i) Shots shall not be fired except during the hours of day light or until adequate artificial light is provided. All holes charged on any one day shall be fired on the same day, as far as practicable.
- (ii) As far as practicable the shot firing shall be carried out either between shifts or during the rest interval or at the end of work for the day.

During the approach and progress of an electric storm, the following precautions shall be taken :

- (a) Neither explosives nor detonators shall be handled;
- (b) If charging operations have been commenced, the work shall be discontinued until the storm has passed;
- (c) If the blasting is to be fired electrically, all exposed wires shall be coiled up and if possible placed in the mouth of the holes or kept covered by something other than a metal plates;
- (d) All wires shall be removed from contact with the steel rails of a haulage track, so as to prevent the charge being exploded prematurely by a local strike of the lightning;
- (e) If the firing circuit has been set up before the thunder storm came on, the persons at the site should withdraw at the earliest and the blast should be fire off immediately;
- (f) All the persons shall be withdrawn from the danger zone.

DGMS (Tech) Circular No.2 of 1995

Dhanbad, dated 26.4.95

To
The Owners, Agents and Managers
of all coal mines.

Sub: Fatal accidents caused by wheeled trackless transportation machinery during the year 1993.

During the last few years fatal accidents have shown an increasing trend in opencast mines. A large number of these accidents are caused by wheeled trackless transportation machinery. An analysis of the fatal accidents due to wheeled trackless transportation machinery in opencast coal mines during the year 1993 showed that :

1. 13.46% of all fatal accidents in coal mines were caused by wheeled trackless transportation machinery. This cause contributed to 38.18% of all fatal accidents in opencast and surface operations.
2. 62% of the accidents by wheeled trackless transportation machinery were caused by trucks.
3. Unauthorised /negligent driving caused 38% of the accidents.
4. 43% of the accidents took place on haul roads or quarry operation areas, 28% occurred at other transportation roads and 19% of the accidents were at or near dumper/truck maintenance workshops. The remaining 10% of the accidents took place in OB dump yard.
5. Reversing of vehicles caused 23% of all the fatal accidents.
6. 33% of the accidents occurred beyond daylight hours.
7. 47.6% of the victims were contractors' workers.
8. In 24% of the cases the victims were not vocationally trained and all of them were employed by contractors.
9. 22.7% of the victims were drivers of the vehicle by which the accidents were caused. 27.3% of the victims were helpers/khalasi of the vehicles. In 9% cases supervisors were involved and in rest of the cases other categories of workers became victims. In quite a few cases fatalities occurred while boarding or alighting from running vehicles by khalasis/helpers.

Finding of the analysis reveal that though attention has been drawn time and again regarding the unsafe acts and practices leading to fatalities, similar accidents continue to occur year after year. To control and minimize accidents due to this cause the following steps shall be taken immediately:

- (a) Recommendations of Seventh Conference on Safety in Mines (1988) regarding "Safety in Opencast Mines" and recommendations of the Eighth Conference on Safety in Mines (1993) regarding "Safety in Opencast and Surface Operations" should be implemented without any further delay.

- (b) DGMS(Tech)(SAPICOM) Circular No.4 of 1993 on the same subject should also be followed strictly.
- (c) Strict supervision should be exercised to prevent unauthorized and negligent driving and sleeping of persons in the mine.
- (d) The quarry as well as haul roads and dump sites should be well illuminated and survey should be done at regular intervals and a plan should be maintained.

DGMS(Tech)(SAPICOM) Circular No.3 of 1995

Dhanbad, Dated 4.12.95

To
The Owners, Agents & Managers of all Coal Mines.

Sub: Fatal accidents caused by fall of roof in underground coal mines

Fall of roof is still the preponderant cause of fatalities in belowground coal mines. In spite of considerable advances made in the area of roof-support, accidents due to fall of roof keep on posing serious threat to the life and safety of persons working belowground. In order to gain meaningful insight into the incidents of fatal accidents caused by fall of roof in Indian coal mines during the year 1993 an exercise was undertaken in this Directorate. Some of the findings are given below:

- (i) In the year 1993, there were 47 fatal accidents killing 54 persons due to fall of roof in underground coal mines.
- (ii) Roof fall accounted for 30.13% of all fatal accidents in coal mines and it contributed 46.53% of all fatal accidents in belowground operations.
- (iii) 55% of the fatal accidents due to fall of roof were in depillaring districts and 38% took place in development areas.
- (iv) 34% of the accidents took place within one hour of blasting and 10.64% of the accidents occurred within 2 hours of blasting. In development districts 55.5% of the accidents occurred within 1 hour of blasting.
- (v) In all, 61.7% of the cases took place within 10 m. of faces. In case of accidents due to roof fall in development districts 77.8% of the cases occurred within 10 m. of the faces and in depillaring districts the same figure was 58%.
- (vi) As far as the type of roof which fell causing fatal accidents are concerned, all types of roof were found involved as would be seen from the following figures:

Type of strata that fell	% of accidents
Sandstone	34
Coal	31.9
Shale	23.4
Others	10.7

- (vii) In 62% of the cases conventional timber support was used. In 8% of the cases roof bolts were in use but these were either inadequate or not correctly installed.
- (viii) It was also revealed that in 34% of the cases supports provided were inadequate, in 21.3% of the case the supports got dislodged after blasting and in 19% cases supports were not provided at all.

Findings of the analysis reveal that though attention has been drawn time and again towards unsafe acts and practices leading to fatalities, similar accidents continue to occur year after year. To control and minimize accidents due to fall of roof in underground coal mines, the following steps shall be taken immediately.

- (a) Recommendation of the Eighth Conference on Safety in Mines regarding prevention of accidents in coal mines due to fall of roof should be implemented strictly without further delay. [see DGMS(Tech) Circular No.2 of 1993]

- (b) DGMS(Tech)(SAPICOM) Circular No.3 of 1993 elaborates guidelines for preparation of support plan. The recommendations made in the circular, if implemented will go a long way in curbing roof fall accidents.
- (c) Some of the accidents took place following dislodgment of supports, improper installation of roof-bolts etc. These reiterate the need for proper use of support material of adequate strength and proper installation of the same. In case of roof bolts, proper type of grout should be used so that the roof bolt developed an anchorage of atleast 3 tonnes within 30 mins. of grouting. Adequate infrastructure facilities should be provided to test atleast 10% of the roof bolts installed and to impart training and retraining of support personnel based on the roof-bolting records. Your attention towards DGMS(Tech)(SAPICOM) Circular No.6 of 1994 in this regard.
- (d) A number of accident occurred inside goaves or at places where the workmen had no business to be present. These accidents also revealed that fencings wherever required were not erected as per requirement of statute. Strict vigil on correct erection and maintenance of fences should be maintained so that these types of failures are avoided in future.

DGMS (Tech) Circular No.4 of 1995

Dhanbad, dated 31.12.95

To,
The Owners, Agents and Managers
of all Coal Mines.

Sub: Prevention of accidents due to explosions in Coal Mines

A study of explosions/ignitions that occurred in coal mines during the last 20 years has revealed that the source of ignition originated from the electrical equipment. The different courts of enquiry set up after the occurrences highlighted over and again the importance of a programme in inspections at regular intervals to ensure installation and proper maintenance of approved type of equipment and maintenance of essential safety features (viz. intrinsic safety/FLP) in good order.

The inspections of mines made by the officers of the Directorate during the last few months however have revealed that approved types of equipment are not being used always in underground mines and the standard of maintenance of safety features in the electrical equipment is not very satisfactory.

You are requested to organize a special drive in your underground mines to identify any contravention in respect of use of different equipment and accessories, standard of maintenance of safety features in electrical equipment being used and take suitable remedial measures. Proper systems for inspection of all electrical equipment and schedules for maintenance are also required to be formulated and enforced. A minewise report may be sent to this Directorate by 15th February, 1996.

No. DGMS(Genl) Circular No. 1 of 1995

Dhanbad, dated 10.4.95

To
The Owners, Agents & Managers
of all Mines.

Number of complaints have been received in this Directorate regarding the use of sub-standard and ineffective type of dust respirators, not conforming to BIS specification (IS:9473-1980) in mines. It is therefore, considered necessary to include the dust respirator in the approved list of the Mines Safety Equipments/Materials of this Directorate.

Thus, in supersession of DGMS (Genl) Circular NO.1 of 1994 dated 21.9.94 regarding 'type of dust respirators for use in mines', it has been decided that dust respirators manufactured as per

BIS specification (IS:9473-1980) and approved by this Directorate shall only be considered suitable for use in mines under Regulation 125(4) of the Coal Mines Regulations, 1957 and Regulation 124(4) of the Metalliferous Mines Regulations, 1961.

No. DGMS(Genl) Circular No. 2 of 1995

Dhanbad, dated 11.8.95

To
The Owners, Agents and Managers of all Mines.

Sub: Winding up of National Council for Safety in Mines, Dhanbad.

It is brought to your notice that National Council for Safety in Mines, Dhanbad, an autonomous body under the Ministry of Labour has been wound up with effect from 15.05.91.

You are requested to bring it to the notice of all concerned. No further correspondence may please be addressed to the Council.

CIRCULARS - 1996

DGMS (Tech) Circular No.1 of 1996

Dhanbad, Dated 31.1.1996

To
Owners/Agents/Managers of all
Coal Mines.

Sub: Use of high pressure hydraulic hose in underground coal mines.

Your attention is invited to this Directorate circulars viz DGMS (Tech) circular no.4 of 1990 and No.1 of 1991, where it was recommended that the hydraulic hoses used in underground coal mines shall conform to specification No,NCB 174 of 1973 and end fitting as per NCB no., 638 of 1978.

As the aforesaid hose standard has been revised, it is recommended that now hydraulic hoses shall conform to specification No.BS: 174 of 1992 and end fittings of 638 of 1978.

It is further recommended that before use of such hoses, user shall ensure that hoses has undergone following tests as per requirement of aforesaid standards. The testing shall be done at Govt./ recognized test hoses for the items 1 to 6 as indicated against each test. For the rest items the test facilities shall be available at manufacturer's works and tests shall be conducted there.

1.	Pressure impulse test-	P & D Center ., Ministry of Defence, Dighi,Pune or any other recognized testing laboratory mutually agreed between the use indirectly and manufacturer.
2.	Ozone resistance test-	Automotive Research Association of India (A CSIR unit) Pune or any other recognized testing laboratoru mutually agreed between the user industry and manufacturer.
3.	Hydrostatic stability and Burst pressure-	-do-
4.	Cold flexibility test-	-do-
5.	Fire resistant tests-	Central Mining Research Institute, Dhanbad.
6.	Electrical Resistance-	-do-
7.	Adhesion-	Facilities to be available with the manufacturer.
8.	Resistance to oil Ommersion-	-do-
9.	Tensile strees and strain	-do-

10.	Hydrostatic proof pressure-	-do-
11.	Abrasion resistance-	-do-
12.	Adhesion between components-	-do-

Any marking on the hose also should be as per BS: 174 :1992, however, as the hose is not covered under the approval list of DGMS so far, stamping of any approval No. on hose is not considered mandatory.

For proper quality control of the hoses supplied by the manufacturers, user industry must ensure that manufacturer have adequate manufacturing and testing facility at their works. The manufacturer must supply proper test certificate of the hoses with each lot.

It is expected that these points will be taken care of in the interest of safety as well as performance.

No.DGMS (Tech) Circular No.2 of 1996

Dhanbad, Dated 9.7.96

To
The owner(s)/Agent(s)/ Manager(s)
of all U/G Coal & Non Coal Mines.

Sub: Replacement of worn out shackle Pins of C.S. Gear in use.

Dear Sir,

It has been reported from some of the field offices of this directorate that at times the worn out pins of Shackle assembly of C.S. Gears are being replaced by pins manufactured by unapproved manufacturers. This may lead to failure of C.S gear as the replaced parts may not be properly forged/heat treated or the material of such may not be suitable for the purpose.

In the meeting of Chief Engineers of various mining companies and D.G.M.S. held on 9.2.96, it was decided to use only approved types of pins at the time of replacement. Please ensure that at the time of procurement of C.S. Gear sets from any approved manufacturer, some spare pins shall also be procured from the same manufacturer so that at the time of replacement, proper Type of pins are used.

The above recommendation may be implemented with immediate effect in interest of safety in mines.

DGMS (Tech) (S&T) Circular No. 3 of 1996 .

Dhanbad, dated 7.8.1996

To
The Owner, Agent and Manager
of all coal mines

Sub: Accidents due to fall of roof in coal mines - Causes and prevention.

Accidents due to movement of strata has been, and is, the major concern of mining engineers as withdrawal of natural support is a logical sequel to the process of mineral exploitation in underground. Over the years, compiled statistics of accidents in Indian coal mines identified the major cause of mine accidents as " fall of roof " .

In 1980, the fifth conference on safety in mines reviewed some of the developments in support technology and emphasized the need for further work in this direction. The sixth conference on safety in mines (1986) made some pioneering recommendations as regards to 'Accidents due to fall of roof & sides' and suggested some basic changes in the process of formulation of

support plan, which were duly followed up by seventh conference on safety in mines (1988). The eighth conference on safety in mines (1993) made some vital recommendations regarding the use of Rock Mass Rating in formulating support design and adoption of roof bolting as a method of support.

The Coal Mines Regulations were amended in 1990, to provide statutory backing to the recommendations of the sixth conference on safety in mines. As per the amended provisions of Reg.108 of CMR'1957, the manager of every mine is required to frame and enforce systematic support rules for supporting, amongst others, the roof within 10 m of working faces with due regard to the physico-mechanical properties of strata, local geological conditions, system of work, mechanization and past experience. Regulation 109 and 110 of CMR.1957 were also amended to take care, inter-alia of different types of steel supports being introduced to replace traditional timber support. In this connection, Technical Circulars [DGMS (Tech.) (SAPICOM) Cir, No.3 of 1993, Circular No.6 of 1994 and Circular No.3 of 1995] were issued concerning the methodology of support design, use of roof bolts in coal mines and fatal accidents in underground coal mines respectively.

1.0 ACCIDENTS DUE TO STRATA MOVEMENT- A REVIEW

Statistics of accidents due to movement of strata has been sending warning signals to all concerned for quite some time. In coal mines, as many as 10 recorded disasters (about 20% of the total) involving 140 deaths caused by the movement of strata. The trend analysis of accidents in last ten years points to the fact that "fall of roof" continues to be the predominant cause of fatal accidents in underground coal mines.

A critical analysis of the different aspects of roof fall accidents spanning a period of four years (1992-95) has revealed many interesting details relating to the event :

- ⇒ A substantial percentage of accidents (34% to 43%) occurred involving 'coal' roof.
- ⇒ Thickness of fall in 70% to 85 % cases was less than 0.5 m.
- ⇒ Roof bolting was not practiced generally, even in coal roof (only about 13 % coal roof was supported by bolting).

A sample analysis of accidents for the period from 1992 to 1995, where roof bolting were used as primary means of support, revealed that:

- Support by roof bolting was either inadequate or got dislodged / was not provided at all.
- In most of the cases, accidents were caused due to "systems failure".

2.0 SUPPORT APPRAISAL IN BORD AND PILLAR WORKING IN COAL MINES

With the advent of modern coal mining techniques associated with increased mechanization or solid blasting, it has become imperative to adopt 'Roof bolting' as a primary means of support in place of traditional timber supports which act as a hindrance for achieving higher productivity, apart from economic and socio-ecological considerations. The fusion of this state-of-art support technique vis-à-vis methodology of mining in underground coal mines started only a decade back and the process of assimilation is still not complete as yet.

2.1 In this back-drop, an accident took place in a coal mine in 1990 (where cable bolts were used as an exclusive means of support in a development area) killing four persons. This accident jolted the all concerned associated with the introduction of this new system of support. The observations at the site of accident revealed that :

- ◇ Support was not provided in a systematic manner.
- ◇ Support density was not adequate .
- ◇ Holes drilled for installation of cable bolts were of 1.0 m deep.
- ◇ Cable bolts were not grouted for the full column in cement and sand mixture.
- ◇ No anchorage tests were carried out to ascertain the efficacy of installed cable/rope bolts.
- ◇ No study on strata movement monitoring conducted.

2.2 In the light of this unfortunate occurrence, it was thought appropriate to carry out an appraisal of support system where roof bolts were in use as principal means of support, encompassing a broad spectrum of geo-mining conditions and an array of work systems, to identify the gray areas required to be atoned. In 1991 , a study was undertaken in coal mines to look into the details of (a) formulation of support system and (b) strata and support behavior monitoring. The finding of the study covering 15 mines of 5 different coal companies were summarized as follows :

(a) Roof bolting was applied in most of the mines without assessing the support requirement on the basis of RMR, leading to either under designing or over designing of support system.

(b) Monitoring of support performance did not receive due attention. In all the cases, the percentage testing of bolts for their anchorage capacity was far below than the required 10%, recommended by the expert committee.

(c) Records of such limited number of testing carried out were not even maintained in proper manner.

(d) The monitoring of strata behavior was literally non-existent .

To sum up, it could be inferred from the study that the progress or absorption of 'Roof Bolting systems designed on the basis of RMR' in Indian underground environment was poor and incomplete largely due to lack of a comprehensive approach. This gross deficiency may have serious consequences from the point of view of safety.

Efforts were made to correct the various imbalances but without much success.

2.3 In 1996, a roof fall accident took place in the development district of a coal mine killing four persons and seriously injuring five .In this district roof bolting was used as primary means of support. An investigation was conducted to ascertain the efficacy of support system in the development district of the mine where accident took place. The investigations revealed that :

(i) Assessment of installed support system : Support of roof in the galleries and at the junction (accident site) was grossly deficient. Only about 25% and 15% support was provided at galleries and junction, respectively.

(ii) Support accessories : 15 mm dia. roof bolt rods were used in place of 20-22 mm diameter M.S/Tor steel rods. The hole diameter was 20-22 mm larger than the bolt's diameter whereas the said value should be between 8-12 mm. This larger annular space in the hole may cause increase in grout consumption and 'Sheath effect' i.e. poor mixing of the grout constituent resulting in 'poor' anchorage.

(iii) Cement Capsules : The infrastructure provided for the manufacture of the cement capsule was not adequate. There was no mechanism to monitor the quality control aspects of the (a) ingredients/chemicals used in the capsules and (b) prepared cement capsules. It was revealed that :

- * The mixing operation was not generally supervised by skilled / experienced person .
- * Identification number(s) was/were not given to prepared cement capsules .
- * No record what so ever detailing the composition of the manufactured cement capsules was maintained.

(iv) Installation of roof bolts : The roof bolts were not installed in a systematic manner. The spacing between the holes in a row and the distance between rows were not maintained; Moreover, the holes were drilled in different direction with widely varied angle of inclination. Bearing plates were also not provided in the roof bolts.

As far as systematic installation of roof bolts was concerned , the enquiry revealed a distinct lack of understanding on the part of management (local mine operators) & supervisors. The level of awareness amongst them about the provisions of DGMS Circulars, concerning use of roof bolts in coal mines was dismal . Proper training was also not given by the management to the officers / supervisors, before and during the introduction of roof support by bolting, in the mine. The details of installation of roof bolts were not entered in the daily report book maintained by the supervisors of the shift concerned and no effort was made on the part of management to introduce a system of recording and monitoring, in this regard.

2.4 Assessment of roof bolting system : As a part of the study, laboratory and field tests were carried out ,whose findings are summarized below:

- At the accident site (Junction of 6th D/R & 8th level), the results of testing point to the fact that although the bolts had a setting time of more than 72 hours, the anchorage capacity varied widely between 0.0 tonne and 5.4 tonnes. Further field tests conducted in the development district of the mine revealed that:

- No anchorage development after 2 hours setting (old seized capsules) with 15 mm diameter roof bolts.

- Anchorage developed after 2 hours, 8 hours & more than 24 hours setting (new cement capsules) with 22 mm diameter roof bolts, were of the order of 1.0 T, 2.5 T and 6.0 T only.

Apart from the above, collected samples of cement capsules & roof bolts (15 mm dia) were sent to an approved Rock Mechanics Laboratory for ascertaining their efficacy as support material. The results of the said test revealed that the anchorage developed after 2 hours & 8 hours setting was of the order of 0.0 T & 0.25 T, respectively.

2.5 Monitoring of roof bolts : Only one anchorage testing machine was available for testing of installed bolts in three different districts of three different pits which was totally inadequate to meet the standards of testing as envisaged in DGMS(Tech)(SAPICOM) Circular No.3 of 1993. About 2.5% installed bolts could be tested for ascertaining their anchorage capacity and a maximum 5 tonnes load was applied during testing. The records of such tests were not maintained in proper format resulting in loss of many valuable information required for carrying out an analysis on the performance of the support system and adoption of corrective measures, if needed. Proper training was also not imparted to the officers / supervisors, incharge of testing operations, on systematic monitoring of roof bolts.

2.6 Strata behavior monitoring : No study was conducted by the management to monitor the behavior of roof rock supported by bolts, as envisaged in DGMS (Tech)(SAPICOM) Circular No.3 of 1993.

3.0 RECOMMENDATIONS

A review of roof bolting practices have revealed that although bolting was used as primary means of support in some selected coal mines , proper attention was not given as regards to design, installation and monitoring procedure of roof bolts and thereby jeopardizing the safety of workpersons. Keeping in view the guidelines contained in DGMS(Tech)(SAPICOM) Circular No. 3 of 1993 , Circular No.6 of 1994 and Circular No.3 of 1995 read with Reg.108 & 109 of CMR'1957 the following steps may be taken to effect qualitative improvement in the existing scenario.

3.1 System's approach : An integrated systems approach to develop the support design and implement it in the mine in the form of an action plan (annexure- I) for coal Mines, is suggested.

3.2 Design of roof bolting system : The assessment of support requirement should be done on the basis of Geo-mechanics classification approach, as recommended vide DGMS (Tech) (SAPICOM) Circular no .3 of 1993, for particular geo-mining condition. Whenever changes are proposed in roadway dimensions or methods of working, or where geo-technical conditions changes, further design verification by fresh RMR studies needs to be carried out to assess the continued validity of the design.

3.3 Support materials : The following materials should only be used.

3.3.1 Roof Bolts

Material : Tor-steel/M.S. (IS: 1786-1985/IS:226/IS:1570)
Rod length : 1.5 m
Rod Diameter : 20-22 mm (ribbed bar)
Length of the thread : 125-150 mm

3.3.2 Bearing plate (IS : 226-1975)

Material : MS
Size : 150 mm sq. or equivalent
Thickness : 6 mm

3.3.3 Nut (IS : 1363, Part-3, 1984)

Shape : Hexagonal
Height : 20 mm

3.3.4 Cement capsules

Length : Not exceeding 400mm
Diameter : 30-32 mm
Type : Quick setting (the grout should provide a minimum anchorage of 3T after 30 minutes, and 5T after two hours of setting.)

3.3.5 General requirements :

- (b) Roof Bolts shall be commercially straight, sound and free from harmful surface defects.
- (c) Thread in the bolts shall be preferably be rolled so that the strength of the bolt is not reduced.
- (d) The threads on bolts and nuts shall conform to tolerance class of 8g and 7 H respectively (IS : 4218-1967).
- (e) (Nut shall be compatible with bolt.
- (f) Threads of the bolts shall be kept lubricated and suitably protected.
- (g) Bolts/capsules shall be marked with the following information at visible places :

- (i) Manufacturer's name
- (ii) Dia. of the bolt/capsule
- (iii) Length of the bolt/capsule

(g) Packing :

- (i) Bolts shall be packed in cleaned condition
- (ii) The cement capsules shall be packed suitably with batch no., month of manufacture etc., so that they are not damaged during transit.

- (h) Quality control : Strict quality control shall be exercised during manufacture of the cement capsules/roof bolts. The manufacture of cement capsules/ roof bolts should be batch tested before packing & dispatch.

3.4 Installation of roof bolts : Roof bolts should be installed, as soon as the roof has been exposed, incorporating following steps, under the direct supervision of an Under Manager/Overman.

3.4.1 Drilling of holes : As per design, the holes should be drilled to the correct diameter and length, with a suitable drill. The hole diameter should not be more than 8 mm to 12 mm larger than the bolt diameter, for full column cement grouted bolts. Due care should be taken to maintain the verticality/inclination of the holes.

3.4.2 Grouting of roof bolts : Where fast and slow bonding materials are used together (i.e. in case of pre-tensioned grouted bolts) it should be ensured that fast capsules are inserted first.

All operations shall be carried out under supported roof (temporary support).

The following steps in sequential order shall be taken to install the roof bolts.

- (a) Soak the cement capsules (quick setting type) in water and allow it to absorb water until the bubbling ceases.
- (b) Remove the capsules from water and insert into the bore hole. Push the capsule to the end of the bore hole.
- (c) Tamper firmly with a stemming rod until the required numbers of cement capsules have been inserted.
- (d) Insert the rock bolt into the hole and push it home.
- (e) If necessary push the rock bolt to the bottom of the hole with suitable mechanical means.
- (f) Fit a bearing plate and a nut. Tensioning should be provided only after the prescribed setting time, has elapsed.

3.5 Monitoring of support performance : At least 10% of installed roof bolts should be invariably subjected to anchorage testing (at random) under the direct supervision of Under Manager and the results of such tests should be maintained in the prescribed format (Annexure - II). The minimum anchorage strength of the bolts should not be less than that of the value, which has been considered for design of support system. The following points should be kept in view, while conducting testing.

3.5.1 Testing should be always carried out under a properly supported roof, with a suitably designed anchorage testing equipment.

3.5.2 The roof bolt load should be increased smoothly and gradually. About 9% bolts should be tested upto the designed capacity and rest 1% may be subjected to destructive testing. The tested bolts should be identified with tags bearing the record of load applied on them.

3.5.3 The anchorage testing equipment should be subjected to regular maintenance and calibration.

3.6 Monitoring of strata behavior : Measurement of roof -floor convergence should be an essential part of monitoring strata behavior scheme. A suitable approach may be used for estimating the critical value of the convergence vis-à-vis gallery size and Rock Mass Rating, in a particular geo-mining condition.

3.7 Supervision : Roof bolting operations in the mine may require the services of a group of dedicated technically qualified personnel headed by an Asstt. Manager/Strata Control officer.

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Annexure-II

ANCHORAGE TESTING DATA SHEET

Colliery/Mine:
Section:

Colliery/Mine ID:
Seam:

Experiment:
Conducted by:

Location	Date & time of testing	Bolt No./ID	Bolt length & dia (mm)	Dimension of bearing plate		Date & time of installation	Grouting			Physical condition of bolt	Load applied	Displacement (mm)	Remarks*
				Area (mm ²)	Width (mm)		Type	No. of capsules	Setting time				

*State whether bolt failed/not failed.

Manager

Assistant Manager/Strata Control Officer

Name & Signature of Undermanager

DGMS (Tech)(S&T) Circular No. 4 of 1996**Dhanbad, Dated 7.8.1996**

To

The Owner, Agent and Manager
of all coal mines

Sub: ACCIDENT DUE TO EXPLOSIVES - CAUSES AND PREVENTION

In every sphere of human activity there is a possibility of an accident and work is no exception. Unsafe act and unsafe conditions of work lead to an accident in mines. Two recent accidents (on 14th Nov.95 and the other on 16/17th March 1996 due to explosives caused us to take serious note of the failures involved and it was considered necessary to review the causes and circumstances leading to such accidents.

Investigations into earlier accidents due to explosives have established that accidents occur mainly due to errors and slippage on the part of supervisory staff (human elements) and due to absence of good system of blasting. It has been proved time and again that an effective enforcement of the existing procedures would make a welcome dent in the figures of the accidents due to use of explosives.

The major causes of these accidents in underground mines may be broadly presented as below-

- Blown through shots and hit by projectiles from the opposite face.
- Direct hit by projectiles on the front side of the face.
- Drilling into misfired shots
- Miscellaneous causes other than above

1.0 Danger from blasting operations in coal mines having below ground workings.

1.1 Causes

1.1.1 Blown through shots and hit by projectiles from opposite face.

Condition – A

A review of accidents was made in 1982 and attention of the management was drawn to unsafe practices in the use of explosives that took a toll of human lives in belowground coal mines.

The major cause of these accidents was found to be non-compliance with the provisions of Regulation 170(3) of the CMR 1957 viz firing shots at a face without removing persons from other face having parting within 4.5 m which resulted in flying pieces of coal inflicting injuries to the workers. Such lapses accounted for 7 fatal accidents in 1980, 2 in 1981 and 3 in 1982. In addition some more accidents resulted in serious and minor injuries and clearly established that a good number of underground workers and blasting crew were exposed to this dangerous operations. Accidents due to this type of cases were occurring even though guidelines and preventive measures were issued through circulars No. 52 of 1971, No. 1 (Tech.) of 1977. It was therefore suggested in the cir. No. 16 of 1982 that the overman incharge of the district who had to carry hand plan as per Reg.40(1)(b) shall take such step when the faces approach within 10 m of each other and consequently the shortfirer would become aware of the existence of danger on this account and would take necessary steps to withdraw persons from the vulnerable places. Thus if the surveyor, overman, mining sirdar and shotfirers are vigilant and do their routine duty this type of accidents can be prevented.

The precautions already laid down during 70s' and early 80s' in different circulars on accidents due to blown throw shots are summarised below.

- Withdrawal of persons from the face and fencing off entrance before the shots are fired at other face which is within 4.5 m of each other (Reg 170(3) read with Circular 52 of 1971)

- Putting up of notices and erecting portable fencing with caution boards in all approach galleries when the faces approached within 4.5. m (Circular 1 of 1977).
- Mining Sirdar to supervise the shortfiring operation to ensure the precautions of putting up fencings and other precautions (Circular 1 of 1977)
- Overman to give instructions in writing to the concerned shotfirer when the provisions of Regularion 170(3) are attracted and when the faces have approached within 10 m of each other. (Circular 16 of 1982).
- It was further advised that work at one of the two faces approaching each should be temporarily discontinued and connection made by advancing along one direction. The approaches to discontinued gallery shall be fenced off.(Circular No. 6 of 1983)
- When a face is temporarily discontinued it should be ensured that stopped face is always kept dry. (Circular No. 6 of 1983)

During analysis of the causes and circumstances leading to the accidents it was revealed that giving instructions to shotfirer in writing by overman and Supervision of the Mining Sirdar for Putting fences and stoppage of one of the faces and made connection from one side when the faces were within 10 m. to each other were all time consuming and needed action plan. As a result these instructions were not being complied with and accidents due to these causes continued to take place.

A review of accident due to blasting with thin parting and hit by projectiles from the opposite face for a period of last 5 years has now been made and the cause wise analysis is presented in table-1.

Table -1 Causewise incidence of fatal accidents due to blasting in coal mines.

Year	Projectiles (on same side) Direct line		Projectiles (opposite side) Blow through Thin parting		Mixture	
	No. of accident	Death	No.	Death	No.	Death
1991	2	2(6)	1	1(2)	1	1(3)
1992	-	-	-	1(6)	-	-
1993	2	2	-	1(2)	-	-
1994	3	1(1)	1	-	1	1(3) 1(4) 1(3)
1995			1 1 1 1	2(12) 1(2) 1(2) 1(7)	1	1(3)

*Figures within parenthesis indicate number of persons exposed to danger due to blasting.

It is observed that except in 1994, accidents due to this cause occurred every year since 1991 and in the year 1995 there were four accidents resulting in death of 5 persons and involving 23 persons. The investigations in these cases revealed that the shotfirers were aware of the parting between the two faces but persons were not withdrawn and fenced off as per standard precautions. It is therefore re-established that there is a need for development of good blasting management practices by formulating a code of safe practices and making all the supervisory staff and officers accountable for lapses in compliance of code of safe practices.

1.1.2 Direct hit by projectiles on the same side.

Condition - B

The unsafe practice commonly adopted by some shotfirers was the main cause of accident under the condition. Here the shotfirer used to fire shots without ensuring that all persons were removed from the danger zone or that they had taken adequate shelter from flying pieces of

coal/stone. DGMS Circular No.16 of 1970 however, outlined the desirability of taking proper shelter.

It was also revealed that unsafe practice of firing shots in a face in two rounds instead of one created confusion amongst the workers who inadvertently entered the danger zone when the second round of shots was fired and this resulted in hitting by projected pieces of coal resulting in accidents. This practice of blasting in two rounds of charged shots for convenience of the shotfirer or for some other reasons (viz. inadequate exploder capacity, more than 10 shots are to be fired in a face) is not permitted under Regulation 168(10) and (16) and this was pointed out vide Circular No. 16 of 1982.

Moreover adequate precautions exist in the Regulation to prevent inadvertent entry into such dangerous areas but there used to be failure somewhere else in the observance of these stipulated precautions.

Thus there is a need to educate the workers on the system of blasting and not to rush into the workings unless asked to enter the face by the shotfirer or his helper. There is also a need to explain to them the implication of danger zone and to be outside the zone or to be at the resting place. All the operations to be carried out by the shotfirer may be in quick succession and may lead to lapses somewhere and therefore the whole system of blasting is to be evolved involving also mining sirdar, senior supervisor and officers in the operation.

1.1.3 Drilling into misfire shots.

Condition - C

The accident due to this cause in coal mine has been occurring even though the statute provides detailed precautions. One of the major reason is lack of proper system of inspection after firing and hurry on the part of shotfirer to leave the mine as soon as the shots are fired.

Another reason as supported by second school of thought that when a round of holes is connected in series either all the holes will fail to blast or all of them will blast and there is no chance of a single misfired hole. However enquiries into misfired shots with different types of detonators has proved that due to varying characteristics of electric detonators possibility of one or more holes in a round of shots failing to detonate can not be ruled out.

1.2 Prevention

For compliance of adequate precautions and thereby to prevent accidents due to above major causes, a system approach for introduction of code of safe practices has been suggested.

Card System

Under the existing system, the errors and omissions arising out of 'human elements' in the conduct of blasting operation are generally not recognised by the officers and supervisors. The card system is therefore designed to reduce the errors due to human elements to the minimum and ensure effective compliance with the laid down procedures and precautions which ultimately would result in preventing accidents due to explosives.

The simple logic behind the card system is that whenever a card of any supervisor/competent person is under the possession of his boss or other competent person it is accepted as a proof that dangers arising out of any operation (here blasting) have been explained to him and he has handed over his card as a proof of his acquaintance with the dangers of the operations or compliance with the precedures. This system will take care of all the ills of verbal instruction/confirmation which in majority of the cases create confusion in the confined environment of underground workings.

In this system the blasting operations would be carried out by a team of officers and supervisors with well defined areas of jurisdiction and responsibility of each. If each one does his job sincerely the whole operation would be safe.

Definitions

Shotfirer (SF) means the Mining Sirdar-cum-shotfirer who is to blast the face.

Explosive Carrier (EC) means who carries explosives and also assists the shotfirer in blasting and as well as guarding the entries/approaches to the site of blasting.

Shotfiring Mazdoor (SM) - The worker whose services are temporarily requisitioned at the time of blasting is temporarily SM for the designated period. SM is selected from sincere face workers and he is given the charge of guarding whenever more number of shortfiring personnel is required. He would assist the S.F. in guarding the entries during blasting.

The Mining Sirdar, Shotfirer and Explosives carriers are issued cards. The S.M. is issued cards by the overman before start of blasting operation. The cards bear the name of the person, his personal number and designation. The cards are signed by the Manager or Safety officer of the colliery, the records of which are maintained.

Duties

Assist Manager/Under Manager - To ensure that the Mining Sirdar, Shotfirer and Explosive carriers have been provided with cards duly signed by the Manager or Safety officer. He is also to ensure that some spare cards are issued to the overman of the district for use in case more than regular number of assistants are required for guarding the entries. A list of persons from the category of face workers (who are being groomed for the supervisory examination) spread over three shifts is to be prepared by him in advance who could be requisitioned for the job of shortfiring Assistant temporarily as and when required.. He shall ensure that in every shift adequate number of assistants are on duty under the control of the overman and the Mining Sirdar.

Overman - To ensure that no person is engaged in blasting without a card with him duly signed by the Manager or Safety officer and that sufficient number of shotfiring assistants has been provided to the shotfirer. He is to carry the spare cards and issue to the face workers from the prepared list as and when required. He is to inform the Mining sirdar and shotfirer whenever the working faces approach with 10 m of each or two sets of workings approach within 10 m of each other. He shall ensure that guards have been placed at the vulnerable entries which are not within the blasting zone.

Mining Sirdar - To supervise blasting operations when the faces are within 10 m of each other. He shall discuss with the overman before positioning the guard at the entries to the opposite face. He shall be with the shotfirer when the guards are posted at different entries.

Shotfirer - In addition to his duties of firing shots he is to discuss with the overman and mining sirdar for posting guards.

Explosive carrier/S.M. - Shall carry out the duties assigned to him by the shotfirer. He shall handover the card to the shotfirer before blasting and shall not leave the place unless asked by the shotfirer. He shall collect the card from the shotfirer after shotfiring.

Magazine clerk - He shall check the card of the S.F. and E.C.. before issue of explosives to then.

Blasting with card system -

Condition A -

When two faces are within 10 m of each other. (Refer Sketch - 1, 2, & 3)

The Manager shall issue instructions in writing to work only one side of the face at a time in one shift which is considered to be safe practice. The following procedures in different stages shall be followed in chronological order to ensure safe blasting.(Annexure - I).

Stage – I : The overman shall study the plan and explain mining sirdar (MS) and shotfirer(SF) when the two faces have approached within 10 m. The overman in presence of Mining Sirdar shall inform the workers about stoppage of opposite face. The opposite face shall be adequately fenced off under guidance of overman and in presence of mining Sirdar.

Stage - II : Overman will discuss with Mining sirdar and shotfirer for identification of vulnerable entries for posting of guards. If more number of guards is required, the overman will issue cards to face workers who would be designated as SM. Care shall be taken to post guards at places with at least 2 right angle bends.

Stage - III : The overman will collect the card of shotfirer as a proof that information about 2 faces approaching within 10 m has been communicated to shotfirer, and adequate numbers of assistants has been provided. The Mining Sirdar shall hand over his card to the shotfirer as a proof that the opposite face has been stopped and fenced off adequately.

Stage - IV :The Shotfiring Mazdoor(SM) shall be posted at the required places & the cards of Shotfiring Mazdoor (S.M.) shall be collected by SF. The S.M. shall not leave the place till he is asked by SF to do so.

State - V : Before blasting shotfirer will go round the area and post the guards (EC) at the identified places to be guarded. The EC shall ensure that workers are withdrawn from the designated face to be guarded and are taken to shelter beyond the blasting zone. EC shall handover the card to SF and shall remain at the place specified by the SF and shall not leave the place before getting his card back from the SF.

Stage - VI : After completion of firing and inspection of the face the shotfirer shall intimate the mining sirdar. The mining sirdar after checking the face and securing roof and sites shall inform the shotfirer to allow the workers to enter the face.

Stage - VII : The shotfirer shall go round the place and handover the cards to the EC/SM. He then allows the workers to enter the face(s).

Stage - VIII : The shotfirer shall handover the card to mining sirdar.

Stage - IX : After completion of blasting in the shift the shotfirer shall collect the card from the overman.

Condition –B

Under normal condition of blasting - Direct hit by projectiles in front of the face as shown in sketch No. 4.

In this case adequate parting between opposite faces exists. So the entries to opposite faces need not be fenced off. The following procedures in different stages shall be followed in chronological order to ensure safe blasting (Annexure-II).

Stage – I : The overman shall study the plan and explain the Mining Sirdar (M.S.) and Shotfirer (SF) about the vulnerable entries for posting of guards. The overman will arrange for

adequate number of assistants (SM) for posting as guards in addition to explosive carriers(EC) wherever required. The shotfirer (SF) shall handover the card to overman as a proof that he has been informed about the condition of different faces, no faces are approaching within 10m. to each other and adequate number of assistants has been provided.

Stage - II : The shotfirer shall prepare charges in the face and after completion of charging post shotfiring mazdoors (SM) whenever required at the appropriate places and collect cards from them. The shotfiring mazdoor shall ensure that no workers allowed to enter within the danger zone. He shall not leave the place till the card is collected by the shotfirer and he is asked by the shotfirer to move from the place.

Stage - III : The rest of the blasting preparation prior to firing shall be completed. The shotfirer shall then post explosive carriers and collect cards from them. He will take adequate shelter and after giving adequate warning shall fire the shots.

Stage – IV : After waiting for sometime the face environment shall be checked by the shotfirer. He shall intimate the condition to the mining sirdar.

Stage - V : The Mining sirdar shall checkup the face and after securing roof and sides allow the workers to enter the face.

Stage - VI : The shotfirer shall go round the workings and hand over the cards to E.C. & S.M.

Stage – VII : After completion of blasting of the district the shotfirer shall collect the card from the overman.

Condition - C

Drilling into Misfired shots.

Stage – I : The overman who kept the card of the S.F. under possession shall not return the card unless a joint inspection is made in 2/3 faces blasted at the end of shotfiring operations.

Stage- II :The whole system of blasting can be improved by continuous monitoring of blasting efficacy and therefore reducing the possibilities of misfired shots.

1.3 Supervision - The blasting operations shall be under the charge of Assistant Manager/ under manager of the mine.

No.DGMS(Tech/OH)/SAPICOM Cir No.5 of 1996

Dhanbad, dated 13.08.1996.

To

The Owners/Agents and Managers of all Mines.

Sub: Medical Examination/Re-examination of persons employed in mines and provision of adequate medical attention to the injured.

Some accident cases were examined from medical point of view in this Directorate. Some of the observations are given below :

In some cases, Periodical Medical Examination of the deceased were conducted in Sept/Oct '89 and they were supposed to get Re-examined by 1994. This was not done. Failure to conduct Re-examination in time resulted in non detection of some Physiological in capacitance and clinical/radiological abnormalities which should have been treated in time and the persons could have been properly rehabilitated by changing the nature of their jobs.

In some other cases although P.M.E. was conducted in time, previous medical history & records of the deceases were not verified properly while conducting his P.M.E. The persons died due to his previous disease which was not noted/ overlooked during his P.M.E. Careful conduct of P.M.E. might have saved his life by, persons, changing the nature of his job.

Some cases were attended by Doctors approximately four to five hours after reporting of the incident. In a few cases timely medical attendance to the injured persons might have saved their lives. Instances of non availability of Medical Officer within the colliery and non provision of immediate transport for sending the cases to nearby Hospital was also noted.

It appears that initial Medical Examination/ Periodic Medical Examination of persons employed in mines are not being conducted methodically & in a systematic manner.

In view of the above observations, you are once again requested to ensure that Initial Medical Examination/ Periodic Medical Examination of persons employed in mines is done in time and in prescribed manner and Medical attendance to the injured is given without loss of time. Adequate arrangement should be provided and kept ready at each mine for use in such emergencies without fail. Your attention is also being drawn to the recommendations of 8th conference on safety in mines on occupational health service for compliance without further loss of time.

DGMS(Tech) Circular No.6 of 1996

Dhanbad, dated 9.10.1996.

To

The Owners/Agents/Managers of all Oil Mines.

Sub: Use of Manila Ropes in drilling operations.

Manila Ropes are being used for various purpose in drilling operation in the oil mines. While the sizes of such Manila ropes intended for use may be selected by respective management giving due consideration to safety, it is being recommended that the Manila ropes used in drilling operation must confirm to BIS-1084: 1994.

It has been brought to my notice by Indian ropes manufacturers association that some of the oil mines are not using ISI mark Manila ropes. On this subject, Bureau of Indian Standard have also advised oil companies to procure and use Manila ropes only from the manufacturers who possess BIS license.

May I therefore request in the interest of quality and safety that all Manila ropes used for drilling operation must strictly conform to BIS 1084: 1994 and such ropes shall be preferably procured from BIS license only.

DGMS(Tech)(S&T) Circular No. 7 of 1966.

Dhanbad, dated 30.12.96

To

The Owners/Agents/Managers of all Mines.

Sub: prevention of spontaneous heating by use of Bitumen based Fire Retardant Sealant.

It has been observed that even during last five years since 1991, 24 to 62 percent of dangerous occurrences were reported to be due to spontaneous heating of coal and in 4 to 14 percent cases of dangerous occurrences old fire reactivated and broke out due to various causes mainly due to leakage of air into sealed off/ isolated areas. The enquiries made by the Directorate had revealed that not only proper monitoring of the environmental condition was not being done but also the isolation stoppings and surface cracks/fissures were not being checked and attended to at the proper time and action taken for minimizing, leakage of air. It has therefore continued to remain as an important problem of safety of workers and mines.

Due to the seriousness of the problems the Research Institute have carried out experiments with two types of base material for development of cost effective suitable coating sealants (i) Lime Based and (ii) Bitumen Emulsion Based Coating. They have come to the conclusion that a Cationic Bitumen Emulsion based coating material would be suitable for coal. As recommended the coating material should have the following characteristics;

1. Should be leak proof and have sealing properly when tested as per IS-4355/77
2. Free from toxic exhaust when heated for 3 hrs. at 150 Degree C.
3. Should be fire resistant
4. Should pass through adherence and washability Tests.

Later on Field trials were carried out by the management (different Subsidiaries of C.I.L.) both in underground and opencast mines under guidance of CMRI and CMPDIL. " COAL SHIELD' Fire Retardant Sealant manufactured by PVR INSHIELD BITUMINOUS PVT LTD., P.O. Disergarh, W.B. possesses the above characteristics. This sealant which had passed different tests carried out at CMRI, Dhanbad (a copy enclosed) was used in such trials with positive results.

It is therefore, recommended that "Coal Shield" Fire retardant Bitumen based sealant may be used under all circumstances e.g. underground sealed off area. Surface cracks at shallow cover, pillar fire, ventilation appliances and opencast coal benches to minimize leakage of air and thereby to reduce, if any, for improvement of the situation further.

DGMS (Tech) (SAPICOM) Circular No.8 of 1966.

Dhanbad, dated 27.12.1996

To

Owners, Agents and Managers of all Mines.

Sub: Use of approved type of tub couplings/ attachment.

In a recent accident due to runaway of empty tubs in haulage roadways, a trammer was killed. The occurrence of the accident is reproduced below :

"While a trolley loaded with timber attached with a set of six empty tubs was being lowered in the haulage plane, the chair of the trolley was hit by the tub and died instantaneously on the spot."

The enquiry into this accident revealed that the coupling/ attachment being used between the tubs and the trolley was not of approved type as required under provisions of Regulation 89(1)(c) of the Coal Mines Regulations, 1957. Had an approved type of coupling/attachment been used between the tubs/ trolley, this accident could have been prevented and the life saved.

You are therefore once again requested to ensure that :

- Only approved type of the couplings/attachment are used while hauling/ lowering tubs.
- Trolleys with long pipes, timber or other similar materials are hauled up or lowered down separately without attaching the same to other tubs/ trolleys in the haulage roadways.

DGMS(Tech) (SAPICOM) Circular No.9 of 1996.

Dhanbad, dated 31.12.1996

To
Owners, Agents and Managers of all mines.

Sub: Fatal accidents to contractor's employees engaged in transportation work in the mines.

Increased demand of minerals/ coal has necessitated large amount of mineral/ waste handling in the mine. The opencast activities have thus been under immense pressure to boost production and achieve required target. It has generally been observed that waste handling job as well as transportation of coal/ mineral from mine faces/pits to waste yards/coal dumps are being increasingly carried out by engaging contractual vehicles and workers.

The analysis of accidents due to wheeled trackless vehicles in opencast mines has revealed that—

- Approximate 33% of the accidents takes place while reversing vehicles in dump yard/ coal benches.
- 60-70 % of the victims were either driver or khalasi of the vehicle deployed by the contractors.
- No basic or specialized training was imparted to the contractual workers before engaging them in the mine.
- In some cases of accidents it has been observed that khalasi etc. engaged by the contractors were run over by the vehicles while sleeping in dump waste yard.

Needless to say, special attention need to be paid towards training of contractors' workers and maintenance of vehicles belonging to the contractors. Greater discipline needs to be enforced by local mine management to ensure that only duly qualified, experienced and trained workers are employed by contractors. The work of all such persons should be invariably supervised adequately by mine management.

Your attention is once more being drawn to various recommendations and circulars issued earlier and enumerated below for strict compliance.

1. Recommendations of Seventh conference of safety in mines in respect of "Safety in opencast mining" to be implemented without further delay. [Ref. DGMS(Tech) circular No.1 of 1089.]
2. Recommendations of Eighth conference on Safety in Mines in respect of "Safety in opencast and surface operations" to be implemented without further delay.
3. Recommendations of DGMS (Tech) Circular No.4 of 1993 are to be strictly adhered to.

All concerned persons are therefore requested to ensure that the steps enumerated above are implemented forthwith.

DGMS (Genl) Circular No. 1 of 1996

Dhanbad, dated 24.4.1996.

To
The Owners, Agents and Managers of all Mines in Southern Zone,
Hyderabad.

Sub: Change of address.

The zonal and Regional Offices at Hyderabad have been shifted to another building with effect 15.04.96. The address of the office of its new location is as below.

Office of Dy.Director-General of Mines Safety, Southern Zone, H.No.10-2-289/16, Shantinagar, 1st street, Near State Bank of Hyderabad, Masab Tank, Hyderabad- 500 028 (A.P.)

No.DGMS (Genl) Circular No.2 of 1996

Dhanbad, dated 18.6.1996.

To
The owners, Agents, Managers of all mines.

Sub: Withdrawal of Flame Safety Lamp.

In the past due to shortage of Flame Safety Lamp M/S. J.K.Dey & Sons, Calcutta was permitted to market Velox Indigenous make GL-5 flame safety lamp without Indian Standard Certification Mark for a maximum period of six months i.e. upto 18.11.78. Recently it has been observed that GL-5 flame safety lamp marketed long back by M/S. J.K.Dey & Sons are still in use for gas testing purposes in mines.

The use of Velox GL-5 flame safety lamp(s) manufactured by M/S. J.K.Dey & Sons is prohibited for gas testing purposes in mines.

You are requested to withdraw all such Flame Safety Lamp from use in all underground mines.

DGMS(Genl) Circular No.3 of 1996

Dhanbad, dated 3.10.1996.

To
Owners, Agents and Managers
of all mines in Karimnagar district of Andhra Pradesh.

Sub: Abolition of Ramagundam-Sub-Region.

In partial modification of DGMS circular No.1 of 1989 dated 14.03.89, this is to inform you that Ramagundam Sub-Regional office has been wound up for the time being. Therefore, all the mines falling under Ramagundam Sub-Region will be under Director of Mines Safety, Hyderabad Region No.1.

The postal and telegraphic addresses of Hyderabad Region No.1. are given below :

Postal Address: Director of Mines Safety, Hyderabad Region No.1.H.No.10-2-289/16, Shantinagar, 1st street, Near State Bank of Hyderabad Masab Tank, Hyderabad- 500 028.

Telegraphic address: Minesafety, Hyderabad.

You are requested to endorse copies of application for statutory permissions, notices of accidents, etc. to the Director of Mines Safety, Hyderabad Region No.1. Hyderabad.

DGMS(Genl) Circular No.4 of 1996

Dhanbad, dated 3.10.1996

To

The Owners, Agents and Managers
Of all mines in Rajasthan district of State of Rajasthan .

Sub: Jurisdiction of Udaipur Region.

This is to inform that erstwhile district of Udaipur State of Rajasthan has been divided into two district i.e. Udaipur and Rajasthan.

Therefore in partial modification of Circular No.1 of 1987 all the mines in Rajasthan district of state of Rajasthan will also fall under Udaipur Region under Northern Zone with immediate effect.

The postal and Telegraphic address of Udaipur Regional Office will remain the same.

You are requested to endorse copies of application for statutory permission, notices of accident etc. to the Director of Mines Safety, Udaipur Region, Udaipur, Rajasthan.

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DGMS

STATUS OF THIS DOCUMENT

This is not an official version.

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DGMS (General) Circular No.1 of 1997**Dhanbad, dated the 17th July 1997.**

Subject: Safety Committee Meeting

In order to improve the effectiveness of the meetings of "Safety Committee" and to make the proceedings more meaningful, it is suggested that the meeting of the Safety Committee at any mine should be held regularly and invariably attended by persons of the superior management. Due and necessary consideration should be given to all the suggestions emanating from the "Workmen's Inspectors" and workers' representatives. Every meeting of the safety committee should also record the action, if any, taken on the suggestions/ observations of the above named persons as well as other defects pointed out in earlier meeting(s).

DGMS(General) Circular No.2 of 1997**Dhanbad, dated the 31st Oct.1997.**

All Coal, Metalliferous & Oil Mines.

Internal Safety Organisation (ISO) is one of the most powerful tool in the hands of the mine operators and workers for enhancement and improvement of the status of safety in Indian mines. Fifth Conference on Safety in Mines held at New Delhi on the 26th & 27th December 1980 in its' recommendations framed guidelines for the formation of "Safety Policy" and "Internal Safety Organisation". Arising out of the recommendations of the Fifth Conference on Safety in Mines, many mining companies have since formulated their "Safety Policy" and created "Internal Safety Organisation" to translate the principle of self-regulation into practice. So far as the functioning of the ISOs are concerned, it has been observed that their functioning could not reach the desired heights of achievement as projected by the National Tri-partite forum.

Under the present circumstances in the mining industry looking at introduction of new and sophisticated technology, mining in increasingly difficult geo-mining locale and evolution of a more conscious techno-social environment, it is now time to revitalize the institution of ISO and all efforts must be directed towards making this institution highly effective.

The Internal Safety Organisation in a company/ organisation should be made independent and directly responsible to the authority/person made responsible for ensuring safety in mines, i.e. . The Chairman/Chairman-cum-Managing Director or a Director on the Board of Directors of a mining company. A system of reporting contraventions of the provisions of law by officers in this cadre should be evolved. A complimentary system for the rectification of the violations by the operative persons in the mines should also be developed and enforced.

The head of ISO should regularly interact with the persons responsible for production in the mine to review the standard of safety therein. A written record for all such meetings should be maintained for information as well as necessary actions at all levels.

I am sure, that, steps taken in the above lines will go a long way in improving the status of safety in our mines.

DGMS(Legislation) Circular No.1 of 1997

Dhanbad Dated the 31st July 1997.

All underground Coal Mines.

Sub: Amendment of Regulation 181(3) of Coal Mines Regulations 1957.

Dear Sir,

Enclosed please find a copy of the Gazette Notification for the above amendment. The following items will not be used in underground Coal Mines unless the same are of such type, standard and made as approved by me by a general or special order in writing :

1. High pressure hydraulic hoses with end fittings.
2. Dust Respirator.
3. Hydraulic fluid used in underground machineries.
4. Cables used for high, medium and low voltage electrical system and also flexible cables/Control cables used for electrical system of all voltages.

You are requested to ascertain that the above requirements of the law are implemented with immediate effect in the interest of safety.

Regd.No.DL-33001/97

The Gazette of India
Published by Authority

No.10

New Delhi, Saturday, March 22,1977

Separate paging is given to this part in order that it may be filed as a separate compilation.

PART II – SECTION 3 - Sub Section (i)

General Statutory Rules (including Orders, Bye-laws etc. of a general character) issued by the Ministries of the Government of India (other than the Ministry of Defence) and by the Central Authorities (other than the Administration of Union Territories) .

MINISTRY OF LABOUR
(Director-General of Mines Safety)

Dhanbad, the 27th February 1997.

NOTIFICATION/ CORRIGENDUM

G.S.R. 169- In exercise of the powers conferred on me under sub-regulation (3) of regulation 181 of the Coal Mines Regulations, 1957, I, V. Mahajan , Chief Inspector of Mines Re-designated as the Director-General of Mines Safety declare 1st July, 1997 as the date from which the following items will not be used

in underground coal mines unless the same are of such type, standard and make as approved by me by a general or special order in writing :-

1. High Pressure hydraulic hoses with its end fittings.
2. Dust Respirator

CORRIGENDUM

2. Reference to G.S.R. 31, published in the Gazette of India, Part-II,, Section 31(i) dated 18th January, 1992. In the said notification:-

(i) Item No.7 shall be read as follows :

“Hydraulic fluid used in underground machineries”.

(ii) Item No.22 shall be read as follows :-

“Cables used for high, medium and low voltage electrical system and also flexible cables/control cables used for electrical system of all voltages”.

Chief Inspector of Mines
Re-designated as Director-General of Mines Safety.

DGMS(Approval) Circular No.1

Dhanbad, dated the 27th Nov’1997.

All Coal and Non Coal Mines.

Sub: Withdrawal of permission to manufacture and supply of winding ropes to mines.

This is to inform you that the permission for manufacturing and supply of ropes to mines for winding purpose granted to M/s.Nicco Corporation Limited (Steel Division), Nicco House, 2, Hare Street, Calcutta-1 through this directorate circular No. DGMS (Approval) Circular No.19 of 1976 has been withdrawn with immediate effect vide this Directorate No.Mech(HQ)/App/ WR/ NICCO/476 dated 20.11.97

DGMS(Tech)(Sapicom) Circular No.1 of 1997. Dhanbad, dated 31st March, 1997

All mines.

Recently an accident took place in a mine while four boys were taking shelter underneath an abandoned haulage foundation. The foundation collapsed injuring all the four boys and one of them succumbed to his injuries in the hospital.

The enquiry revealed that the haulage foundation was a part of the mine. Further there is also need for prohibiting persons below eighteen years of age in any part of the mine under Section 45 of the Mines Act, 1952.

You are requested to comply with the following recommendations :

- (i) Any part of the equipment or installation not being used for the mining purpose currently shall be totally dismantled or properly, adequately and duly fenced off effectively. If any covering is to be done. That should be done in a permanent safe way.
- (ii) Mine management should ensure that children do not enter the mine premises/ workings (current or abandoned) so as to endanger their lives.

DGMS(Tech)(Sapicom) Circular No.2. of 1997 Dhanbad, dated the 8th April, 1997.

All Coal Mines.

Sub: Support of freshly exposed Roof and Sides in belowground coal mines.

Roof and sides fall accidents still continue to be the major cause of fatality in underground coal mines inspite of our best efforts. An exercise was therefore undertaken to analyse the accidents caused by fall of roof and sides in detail. Frequency distribution of all fatal accidents were carried out to identify the major cause of fatality. The analysis has revealed that :

- 38.76% of total fatal accidents and 39.46% if total fatalities are caused by fall of roof and sides only.
- 60.30% of belowground fatal accidents and 57.43% of belowground fatalities occur due to fall of roof and sides only.

It has also been noticed that most of these fatal accidents had occurred invariably in Roof and Pillar method of extraction both during development as well as during depillring operations. The place wise distribution of such accidents has indicated crowding of accidents within Freshly Exposed Roof and sides.

- 58.50% of roof and side fall accidents and 58.40% of fatality due to fall of roof and sides occurred within 10m of development and depillaring faces i.e. in Freshly Exposed Roof area.

Although Coal Mines Regulations provide for support of such Freshly Exposed Roof and sides as per the Systematic Support Rules framed for the purpose, but it has been observed during the course of enquiries into such accidents that :

- Either the supports were not provided or were in-adequate.
- The supports were not designed in accordance with the geo-technical requirements specific to such workings, and
- The type of support was not commensurate with the type of ground to be supported.

Recommendations:

In view of the situation described above and it is recommended that :-

1. Full column grouted roof bolts may preferably be used as support in Freshly Exposed Roof area in development workings.
2. The design and pattern of roof bolting shall be based on RMR and in consultation with the Technical experts from a recognized Scientific and Technical institutions in Association with this Directorate.
3. Quality and Efficiency of roof bolts shall be monitored regularly in accordance with the recommendations of the circular (Tech) (Tech) No.1 of 1996 issued from this Directorate.
4. All other circulars issued earlier in this respect shall be strictly implemented so as to ensure safe and secured ground conditions for improved safety standard in the mine.

DGMS(Tech)(Sapicom) Circular No.3 of 1997**Dhanbad, dated the 8th April,1997.**

All Underground Metalliferous Mines.

Sub: Fatal /Serious accidents due to defective design of ore chutes.

The accidents in belowground non-coal mines due to defect in the ore chute design and connected operations therewith have been noticed during the course of accident enquiries and subsequent analysis of accidents. The analysis has revealed that proper safety measures and effective design feature had not been incorporated to prevent the dangers from the following :

- a. Sudden run down/rolling of much from the stope or ore pocket any empty ore chutes.
- b. Improper design of the covering lips of the ore chutes to prevent any openings being left therein.
- c. Operators safety in case of sudden run down/ rolling of muck.

In view of the above, it is recommended that :-

- (i) a buffer stock (much) shall always be left over the chute to work as cushion and to guard against sudden rub/roll down of debris.
- (ii) manual operation of ore chutes / pocket with the help of wooden planks as covering of the opening shall be eliminated and should be replaced with mechanically (pneumatic or hydraulic) operated chutes.
- (iii) safety of the chute operator or the persons passing underneath shall be ensured by providing operator's cabin or refuse chamber with a view to guard against any dangers associated therewith.

DGMS(Tech) Cir.No.4 of 1997**Dhanbad, dated the 17th April,1997.**

All shaft Mines.

Sub: Routine Test of Cage Suspension Gear Components.

Attention is being drawn towards DGMS (Tech) in 7 of 1994 when it was stipulated that at least 25% of the routine tests of Cage Suspension Gears shall be carried out at National Test House.

The matter has been further discussed with user industry and now it has been decided that at least 50% of the routine tests of the Cage Suspension Gears shall be done at any National Test House and rest 50% of the routine tests may be done at DGMS approval test houses.

It is to clarify that it is the responsibility of the user to ascertain quality of the C.S.Gears being purchased by them for their mines.

Both the user as well as the manufacturer may collaborate as to ensure that the above recommendations shall be complied with strictly hence forth.

DGMS (Tech) Circular No.5 of 1997**Dhanbad, dated the 30th April 1997.**

All Shaft Mine.

Sub: Dangerous Occurrence due to mis-match of Detaching hook and its catch plate.

Recently serious dangerous occurrence has taken place in amine involving fall of cage after over-wind . During over-winding of cage, the detaching hook got detached after its wings hit the catch plate but the hook in detached condition could not rest properly on the catch plate as their resting area of the projected fin on the catch plate was very less and thus the fins broke and the cage had a free fall till it rested luckily on the keps.

There had been similar incident in the past also when the cage broke the kep and had a free fall in the shaft causing fatal devastation.

Fortunately persons were not in the cage on either occasion so major accidents were avoided.

In the earlier case, lower capacity of detaching hook was used where as the catch plate of the earlier detaching hook of higher size was allowed to remain but in the later case detaching hook of 5 tonne SWL was used with a catch plate meant for STSWL detaching hook. Obviously there was some mis-match in detaching hook and catch plate at some level.

As a safe practice, after the detachment of the detaching hook, the projected fins of the hook must sit on the catch plate having adequate resting area on both side. To have this adequate resting area, the clearance between the catch plate hole and detaching hook width should not exceed 4 mm. While purchasing of the equipment, copy of the approved drawing may be collected from the respective manufacturer. However for a ready reference the table given below may be useful.

TABLE - 1

Sl.No.	SWL of the detaching hook.	Width of the detaching hook.	Bore of the catch plate	Thickness of the catch plate	Min. resting area of the projected fins on either side of the hole of the catch plate.
1.	5 & 8 tonne	178 mm	181 mm	25 mm	430 sq.mm
2.	10 tonne	203mm	207 mm	25 mm	700 sq.mm
3.	12 tonne	254 mm	257 mm	32 mm	850 sq.mm

In future, the following recommendations are to be complied strictly while installing new suspension gears and during subsequent maintenance operations.

- (a) The cappel should pass smoothly through the catch plate bore,
- (b) The catch plate shall be fitted properly so that the winding rope remains at its centre of the catch plate hole and also the champering of the catch plate around its hole is placed downward to facilitate smoother entry of the cappel into the catch plate in case of over wind.
- (c) The catch plate shall be so installed on the girders that in case of over-winding, no part of the structure obstruct the detaching hook to enter the catch plate hole smoothly.
- (d) The catch plate is a part of the detaching hook so it must have the same identification number to that of the detaching hook supplied together.
- (e) Before installation of the detaching hook, engineer shall measure the fin distance of the detaching hook in detached condition and shall also measure the catch plate hole dia and the extent of resting area of the projected fins on both side of the catch plate hole shall be recorded.

- (f) As required under Regulation 81(2)(a) of Coal Mines Regulation 1957 and Regulation 89 (2)(a) of Metalliferous Mines Regulations 1961, the detaching hook shall be taken apart for examining wear and tear once at least in every six months and during such process, the copper pin of the detaching hook shall be replaced by a new one having identical specification and dimensions. The replaced copper pin shall be checked for any partial shear. If any partial shear/ abnormal indentation is observed the matter must be referred to manufacturer of the detaching hook as well as to this directorate to ensure its suitability for further use of the detaching hook.

Such resting area and the position of catch plate shall be rechecked during each recapping of winding rope and the measurement shall be recorded. The resting area of the projected fins on either side of catch plate hole as mentioned above shall not be less than what has been indicated in the table-1.

DGMS(Tech) Circular No.6 of 1997

Dhanbad, dated the 20th August 1997.

All Mines.

Sub: Quality of Tub Couplings.

- 1.0 Enquiries into fatal /serious accidents and incidents connected with haulage system occurred during the last ten years since 1986 have again brought to the light the inadequacy of strength of tub couplings being in use at present. The analysis of accidents for this period revealed that about 28% of the total haulage accidents occurred due to mechanical failure (i.e. sub-standard equipment, installation and maintenance) and failure of tub coupling and opening of couplings contributed about 35% of the accident under this category.

The above analysis prompted the need for an in-depth study regarding design, strength of tub couplings, quality, manufacturing process etc. With the above objective in view 14 tub couplings from different subsidiary of Coal India Ltd, Singareni Coal Company Ltd and J & K Minerals Ltd, were collected at random, examined & got tested at Central Mining Research Institute, Dhanbad.

2.0 Tests

- (i) 12 couplings were subjected to the following tests :

- (i) Breaking load
- (ii) Load at which the coupling start deforming
- (iii) Hardness
- (iv) Chemical Composition
- (v) Micro Examination
- (vi) Adequacy of heat treatment
- (vii) NDT

- (ii) Two couplings from J&K Minerals Ltd did not conform to the approved design and therefore were not subjected to above tests.

3.0 Results of the 12 tub couplings tested at CMRI

The CMRI report has revealed the following observations.

- i. Only three couplings had attained the required yield load and factor of safety.
- ii. The material for most of the couplings did not conform to the approved design.

- iii. The hardness of couplings in most of them were either very high or low because the heat treatment given were not proper.
- iv. The dimensions of some couplings also varied from standard.

So it was very clear that 9 out of 12 couplings sent for testing (75%) did not conform to the standards stipulated vide DGMS (Tech) Circular No.1 of 1986. Further this approval was given for the type and no specific/particular manufacturer was approved. It was therefore the responsibility of the user industry to assure itself of the proper quality of tub couplings from reliable & reputed manufacturers who had the proper manufacturing facilities.

4.0 Conclusion

It could be inferred from the study that efforts made by the Directorate-General of Mines Safety to correct the various irregularities in design, strength, material to be used, heat treatment, quality control both during manufacturing and during procurement through issue of different circulars viz. DGMS Circular No.59 of 1964, DGMS (Tech) Circular No.10 of 1979, DGMS (Tech) Circular No.4 of 1985 and DGMS (Tech) Circular No.1 of 1986 have met with little success. The quality control for tub couplings although is a matter of interest of the management (users) but it has been established that the quality control aspect was not given due priority and importance.

5.0 Recommendation

In view of the fact that Rope haulages still remain the primary means of transportation of mineral in the belowground mines, continuance of the above irregularities is a matter of grave concern. It may also be noted that over the last decade haulages have remained the second largest contributor to underground serious accident due to all causes.

In this backdrop, it is imperative to initiate suitable action by all concerned to meet the challenge for improvement in safety and thereby enhance operational performance while reducing the risk of accidents due to haulages.

You are requested to take the following steps/ measures for evolving a system of quality assurance scheme in the organisation.

- i. The design of the couplings to be used in the mine shall comply requirements of DGMS (Tech) Circular No.1 of 1986.
- ii. 5-10 % of the couplings selected at random shall be tested of proof load & NDT at any national Test House or approved test House.
- iii. 1% of the couplings shall be subjected to Break load and the chemical, composition of the material shall be analysed.
- iv. The manufacturer(s) of tub couplings must have adequate manufacturing and testing facilities.
- v. Quality control cell shall be set up at company level to ensure purchase and use of quality tub couplings.
- vi. Intensive inspection of all haulage installations shall be done in a phased manner and all sub-standard tub couplings shall be withdrawn from use immediately.

DGMS (Tech) (S&T) Circular No.7 of 1997**Dhanbad, dated the 29th August, 1997.**

All Mines.

Sub: Damage of structures due to blast induced ground vibrations in the mining areas.

1.Introduction :

In response to increase demand for coal and other minerals, a number of large mechanised opencast mines have come into operation. Some of these opencast workings are located near surface structure like residential buildings , schools, commercial shops. Hutments with large number of inhabitants etc. Whenever blasting is done in these opencast mines, ground vibrations are generated outward from the blast area and cause damage to surrounding surface structures. The vibrations radiating from the blast holes while passing through surface structures, induce vibrations on the structures causing resonance. The components of ground motion can affect the structures through compression and tension and also through vertical and horizontal shearing effects. Blast induced ground vibrations create socioeconomic problems for the mine managements as well as the people residing in vicinity of these mines. As only 20-30 % of energy of commercial explosives used in the mines is utilized for fragmenting the rock, the rest of energy is transmitted through the earth in the form of ground vibrations resulting in damage to the surrounding structures.

2.0 Damager Criteria

The peak particle velocity has so far been considered as the best criteria for evaluating blast vibrations in terms of its potential to cause damage. The extensive studies on the problems have established that the frequency of the waves is also equally important factor to consider the effect of damage.

The blasting damage is generally classified into following four categories :

Sl. No.	Category	Description of damage
(i)	No appreciable damage.	No formation of noticeable cracks.
(ii)	Threshold damage	Formation of fine cracks, fall of plaster, opening & lengthening of old cracks, loosening of joints, dislodging of loose objects etc.
(iii)	Minor damage	Superficial not affecting the strength of structure(s). Hair line cracks in masonry around openings near partition, broken windows. Fall of loose mortar etc.
(iv)	Major damage	Formation of several large cracks, serious weakening of structures, shifting of foundation, fall of masonry, ruptures of opening vaults etc.

3.0 Natural Frequencies

Elements of building construction such as sprung floors, stud partition walls, ceiling and windows can all react as mass-spring systems, each with its own natural frequencies of about 4-24 Hz (low frequencies). Ground vibrations at these frequencies amplified by the structures increase the risk of damage. When the low frequency ground vibration coincides with the natural frequency of the structure resonance is originated. The resonance is a state in which the structure absorbs most energy progressively becoming deformed with time, until plastic deformation occurs. Therefore even the low peak particle velocity of ground vibrations at natural frequency of structure is more harmful to the structure. Natural frequencies of brick and concrete structure generally vary from 8-16 Hz.

4.0 Structural response

All structures develop cracks from natural causes like periodic changes in humidity, temperature and wind velocity. Changes in soil moisture cause foundation cracks. The width of old cracks change seasonally and number of cracks increase with the time. This damage is independent of damage caused by blasting.

The cracking location and the wall material have an influence on the particle velocity at which cracking begins. If the entire structure is not inspected thoroughly, there may be chances of biased opinion on the type of cracks. Thus it is important to place transducer properly for the correct assessment of damage.

In the mud houses, number of cracks develop before blasting and these cracks widened and extended with the passage of time. These cracks are further widened and get extended due to blast induced ground vibrations. Concrete structures vibrate for longer duration than brick and mud structures. Concrete walls have free top and show no cracks at vibration levels for which mud and brick walls can damage. Cracks develop in concrete walls with large vibration level. Cracks in brick- structures can be observed in junction of walls, roof and at window corners. Brick walls with clay mortar and cement- sand mortar behave in same fashion. Steel structures can sustain more vibration level.

The magnitude of vibration on structures is much more than on the ground. Duration of vibration in structure is also longer than, that of ground vibration. Multi-storied buildings are more sensitive to blast vibration than the single-storied buildings.

To predict the extent of damage and to take preventive measures, it is necessary to measure ground vibrations due to blasting. Studies on structural response of ground vibration in the structures of different constructions within the mining areas under Indian condition are limited and therefore such study should be carried out to ascertain the degree of damages for improvement and standardization of damage criteria under Indian conditions.

5.0 Measurement of blast induced vibrations

5.1 Instrumentation

The instrument selected for monitoring blast induced ground vibration shall be simple, light, compact, easily portable, battery operated, digital form output, triggering by geophone etc. Triaxial transducers for recording blast vibration shall have a liner frequency upto 500 Hz and capable of recording particle velocity upto 100 mm/s.

5.2 Methodology

The transducers shall be placed near the structure on the solid undisturbed ground and should be placed well in contact with the ground. For structural response, the transducers shall be placed horizontally over the wall, floors and ceiling. A minimum of 15 points of observations corresponding to a minimum of 10 blasts shall be made for better prediction with a high index of determination.

5.3 Predictor Equation

The least means square method of regression analysis shall be used to interpret the data. The square root scale distance shall be used for analysis and interpretation of data when blasting is done on surface and measurements are taken on the surface, or the blasting is done underground and measurements are taken underground. On the other hand, if blasting is done on the surface and the measurements taken underground the cube root scaled distance shall be used.

6.0 Guidelines on experimental blasting

6.1 Factors

Major factors affecting particle velocity of ground vibration are type and amount of explosive charge used, distance from the charge to the point of observation (surface structures), geological, structural and physical properties of the rock that transmits the vibrations, height of structures and blast geometry. Use of safe charge/delay, in hole delay with non- electric initiation systems. Proper burden, inclined holes in conformity with slope of bench, deck charge, air deck, sequential blasting, clearing off loose pieces of rocks from the blast site and proper stemming of holes bring reduction in blast induced ground vibrations. Controlled blasting methods in conjunction with effective muffling of holes will control ground vibrations and also arrest fly rock.

6.2 Plan

A plan showing structures belonging to the to the owner and not belonging to the owner in different prominent shades should be prepared. The plan shall incorporate details of construction of the structures in a tabular form. Plan should also show 50 m., 100m, 200 m and 300 m zones from the structures, the place of experimental study and the limit upto the which blasting is proposed to continue.

6.3 Study/ observations

In a particular mining area with built-up structures where deep hole blasting is to be introduced for the first time, experimental blasting shall be carried out by any research/ academic institute much before the structures fall within the blasting danger zone. The type of instruments, the methodology and predictor norm as recommended in para 5.0 shall be followed in measurement of blast induced vibrations. Based on the study, the safe charges for different zones shall be determined and recommendations made in the report. In a cluster of buildings of different types existing close to each other, the charge for the buildings/ structures requiring greater protection against damage shall be assessed and recommended.

6.4 Structural response

During the study the response of the structures assuming different natural frequencies should be calculated and plotted on a figure. Softwares with the different programmes are available now for the said plot and should be used for convenience.

6.5 Monitoring

In order to ensure effective control over the vibration and related damages there is a need for regular in-house monitoring and the managements should train the blasting personnel during the experimental study and start observations on their own during the regular blasting operations.

7.0 Recommended permissible standards of blast induced ground vibrations:

7.1 Technical considerations

Permissible standards for different type of structures have been arrived at considering the importance of building and structures. The buildings of historical importance and multi- storied structures are likely to get damaged with low level of vibration and therefore permissible standards are to be lowest. Similarly buildings not belonging to the owner but with mud/brick in cement construction and others with good construction (RCC and framed structures) should also be protected but higher permissible standards than that of the level fixed for first category has been allowed.

The buildings belonging to the owner of the mine are constructed for a limited period generally equal to the life of the project. The management accept that these buildings constructed within the mining area are likely to suffer some damages during the extraction of minerals, but the damages should be repairable. Therefore, slightly higher permissible levels of vibrations have been allowed in such cases.

7.2 Permissible standards

Depending on the type of structures and the dominant excitation, the peak particle velocity (ppv) on the ground adjacent to the structure shall not exceed the values given below in the table.

Table: Permissible Peak Particle Velocity (ppv) at the foundation level of structures in Mining Areas in mm/s

Type of structure	Dominant excitation Frequency, Hz		
	<8 Hz	8-25 Hz	>25 Hz
(A) Buildings/structures not belong to the owner			
(i) Domestic houses/structures (kuchha brick & cement)	5	10	15
(ii) Industrial Buildings (RCC & Framed structures)	10	20	25
(iii) Objects of historical importance & sensitive structures	2	5	10
(B) Buildings belonging to owner with limited span of life			
(i) Domestic houses/structures (kuchha, brick & cement)	10	15	25
(ii) Industrial buildings (RCC & framed structures)	15	25	50

In view of the complexities of the problems I hope you all would take adequate measures as recommended above to ensure that the blasts near surface structures are carried out with utmost care and precautions. The blast induced ground vibration should be within the permissible limits as specified above.

DGMS (Tech) (S&T) Circular No.8 of 1997

Dhanbad, dated the 12th Nov,1997.

All Mines.

Sub: Suppression of Mine Dust by using 'Pulver Bond' and 'Dust Bond'

1.0 Introduction :

Most Mining operations produce dust which, when air borne, becomes a serious hazard to the health of workers and the equipment/ machines. Besides coal dust which is inflammable may also lead to disastrous explosion. In recent times with introduction of mechanisation both in opencast and underground mines, it has become a bigger danger than ever before since operations of machines usually throw up much more dust as compared to hand operations. Dust of any kind of sufficiently fine quality when inhaled in large quantities may lead to development of respiratory diseases such as Pneumoconiosis and Silicosis etc. Sizeable amounts of dusts are also produced and are rendered air borne in and around haul roads in open cast mines during material transportation by dumpers etc.

Fine dust rendered air borne remain in the atmosphere for a considerable length of time thereby positively polluting the environment. The best method of preventing roadways dust getting air borne is to consolidate it by wetting the dust with water sprays, but water sprays alone do not produce good wetting of all deposited dust and a large quantities of water may be needed frequently for producing effective results due to propensity of water to evaporate in hot and dry conditions. Wetting Agent, if added would increase the ability of water to consolidate & hold together the smaller dust particles and this Directorate vide Cir. No. 31 of 1966, Cir No.62 of 1966 and Cir No.40 of 1967 had advised the industry to use Wetting Agents for effective suppression of dust. These wetting agents were either syrupy liquid or non-ionic detergents and did not form ionized emulsion and thus not very effective for consolidation of loose dust in order to ultimately prevent it from air borne.

Due to limited availability of Wetting Agents along with the absence of methodology of correct treatment, dosages. etc. and non-availability of sufficient water, the industry had not responded to the advice and standard of dust suppression remains unsatisfactory.

To overcome the above difficulties, the research Institutes have carried out experiments with Ionized Emulsion for development of cost effective suitable Dust-Settling-Ionizer for effective dust suppression/dust consolidation including air borne dust for both opencast and underground mines.

2.0 Principle of Operation :

A dilution of an Ionized Emulsion with positive and negative charged ions when sprayed in/ on dusty atmosphere, binds the small charged particles together to a large particles suspended in air and bring them down to settle on surface and remain there for long time. The dust suppression material thus is able to encrust surface dust and reduce the concentration of air dust.

3.0 Methodology Application :

About 10 to 20 number of applications would be required in a eye lie manner for efficient dust suppression. Each application is required to be done once in two weeks followed by daily watering. The requirement of water would gradually decrease over the period of time.

4.0 Properties :

The Dust settling tonizer should have the following characteristics.

1. Flash point of Ionizer should be more than 175o C.
2. It should be non- toxic and hygroscopic in nature ; &
3. It should be effective to conglomerate fine dust including air borne dust.

Field Trials of Dust Settling Ionizer have been carried out by the managements of some Coal Companies in the Open Cast Mines under the guidance of CMRI, "Pulver Bond" and "Dust Bond" two Dust settling Ionizers manufactured by the M/S. PVR Inshield Bituminous private Limited, P.O. Dishergarh, Dist Burdwan, West Bengal and M/S. Calcutta Mining Sealants Pvt. Ltd., P.O. Dishergarh, Dist Burdwan, West Bengal respectively possess the above characteristics and have been used for dust suppression in open cast mines. Pulver Bond passed different tests carried out by Indian School of Mines Dhanbad and Dust Bond also passed same type of tests carried by the CMRI, Dhanbad.

It is therefore, recommended that a Dust Settling Ionizer may be used under all circumstances for dust suppression including air borne dust in open cast mines to start with.

We, would be pleased to get a feed back and the action taken in the matter along with recommendations, if any, for improvement of the situation further in our mechanised open cast mines.

DGMS(Tech) (S&T) Circular No.9 of 1997

Dhanbad, dated the 26th Dec,1997.

All Mines.

Sub: Identification for newly recruited inexperienced mine workers.

A person newly recruited for mine employment in a mine do not possess any knowledge of mining activities and is therefore, exposed to dangers & hazards in the same. According to Regulation 115(9) of the Coal Mines Regulations, 1957, and Regulation 118 (10) of the Metalliferous Mines Regulations 1961, an inexperienced person shall not be allowed to work alone without presence/ guidance of an experienced worker so as to ensure the safety of new worker.

It is necessary that every new person shall be given initial training as per the Mines Vocational Training Rules, 1966 to develop necessary and requisite skill and safety awareness on him. The new worker should be aware of the various dangers involved in different types of operations. No inexperienced worker should be allowed to work any particular job unless he has been trained thoroughly in safe work procedure related to that job.

In view of the above, every newly recruited mine worker shall be issued a coloured helmet of a distinct colour, one different from those worn by experienced mine workers. He shall wear this distinctively coloured helmet all time while at work in or around a mine for at least one year from the date of initial employment. The coloured helmet should bear luminous markings/strips for ready identification while at work in the dark.

By introducing the system, the newly recruited mine workers can be easily and readily identified by these distinctively coloured helmets (preferably written N.E.W. newly employed worker). Competent persons and mine officials shall help to develop/ inculcate safety consciousness and safety awareness in them from the very beginning of their employment. Mine officials shall take care of, watch and guide the new workers to discharge their duties safely.

You are requested to take appropriate action in the matter at the earliest and ensure that all newly recruited mine workers are issued with distinctively coloured helmets and to ensure that they wear them at all times.

DGMS (Tech) (S&T) Circular No.10 of 1997

Dhanbad, dated the 30th Dec.1997.

All Coal Mines.

Sub: Suppression of Coal dust by using "Dust Setting Ionizer"

In DGMS (Tech) Circular No.8 of 1997 the need and results from experiments with a dust setting ionizer was elaborated. The field trials for the ionizers were carried out both in opencast as well as underground mines. The results of the trials were found to be encouraging. The method of suppressing dust could be used effectively in underground coal mines also provided the methodology of application as described in the circular mentioned above is followed and the ionizer possess the prescribed properties.

It is, therefore, recommended that the dust setting ionizers may be used for dust suppression applications in underground coal mines.

As mentioned in the circular referred above, recently two such dust setting ionizers have been introduced by M/S PVR Bituminous Pvt. Ltd and M/S. Calcutta Mining Sealant Pvt. Ltd with trade names of "Pulver Bond" and "Dust Bond" respectively.

STATUS OF THIS DOCUMENT

This is **not** an official version.

It is based on a copy of the Circulars issued by the Directorate General of Mines Safety (DGMS) during the year 1997. Although care has been taken, to maintain accuracy but it cannot be guaranteed.

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DGMS(Genl) Circular No. 1 of 1998

Dhanbad, dated the 12th Feb, 1998.

All Coal Metalliferous /Oil Mines.

The role of the Internal Safety Organization (ISO) in promoting the cause of safety, does not need any more emphasis when viewed from the current safety scenario in mines. Though, the successive safety conferences in mines deliberated on certain principles of self regulation, it was the Fifth Conference on Safety in mines held in 1980 which clearly spelt-out the structure, role and functions of the ISO in every mining company. The matter was also covered extensively in the recommendations of the Courts of inquiry of Kessurgharh colliery and Sudamdih Colliery, wherein the role of Internal Safety Organization was made specific. These recommendations have been circulated to the Industry vide DGMS Technical Circular No.5 of 1979. The sixth conference on safety in mines contemplated further on expansion of the role and functions of the ISO.

But, from its inception as one of the main recommendations of the Fifth Conference on Safety in Mines, the ISO's Contribution to safety in mines have been unfortunately clouded. It is an accepted fact that more thrust is required in strengthening the role and functioning of the Institution.

An analysis of the chronological sequence of the status of Internal Safety Organisation and its functioning in mines from inception, in light of the present scenario in mines appear to convey the following as the major shortcomings.

1. The functioning of the ISO in mines, is far from meeting the desired objectives.
2. The formulated and effected Corporate level safety Policy in mines by the mining companies, have not been successful in mitigating the incidences of mining accidents and disasters.
3. Failure of effectively monitor the status of implementation of policy directives by the mining companies.
4. Ineffective Inspection of mines for assessment of safety status.
5. Failure of effectively propagate the theme of safety in mine across the various cross section of the management.

Thus, there appears to be an urgent need for reviewing critically, the entire gamut of the concept of ISO, with a view to streamlining the efforts and in identifying the grey areas in the field of safety, for tackling the challenges effectively. In this connection, your attention is also brought to this Directorate's General Circular No.2 of 1997, which was explicit in the role of ISO for meeting the challenges of the future.

It is therefore advised that the management of all mining companies, adopt the following measures as recommended in the 5th and 6th Conference on Safety in Mines and also in the

recommendations of the Courts of Enquiries of “Kessurgarh” Colliery and “Sudamdih” colliery, in reviving the institution of the ISO for justifying its role in improvement of safety standards in mines.

- a. The ISO in every mining company, shall make an in-depth mine wise, cause-wise analysis of all fatal/serious accidents.
- b. The ISO shall monitor the impact of the “Safety Campaigns” drawn up by the Board of Directors based on the ISO’s analysis of accidents as mentioned above, and also submit a report to the Board of Directors at intervals not exceeding 3 months.
- c. The ISO shall be made independent of the production line up at all levels.
- d. The Chief of ISO shall be of a senior rank, next only to the Dir(Tech)/M.D.D./ Chief Executive of mining companies.
- e. The ISO shall be a multidisciplinary team, with a field set-up which shall be above the mine level.
- f. For ISO to be effective in its functioning, suitable policy shall be framed on the basis of the following guidelines.
 - i. A proper Safety Policy shall be drawn up at corporate level to the company.
 - ii. A suitable machinery shall be evolved for effective monitoring of the implementation status of policy directives.
 - iii. There shall be system of periodic mine inspections for assessment of safety status.
 - iv. All mine accidents and dangerous occurrences shall be independently enquired into by the ISO.
 - v. The ISO shall make independent assessment of the safety implication in all cases of opening of new mine/ district, use of new equipment, adoption of new method of work and all grievances on safety related matters.
 - vi. All applications for obtaining statutory permission, shall be studied and vetted by the ISO before submission.
 - vii. Findings of the ISO on safety matters shall be discussed in the Safety Committees at mines.
 - viii. The ISO shall periodically assess the proper functioning of the institutions of Workmen’s Inspectors and the Safety Committee in mines.
 - ix. There shall be a system of auditing the safety standard at intervals of not more than an year, for each mine.

Therefore you are requested to take all possible steps in achieving the set objectives of the Institution of the Internal Safety Organisation.

DGMS (Genl) Circular No.2 of 1998

Dhanbad, dated the 4th June 1998.

All mines

In order to facilitate quick delivery of unregistered letters, two letter boxes have been earmarked for this Directorate. Particulars of the letter boxes are as follows :

1. Post Box No.65 : For all correspondences addressed to the Secretary, Board of mining Examination, Dhanbad.
2. Post Box No.73 : For all correspondences addressed to the Director-General of Mines Safety, Dhanbad.

It is therefore requested that while sending the letters to this Directorate, the concerned Post Box numbers as mentioned above, should invariably be mentioned on the envelope so as to enable their prompt collection from the Post Office.

DGMS

NOTIFICATIONS & CIRCULARS

Notifications – 1999

New Delhi, the 12th February, 1999

S.O. 102(E) – In exercise of the powers conferred by section 12 of the Mines Act, 1952 (35 of 1952) and in supersession of the notification of the Government of India in the Ministry of Labour, No.S.O.886(E), dated the 18th November, 1993, except as respects things done or omitted to be done before such supersession, the Central Government hereby constitutes with effect from the date of the publication of this notification in the Official Gazette, a committee consisting of the following namely:

1.	The Addl. Secretary to the Government of India, Ministry of Labour, New Delhi (Ex-Officio)	Chairman [Appointed by the Central Government under clause (a) of sub-section (1) of Section 12]
2.	The Chief Inspector of Mines (Ex-Officio)	Member [Appointed under clause (b) of sub-section (1) of Section 12]
3.	Shri Rajbansh Singh, Bihar Minerals Mazdoor Sangathan, Upper Bazar, Gudari, Dist. Lohardagga (Bihar).	Member [Appointed under clause (c) of sub-section (1) of Section 12]
4.	Shri GB Nagpure, Working Committee Member, Indian National Mineworkers' Federation, P.O.Kamptee Colliery, Tehsil:Parseoni, Dist. Nagpur-441404	Member [Appointed under clause (c) of sub-section (1) of Section 12]
5.	Shri KS Kropha, Director, Ministry of Coal, 5 th Floor, Lok Nayak Bhavan, Khan Market, New Delhi- 110003	Member [Appointed under clause (d) of sub-section (1) of Section 12]
6.	Shri AN Bose, Controller General, Indian Bureau of Mines, Nagpur	Member [Appointed under clause (d) of sub-section (1) of Section 12]
7.	Shri ML Gupta, Scientist F, Central Mining Research Institute, Barwa Road, Dhanbad.	Member [Appointed under clause (e) of sub-section (1) of Section 12]
8.	Prof. BK Kejriwal, Head of Department, Mining Engineering, Indian School of Mines, Dhanbad.	Member [Appointed under clause (e) of sub-section (1) of Section 12]

[F.No.S-29025/3/98-ISH.II
CD Bhardwaj, Under Secretary

New Delhi, the 12th July, 1999

S.O. 2110 – In pursuance of sub-rule (4) of Rule 10 of the Official Language (Use for Official Purposes of the Union) Rules, 1976, the Central Government hereby notifies the following Regional Offices of Director-General of Mines Safety, Dhanbad :

- (1) Office of Director of Mines Safety, Jabalpur Region, Jabalpur.
- (2) Office of Director of Mines Safety, Bilaspur Region, Bilaspur.

Circulars – 1999

DGMS (Tech) Circular No.1 of 1999

Dated: 27.1.1999

To
Owners/Agents/Managers
of all Coal, Metalliferous and Oil Mines.

Sub: Audit/ Inspection of equipments on hire/contract.

Investigation into a number of accidents connected with equipments/machinery involving equipments on hire/under contract have revealed that, substandard equipments and unsatisfactory maintenance were mainly responsible for the accidents.

Recently a fatal accident took place in a oil mine when the crane super structure fell of its turn table during the operation. The enquiry has revealed that the crane belonged to a contractor and there were no system for audit for such equipments though system of auditing exist in the mine for departmental machinery/equipments.

In this connection your attention is once again invited to the DGMS (Tech) Circular No.36 of 1972, (Tech) Circular No.3 of 1981, (Tech) Circular No.2 of 1986 and (Tech) circular No.1 of 1989 which cover the requirement of proper care, maintenance and examination of equipments. It is further to say that apart from the measures suggested in the circulars, the following procedure be adopted to avoid recurrence of such accidents.

- (i) All contractual/hired machineries engaged in the mine shall be audited/ inspected by a team consisting of mine officials and contractors' technical personnel for their suitability before engaging in the mine.
- (ii) The contractors' equipments are also to be checked by a competent person of the mine periodically.

DGMS (Tech) Circular No.2 of 1999

Dated 21.4.1999.

To
The Owners, Agents and Managers of
all Coal & Non-Coal Companies.

Sub: Accident in Coal Handling Plant/ Crushing Plant in Mines.

Recently an accident occurred in Coal Handling Plant of a coal mine in which the bunker structure collapsed and two persons were killed. Enquiry was conducted and samples of failed and other pillars were sent to a National Institute of Engineering Technology for failure analysis.

During enquiry by this Directorate, it was revealed that the design and drawing of the Coal Handling Plant was taken from a neighbouring mine of the same company. Capacity of bunkers in the neighbouring mine was 100 tonnes, while the capacity of bunker of the mine was 160 tonnes. But the number and size of pillars were kept same i.e. 6 pillars of 356 mm I Section.

The conclusion of reports from National Institute of Engineering Technology was as follows :

1. The Original Bunker supporting structure of neighbouring mine was unsafe and was having poor stability. The bunker structure was serving at the cost of Factor of Safety and also full conceivable loads never occurred simultaneously. But increasing the capacity of Bunker in this mine it was made further unsafe. This Bunker structure was

working in the plastic stage and with excessive deflection not permitted under code of practice (IS: 800) and as such finally collapsed.

2. Fatigue cracks appeared to have propagated in the flange to a length of 40 – 50 mm. (almost 30% of the width of flange) resulting in possible bending of column and ultimately led to cleavage type of brittle fracture in remaining portion of I Section leading finally to failure of pillars.

There had been failure of out door structures in various mines in the past also resulting in serious and fatal accidents. Similar failure of a twin steel bunker took place in an another coal mine in 1996 when also it was noticed that the structure design was not stable due to inadequate factor of safety and the structure members subsequently got badly rusted and corroded and thus became further weak and subsequently collapsed after 7 years of use.

Based on the recommendations made in the report of the National Institute of Engineering Technology and the findings of the enquiries conducted by this Directorate, it is suggested that following precautions shall be taken in order to prevent similar failures of structures.

1. The structures of Coal Handling Plant/Crushing Plant shall be designed taking into consideration all sorts of conceivable loads for making them safe as per Indian Standard Code of Practice IS:800. Adequate stability bracing shall be provided to avoid excessive deflection.
2. The composition of steel used in fabrication of structures shall confirm to IS: 2062: 1992.
3. Steel used for fabricating the structures shall be free from defects as per IS 2062: 1992. The finished material should be reasonably free from surface flaws, laminations, rough/ jagged and imperfect edges and all other harmful defects.
4. Foundation of all the pillars shall be shrouded with cement concrete so that water may not come in contact with steel to avoid corrosion/ pitting etc. The surface area near pillars shall be cleaned regularly to remove coal/ other material piling above shrouded portion of pillars. Adequate care shall be taken so that pay loader/ tipper working under bunker do not damage pillar by hitting.
5. For detection of defects in the CHP/ crushing plants of mines, all such structures may be examined by an expert team including a number having expertise in design of structures. Suitable measures should be taken to strengthen the existing structures wherever required. A system of annual inspection of such structures using visual and non-destructive testing techniques shall also be introduced in all mines.

No. DGMS (Tech) Circular No.3 of 1999

Dated 28.4.1999.

To
The Owner, Agents, Managers of
All Opencast Mines.

Sub: Accident due to dumpers due to sudden stoppage of Engine/
failure of braking system.

It has been observed during course of enquiry into a recent accident in an opencast coal mine that one 35 Tonne haul-pack dumper traveling against a gradient of 1 in 10 rolled back and fell down on the lower bench causing fatal injuries to the operator. The enquiry revealed that the engine of the dumper stopped suddenly of its own and due to non/partial functioning of brake

and non functioning of the emergency steering system, the operator failed or became rather helpless to control backward movement of the dumper.

In such dumpers the steering system and the power transmission system are hydraulically operated. Due to stoppage of the engine, hydraulic pressure comes to zero almost instantaneously, hydraulically operated steering gets locked and the gear system becomes as if kept in NEUTRAL position. Hence the vehicle (when moving against the gradient) starts going back. In such cases, effective parking brake/ service brake and secondary braking system having no leakage in the pneumatic system can only save the vehicle from going back. Battery operated emergency steering system provided in such dumpers also can be useful for controlling the vehicle if the driver can keep himself cool as he has to manually switch on the emergency steering circuit.

It is therefore necessary to maintain the parking brake/ service brake and secondary braking system and emergency steering unit in all dumpers in safe working order to avoid such accidents. It is also necessary that these system are more frequently examined and record of such examinations are maintained.

In this connection I like to draw your attention to DGMS (Tech) circular No.3 of 1981 wherein the importance and methods for testing of parking brake and service brake have been highlighted.

The accidents due to HEMM are on the rise due to increased activities in the open cast mining sector. Hence the above recommendations in consultation with the equipment manufactures must be strictly complied with.

DGMS/S&T(Tech) Circular No.4 of 1999.

Dated: 13.5.1999.

To
All Owner/Agent/Manager of
All Coal Mines.

Sub: Prevention of accidents in mechanised longwall coal mine.

In the recent past two fatal accidents occurred in longwall powered support workings of a coal mine. The causes of the accidents are given below.

1. While a crew of five piece rated majdoors were engaged in inserting one front leg of a shield support in the salvage gallery the other front leg holding the canopy suddenly closed causing the canopy to collapse inflicting serious bodily injuries to two of them. One majdoor succumbed to his injuries.
2. While a cable man-cum-lockout switch operator, standing between the spill plate of the Armoured Face Conveyor and the front legs of the hydraulic chock, was attempting to operate a lockout switch to stop the AFC after a roof fall, a piece of roof shale measuring about 1.45m x 0.45m x 0.45m thick fell down from a height of 1.7m on the AFC and hit him inflicting serious bodily injury to which the succumbed one hour later.

In the first case, it was revealed that one pressure hose was not connected properly to the leg, the staple pin required to be put for locking the hose in place was either not fully inserted or broke while being inserted. The supervisor overseeing the operation was held responsible for the accident.

In the second case, it was found that the Code of Practice was not followed by the Mining Sirdar and the deceased. The overman in-charge also did not ensure compliance to the code of practice.

In both cases, it came to light that established for doing a particular job at the longwall face was not followed and supervision was slack.

In highly mechanised operations strict compliance to statute and systems cannot be overemphasized. It is necessary to frame relevant Codes of Practice for various operations and follow them strictly. The necessity of on-going training plan for all workers get highlighted by such tragic losses of life.

In view of the above, I once again draw your attention to the aspects mentioned above and advise, that

- (i) Strict supervision be ensured at all places in a mechanised operation.
- (ii) Proper codes of practices be framed for all operations in longwall mines and their implementation is ensured, and
- (iii) Only properly trained workers are deployed at longwall and other mechanised face operations.

DGMS (Tech) SOMA Circular No.5 of 1999

Dated: 13.5.1999.

To
Owners, Agents & Managers of
All Coal Mines.

Sub: Charging and firing of explosives in a crack, i.e. in an improperly drilled, charged and stemmed shot hole.

Recently there had been an accident from a secondary blasting in an opencast mine. The enquiry revealed that about 62.5 kg. of explosives was placed in a crack measuring 7m by 4 m. and 0.25 m. in thickness without sufficient confinement in a toe of a dragline bench. The result was that a blasting projectile measuring 21 cm. x 21 cm. and 4 cm. in thickness and weighing about 4.5 kg. flew through a distance 330 m. and hit a person who had taken shelter beneath a tree, inflicting fatal injuries to him.

Your attention is drawn to the provisions of Reg. 168(1), which requires firing of shot in a properly drilled, charged and stemmed shot hole and Reg. 170(1) of the Coal Mines Regulations, 1957 read with DGMS (Tech) Circular No.8 of 1982 on taking proper shelter. Compliance of these mandatory provisions and circulars will go a long way in preventing such type of accidents.

DGMS (Tech) Circular No.6 of 1999

Dated: 15.6.1999.

To
Owners, Agents & Managers
of all Coal Mines.

Sub: Observations of New Kenda Court of Inquiry.

The court of inquiry appointed under section 24 of the Mines Act, 1957 to enquire into causes and circumstances attending the accident that occurred in New Kenda Colliery of M/s. Eastern Coalfields Ltd on 25.1.94 causing loss of 55 lives due to fire, made the following observations :

1. Workers shall be made acquainted with the existence of escape routes/2nd outlets from work places/working district to the surface of the mine/mine outlets. Maintenance of the escape routes should strictly be adhered to and there must be

marking/signs to indicate such escape routes. Mock rehearsals shall be carried out regularly to keep them aware of the escape routes.

2. There is an immediate need for development of awareness amongst workers, supervisors and management officials for identifying hazards due to fire in underground coal mines. Intensive education and training of the miners as well as supervisory staff shall be taken up in this regard. Training modules on fire hazards shall be prepared for imparting training.
3. In a belowground coal mines, efficient telephone communication shall be provided and maintained from the working districts/places to the surface. Provisions of Regulation 87(4)(b) of CMR, 1957 shall be strictly complied with.
4. In all working places in belowground and all other places of fire risk such as coal stocks, spoil heaps containing carbonaceous material and exposed coal surfaces liable to heating, adequate quantity of water at sufficient pressure for the purpose of efficient fire-fighting along with other fire fighting equipment shall be provided and kept maintained as required under provisions of regulation 120(1)(a) of Coal Mines Regulations, 1957.
5. No person should be permitted to go belowground without self-rescuer. It is mandatory as per Regulation 191D of Coal Mines Regulations, 1957. It should be strictly complied with. Measures should be taken for training & re-training of the workmen in proper use of self-rescuers.

Proper implementation of safety measures in accordance with these observations can bring about definite improvement in the safety standards in the mines. Suitable steps may therefore be taken early in this direction.

No. DGMS (Tech) Circular No.7 of 1999

Dated: 17.6.1999.

To
The owners. Agents & Managers
of all Coal Mines.

Sub: Proper quality assurance, storage, maintenance & use of filter self-rescuers.

Self-rescuer is essentially a life escape type of protective equipment used in emergency for escaping to safety though an irrespirable atmosphere containing highly toxic carbon monoxide gas. Therefore, it is of utmost importance to ensure that the same should be of proper design, construction and quality as per specified standards. While in use, it should be properly stored, maintained and handled with care so that it provides adequate protection in emergency.

The importance of the self-rescuers as a life saving equipment, the need for maintaining the same to the highest degree of availability and important issues connected with use and maintenance of filter self-rescuers had been brought to the attention of the industry vide DGMS(Tech)Circular No.7 of 1982.

The importance of providing, maintaining and proper storage of filter self-rescuers also came to sharp focus after an occurrence of the disaster due to fire in New Kenda Colliery of M/s. E.C.L. on 24.01.1994.

The testing of filter self-rescuers came into prominence when a few of the samples of filter self-rescuers collected from the mines by DGMS officials and subjected to CO break through test in the Artificial Lung Simulator Machine provided at DGMS, Dhanbad failed. Since the samples tested were drawn from those actually being used in the mines, the matter gained greater

seriousness. It was felt that the proper quality of such life saving product was not checked by the user.

Till recent past, facility for testing of FSRs as per BIS specifications was provided with manufacturers only. No National Test House Laboratories had such facilities. The need for having testing facilities with an independent agency was long felt. Testing facility was developed at CMRI, Dhanbad in 1996. However none of the coal companies including Coal India Ltd. who are the main user of the FSRs have any testing facility as yet.

In view of the above, a committee was set up by the undersigned to look into the use of filter self-rescuers with a view to determine self-rescuers adhere to the prescribed standards and approved design, assess their quality and condition and review the existing quality control, testing and maintenance procedure by users and suggest remedial measures to ensure their sustained availability with proper quality.

Committee during the enquiry observed that storage, maintenance and use of filter self-rescuers in coal mines was far from satisfactory. Filter self-rescuers were not being generally weighed at regular intervals in most of the mines. Moreover, accurate weighing machines were not available in most of the mines. From the data submitted by coal companies, it revealed that substantial number of filter self-rescuers had gained weight beyond the permissible limit and were therefore unfit for use in mines. The mine management however remained oblivious of this fact. It reveals that standard of maintenance of the self-rescuers in the mines is generally not satisfactory at all.

Proper storage & use of filter self-rescuers is particularly important as the life of the filter self-rescuers depend on the same. Improper storage & use may lead to damage of outer container and consequent ingress of moisture, which will render the catalyst of filter self-rescuers ineffective. This ineffectiveness of the catalyst is reflected by gain in weight. Therefore, as a check for effectiveness of the self-rescuers, periodic weighing in sensitive & accurate weighing machine is essential and this forms the most important feature of the regular maintenance schedule.

Regarding 'Self-life' of filter self rescuers, BIS: 9563: 1980 stated as follows :

"The filter self-rescuers shall at no time gain in mass by more than 12 grams at which stage it shall be considered to have lost its effectiveness. This gain in mass shall not take place in less than 4 years from the date of manufacture.

Note 1: Further, if a vacuum sealed self-rescuer is found to have opened, it shall be weighed immediately, and if found within the limits, then should be resealed as per manufacturer's instructions ".

Committee observed that most of the instructions of DGMS (Tech) Circular No.7 of 1982 were not being complied with. Therefore, the chances of ineffective filter self-rescuers, continued to be used by the mine workers, always remain high. It is necessary to ensure that the aforesaid recommendations of circular are strictly complied with. The existing maintenance, checking testing and use of filter self-rescuers at the mine level gives enough scope for improvement. Measures and suggestions to improve the same are given below :

1. It is necessary for all of coal mining companies having belowground mines to have their own quality control and testing facilities for filter self-rescuers possibly at apex level i.e. ISO, Rescue Stations, CMPDIL etc. A system shall be established for quality assurance at the user end. The quality control and samples checks should be carried out at the procurement stage and then periodically during its use in the mines.
2. A thorough check shall be carried out of all self-rescuers being used in belowground coal mines to ensure that these are as per prescribed standard IS:9563-1980 and of

proper quality. In case of any sub-standard or defective equipment is detected, the same shall be immediately removed from the mine and replaced by proper ones.

3. Most of the mines don't have a system for weighing of FSR. In some mines, where it is provided, it is by grocers pan & weight which cannot measure gain in weight upto 12 gm. accurately. Suitable sensitive type of balance shall be used for accurate weighing of the self-rescuers. Moreover, filter self-rescuers should be weighed at least every three months to determine the gain in mass. The filter self-rescuers shall at no time gain in mass by more than 12 grams at which stage it shall be considered to have lost its effectiveness.
4. Filter self-rescuers is essentially an escape type of personal protective equipment. It should not be used for purposes other than escaping to safety through an irrespirable atmosphere containing CO. The practice of dealing fires using filter self-rescuers should be discontinued.
5. Filter self-rescuers shall be carried by each person going belowground and shall be kept with him while at work. Sufficient number of filter self-rescuers shall be provided at the mines in good condition so that the same can be issued to individual persons by name which will improve maintenance, upkeep and proper usage.
6. In respect of care, maintenance and use of self-rescuers a detailed circular was issued to the industries in 1982 bearing DGMS (Tech) Circular No.7 of 1982. Recommendations of this circular shall be strictly complied with.

Defective filter self-rescuers may create false sense of security to the miners with serious consequences. It will be prudent on the part of the user to maintain a vigilant eye on the quality and upkeep of filter self-rescuers in the interest of safety of persons employed in the underground coal mines. Corrective action in this regard shall be taken at the earliest.

DGMS(Tech) S&T Circular No.8 of 1999

Dated: 29.6.1999.

To
The Owners/Agents/ Managers
of all Coal/ Non-Coal Mines.

Sub: Code of practice for in-situ Examination of Winding Drum Shaft by Ultrasonic Flaw Detection Testing Technique and Recommended Frequency of Testing.

Safety and efficiency of the winding engine installation have always been the concern of all and it is necessary that the winding engine installation and components are of good quality and high reliability. The problem is more critical due to existence of large numbers of old engines. In order to ensure the reliability of the same it is necessary to monitor the condition of the winding installations periodically to prevent failure of the winding equipments and components during service which may result in loss of life and property. It is necessary to adopt planned preventive maintenance in addition to periodical visual examination.

Non Destructive Testing (NDT) is a means for ascertaining and monitoring the health of vital components. Keeping this in view, the Directorate had issued a Technical Circular (10 of 1982) recommending adoption of NDT method for testing the vital components of winding engine and other equipments. However, when implementing the method, difficulties were felt due to non-availability of standards of acceptance or rejection. Therefore, a code of practice has been evolved and this has been accepted by the various agencies for carrying out in-situ testing of drum shaft. A copy of the code of practice is in appendix-1. The code of practice may be followed in respect to all winders of mines with immediate effect. The norms of the acceptance/ rejection as stipulated therein shall be strictly adopted.

I would like to further stress that non-destructive testing of vital components need to carry out periodically. This is necessary as most of the winders in our country are old and aging process has started long back.

The frequency of such testing is given below:

1. Component	Heavy Duty	Medium Duty	Light Duty
a. Drum Shaft Electric Winder.	Once in a year	Once in two years	Once in four years
b. Drum shaft Steam/Compressor Air operated.	Once in a year	Once in two years.	Once in Two years.

The duty is based on number of hours the winding engine is working per shift which is given below :

2. Heavy Duty	Winding Engine working more than	3 Hrs/Shift
Medium Duty	Winding Engine working between	1½ Hrs to 3 Hrs/Shift
Light Duty	Winding Engine working less than.	1½ Hrs/Shift.

I am sure that in the interest of safety, all mining companies shall take immediate action in the implementation of the above recommendations.

APPENDIX-1

CODE OF PRACTICE FOR IN- SITU EXAMINATION OF WINDER DRUM SHAFTS BY ULTRASONIC FLAW DETECTION TESTING TECHNIQUE.

1.0 SCOPE

This recommended practice covers the ultrasonic testing method and acceptance norms for in-situ examination of winder drum shafts, by pulse echo direct contact method.

2.0 EQUIPMENT

An ultrasonic pulsed echo type of instrument shall be used for this testing. The system shall have a minimum capability for examining at frequencies from 0.5 to 5 MHz.

The ultrasonic instrument shall be calibrated for Time base Linearity and Amplitude Linearity.

In general, Normal beam probes of 2 MHz frequency & 20/25 mm diameter shall be used for scanning of the shaft.

Other probes may be used for evaluating and pin-pointing the indications, whenever required.

3.0 COUPLANTS

Couplants having good wetting characteristics like machine oil/lubricating oil or grease shall be used. Same couplants shall be used for calibrating the ultrasonic instrument and during the examination of the shaft.

4.0 REFERENCE BLOCKS

Standard 500 mm long bar shall be used for calibration of the ultrasonic instrument and for achieving the required test range. Standard IIW blocks (V1 and V2) shall also be used for calibration of the instrument, as and when necessary, to check the linearity of the instrument.

5.0 SURFACE CONDITION

The surface condition of the area which will be scanned shall be smooth and even to enable good contact of the probe during testing. The end surface of the shaft shall be perpendicular to the horizontal axis of the shaft. In case the same is not even and smooth and not perpendicular to the horizontal axis of the shaft, the same shall be dressed accordingly using grinding/filing, etc. Further the surface of the area to be examined shall be free from extraneous material such as loose scale, paint, dirt, etc.

6.0 TESTING METHOD

Generally, end surfaces will be available for scanning ultrasonically when the winder drum shafts are required to be examined in in-situ condition. However, where even possible, length-wise scanning from diametrically opposite faces of the shaft shall be done.

While scanning a 15% overlap on each pass of the scanning shall be maintained. The probe shall be given a slight rotary movement for proper coupling.

Horizontal distance of the C.R.T. shall be calibrated for the desired length of the shaft by using the standard length bar. As far as possible the distance calibration shall be done in such a manner, so that the back wall echo is located approximately at $3/4^{\text{th}}$ of the horizontal base line.

Adjust the instrument controls to obtain a back wall echo approximately 100 % of the full screen height (FSH) from opposite side of the shaft. For scanning, the amplification may be increased by 6 to 12 dB, if required. However, in case of detection of defect indications, the same shall be evaluated by increasing the gain of the instrument by 6 dB in addition to the gain at which the back wall echo was set earlier at 100 % FSH.

Whenever a flaw is detected with normal beam probe, efforts shall be made to cross check the same by using suitable angle beam probe, keeping in view the accessibility for such testing.

The bearing portions of the winder drum shaft shall be circumferentially scanned using normal beam probe of suitable frequency by removing the covers. Efforts shall be made to test the portions of the fillet and surface areas below drum checks of the drum shaft by suitable angle beam probes, keeping in view the accessibility for such testing.

Any change in the probe unit, couplant and instrument test range setting from that used for previous calibration, shall require recalibration of the instrument.

During the examination of the shaft, monitor the back wall echo for any significant reduction in amplitude. Reduction in back wall echo amplitude may indicate not only the presence of a discontinuity but also poor coupling of the probe unit with the surface of the shaft.

7.0 RECORDING

Record all the information as regards to the instrument, probe, couplant, calibration gain, test range and test gain and positions of the defect indications, for further evaluation.

8.0 REPORT

The report shall contain the details in respect of test location, equipment used, date of test, team of engineers conducting test, test conditions, couplant used and test results. Necessary drawings shall also form the part of the report.

9.0 ACCEPTANCE CRITERIA

The winder drum shafts are considered to be under the category of “components subjected to normal stresses” and hence are classified as Level-III forgings. Keeping the above view the following acceptance criteria shall be followed in relation to the permissible indication patterns enclosed herewith, while carrying out the ultrasonic testing of shafts from end faces and length-wise scanning wherever the same is approachable.

- i) Isolated defect indication, which results in the defect echo of 100% FSH (Full screen height) and still keeps the back wall echo to 90% FSH, is permissible.
- ii) In case of distributed (non isolated) indications, which result in the defect echoes of more than 75% FSH and causing the back wall echo to drop to below 25% FSH are not permissible.
- iii) More than five (5) defect indications per metre length and each having echo height of more than 35% FSH and two such consecutive indications less than 60 mm apart are not permissible.
- iv) The frequency of defect of more than three (3) per metre of circumference and each having echo height of more than 35% FSH, is not permissible.
- v) If no back wall echo is obtained during testing due to any unforeseen reasons, the whole surface of the shaft shall be checked ultrasonically by diametrically testing the complete length of the shaft, for which shaft may be removed for complete checking. Further the whole surface area shall be tested by magnetic particle flaw detection technique for detection of any impermissible surface cracks.

NOTE:

The above in-situ ultrasonic testing of winder drum shaft shall be supplemented by magnetic particle inspection of the areas below the bearing cover plates and other accessible surface areas of the drum shaft for the detection of any impermissible surface cracks.

ACCEPTANCE CRITERIA FOR SITU EXAMINATION OF WINDER DRUM SHAFTS BY
ULTRASONIC FLAW DETECTION TESTING TECHNIQUE

PERMISSIBLE INDICATION PATTERNS

DGMS

No. DGMS (Tech) Circular No.9 of 1999**Dated: 8.11.1999.**

To
Owners, Agents and Managers of
all opencast Mines.

Sub: Accidents due to failure of brake in tippers (tipping trucks).

Tippers (tipping trucks) are being increasingly used for transport of coal/mineral or waste material in Opencast Mines. These tippers are provided with service brakes which operate by air over hydraulic pressure and parking brakes released by air pressure. Such tippers are causing a number of accidents every year due to failure of brakes particularly where a vehicle is plying on gradient.

Inspections made by the officers of this Directorate have revealed that parking brakes which could stop the tipper in case of failure of service brakes were found defunct in most of the tippers. Therefore in case of failure of service brakes on gradient, the tippers rolled down causing accidents.

Parking brake in general is understood as a brake meant to hold a stationary vehicle in stopped condition. But most of the manufacturer now provide parking brakes which can stop a moving vehicle in case of failure of service brakes. Some of the models of tippers (e.g. TELCO Model 1210 of 1992) are provided with fail safe parking brakes. In some other models of tippers i.e. TATA 1510 & 1510A, the manufacturer can provide full air brake system on request of purchasers. In case of leakage of air pressure or pressure drop in air system in these models, the brakes are automatically applied on all the four wheels. Ashok Leyland also provide this type of braking system on "Comet" model tippers.

In order to prevent accident due to failure of brakes, you are requested to get the tippers regularly checked for the braking system including parking brakes and ensure that the same are maintained in order. Action may also be taken to introduce tippers with full air brake system (and not air over hydraulic) in which the tipper stops immediately if the air pressure drops in the brake system.

DGMS (Tech) (S&T) Circular No.10 of 1999**Dated: 15.11.1999.**

To
The Owner/ Agent/ Manager
of all Opencast Mines.

Sub: Provision of propeller shaft Guard in Dumpers and tippers.

While a tipping truck loaded with coal was being driven up a haul road at a gradient of 1 in 16" in an Opencast Mine, the propeller shaft suddenly broke, thus damaging the service brake. The tipper rolled back for a distance and fell down in 5m deep water logged ditch causing fatal injuries to the driver.

There are several cases in which due to a mechanical failure (such as shearing of bolts etc. at the near end of propeller shaft) the shaft would become free to dangle and consequently spin violently over a wide arc and thus smash the brake system components (Servo chambers, master cylinders as well as pneumatic and hydraulic lines) which are in the vicinity and this damage would in turn result, almost immediately in the brake failure.

To prevent possibility of failure in the above situation, BEML has provided a sturdy safety guard for the propeller shaft in BH-35 dumpers. These are simple in design and can be adopted to any type of dumpers easily.

In this connection attention is drawn to the DGMS Tech. Circular 3 of 1999 wherein the importance of other safety devices has also been highlighted.

Hence it is recommended that a sturdy propeller shaft guard shall be provided in all types of dumpers and tippers irrespective of tonnage capacity in consultation with equipment manufacturer.

DGMS (Tech)(SOMA) Circular No.11 of 1999

Dated: 25.11.1999.

To
Owners, Agents & Managers of all Mines.

Sub: Accidents due to blown through shots in coal mines during
blasting operations belowground.

Blown through shots still continue to be the common cause of fatal accident in belowground coal mines, despite clear safety provisions being laid down in the Coal Mines Regulations, 1957 and circulars issued on the subject by DGMS from time to time. Analysis of such type of accidents revealed that unsafe acts and practice lead to such accidents.

Recently there had been an accident in a coal mine due to blown through shots in a development face causing fatal injuries to three drillers. Inquiry into the accident revealed that while two working faces had approached within 1.8m of each other and a round of shots was fired in one of the faces, without withdrawing persons from the other, blasting projectiles from the blown through shot struck, buried and killed the three drillers immediately.

Your attention is invited to Regulation 170(1) & (3) of the CMR' 1957, and DGMS(Tech)(S&T) Circular No.4 of 1996 which lays down in details the precautions that are required to be taken to prevent accidents due to explosives, including blown through shots.

I am to request you to take immediate steps as may be deemed fit for compliance of the aforesaid provisions which will go a long way in prevention of such type of accident in future.

DGMS Circular No. (Tech) No.12 of 1999

Dated: 24.12.1999.

To
Owners Agents & Managers of
all Mines.

Sub: Precaution while reversing vehicles.

Accidents due to transportation machinery in opencast mines continue to remain high and several such accidents have occurred while reversing vehicles. The code of precautions for truck transport in opencast mines attached to DGMS circular No.11 of 1973, require audible warning signals before reversing. DGMS Circular No.7 of 1997 again drew the attention of the industry to this hazard, requesting that a separate horn with a sound different from normal horn of the vehicle should be provided for the purpose. The driver should continue blowing this horn during reversing, and the horn should be standardized in a mine so that whenever a horn having a particular sound is given, it would become evident that a vehicle is being reversed. The possibility of incorporating horns which operate automatically when the vehicle is reversed should be also explored.

In some of our mines where such audio visual warning have been provided, it is observed that sometimes the level of sound of horn is so low so as to become ineffective and in other case it is so high that it may even exceed the permissible limits, posing another hazard. High sound level, besides causing hearing impairment and distraction, can even drown sound warning emitted from nearby sources posing additional hazard. It is needless to say the sound generated by the alarm should be such so and not to be shrouded by the sound of the vehicle and the surrounding sources but at the same time should not be high enough to cause hearing impairment and become a source of another hazard.

It is recommended that an audio-visual backup alarm system which adjusts itself to the surrounding noise level maintaining minimum 5 dB(A) above the noise level may be used in the trucks and dumpers. Such alarm system have been developed in other countries (i.e. "ECCO " of U.S.A.) and the marketed in India. These or similar product may be tried.

DGMS(Genl) Circular No.1 of 1999

Dated: 29.9.1999.

To

Owners, Agents and Managers of all mines within the jurisdiction of Bellary Sub-Region under Hyderabad Region No.II, Southern Zone, Hyderabad.

Sub: Jurisdiction of Bellary Sub- Region.

This is to inform that the Raichur District in Karnataka State has been divided into two districts namely Raichur & Koppal.

Therefore, in partial modification of Circular No.DGMS(Genl) 1 of 1987 & DGMS (Genl) 1 of 1989, all the mines in Raichur and Koppal districts in the State of Karnataka will also fall under Bellary Sub-Region under Hyderabad Region No.II, Southern Zone, Hyderabad.

The Postal and telegraphic address of Bellary Sub-Region i.e. P.O. Bellary, District. Bellary will remain the same. The Telephone No. of Bellary Sub-Region is (08392- 40614)

You are requested to endorse copies of application for statutory permission, notices of accidents etc., to the Dy. Director of Mines Safety, Bellary Sub-Region for taking necessary action.

DGMS(Approval) Circular No. 1 of 1999

Dated: 5.7.1999.

To

The Owners/Agents/Managers
of all Coal and Non Coal Mines.

Sub: Withdrawal of permission to manufacturer and supply of winding ropes to mines.

This is to inform you that the approval for manufacture and supply of ropes to mines for winding purpose granted to :-

1. M/s. Bombay Wire Ropes Ltd., 401/405 Jolly Bhavan No.1, 4th floor, 10 New Marine Lines, Bombay.
2. M/s. South India Wire Ropes Ltd., Edathala, P.O. Alwaye, Kerala- 683 561

Vide this Directorate Circular No. DGMS (Approval) Circular No. 19 of 1976 has been withdrawn with effect from 13th April 1999 as the said manufacturers are not manufacturing winding ropes presently.

No.DGMS (Legis) Circular No.1 of 1999

Dated: 11.2.1999.

To
The Owners/Agents/Managers of
all Mines.

Sub: Certification of the First Aid course conducted by Multi Disciplinary Centre on Safety, Health and Environment, Bhubaneswar.

Sir,

This is to bring to your notice that the syllabus for First Aid Course prescribed by the Multi Disciplinary Centre on Safety, Health and Environment, Bhubaneswar, an autonomous body sponsored by Govt. of Orissa is of the same standard as prescribed by St. John Ambulance Association (India) for the purpose of Rule 41 of Mines Rules 1955, Regulation 15(1)(b) of Coal Mines Regulations, 1957 and 15(1)(b) of Metalliferous Mines Regulations, 1961.

The course conducted by this Centre is recognised and the certificate issued by the Centre is approved under the relevant Rules & Regulations.

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DGMS

Circulars – 2000

DGMS (Tech) Circular No.1 of 2000

Dated the 4.1.2000

To
Owners, Agents and Managers
of all mines.

Sub: Danger due to explosives during testing of electric detonator.

Recently there has been an accident in a stone quarry resulting in death of four persons due to premature detonation of a primed cartridge of special gelatin. The detonator in the prime cartridge was being tested by a multi meter by a person who was not holding the required competency certificates, when the shot exploded resulting into the accident.

Enquiry into the accident revealed that testing of the detonator was being carried out without using an apparatus specially designed for the purpose in contravention of Reg. 169(5)(c)/Reg. 163(4)(c) of CMR,1957/MMR,1961 and without taking proper shelter in contravention of Reg. 170/164 of CMR 1957/MMR 1961.

The accident resulting in loss of four invaluable lives was caused due to failure to comply with the provisions of safety laws. In this connection it may be mentioned that the circuit continuity tester used for electric shot firing in mines need to be either of a type approved by DGMS or conform to requirements of Appendix-A of I.S. 9836-1981 as amended upto date.

I am to request you to comply with provision of the safety law and safe practices in usage of explosives to prevent recurrence of such accident in future.

DGMS (Tech) Circular No.2 of 2000

Dated the 31.1.2000

To
The Owners, Agents and Managers
of all coal mines.

Sub: Use of Fire Resistant Hydraulic Fluid in Machinery used belowground in coal mines

Use of approved type of fire resistant fluid in machinery working belowground coal mines is mandatory as required under Regulation 181(3) of Coal Mines Regulations, 1957.

Mineral oils are not suited for the purpose, as the same do not possess fire resistant properties.

I understand from the feedback from various coal companies that FRHF used in SDL and LHD machines have been found satisfactory in general but a few incidents/occurrences of jamming of valves, premature failure of seals, breaking up of the emulsion, premature failure of pump have been reported.

In view of safe and effective use of the fluid, following guidelines shall be strictly complied with.

1. Contamination in the fluid:

Contamination of hydraulic system can cause tremendous damage to the hydraulic system. In mineral oils, the contaminations present may settle down at the bottom of the tank but in emulsified FRHF, the contamination like coal dust etc. may not settle down and the whole contamination/particles travel at high speed which may cause enormous damage to seals/gaskets, pumps etc.

The problem can be solved by two ways:

- (i) Change of filters at an interval of 500 hours as recommended by the equipment manufacturer.
- (ii) Maximum contamination takes place during topping up of the fluid by opening of the lid of the tank in the coal face. Such manual topping up shall be discouraged. Topping up must be carried out directly from the fluid container to the tank by hose pipe with the assistance of hand pumps provided by the equipment manufacturer. Maximum contamination level has been indicated by M/s.IOC in one of the seminars shall be 0.1% of the fluid by weight provided the contamination is abrasive like coal/silica. But it requires further study by the users, oil manufacturers and equipment manufacturers.

2. Life of FRHF:

Since contamination play a vital role in the safe use of the fluid, apart from complying the recommendation mentioned at para 1, the hydraulic system including the tank of each machine shall be cleaned atleast once in a year and charged with fresh fluid after replacing the filter by a new one.

3. Mixing of FRHF of different make:

Basic petroleum oils in the fluid may be of different makes and additives added may also be different, so it is not recommended at present to mix the fluids during use. A detailed study on the effect of mixing of fluids of different makes on stability, wear and corrosion I needed before inter mixing of various fluids.

4. Seal/gasket compatibility:

The various fluids may affect the various seals in different proportion depending up the polymeric material used. Equipment manufacturer should indicate the compatibility of recommended fluid with the seals used by them.

5. Quick analyzer to assess the percentage of water in oil

It is necessary to maintain water level between 36% to 42% in the HFB fluid and to ascertain the water content, samples must be drawn atleast once in three month. Availability of refractometers for quick analyzing of oil/water percentage for HFA fluid for powered roof supports is not a problem. But in fluids where the oil content is nearly 60% as in HFB, such refractometers do not work. Each oil manufacturer shall provide a method of breaking of the sample of fluid and method to determine water content at site.

It is, therefore, essential that the users shall initiate all actions as per the guidelines mentioned above and they shall procure only those equipments which are compatible with the particular FRHF as recommended by the equipment manufacturer.

DGMS (Tech) Circular No.3 of 2000

Dated the 11.9.2000

To
The Owners, Agents and Managers
of all mines.

Sub: Recommendations of 9th Conference on Safety in Mines held on 2nd & 3rd February, 2000 at New Delhi.

You may be aware that the 9th Conference on Safety in Mine was held on 2nd and 3rd February, 2000 at New Delhi. Besides reviewing the status of implementation of the recommendations of Eighth Conference on Safety in Mines, the conference had deliberated upon and had made valuable recommendations on the following subjects:

1. Preventing Mines Disasters
 - (a) from inundation, and
 - (b) from fire, and effective emergency response.
2. Risk Management as a Tool for Development of Appropriate Health and Safety Management Systems.
3. Quality control for improving safety.
4. Communication system between DGMS offices and mine management site.
5. Blow out and fire hazards in oil mine.
6. Occupational health surveillance in mining industry.
7. Increasing effectiveness of Worker's Participation in Safety Management through Safety Committees.

The recommendations of the Conference are hereby being brought to your attention for information and necessary action.

RECOMMENDATIONS OF THE NINTH CONFERENCE ON SAFETY IN MINES HELD ON 2ND AND 3RD FEBRUARY 2000, AT NEW DELHI.

1.0 Review of Status of Implementation of Recommendation of the 8th Conference on Safety in Mines:

- 1.1.1 Necessary facilities for monitoring the environmental parameters in respect of Methane & Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy coal mines and in such other mines having active underground fire. Indigenous manufacturers should be encouraged to manufacture necessary equipments.

- 1.2 In mines where long or arduous travel is involved, arrangement for transport of men should be made.

- 1.3 In respect of small-mechanised mines, which are operating in non-coal sector, it may not be feasible for a small organisation to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mines operators creates common facilities and infrastructure for occupational health services. Creation of such facility is specially needed for asbestos, manganese and mica mines.

Simultaneously with creation of facilities for occupational health services, it is also necessary to improve quality of life of employees working in mining industry by provision of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facility.

- 1.4.1 Suitable type of steel/metal supports should be introduced in all the development districts in coal mines within two years.

- 1.4.2 Wherever practicable, roof bolting as a method of support in coal mines should be used. Its performance should be monitored regularly. A few conventional timber props may be used as indicator props.

- 1.4.3 Coal mining companies should take initiative to select/promote development of suitable type of drills & other accessories for use in various types of roof strata. A task force may be created for the purpose, which may oversee the introduction of steel supports.

- 1.4.4 Development of a portable instrument for detecting the hidden slips in the roof of coal mines should be taken up on priority by R&D organisations.

- 1.5 All front-line supervisory officials like Sirdars/Mates, Overmen/ Foremen, Surveyors, Electrical/ Mechanical supervisors/Chargemen/ Foremen as well as persons supervising other surface operations should be imparted structured training in safety

management, for at least two weeks, once in every five years, covering about 20% strength every year.

- 1.6 The recommendations of DGMS (Tech) Circular No.18 of 1975 shall be implemented forthwith.
- 1.7 Audiometry should be introduced, as a part of mandatory medical examination, for persons seeking employment in mines and for persons engaged in operations/areas where noise level exceeds 90 dB(A).
- 1.8.1 The portion of surface haul road in mine premises where there is heavy traffic of men and machines, should have a separate lane properly fenced off from the haul road for pedestrians and two wheelers.
- 1.8.2 Trucks and other heavy vehicles, not belonging to management should not be allowed in the mine premises without a valid pass issued by the competent authority of the mine.

Before the pass is issued the mine engineer should check the road-worthiness of such vehicles.

In order to check entry of unauthorised vehicles in mine premises, each mine should establish properly manned check gate(s) at the entrance(s) where record of entry and exit of each such vehicle should be maintained.

At the check gate the license of the drivers should also be checked for eliminating the possibility of unlicensed persons driving the vehicles.

- 1.9 Persons engaged in surface operations and, in particular, the contractors' workers, who incidentally are often inexperienced and least informed about job-safety matters, need closer and more competent supervision. To minimise accidents due to surface operations it would be ensured that:

All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".

Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.

In case of smaller mines, such arrangement may be made by association of mine operators.

2.0 Preventing Mine Disasters from Inundation

- 2.1 Each mine shall be critically examined for its proneness to inundation and assessment regarding danger of inundation and precaution to be taken should be reviewed and updated yearly preferably before the onset of the monsoon. The recommendations may be deliberated in the (Pit) Safety Committee of the mine and information disseminated as widely as possible.
- 2.2 Suitable infrastructure at area level may be provided for drilling advance bore holes to detect presence of waterlogged workings in advance.
- 2.3 Embankments provided against river and jore to guard against inundation should be designed properly keeping in view the engineering parameters. The details of such construction should be properly shown in the underground plan and water danger plan.

- 2.4 Surface excavation or disturbance in or near major sources of water, which are connected or are likely to be connected to below ground workings should be filled up completely.
- 2.5 Detailed precautions against inundation may be laid down while working beneath or in the vicinity of river and major water bodies. This may include framing and implementing standing order for safe withdrawal of persons, including system of information both manual and automatic, effective communication system and system of safe and timely withdrawal of persons to safety.
- 2.6 Mechanism may be developed for warning mines about impending heavy rains similar to warning of impending cyclone issued in coastal areas for taking necessary action. Also coordination with concerned agencies/departments about opening of dams in the rivers on the upstream side should be examined.
- 2.7 Winding system serving as sole means of ingress and egress may be made constantly available even in adverse weather conditions, failure of steam or electricity or any other reasons.
- 2.8 Effective communication may be established within the mine and between mines for safe withdrawal of persons. Necessary standing orders in this regard need to be framed and enforced.
- 2.9 Recommendations of 6th Conference on Safety in Mines to evolve suitable cadre structure for mine surveyors and upgradation of their skill by availing facilities at various institutions, appointment of qualified surveyors and providing infrastructure including computerized facility at area level to oversee survey work of the mine etc. may be implemented.
- 2.10 R&D efforts should be continued to develop a system for construction of water-tight chamber as last refuge below ground in case of inundation.

3.0 Preventing Mine Disasters from Fire, and Effective Emergency Response

- 3.1 Considering the risk of fire, all coal mine companies shall rank its coalmines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining companies.
- 3.2 Recognizing the urgent need for making the emergency plan responsive, speedy and effective, each mine shall review the existing emergency plan, at a higher level keeping in view the risk from fire.
- 3.3 A tripartite committee may be formed to study the feasibility of establishing rescue rooms in coal mines having high risk of fire and employing more than 350 persons ordinarily employed in a shift below ground.
- 3.4 A tripartite committee may be formed to study the feasibility of storing oxygen type self rescuer at strategic places below ground in coal mines with risk of fire in such scale so as to cater to the needs of persons who can be affected in an emergency.
- 3.5 Each mining company shall formulate and implement structured training programme for development of awareness and increasing effectiveness of emergency response in case of fire amongst work persons, officials and management.
- 3.6 Through sustained and meaningful R&D activities, mining companies and research institution shall help in creating a better understanding of the complex geo-mining situations leading to the occurrence of fire, which in turn will help in formulating guidelines to combat the problem of fire in effective manner. Early detection of heating effect of reversal of fan and control of fire, other associated aspects may be studied.

4.0 Risk Management as a Tool for Development of Appropriate Health and Safety Management Systems.

- 4.1 Every mining company should identify one or more mines and should undertake a formal risk assessment process aimed at reducing the likelihood and impact of mishaps of all kinds in mines. Subsequently risk assessment process should be extended to other mines.
- 4.2 Risk assessment process should aim at effective management of risks, by identifying,
 - (i) which risks are most in need of reduction, and the options for achieving that risk reduction,
 - (ii) which risks need careful on-going management, and the nature of the on-going attention
- 4.3 The risk assessment exercise should follow an appropriate process.
- 4.4 Risk management plans shall be prepared on the basis of risk assessment and implemented in the identified mines.

5.0 Quality Control for Improving Safety

- 5.1 Each mining company and the manufacturer/supplier shall satisfy themselves that the product has valid approval where applicable and conform to relevant standards where available at the time of supply.
- 5.2 Each large mining company may setup quality control cell or strengthen where the same exist, identify critical items which require testing for quality assurance at the time of procurement and during use and arrange testing of the same. Testing facilities may be setup wherever feasible;
- 5.3 Any defect or failure of approved items or those having BIS certification may be promptly brought to the notice of the appropriate authority for further action.

6.0 Communication System between DGMS Offices and Mine Management at Site.

- 6.1 Recognizing existence of a large variety of communication systems in mines, a comprehensive review of the existing communication systems at all mines in all mining companies should be undertaken and a consolidated status report prepared for working out a realistic and effective system of communication.
- 6.2 In organized mining sector, an effective internal and external system of communication besides P&T means shall be established both ways between the mines and, Rescue Rooms/stations, hospitals and DGMS offices.
- 6.3 Each mining company in the organized sector shall formulate and implement a comprehensive communication protocol clearly assigning duties and responsibilities of persons at various levels.
- 6.4 In un-organized mining sector, effective communication system shall be established in the following manner,
 - i. In large mines effective wireless communication within the mine including attendance rooms and managers' office and residence; and,
 - ii. P&T telephone at managers' office and residence.
- 6.5 Steps shall be taken to strengthen communication system within DGMS offices and amongst DGMS offices and mine sites besides other concerned agencies.

7.0 Safety in Oil Mines – Blowout and Fire Hazards.

7.1 General:

Each oil company shall formulate a system to monitor all incidents of fire and blowout, whether or not involving loss of life, injuries and loss of property, investigate the causes and take necessary remedial measures.

7.2 Precautions Against Blowout:

7.2.1 Each oil company shall frame an action plan to provide following safety devices in all the drilling rigs:

- (a) Pit level indicator registering increase or reduction in the drilling mud volume with an audio-visual warning device near the driller's stand,
- (b) A gas detector or explosimeter at the primary shale shaker with audio-visual warning device near the driller's stand,
- (c) A device to accurately measure the mud required to keep well filled at all the time, and
- (d) A device to ensure filling of the well with mud when string is being pulled out.

7.2.2 To ascertain that BOPs function properly up-to their rated capacity, it is essential that all BOPs & choke manifold are pressure tested as prescribed. Adequate facilities/hydraulic test benches shall be provided in each company so that BOPs and its accessories can be pressure tested to ensure their effectiveness.

7.2.3 At regular intervals, blowout mock rehearsals shall be carried out. Drilling crew including the chemists and geologists at the well site shall to be trained so that they recognize the warning signs of a kick and know what action must be taken to detect and control a kick.

7.2.4 Fitness of the drilling rigs, work-over rigs & well head equipment should be checked initially and periodically. Quality control procedures for tubings/casings shall be appraised and strengthened.

7.2.5 At the time of drilling of the wells, Geo-technical details shall be thoroughly disseminated with the concerned drilling crew to forewarn them about the presence of gas/oil bearing horizons etc.

7.3 Precautions Against Fire:

7.3.1 Each Oil company shall examine the condition of pipelines carrying hydrocarbon with special emphasis on:

- Trunk lines
- High pressure gas/oil pipelines
- Pipelines passing through highly populated area, rivers etc.
- Hazards from vehicles plying on the road.
- Old pipe lines.

Action plan shall be prepared to take corrective action in a phased manner.

7.3.2 Plans of pipe lines of flowing wells connected with group gathering stations shall be up-dated showing villages, surface features, location of valves etc. and copy of such plans shall be displayed at every group gathering station.

7.3.3 Work permit system for hot work, cold work and electrical work should be formulated and implemented under the competent supervision at all the oil installations.

8.0 Occupational Health Surveillance in Mining Industry

- 8.1 Occupational Health services as recommended by 7th Conference where ever not yet established shall be established within a period of one year.
- 8.2 Each mining company operating mechanised mines shall computerise all records of medical and environmental surveillance.
- 8.3 Every PME Centre shall be provided with the facility for chest radiographs, lung function tests, arrangement for classification of chest radiographs and also wherever required facilities for audiometry.
- 8.4 All chest radiographs of Initial and Periodical Medical Examinations shall be classified for detection, diagnosis and documentation of pneumoconiosis in accordance with ILO classification for pneumoconiosis.
- 8.5 The PME Medical Officer in every PME centre shall be trained in occupational health and use of ILO classification for pneumoconiosis.
- 8.6 Each mining company operating mechanised mines shall set up an Occupational Diseases Board consisting of one occupational Health Physician, one radiologist and one general physician.
- 8.7 Occupational Diseases Board shall formulate guidelines for referral, re-evaluation, classification of cases of pneumoconiosis and necessary remedial actions at workplace as well as rehabilitation of affected persons(s).
- 9.0 Increasing Effectiveness of Worker's Participation in Safety Management.**
 - 9.1.1 All mechanised mines and mines using heavy earth moving machinery for exploitation of minerals, where 100 (hundred) or more number of workers are employed, should appoint Workmen's Inspectors.
 - 9.2 In large mines sectional/departmental safety committees under the main safety committee may be constituted for specific area of operation.
 - 9.3 The tenure of the Safety Committee shall normally be for a period of two (2) years.
 - 9.4 Arrangements shall be made to train the trainers of the Safety Committee members.
 - 9.5 One of the agenda items in the periodic meetings of the Boards of mining companies shall be "Safety Performance Appraisal" of the company.

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Circulars – 2000

DGMS (Tech) Circular No.1 of 2000

Dated the 4.1.2000

To
Owners, Agents and Managers
of all mines.

Sub: Danger due to explosives during testing of electric detonator.

Recently there has been an accident in a stone quarry resulting in death of four persons due to premature detonation of a primed cartridge of special gelatin. The detonator in the prime cartridge was being tested by a multi meter by a person who was not holding the required competency certificates, when the shot exploded resulting into the accident.

Enquiry into the accident revealed that testing of the detonator was being carried out without using an apparatus specially designed for the purpose in contravention of Reg. 169(5)(c)/Reg. 163(4)(c) of CMR,1957/MMR,1961 and without taking proper shelter in contravention of Reg. 170/164 of CMR 1957/MMR 1961.

The accident resulting in loss of four invaluable lives was caused due to failure to comply with the provisions of safety laws. In this connection it may be mentioned that the circuit continuity tester used for electric shot firing in mines need to be either of a type approved by DGMS or conform to requirements of Appendix-A of I.S. 9836-1981 as amended upto date.

I am to request you to comply with provision of the safety law and safe practices in usage of explosives to prevent recurrence of such accident in future.

DGMS (Tech) Circular No.2 of 2000

Dated the 31.1.2000

To
The Owners, Agents and Managers
of all coal mines.

Sub: Use of Fire Resistant Hydraulic Fluid in Machinery used belowground in coal mines

Use of approved type of fire resistant fluid in machinery working belowground coal mines is mandatory as required under Regulation 181(3) of Coal Mines Regulations, 1957.

Mineral oils are not suited for the purpose, as the same do not possess fire resistant properties.

I understand from the feedback from various coal companies that FRHF used in SDL and LHD machines have been found satisfactory in general but a few incidents/occurrences of jamming of valves, premature failure of seals, breaking up of the emulsion, premature failure of pump have been reported.

In view of safe and effective use of the fluid, following guidelines shall be strictly complied with.

1. Contamination in the fluid:

Contamination of hydraulic system can cause tremendous damage to the hydraulic system. In mineral oils, the contaminations present may settle down at the bottom of the tank but in emulsified FRHF, the contamination like coal dust etc. may not settle down and the whole contamination/particles travel at high speed which may cause enormous damage to seals/gaskets, pumps etc.

The problem can be solved by two ways:

- (i) Change of filters at an interval of 500 hours as recommended by the equipment manufacturer.
- (ii) Maximum contamination takes place during topping up of the fluid by opening of the lid of the tank in the coal face. Such manual topping up shall be discouraged. Topping up must be carried out directly from the fluid container to the tank by hose pipe with the assistance of hand pumps provided by the equipment manufacturer. Maximum contamination level has been indicated by M/s.IOC in one of the seminars shall be 0.1% of the fluid by weight provided the contamination is abrasive like coal/silica. But it requires further study by the users, oil manufacturers and equipment manufacturers.

2. Life of FRHF:

Since contamination play a vital role in the safe use of the fluid, apart from complying the recommendation mentioned at para 1, the hydraulic system including the tank of each machine shall be cleaned atleast once in a year and charged with fresh fluid after replacing the filter by a new one.

3. Mixing of FRHF of different make:

Basic petroleum oils in the fluid may be of different makes and additives added may also be different, so it is not recommended at present to mix the fluids during use. A detailed study on the effect of mixing of fluids of different makes on stability, wear and corrosion I needed before inter mixing of various fluids.

4. Seal/gasket compatibility:

The various fluids may affect the various seals in different proportion depending up the polymeric material used. Equipment manufacturer should indicate the compatibility of recommended fluid with the seals used by them.

5. Quick analyzer to assess the percentage of water in oil

It is necessary to maintain water level between 36% to 42% in the HFB fluid and to ascertain the water content, samples must be drawn atleast once in three month. Availability of refractometers for quick analyzing of oil/water percentage for HFA fluid for powered roof supports is not a problem. But in fluids where the oil content is nearly 60% as in HFB, such refractometers do not work. Each oil manufacturer shall provide a method of breaking of the sample of fluid and method to determine water content at site.

It is, therefore, essential that the users shall initiate all actions as per the guidelines mentioned above and they shall procure only those equipments which are compatible with the particular FRHF as recommended by the equipment manufacturer.

DGMS (Tech) Circular No.3 of 2000

Dated the 11.9.2000

To
The Owners, Agents and Managers
of all mines.

Sub: Recommendations of 9th Conference on Safety in Mines held on 2nd & 3rd February, 2000 at New Delhi.

You may be aware that the 9th Conference on Safety in Mine was held on 2nd and 3rd February, 2000 at New Delhi. Besides reviewing the status of implementation of the recommendations of Eighth Conference on Safety in Mines, the conference had deliberated upon and had made valuable recommendations on the following subjects:

1. Preventing Mines Disasters
 - (a) from inundation, and
 - (b) from fire, and effective emergency response.
2. Risk Management as a Tool for Development of Appropriate Health and Safety Management Systems.
3. Quality control for improving safety.
4. Communication system between DGMS offices and mine management site.
5. Blow out and fire hazards in oil mine.
6. Occupational health surveillance in mining industry.
7. Increasing effectiveness of Worker's Participation in Safety Management through Safety Committees.

The recommendations of the Conference are hereby being brought to your attention for information and necessary action.

RECOMMENDATIONS OF THE NINTH CONFERENCE ON SAFETY IN MINES HELD ON 2ND AND 3RD FEBRUARY 2000, AT NEW DELHI.

1.0 Review of Status of Implementation of Recommendation of the 8th Conference on Safety in Mines:

- 1.1.1 Necessary facilities for monitoring the environmental parameters in respect of Methane & Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy coal mines and in such other mines having active underground fire. Indigenous manufacturers should be encouraged to manufacture necessary equipments.

- 1.2 In mines where long or arduous travel is involved, arrangement for transport of men should be made.

- 1.3 In respect of small-mechanised mines, which are operating in non-coal sector, it may not be feasible for a small organisation to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mines operators creates common facilities and infrastructure for occupational health services. Creation of such facility is specially needed for asbestos, manganese and mica mines.

Simultaneously with creation of facilities for occupational health services, it is also necessary to improve quality of life of employees working in mining industry by provision of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facility.

- 1.4.1 Suitable type of steel/metal supports should be introduced in all the development districts in coal mines within two years.
- 1.4.2 Wherever practicable, roof bolting as a method of support in coal mines should be used. Its performance should be monitored regularly. A few conventional timber props may be used as indicator props.
- 1.4.3 Coal mining companies should take initiative to select/promote development of suitable type of drills & other accessories for use in various types of roof strata. A task force may be created for the purpose, which may oversee the introduction of steel supports.
- 1.4.4 Development of a portable instrument for detecting the hidden slips in the roof of coal mines should be taken up on priority by R&D organisations.
- 1.5 All front-line supervisory officials like Sirdars/Mates, Overmen/ Foremen, Surveyors, Electrical/ Mechanical supervisors/Chargemen/ Foremen as well as persons supervising other surface operations should be imparted structured training in safety

management, for at least two weeks, once in every five years, covering about 20% strength every year.

- 1.6 The recommendations of DGMS (Tech) Circular No.18 of 1975 shall be implemented forthwith.
- 1.7 Audiometry should be introduced, as a part of mandatory medical examination, for persons seeking employment in mines and for persons engaged in operations/areas where noise level exceeds 90 dB(A).
- 1.8.1 The portion of surface haul road in mine premises where there is heavy traffic of men and machines, should have a separate lane properly fenced off from the haul road for pedestrians and two wheelers.
- 1.8.2 Trucks and other heavy vehicles, not belonging to management should not be allowed in the mine premises without a valid pass issued by the competent authority of the mine.

Before the pass is issued the mine engineer should check the road-worthiness of such vehicles.

In order to check entry of unauthorised vehicles in mine premises, each mine should establish properly manned check gate(s) at the entrance(s) where record of entry and exit of each such vehicle should be maintained.

At the check gate the license of the drivers should also be checked for eliminating the possibility of unlicensed persons driving the vehicles.

- 1.9 Persons engaged in surface operations and, in particular, the contractors' workers, who incidentally are often inexperienced and least informed about job-safety matters, need closer and more competent supervision. To minimise accidents due to surface operations it would be ensured that:

All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".

Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.

In case of smaller mines, such arrangement may be made by association of mine operators.

2.0 Preventing Mine Disasters from Inundation

- 2.1 Each mine shall be critically examined for its proneness to inundation and assessment regarding danger of inundation and precaution to be taken should be reviewed and updated yearly preferably before the onset of the monsoon. The recommendations may be deliberated in the (Pit) Safety Committee of the mine and information disseminated as widely as possible.
- 2.2 Suitable infrastructure at area level may be provided for drilling advance bore holes to detect presence of waterlogged workings in advance.
- 2.3 Embankments provided against river and jore to guard against inundation should be designed properly keeping in view the engineering parameters. The details of such construction should be properly shown in the underground plan and water danger plan.

- 2.4 Surface excavation or disturbance in or near major sources of water, which are connected or are likely to be connected to below ground workings should be filled up completely.
- 2.5 Detailed precautions against inundation may be laid down while working beneath or in the vicinity of river and major water bodies. This may include framing and implementing standing order for safe withdrawal of persons, including system of information both manual and automatic, effective communication system and system of safe and timely withdrawal of persons to safety.
- 2.6 Mechanism may be developed for warning mines about impending heavy rains similar to warning of impending cyclone issued in coastal areas for taking necessary action. Also coordination with concerned agencies/departments about opening of dams in the rivers on the upstream side should be examined.
- 2.7 Winding system serving as sole means of ingress and egress may be made constantly available even in adverse weather conditions, failure of steam or electricity or any other reasons.
- 2.8 Effective communication may be established within the mine and between mines for safe withdrawal of persons. Necessary standing orders in this regard need to be framed and enforced.
- 2.9 Recommendations of 6th Conference on Safety in Mines to evolve suitable cadre structure for mine surveyors and upgradation of their skill by availing facilities at various institutions, appointment of qualified surveyors and providing infrastructure including computerized facility at area level to oversee survey work of the mine etc. may be implemented.
- 2.10 R&D efforts should be continued to develop a system for construction of water-tight chamber as last refuge below ground in case of inundation.

3.0 Preventing Mine Disasters from Fire, and Effective Emergency Response

- 3.1 Considering the risk of fire, all coal mine companies shall rank its coalmines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining companies.
- 3.2 Recognizing the urgent need for making the emergency plan responsive, speedy and effective, each mine shall review the existing emergency plan, at a higher level keeping in view the risk from fire.
- 3.3 A tripartite committee may be formed to study the feasibility of establishing rescue rooms in coal mines having high risk of fire and employing more than 350 persons ordinarily employed in a shift below ground.
- 3.4 A tripartite committee may be formed to study the feasibility of storing oxygen type self rescuer at strategic places below ground in coal mines with risk of fire in such scale so as to cater to the needs of persons who can be affected in an emergency.
- 3.5 Each mining company shall formulate and implement structured training programme for development of awareness and increasing effectiveness of emergency response in case of fire amongst work persons, officials and management.
- 3.6 Through sustained and meaningful R&D activities, mining companies and research institution shall help in creating a better understanding of the complex geo-mining situations leading to the occurrence of fire, which in turn will help in formulating guidelines to combat the problem of fire in effective manner. Early detection of heating effect of reversal of fan and control of fire, other associated aspects may be studied.

4.0 Risk Management as a Tool for Development of Appropriate Health and Safety Management Systems.

- 4.1 Every mining company should identify one or more mines and should undertake a formal risk assessment process aimed at reducing the likelihood and impact of mishaps of all kinds in mines. Subsequently risk assessment process should be extended to other mines.
- 4.2 Risk assessment process should aim at effective management of risks, by identifying,
 - (i) which risks are most in need of reduction, and the options for achieving that risk reduction,
 - (ii) which risks need careful on-going management, and the nature of the on-going attention
- 4.3 The risk assessment exercise should follow an appropriate process.
- 4.4 Risk management plans shall be prepared on the basis of risk assessment and implemented in the identified mines.

5.0 Quality Control for Improving Safety

- 5.1 Each mining company and the manufacturer/supplier shall satisfy themselves that the product has valid approval where applicable and conform to relevant standards where available at the time of supply.
- 5.2 Each large mining company may setup quality control cell or strengthen where the same exist, identify critical items which require testing for quality assurance at the time of procurement and during use and arrange testing of the same. Testing facilities may be setup wherever feasible;
- 5.3 Any defect or failure of approved items or those having BIS certification may be promptly brought to the notice of the appropriate authority for further action.

6.0 Communication System between DGMS Offices and Mine Management at Site.

- 6.1 Recognizing existence of a large variety of communication systems in mines, a comprehensive review of the existing communication systems at all mines in all mining companies should be undertaken and a consolidated status report prepared for working out a realistic and effective system of communication.
- 6.2 In organized mining sector, an effective internal and external system of communication besides P&T means shall be established both ways between the mines and, Rescue Rooms/stations, hospitals and DGMS offices.
- 6.3 Each mining company in the organized sector shall formulate and implement a comprehensive communication protocol clearly assigning duties and responsibilities of persons at various levels.
- 6.4 In un-organized mining sector, effective communication system shall be established in the following manner,
 - i. In large mines effective wireless communication within the mine including attendance rooms and managers' office and residence; and,
 - ii. P&T telephone at managers' office and residence.
- 6.5 Steps shall be taken to strengthen communication system within DGMS offices and amongst DGMS offices and mine sites besides other concerned agencies.

7.0 Safety in Oil Mines – Blowout and Fire Hazards.

7.1 General:

Each oil company shall formulate a system to monitor all incidents of fire and blowout, whether or not involving loss of life, injuries and loss of property, investigate the causes and take necessary remedial measures.

7.2 Precautions Against Blowout:

7.2.1 Each oil company shall frame an action plan to provide following safety devices in all the drilling rigs:

- (a) Pit level indicator registering increase or reduction in the drilling mud volume with an audio-visual warning device near the driller's stand,
- (b) A gas detector or explosimeter at the primary shale shaker with audio-visual warning device near the driller's stand,
- (c) A device to accurately measure the mud required to keep well filled at all the time, and
- (d) A device to ensure filling of the well with mud when string is being pulled out.

7.2.2 To ascertain that BOPs function properly up-to their rated capacity, it is essential that all BOPs & choke manifold are pressure tested as prescribed. Adequate facilitates/hydraulic test benches shall be provided in each company so that BOPs and its accessories can be pressure tested to ensure their effectiveness.

7.2.3 At regular intervals, blowout mock rehearsals shall be carried out. Drilling crew including the chemists and geologists at the well site shall to be trained so that they recognize the warning signs of a kick and know what action must be taken to detect and control a kick.

7.2.4 Fitness of the drilling rigs, work-over rigs & well head equipment should be checked initially and periodically. Quality control procedures for tubings/casings shall be appraised and strengthened.

7.2.5 At the time of drilling of the wells, Geo-technical details shall be thoroughly disseminated with the concerned drilling crew to forewarn them about the presence of gas/oil bearing horizons etc.

7.3 Precautions Against Fire:

7.3.1 Each Oil company shall examine the condition of pipelines carrying hydrocarbon with special emphasis on:

- Trunk lines
- High pressure gas/oil pipelines
- Pipelines passing through highly populated area, rivers etc.
- Hazards from vehicles plying on the road.
- Old pipe lines.

Action plan shall be prepared to take corrective action in a phased manner.

7.3.2 Plans of pipe lines of flowing wells connected with group gathering stations shall be up-dated showing villages, surface features, location of valves etc. and copy of such plans shall be displayed at every group gathering station.

7.3.3 Work permit system for hot work, cold work and electrical work should be formulated and implemented under the competent supervision at all the oil installations.

8.0 Occupational Health Surveillance in Mining Industry

- 8.1 Occupational Health services as recommended by 7th Conference where ever not yet established shall be established within a period of one year.
- 8.2 Each mining company operating mechanised mines shall computerise all records of medical and environmental surveillance.
- 8.3 Every PME Centre shall be provided with the facility for chest radiographs, lung function tests, arrangement for classification of chest radiographs and also wherever required facilities for audiometry.
- 8.4 All chest radiographs of Initial and Periodical Medical Examinations shall be classified for detection, diagnosis and documentation of pneumoconiosis in accordance with ILO classification for pneumoconiosis.
- 8.5 The PME Medical Officer in every PME centre shall be trained in occupational health and use of ILO classification for pneumoconiosis.
- 8.6 Each mining company operating mechanised mines shall set up an Occupational Diseases Board consisting of one occupational Health Physician, one radiologist and one general physician.
- 8.7 Occupational Diseases Board shall formulate guidelines for referral, re-evaluation, classification of cases of pneumoconiosis and necessary remedial actions at workplace as well as rehabilitation of affected persons(s).
- 9.0 Increasing Effectiveness of Worker's Participation in Safety Management.**
 - 9.1.1 All mechanised mines and mines using heavy earth moving machinery for exploitation of minerals, where 100 (hundred) or more number of workers are employed, should appoint Workmen's Inspectors.
 - 9.2 In large mines sectional/departmental safety committees under the main safety committee may be constituted for specific area of operation.
 - 9.3 The tenure of the Safety Committee shall normally be for a period of two (2) years.
 - 9.4 Arrangements shall be made to train the trainers of the Safety Committee members.
 - 9.5 One of the agenda items in the periodic meetings of the Boards of mining companies shall be "Safety Performance Appraisal" of the company.

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Circulars – 2001

DGMS (Genl) Circular No.1. of 2001

Dated the 19th April 2001.

To
The Owners, Agents & Managers of all mines.

**Sub: Re-organisation of Eastern Zone, Sitarampur & Nagpur
Region under Western Zone Nagpur.**

For the purpose of convenience and better administration of the Mines Act, 1952 the Eastern Zone of the Directorate- General of Mines Safety with the headquarters at Sitarampur has been re-organised into three regions against the existing four regions. These regions have been named as Sitarampur Region No.1, Sitarampur Region No.II & Sitarampur Region No.III. The regional office at Nagpur under the jurisdiction of western zone has been also re-organised into two regions. These regions have been names as Nagpur Region No I and Nagpur Region No.II .

The revised jurisdictions of these regions are given in appendix enclosed. This partially modifies DGMS (Genl) Circular No.1. of 1987 and DGMS (Genl) Circular No.1 of 1988.

The revised jurisdiction will come in force from 16th of May 2001.

All correspondence in the matter may henceforth be carried out with the regional offices as constituted.

APPENDIX

Eastern Zone with Headquarters at Sitarampur comprising Sitarampur No.1, Sitarampur No.II (including Digboi Sub-Region) and Sitarampur Region No.III Regions.

Sitarampur Region No.1 HQ at Sitarampur State of West Bengal.	(a) All mines in the district of Burdwan situated on the South of G.T.Road & bounded by Burnpur Road leading from GT Road on the East and Neamatpur, Radhanagar and Chinakuri Ghat Road on the west. (b) All mines in the district of Burdwan in the area bounded by GT Road on the South, road leading from Andai turning on the GT Road to Khandra, Ukhra, Haripur, Krishnagar, Jamuria and Chanda more on GT Road.
Sitarampur Region No.II HQ, at Sitarampur. (a) State of West Bengal. (b) State of Jharkhand & WB. (c) State of Assam. (d) State of Nagaland. (e) State of Meghalaya. (f) State of Manipur. (g) State of Tripura.	(a)All mines in the State of West Bengal except those included in Sitarampur Region Nos.1 and III. (b)Oil pipelines extended from the oil-fields in the state of Assam upto the refineries situated in the states. All Mines All Mines. All Mines. All Mines. All Mines.

(h) Union Territory of Andman and Nicobar Island.	All Mines.
(i) Union Territory of Arunachal Pradesh.	All Mines.
(j) Union Territory of Mizoram.	All Mines.
DIGBOI- SUB-REGION.HQ At Digboi.	
(a) State of Assam.	All Mines.
(b) State of Nagaland.	All Mines
(c) State of Meghalaya.	All Mines
(d) State of Manipur.	All Mines.
(e) State of Tripura.	All Mines
(f) Union Territory of Andman & Nicobar Island.	All Mines.
(g) Union Territory of Arunachal Pradesh.	All Mines.
(h) Union Territory of Mizoram.	All Mines.
(i) State of West Bengal.	All Mines.
State of West Bengal & Jharkhand.	Oil pipelines extended from the oil fields in the State of Assam upto the refineries situated in the State.
Sitarampur Region No.III HQ at Sitarampur. State of West Bengal.	(a) All the mines in the District of Burdwan situated on the South of GT Road except these included in Sitarampur Region No.1.
	(b) All mines in the District of Burdwan bounded by road leading from Pandaveswar ghat to Haripur, Krishnanagar, Jamuria and Darbardanga.
State of Jharkhand.	(a) All mines in the district of Dumka Deoghar, Godda and Sahibganj.
	(b) All mines in the district of Dhanbad lying South of GT Road and to the East of North-South line drawn through mine post 150 on GT Road.

Nagpur Region No.I & Nagpur Region No.II under Western Zone with Headquarter at Nagpur.

Nagpur Region No.I Hq at Nagpur. (including Parasia Sub-Region)	
State of Maharashtra.	All mines in the district of Nagpur.
State of Madhya Pradesh	All mines in the districts of Betul, Balaghat, Bhopal, Seoni, Hoshangabad, Raisen, Vidisha and Sehore.
Parasia Sub-Region HQ at Parasia	All mines in the district of Chhindwara.
Nagpur Region No.II HQ at Nagpur.	All mines in the districts of Chandrapur, Yavatmal, Amravati, Wardha, Bhandara, Gondia, Akola, Buldhana, Gandhchiroli, Beed, Aurangabad, Osmanabad, Nanded,
State of Maharashtra.	

	Latur, Washim, Jalana and Parbani.

No.6(1)2001-Genl/ 1331- 1581

Dated the 24th May 2001.

To
The Owners, Agents & Managers of all mines.

**Sub: Corrigendum to DGMS(Genl) Circular No.1 of 2001 dated 19.4.2001
Reorganization of Eastern Zone Sitarampur & Nagpur Region
under Western Zone.**

Sir,

Please refer to the jurisdiction of Sitarampur Region No.III in the Jharkhand State given in the appendix of above-mentioned circular.

Due to oversight the "Pakur" district which was created out of earlier " Sahibganj" district has been left out. Accordingly all mines in 'Pakur' district shall also be within jurisdiction of Sitaramppur Region No.III. The revised jurisdiction of Sitarampur Region No.III shall be as under:

Sitarampur Region No.III HQ, at Sitarampur, State of West- Bengal.	(a) All mines in the district of Burdwan situated on the south of GT Road Except those included in Sitarampur Region No.1.
	(b) All mines in the district of Burdwan bounded by road leading from Pandeveswar Ghat to Haripur, Krishnagar, Jamuria and Darbardanga.
State of Jharkhand.	(a) All mines in the district of Dumka, Deoghar, Godda, Sahebganj & Pakur.
	(b) All mines in the district of Dhanbad lying south of GT Road & to east of North-South line drawn through mile post 150 on GT Road.

All other details in DGMS (Genl) Circular No.1 of 2001 dated 19.4.2001 shall remain unchanged.

DGMS (Tech)(SOMA) Circular No.1 of 2001

Dated the 18th January, 2001.

To
All Owners, Agents & Managers
of all mines.

Sub: Recommendations of Gaslitand Court of Inquiry

The Court of Inquiry appointed under Section 24 of the Mines Act, 1952 to enquire into causes and circumstances attending the accident that occurred in Gaslitand Colliery of M/s. Bharat Coking Coal Limited on 27th September, 1995 causing loss of 64 lives due to inundation, made the following recommendations:

- (1) Before the onset of monsoon, mines situated by the side of the river or other water sources should be inspected by the Directorate-General of Mines Safety along with the mine management.
- (2) The feasibility of reclamation of opencast workings including the disused ones, near rivers and major source of water, particularly those having connections to belowground workings either directly or through subsidence cracks and fissures may be examined to prevent inundation in such mines.

- (3) Detailed precautionary measures against danger of inundation should be laid down while working beneath or in the vicinity of rivers and major surface water bodies, particularly during the rainy season. This may include framing and implementing standing orders for safe withdrawal of persons, provision of float alarm as a means of warning in case of rise in water level in the river in addition to river guards and an effective and speedy communication system which can function even independent of electricity and work in adverse conditions.
- (4) The need for fore warning the mines about possible impending heavy rains, similar to the warning of impending cyclone issued in costal areas, may perhaps go a long way in ensuring safety of mine workers from inundation. The feasibility of linking the coalfields to the local meteorological observatories for timely dissemination of information may be examined.
- (5) The possibility of stoppage of winders due to non-availability of motive force, be it steam or electricity, particularly in adverse weather conditions continue to exist in the mine. Therefore, mines which have pits as the only means of exit may require captive generators in working conditions to run the winders in case of emergency. In case of steam boilers, basic precautionary measures like keeping the boilers under proper shed, providing sufficient insulation around the boilers and the pipelines as well as attending the boilers constantly particularly in adverse weather need to be religiously followed.
- (6) The need for an effective communication system over and above the signaling system between the surface and belowground which shall remain in operation even with failure of electricity and also be rugged enough to remain operative in adverse conditions has been felt strongly. Suitable system may be developed, if not already available and used in belowground mines.
- (7) Intermine barrier is an effective means to prevent transference of danger from one mine to another. In mines where the barrier have become ineffective due to interconnections or otherwise, the same may be restored early, even artificially, by constructing suitable dams, explosion roof stoppings and other methods.
- (8) All disused pits, potholes and surface subsidence existing in the vicinity of river or surface source of water and where there is a danger of inundation present, shall be sealed by reinforced concrete seals or other suitable effective means.

Proper implementation of safety measures in accordance with these recommendations can bring about definite improvement in the safety standards in the mines as far as danger of inundation is concerned.

You are requested to take suitable steps to implement the recommendation of the Court of Enquiry in the mines under your control.

DGMS (Tech)(SOMA)Circular No.2 of 2001

Dated the 13th February,2001

To
The Owners, Agents & Managers
of all mines.

Sub: Recommendations of Gaslitand Court of Enquiry

The Court of Enquiry appointed under Section 24 of the Mines Act, 1952 to enquire into the causes and circumstances attending to the accident that occurred in Gaslitand Colliery of M/s. Bharat Coking Coal Limited on 27.9.1995 causing loss of 64 lives made the following recommendations in addition to those circulated vide DGMS (Tech)(SOMA) Circular No.1 of 2001 dated 18.1.2001.

- (1) Sanctity of mine boundary: A mine boundary should be such as to contain hazards caused due to mishap in a neighbouring mine with the help of suitable

vertical barriers along the boundary in all seams being worked. In cases where such barriers do not exist, neighbouring mines will have to be isolated and protected with construction of suitable protective measures along the boundary in all seam workings keeping in view of the nature of the hazard. There should be no horizontal transfer of property between two mines.

- (2) Embankment : Construction of embankment is an engineering activity meant to provide protective measures against hazard of inundation from surface water. The current practice of embankment construction is limited to the geometric dimensions only. There are no guidelines regarding the foundation design, the material of construction, nature of slope facing and the procedure of construction. There is an urgent need for modification and framing guidelines concerning the above parameters for embankment construction.
- (3) River channel: In the Jharia Coalfield with a high concentration of coal seams being worked in the neighbourhood and under the river channels, the later are found perched at higher levels compared to the post-mining depressed surface topography of the immediate neighbourhood. In case of breach of embankments constructed to provide preventive measures against inundation, the river course finds its way to the adjacent depressed land thereby providing a large source of water supply adding to the magnitude of the problem. Such topographic changes in the surface profile need to be prevented and/or remedied by suitable corrective action.
- (4) Highest known flood level (H.F.L) : The height of a protective embankment is related to the HFL. The HFL on the other hand is related to the amount of water flow in the river channel during a particular year. This however presupposes the cross section of the river channel remaining undisturbed. In reality this gets disturbed due to mining activity as well as considerable amount of silting. Thus it would be necessary to adjust the HFL according to the changed river channel cross-section.
- (5) Abandoned pits: All pits proposed to be abandoned pits are to be properly secured at the collar level against hazards of inundation by surface water.

You are requested to take suitable steps to implement the recommendation of the Court of Enquiry in the mines under your control.

DGMS (Tech) Circular No.1 of 2001

Dated the 18th June, 2001

To
Owners, Agents & Managers of all
Underground Metalliferous Mines.

Sub: Use of vital safety items in mines.

There are certain vital safety items like winding rope, cage suspension gears etc. which are required to be approved by this Directorate if used in coal mines but there is no provision in the Metalliferous Regulations, 1961 for according DGMS approval for such items.

Since any failure of rope/cage suspension gear in shafts/winzes in any mine may prove disastrous, user mines, in metalliferous sector, must ascertain that items like ropes/cage suspension gears conform to relevant Indian Standards and are manufactured in Workshops of repute having adequate manufacturing and testing facilities.

The following are the some basic guidelines to assess the competency of the manufacturers and expected standards/ quality of such items:

WINDING ROPES;

- (1) Design/ construction should conform to BIS 1855 of 1977 for round strand and flattened strand ropes and the design/construction of locked Coil ropes should conform to BIS 3626 of 1978.
- (2) All indigenous manufacturers of winding ropes shall be BIS Licensee.
- (3) Foreign manufacturers who are not BIS Licensee must possess ISO 9002 quality standard or its equivalent as acceptable in India.

CAGE SUSPENSION GEARS;

- (1) Design/ construction of cage suspension gears shall conform to BIS 7587 (Part 1 to Part 8) in general. If the design/ constructions of the items are not covered under BIS, such design/ construction must be proven from part performance.
- (2) The material of cage suspension gear components shall be conforming to BIS 7587.
- (3) The heat- treatment of the items shall also be in accordance with the guidelines stipulated in BIS- 7587.
- (4) Factor of safety of the cage suspension gear components shall be atleast 10. Threaded joints shall be avoided as far as possible but if the same cannot be avoided, factor of safety of the threaded joints shall be atleast 15.
- (5) All tests are to be carried out as prescribed in BIS 7587 Part-I (general requirement) and certificate of test to be submitted in the proforma prescribed in the standard. User Industry and the manufacturer may decide where such testing shall be carried out.
- (6) Manufacturer must have adequate manufacturing facilities and forging facilities.

For forging, the recommendation of hammer capacity are as follows: -

- (i) Upto 10 Tonne SWL- Minimum 250 kg. Hammer.
- (ii) Upto 12 Tonne SWL- Minimum 500 kg. Hammer.
- (iii) Upto 20 Tonne SWL- Minimum 1000 kg. Hammer.
- (7) Manufacturer must have adequate testing facilities manned with qualified personnel to ensure quality.

Minimum qualification for carrying out NDT for Magnetic Particle Flaw Detection and Ultrasonic Flaw Detection shall be Level II competency certificate issued by ISNT/ASNT.

Permissible imperfections for magnetic particle inspection are given at Annexure- A.

- (8) Manufacturer must have sufficient experience in the trade.
- (9) Surface finish of the various parts of the Cage Suspension Gears shall be as follows:-
 - (i) for pins and holes- 0.8 to 1.6 Micron.
 - (ii) for mating surface - 1.6 to 3.2 Micron.
 - (iii) for outside surface- 3.2 to 6.4 Micron.
- (10) Ductility properties- Izod impact test values of the standard specimen as per IS 1598 of 1977 shall not be less than 4.8 Kgf.mtr.
- (11) Non-metallic inclusion rating in the steel shall not be more than type 1.5 as described in IS 4163 of 1982.
- (12) Hardness for the various materials shall be as follows :

(i) 11 Mn 2-	190 to 220 HV
(ii) 20 MN 2 -	200 to 230 HV
(iii) 20 NI 55 Cr MO 20-	250 to 280 HV

You are requested to comply with the above requirement in the interest of safety.

DGMS

APPENDIX-A**PERMISSIBLE IMPERFECTIONS FOR MAGNETIC PARTICLE INSPECTION**

A1. Magnetic particle flaw detection shall be carried out as per IS 3703. The type of defects and their limits are given below:

A2. Imperfections in components may be in the form of :

- (a) non-metallic inclusions which are inherent in steels, and
- (b) Cracks.

Note: Magnetic particle inspection will reveal these imperfections when they are on or just below the surface.

A3. LIMITS OF PERMISSIBLE IMPERFECTIONS - Enclosed Tables given under Figures A1 to A11 show the limits of permissible inclusions, Cracks shall not be permitted.

A4. A longitudinal imperfection is one which generally runs parallel to the major dimension of the component: a transverse imperfection is one which runs at right angles to the line defined for a longitudinal imperfection.

A5. RECORD: imperfection, which, although within the permissible limits, are of a large number, unusual pattern or direction, should be recorded on the component certificate.

No. DGMS (Tech) (S&T) Circular No.2

Dated the 20th June, 2001.

To
All Owner, Agent & Managers of Coal Mines.

Sub: Accident due to failure of slope in an opencast coal mine.

In one opencast mechanized coal mine, while 16 workers under supervision of two (2) mining Sirdars and one (1) overman were working at the bottom of a 15m high coal bench, the overlying benches in sandstone and black cotton soil failed trapping the workers in debris. 10 of whom asphyxiated to death while the remaining six (6) persons escaped with minor injuries.

The immediate combined bench above coal was about 52m high with individual width of only 8-10m; this was overlain by benches in black cotton soil as high as 15m but with width of only 4-8m. The coal seam was earlier developed in two sections by underground workings and the coal was also on fire. The benches were formed against a fault plane along a barrier with the adjoining mine.

Inquiry into the accident revealed that if the workings were properly benched and special care taken while working near the fault plane and in coal benches affected by fire as required under statute, the disaster could have been averted.

The accident described above leaves no doubt about the fact that the design and workings in opencast mines need to be reviewed seriously. In this particular case design of a safe slope and the method of working practiced left much to be desired. It is emphasized here that proper design of benches and ultimate pits based on slope stability considerations is a must for safe working of an opencast mine.

A basic guideline for a scientific approach towards design of open pit slopes is given in the following paragraphs.

A systematic detailed work needs to be undertaken for solving or understanding the problems of slope failure in open pit mines. The objective of such type of work could be, (1) increase the knowledge of the behaviour of mine slopes, (2) improve the ability to estimate rock mass strength for such slopes, and (3) develop an improved design methodology for forward design of rock slopes in the open pits. The fourth objective could be formulation of a detailed slope monitoring protocol for such slopes.

A geomechanical model needs to be developed based on extensive fieldwork and review of previous studies at the sites. The model may comprise of a detailed description of the geology, joint sets and structures, mechanical properties of intact rock and joints, geohydrological conditions, and virgin stress state. From this, a representative design cross-sections and parameter values need to be established which could later be used as input to stability analysis of the pit slopes.

Assessment of representative rock mass strength needs to be addressed through the use of appropriate failure criterion in conjunction with rock mass classification. By comparing back-calculated strengths available from old case studies a reliable estimate may be established. Failure mechanisms need to be studied preferably by means of numerical modeling. For this purpose the finite difference code FLAC and the distinct element code UDEC can be used. The work must be aimed at investigating failure mechanisms in detail, all the same time developing a reliable modeling technique for the pit slopes.

No discussion about slope stability in open pits can conclude without discussing the effect of groundwater. In the following para a general discussion about groundwater problems have

been attempted. This most important parameter must be fully understood before any attempt is made to model or to study the slope stability problems in mines.

Rainfall and subsequent movement of groundwater greatly affect slope stability. The groundwater regime is considered the most changeable natural parameter which affects slope stability in several ways.

- by generating pore pressure, both positive and negative, which alter stress conditions-
- by changing the bulk density of the materials forming the slope.
- by both internal and external erosion, and
- by changing the mineral constituents of the materials forming the slope.

Groundwater in soil may be of two types, occurring above or below the water table (phreatic surface) respectively. Water above the water table may be transient percolation moving downwards to join the Phreatic water below the water table or capillary water held above the water table by surface tension. Phreatic water below the water table is subject to gravitational forces and saturates the pore space in the material below the water table.

Usually three water zones below ground surface can be identified, (1) zone of permanent saturation- where pore spaces are always filled with water, (2) zone of intermittent saturation - where pore spaces are filled with water only after heavy rains and (3) zone of no-saturation - where pore spaces are never saturated, though water may pass through. Water table is the upper surface of the zone of permanent saturation. Its level migrates from season to season.

Water flows through soil or rock in different ways depending on the nature of ground material.

Aquifer refers to any water- transmitting soil or rock. Aquifers have various modes of ground water flow, such as homogeneous (inter-granular) flow and path-preferential (either fissure or conduit flow). The latter tends to be more rapid and can therefore significantly influence slope stability.

Flow in soil is more likely to be inter- granular, although fissure or conduit flow can also occur via fissures. Pipes and drying cracks. Flow in rock can be inter- granular, but is more common through joints and other discontinuities. It is remarkable that joints in rock may get filled with water during intense rainfall, inducing high hydraulic pressure on the rock mass and therefore adversely impacting stability.

While designing an open pit mine slope, it is essential to consider all the issues discussed above. Moreover, it may be borne in mind that only design is not enough and a comprehensive design, implementation and monitoring protocol needs to be developed by every opencast mine operator in order to achieve safe working conditions in such mines.

No.DGMS(Tech)(S&T) Circular No. 3 of 2001

Dated the 20th June 2001.

To

All Owner, Agent & Managers of Coal Mines.

Sub: Dealing of fire in open cast coalmines.

In the recent past, in one opencast coal mine while 20m³ bucket capacity shovel was excavating burning coal from the bottom of a coal bench, 15m in height, and two persons were in the process of fighting the coal fire with water jet standing 10m. away from the face on the floor of the bench, burning coal slid from top of the bench engulfing the fire fighters in hot coal, ash and steam. One person could escape with burn injuries but one other person unfortunately received 60% burns and succumbed to his injuries later.

In another case, while a shovel was deployed at the bottom of a coal bench on fire in a quarry, fall of side occurred forming thick cloud of hot dust. A shovel operator and an overman got trapped and received serious burn injuries to which the shovel operator succumbed later.

Other similar cases have also come to the notice of this Directorate where no persons were involved. In all these cases it could be observed that the system established for fire fighting was directing water jets on the fire standing away from the face on the bottom of the bench. Some of the shortcomings of such systems were.

1. The distance of which the fire fighters were positioned from the face was less than the height of the bench/face or the persons dealing such fires were positioned at an unsafe distance from the burning coalface.
2. No personal protective equipment like protective clothing for dealing fire was provided to the persons employed for fire fighting.
3. There was no established system, i.e. code-of-practice was not framed to deal with such situations;

In all these cases, the system itself was fraught with danger and circumstances were created at the work place where the accidents were waiting to occur.

In this context, attention is also drawn to regulation 119(2)(b) of CMR 1957 which requires adequate precautions to be taken to prevent danger to persons from flame, steam and ejected or rolling down hot material, explosion of water gas, etc. among other things.

Considering that establishment of a good system of fire fighting in opencast coal mines could and may save valuable life of workers, all coal mines with opencast workings where danger of fire exists should frame a comprehensive plan for fighting fire in the workings. Such mines should also frame site-specific code-of-practice for fire fighting under different circumstances in the mine. The code-of-practice may include interalia the following-

- (a) The process of dealing different types of fires under different circumstances at the mine in a manner, which is safe.
- (b) Responsibility of all concerned personals starting from the workers at grass root levels to supervisors, managers and higher management levels at the mine and of the company.
- (c) Outline of the training needs of various concerned persons.
- (d) Details of appropriate personal protective equipment for fire fighting.

I am sure that appropriate steps taken as detailed above would go a long way in preventing accidents from dealing fire in opencast coalmines.

DGMS(Tech)(SOMA) Circular No.4 of 2001.

Dated the 6th August, 2001

To
All Owners, Agents & Managers
of all underground coal mines.

Sub: Fatal accident due to fall of roof in belowground coal mines

In a recent accident due to roof fall in belowground coal mines it was revealed that while six coal fillers were engaged in loading coal by the Overman in his presence in a slice in a depillaring district, a mass of roof measuring 6.5 m long x 4.2 m x 0.5 - 2.5 m thick fell of roof at a height of about 2.5 m trapping the Overman and four coal fillers, while the Overman and two coal fillers died instantly, third coal filler died soon after he was rescued and the fourth died after about five hours of the accident.

The enquiry further revealed that the Overman ignored the cracking sound of the impending fall and the coal fillers were asked to fill the tubs in his presence. As the sound due to goaf movement is a clear phenomenon, the supervisors have to take the decision of withdrawal. This was ignored in this case, which could have saved the valuable lives.

It is therefore reiterated that the workers and the supervisors engaged in the depillaring district shall be trained to make them conversant with the workings of the depillaring including timely withdrawal of work persons during impending fall.

I sincerely believed that the management will make all out efforts to train and retrain the workers and supervisors which will definitely make a headway in eliminating similar type of accidents in future.

DGMS (Tech) Circular No.5 of 2001.

Dated the 3rd September, 2001

To
All Owners, Agents and Managers of
Underground Coal and Non-Coal Mines.

Sub: Safe use of guide ropes.

A number of accidents/dangerous occurrences have taken place during winding in shafts due to either snapping of guide rope or bird caging of the such ropes due to breakage of rod in the past. Major accident has also taken place when two cages collided at the mid- shaft due to slackness in the guide rope tension caused due to the cheese weights at the pit bottom not hanging freely.

In supersession of DG's (Technical) Circular No.11 of 1976 and DG's (Technical) Circular No.6 of 1982, the following guidelines are being given for proper selection, installation, maintenance and other safe practices are being recommended :-

(1) Construction of Guide Ropes :

Guide ropes shall be either 6 over 1 type of construction or half-locked coil as described in BIS 3623 of 1978. No guide rope in non- conformity to the above standard shall be used in winding shaft.

(2) Selection of proper Guide Rope :

For optimum life of guide rope and safety, for following norm is recommended: -

- 2.1 Upto 50m depth- Minimum requirement is 29 mm dia. 6 over 1 type of guide ropes.
- 2.2 Above 50m and upto 250 mtrs- Minimum requirement is 32 mm dia, of 6 over 1 type of guide ropes/29 mm dia. Half locked construction guide ropes.
- 2.3 Above 250 mtrs. And upto 500 mtrs.- Minimum requirement is 38 mm dia, of 6 over 1 type of guide ropes/32 mm dia half locked construction guide ropes.
- 2.4 Above 500 mtrs.- Minimum requirement is 38 mm of half locked coil type of guide ropes.
- 2.5 It may be noted that half locked coil guide ropes may be preferred in any watery shafts because they have a smooth and larger wearing surface and offer a greater resistance to corrosion as it is not so easy for water to enter the interstices between the wires. In addition, half locked guide ropes are having higher breaking load compared too 6 over 1 construction guide ropes.
- 2.6 Number of guide ropes – Normally four guide ropes shall be arranged at four comers of each cage to provide maximum resistance against the tendency of standard winding ropes to untwist and reduce swinging.

(3) Selection of proper tensioning arrangement:

In vertical shafts a guide rope must be anchored at one end and tensioned by suitable means at the other end.

Guide rope attachment at the top and bottom should be of adequate strength to not only safely suspend the rope but to withstand normal and abnormal vibration/jerks likely in the guide from various factors.

Two basic types of guide ropes attachments are being recommended.

3.1 Weight loading in the sump :

Where there is adequate space in the sump and there is provision to keep the sump clear, such weight loading of guide ropes in the sump are found satisfactory. If the weights are not hanging freely and not kept exposed for regular inspection, the system may prove disastrous.

The most common type of such arrangement is shown in Drawing No.1 (Courtesy - M/S. Reliance Barker Davis, U.K.)

3.2 Spring loaded Tensioning at the head frame:

Where the space at the sump is not adequate/or else the sump cannot be maintained clean there it is recommended that the guide rope is anchored at the pit bottom as per the enclosed Drawing No.2 (Courtesy- M/S Reliance Barker Davis, U.K.) and the spring loaded tensioning arrangement may be provided at the head frame. With spring tensioning in the head frame, the spring capacity has to be large enough to negotiate for the weight of the rope in addition to the tensioning load.

The correct tension of the rope is obtained by screwing the adjusting nut. A tension scale is to be provided to know the tension of the guide ropes at any time.

3.3 Advantages of Spherical Seat:

Spherical Seating has been shown in both types of guide rope tensioning arrangement (in Drawing No.1 & 2).

The spherical seat allows the top anchorage to swing and adjust itself to any twisting which may be imposed upon the guide rope during conveyance movement through the shaft. This form of seating also permits easy and ready radial adjustment of the guide rope. The rope and attachment can be lifted and turned to present a new wearing surface to the conveyance guide shoes should any particular part of the rope's surface be showing signs of unequal wear.

3.4 Guide rope Tension:

The following tension is recommended in the guide ropes:-

Upto 500 mtrs. Depth = 1.25 Tonne per hundred meters.

From 501 mtrs. To 800 mtrs. Depth = 6.25 Tonne + 0.75 Tonne per additional 100 metres beyond 501 mtrs.

From 801 mtrs. And above = 8.5 Tonne + 0.5 Tonne per additional 100 mtrs. Beyond 801 mtrs.

It may be noted that for the weight loading tensioning arrangement the tension to be given as above include guide rope weight also. For illustration, in a 200 mtrs. Shaft, the weight to be attached at the sump = 2 Tonne – Wt. Of 200 mtrs. Of guide rope used. But in the case of tensioning from top, the tension to be given as per the above norm shall be in addition to the rope weight. For illustration in a 200 mtrs. shaft the tension applied by adjusting the nut shall be 2 Tonne + Wt. of 200 mtrs. of guide rope used which may be read from the tension scale provided.

It may be noted that weight of guide ropes is indicated in the test certificates issued by the rope manufacturers.

3.5 The tension in various guide ropes in the shaft shall be varied to avoid vibration caused due to resonance.

4.0 Code of practice for installation of guide rope:

Lot of dangerous occurrences/accidents also do occur during replacement or old guide rope by new ones. Each mine must establish their own code of practices for the guide rope installation jobs where method of removing the old guide rope and installation of new guide rope shall be clearly described. A hand winch without separate braking arrangement is not considered safe for lowering of guide rope in the shaft.

Such codes of practice may be asked for from mine management by the officers of this Directorate during their inspections.

The following additional care shall be taken during installation: -

- (i) Suitable extra length of guide rope should be kept on top for future lowering and the extra length should be securely clamped on the headgear so that the fixture can safely withstand the load of the guide rope during examination of its suspension fixtures or during tensioning of the guide rope.
- (ii) Guide rope must be installed to remain vertical. Verticality of rope is very important.

5.0. Storage:

Guide rope shall be stored in reeled condition under covered shed for a period not more than two years. Enquiry into a premature snapping of guide rope in a deep shaft had revealed that the guide rope was kept stored in an open space for nearly five years, before the installation and the guide rope got corroded during storage.

6.0 Use of Rubbing Ropes:

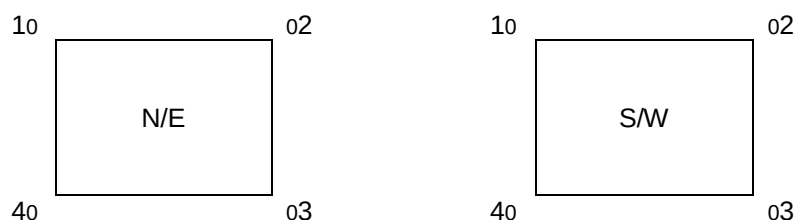
Rubbing ropes are special guide ropes provided between the cages in shafts where clearances are small.

The constructions of rubbing ropes are same to that of the guide ropes. Conforming to IS 3623 of 1973 but the tension given in the rubbing ropes shall be atleast 10% more than the tensions given in the guide ropes. Use of half locked Coil construction as rubbing ropes is preferred.

7.0 Maintenance:

- (i) Bottom attachment whether cheese weights or clamps should be kept exposed for which suitable arrangements must be provided through drains, etc., and suitable inspection gallery, ladderway etc, for regular inspection for the attachments.
- (ii) Guide rope should be properly lubricated at regular intervals. Frequency of lubrication will depend upon the shaft condition and the lubricant. In fairly dry shaft the frequency may be one month. Suitable lubricant adhesive to the steel rods should be used. Lubricant should be free from acid. Properly lubricated guides will be not only protected against corrosion but also reduce abrasive wear.
- (iii) Each guide rope should be properly inspected at regular interval but not exceeding one month. Inspection of the portions where the cage/means of conveyance normally rests on landing, where guide is exposed to ventilation exhaust, mid shaft position, top and bottom portions in or about the fixtures should be specially inspected for wear, corrosion, broken wire etc.

- (iv) Proper record of each guide should be maintained in separate bound register where proper identification of each guide shall be shown; by a sketch such as.



Reference of guide rope of North/East cage may be given in inspection report as N1, N2 or E1, E2 etc., similarly for the other cage.

In inspection report, suitable columns should be made on following heads :

- (1) Name of mine and pit number.
- (2) Name of supplier of guide rope.
- (3) Original actual diameter (mm), construction of guide rope and date of installation.
- (4) Type- Galvanised/ungalvanised.
- (5) Pit condition:
 - (a) Dry/Wet.
 - (b) Down casting/Up casting.
 - (c) Pit water- (PH value) when last tested.
- (6) Top and bottom fixtures- clamps/cheese weights/spring loaded tensioning arrangement.
- (7) Measurement of diameter of rope
 - a. Portions where measurements taken
 - b. Maximum and minimum diameter (mm)
 - c. Broken wire if any
 - d. Pitting/Corrosion
 - e. % reduction in diameter with respect to original diameter when new

8.0 Discard Norm:

Guide rope should be replaced –

- (a) when reduction in diameter is between 12% and 15% of the original diameter when new.
- (b) 12% reduction in diameter if the rope is effected by corrosion of medium degree and extended to most of the portion in the shaft.
- (c) Corrosion of heavy degree.
- (d) 15% reduction in diameter of the rope anywhere along the length.
- (e) When the outer rods have lost more than one third (35%) of their depth by wear or corrosion or both or the rope no longer appears safe for use due to any defect such as broken wires etc.

This circular shall apply to rubbing ropes also.

You are requested to comply to the above guidelines in the interest of safety.

DGMS (Tech) Circular No. 6**Dated the 6th September, 2001.**

To
The Owner, Agent and Manager
of all Coal Mines.

Sub: Use of Fire Resistant Grade Conveyor Belting for surface application.

A number of fires have been reported in conveyor belting being used in coal handling plants and open cast mines.

Enquiry into such fires had revealed total devastation of the conveyor equipment and associated property of the mine. Such fire in belting in tunnel conveyors may cause serious risk of life to the persons present in the tunnels.

To avoid and to deal with such fire, the following recommendations are being done: -

- (i) Only fire resistant belting conforming to the standard recommended below shall be used while carrying crushed coal.
- (ii) Water hydrant line with tapping at every 40 meters with sufficient hose lengths shall be laid all along the belt conveyors working in the mine.
- (iii) All defective idlers, bearing and defective lengths of belting shall be identified and replaced forthwith. Any other objects or parts of structure likely to cause friction or heating shall be removed.

Recommended Standard of Fire Resistant Belting:

- (1) Fire Resistant properties of the cover- to conform ISO 340
- (2) Drum Friction Test- to conform IS 1891 (part- V) of 1993.
- (3) Max Surface Electrical Resistant- to conform IS 1891 (part V) of 1993.
- (4) Cover Abrasion Loss (when tested as per DIN- 53516)- 175 mm³ (Max.)

The above values are applicable for all types of Textile Conveyor Belting and Steel Cord Conveyor Belting to be used on surface in coalmines. Other mechanical properties like Adhesion PLY/PLY, Adhesion Cover/PLY, cover thickness and cover tensile strength etc. may be fixed by the user industry in consultation of the belting manufacturer. No DGMS approval of the above belting is necessary.

However, any belting used in underground coal mine shall be of the type approved in writing by Director- General of Mines Safety as required under Regulation 181(3) of Coal Mines Regulations, 1957.

You are requested to comply to the above recommendations in the interest of safety.

DGMS (Tech)(SOMA) Circular No.7**Dated, the 10th July 2001.**

To
All Owners/Agents/Managers of mines.

Sub: Accident due to explosives.

In a recent accident in an opencast mine it was revealed that while two persons were charging shot holes with the help of an iron rod in close vicinity of another five persons who were engaged in drilling holes, explosive inside the shot hole got exploded causing fire and explosion to uncharged explosive kept near the face. Flying fragment and burning materials caused by the explosion inflicted serious bodily injuries to all the seven persons two of whom succumbed to their injuries.

The extant regulation under CMR 1957 & MMR 1961 provide for the following:

1. Before a shot hole is charged stemmed or fired, the shot firer/blaster is required to see that all the persons in the vicinity have taken proper shelter.
2. In charging or stemming a shot hole no metallic tool/scrapper or rod is to be used.

In the instant accident it is evident that the accident happened merely due to negligence and human failure. In spite of specific provision of law, the persons in the vicinity were not removed before commencement of the charging operation and an iron rod was used for charging the shot holes, which resulted into loss of two precious lives and serious injuries to five persons.

All concerned are therefore advised to take utmost care during charging a shot hole so that similar accident does not recur. It is sincerely believed that management will spare no efforts to eliminate accident due to above causes.

DGMS (Tech) Circular No.8

Dated the 20th September, 2001.

To
The Owner, Agent and Manager of
All the Mines under the Central Government Undertaking.

Sub: Jurisdiction of Electrical accidents in residential areas.

In supersession of Circular No.29 of 1972 and 23 of 1973 and as per the Notification No.S.O.659 dated 20.1.82 issued by the Central Electricity Authority the following Circular is issued for observance of all the mines under the Central Government undertaking. For the general information of the managements of all mines and for removing doubts whether the residential areas, pertaining to a mine, if fed from a Power Station or sub- station situated in or around a mine and forming part thereof, come within the jurisdiction of Electrical Inspectors of Mines, Govt. of India, or they come within the jurisdiction of the Electrical Inspectors of the concerned Inspectorate of the Central Electricity Authority the following clarification is issued after duly consulting the Central Electricity Board, in the matter.

- (1) If any power station/ sub-station/switch station which supply electricity mainly for the purpose of working a mine or a number of mines under the same management, also supplies electricity to the residential areas of the mine or mines referred to, the supply to the residential areas shall be given from a separate control gear and only that portion from such control gear to the residential areas, shall fall within the jurisdiction of the Electrical Inspector of the concerned Inspectorate of the Central Electricity Authority.
- (2) Whereas, if the supply of electricity at a mine is obtained from a power station/ sub-station /switch station which supplies electricity, besides the mine, to other places as well, only that portion from the switch gear or gears which are feeding the mines shall fall within the jurisdiction of the Electrical Inspector of Mines, Govt. of India.
- (3) In cases falling under clause (1) above, the power station/ Sub- station/ switch station shall fall within the jurisdiction of the Electrical Inspector of Mines Govt. of India whereas, in cases falling under clause (2) above. Such stations shall be within the jurisdiction of the Electrical of the concerned Inspectorate of the Central Electricity Authority.

Above circular laid down that lighting installations including overhead lines for the purpose of non- mining operation such as quarters, etc. shall come within the purview of inspection of the Electrical inspectorate of the Central Electricity Authority concerned. It is, however, being noticed that of the aforesaid Circular notices of accident pertaining to lighting lines are still being forwarded to the Electrical Inspector of Mines (Now Director of mines Safety/ Dy. Director of Mines Safety, Electrical). Therefore, in future such notices must be sent to the Electrical Inspector of the Inspectorate of the Central Electricity Authority concerned. A copy, however, may be sent to the Director of Mines Safety (Electrical) for information only.

DGMS (Tech) Circular No.9**Dated the 20th September, 2001.**

To
The Owner, Agent and Manager
of all the Mines and Oil Fields.

Sub: System of earthing of Power Supply System for underground Mines and Oil Fields.

There was a national workshop on choice and standardization of electrical power supply system in mines on 11th and 12th May 1990 at Dhanbad. Representatives of Mining Industries, National Laboratories, Statutory Authorities, Academic Institutions attended the above workshop and thorough discussion was made regarding the suitable system of earthing the neutral point of the transformer of the power supply system both at surface and at underground feeding power to the electrical equipments in the mines and oil fields. After detailed deliberations it was decided that the restricted neutral system of earthing with suitable impedance between the neutral point and earth is safest system for the power supply system in the mines. The recommendation of the national workshop was therefore.

- (a) With increase in degree of mechanization of power under coalmines, it has been felt necessary to limit the earth leakage current at not more than 750 milliampere.
- (b) Compared to solidly earthed neutral system, the insulated and restricted neutral power supply system for mines has distinct advantages in reducing the hazards from the electrical sources.
- (c) Restricted neutral system can be conveniently adopted in mines. This is also in accordance with I.S. code of practice.
- (d) Solidly earthed neutral system supply in coalmines is to be discontinued accordingly.

With the above background, the provision of the Rule 116(1) of the Indian Electricity Rules 1956 was accordingly amended as "In the interest of safety appropriate equipment shall be suitably placed in the mines for automatically disconnecting supply to any part of the system where a fault, including an earth fault occur. Fault current shall not be more than 750 milliampere in 550/1100-volt system in underground/ oil fields. The magnitude of the earth fault current shall be limited to these specified values by employing suitably designed restricted neutral system of power supply".

It is, therefore, requested that mine management take suitable action to convert the underground/oil field power supply system from solidly earthed system to restricted neutral system within a year.

DGMS(Tech/SOMA) Circular No.10 of 2001**Dated the 22nd October, 2001**

To
The Owners, Agents and Managers
of all Coal and Metalliferous Mines.

Sub: Accident due to misfired charges.

Accidents due to misfired charges continue to occur in mines even though clear and detailed precautions have been stipulated in the statute and Circulars issued from time to time. Recently two such accidents took place due to this cause and persons received serious injuries. These accidents are described below: -

Case-1. In an underground coal mine while a coal cutter was digging floor in a blasted muck for making buffer hole by a pick axe, the misfired shot of earlier blast got exploded inflicting injuries on faces and eyes to the shot firer and another coal cutter standing near by.

Case-2. In another underground coal mine while four coal cutters were engaged in drilling holes from over the top of a coal heap covering a portion of the face in a development district, the drill rod came in contact with the misfired charge of the previous blast and the charge exploded. The coal cutter and one of his helpers sustained serious injuries when hit by flying fragments projected by the blast.

The investigations into the above accidents revealed that the blasted material and loose rocks were not removed from the floor before digging into the floor by a pick axe in the first case and all the coal from the face were not cleaned before drilling further round of shot holes in the second case.

The investigations also revealed that the site of accidents was not carefully examined for the presence of misfires.

The above accidents and injuries could have been avoided if the safety provisions as provided for by Regulation 178(a) of Coal Mines Regulation 1957 & DGMS Tech. Circular No.2 of 1983 were complied with.

It is, therefore, advised to all concerned to ensure that the precautions stipulated for eliminating such accidents are strictly complied with and also a suitable code of practice mentioning specific duties of shot firer/blaster, sirdar/mate and Overman/foreman shall be formulated and enforced so that similar accidents do not recur.

DGMS (Tech) Circular No.11 of 2001.

Dated the 8th November, 2001

To
Owners of all
Coal and Metal Mines.

Sub: Safe practice of repairing Hydraulic System in Boom of side discharge loader.

A fatal accident took place in a belowground coal mine using side discharge loader under the following circumstances.

While a mechanical fitter was engaged in repairing the spring loaded cartridge valve of lift cylinder of a side discharge loader by working underneath it without locking the same but resting it on a single vertical wooden sleeper, the load cartridge valve flew off causing sudden lowering of the bucket breaking the sleeper and inflicting serious bodily injuries proved fatal.

The enquiry revealed that had the bucket boom been kept secured "left" position by locking arrangement so provided and had the unsafe method of using wooden sleeper to support the bucket in lift position not been followed, this accident could have been averted.

The practice of supporting the bucket in "lift" position by wooden sleeper is in vogue in many mines and is within the knowledge of many supervisors and engineers and yet this practice is allowed to continue against the interest of safety, therefore it is necessary to stop this practice forthwith.

It is requested that while repairing the hydraulic system in the boom or near by area care shall be taken to keep the bucket in the floor as far as practicable or otherwise the boom shall be locked by the locking arrangements provided by the manufacturer and such arrangement shall be kept readily available in the machine at all times. These steps will help in preventing recurrence of such accidents in future.

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NOTIFICATIONS & CIRCULARS

Notifications – 2002

New Delhi, the 1st August, 2002

S.O.816(E) – In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines, 1952 (35 of 1952), the Central Government hereby appoints Shri Dashrath Singh, Deputy Director General, Directorate General of Mines Safety, Eastern Zone, Sitarampur to be the Chief Inspector of Mines for all the territories to which the said Act extends. This notification shall come into force on and from the date of its publication in the Office Gazette until further orders.

[File No.S-29025/4/2000-ISH.II]
K. Chandramouli, Joint Secretary

New Delhi, the 28th November, 2002

S.O. 3833. In exercise of the powers conferred by sub-section (1) of the Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints the following officers as Inspectors of Mines subordinate to the Chief Inspector of Mines, until further orders:

1.	Satish D. Chiddarwar	DDMS(Mining)
2.	Manish E. Murkute	DDMS (Mining)
3.	Ram Madhab Bhattacharjee	DDMS (Mining)
4.	Ujjwal Tah	DDMS (Mining)
5.	Mihir Choudhury	DDMS (Mining)
6.	BL Meena	DDMS (Mining)
7.	Harish Chandra Yadav	DDMS (Mining)
8.	Susanta Kumar Mandal	DDMS (Mining)
9.	Raj Narayan Singh	DDMS (Mining)
10.	Probhat Kr. Kundu	DDMS (Mining)
11.	Ram Abhilash	DDMS (Mining)
12.	Md. Rafique Sayeed	DDMS (Mining)
13.	Arvind Kumar	DDMS (Mining)
14.	Ashok Kr. Porwal	DDMS (Mining)
15.	DB Naik	DDMS (Mining)
16.	Prabhat Kumar	DDMS (Mining)
17.	Rajendra Prasad	DMS (Electrical)
18.	JK Roy	DDMS (Mining)
19.	Vinod Kumar	DDMS (Mining)
20.	SK Chabra	DDMS (Mining)
21.	M Tikadar	DDMS (Mining)
22.	SK Gangopadhyay	DDMS (Mining)
23.	Satish Kumar	DDMS (Mining)
24.	UP Singh	DDMS (Mining)
25.	PK Maheswari	DDMS (Mining)
26.	S Haladar	DDMS (Mining)
27.	A. Dan	ADMS(Mining)
28.	SK Das	DDMS (Mining)
29.	KS Yadav	DDMS (Mining)
30.	SK Bagchi	DDMS (Mining)
31.	G. John	ADMS(OH)
32.	B. Papparao	DDMS (Mining)
33.	PK Palit	DDMS (Mining)
34.	K. Sarkar	ADMS(Mining)
35.	G. Moitra	DDMS (Mining)
36.	Kamlesh Sharma	DDMS (Mining)
37.	Dr. Satya Sundar Chakraborty	ADMS(OH)

[F.No.S-29025/5/2002-ISH.II]
Braj Mohan, Under Secretary.

New Delhi, the 13th December, 2002

No.A-12025/6/97-ISH.II – The President is pleased to appoint Dr. Amitabha Dan, to the post of Assistant Director (Occupational Health) Gr.I in the Directorate General of Mines Safety, Dhanbad with effect from 3.4.2002 in a substantive capacity.

Braj Mohan, Under Secretary.

Circulars – 2002

DGMS (Tech) Circular No.1 of 2002

Dated the 28th January, 2002

To
Owner, Agents & Managers of all Mines.

Sub: Design of Draw Bar of five tones capacity.

Enquiries into incidents of runaway of tubs due to breakage of draw bar or its end attachments have revealed that failure generally occurs due to one or more of the following reasons:

- (i) Manufacturing defects.
- (ii) Material was not as per specifications.
- (iii) Draw bar & attachment were deviated from the standard design.
- (iv) Draw bar & attachment were worn out beyond limit or damaged.

As per Regulation 89 (1)(c) of Coal Mines Regulations, 1957 and Regulation 97(c) of Metalliferous Mines Regulations, 1961, the attachment between a rope or locomotive and a tub and the attachment between any two tubs in a set or train of tubs is required to be of a type approved by the Chief Inspector.

In supersession of DGMS (Tech) Circular No.8 of 1987, the type approval is as follows:

3. Design: Two designs of tub draw bar and suitable end fittings are given in the sketch annexed. Any other design may be used with the express permission in writing by the Director General of Mines Safety. In the past, if any other design has been specially permitted by the Director General of Mines Safety the same should be resubmitted for re-examining the matter. Existing drawbars not conforming to the designs shown in the Annexure should be replaced as early as possible, but not later than a period of one year from the date of this circular.

2.0 Material:

(a) For Draw Bar: The material shall be any of the following:

- (i) 11 Mn2 conforming to IS 4432- 1967
- (ii) 20 mn2 conforming to IS 1570-1961.

(b) For End Fittings: The material shall be any of the following:

- (i) 11 Mn2 conforming to IS 4432- 1967
- (ii) 20 Mn2 conforming to IS 1570- 1961
- (iii) 20 Ni 55Cr 50 Mo 20 conforming to IS 4432- 1967.

(c) Only tested and certified material shall be used and some random samples shall be periodically tested to ensure proper quality of material.

3.0 Manufacturing & Workmanship:

The draw bar shall be manufactured in workshop having adequate facilities for forging, machining and heat treatment. The manufacturer shall give evidence of good workmanship and the draw bar shall be free from any visual defect. Holes in the draw bar or its attachment shall be made by drilling and not by punching. Forged draw bar should avoid sudden change

of section, thickness, and/or shape both. In draw bar with eye termination, the eye shape shall be made with the help of suitable mandrel and shall be so made that the line of pull is in line with the axis of the draw bar. The ends of the draw bar shall be such that there is no fouling when tubs are buffed together and there is no locking on curves.

In draw bar of lapsed design, the lapped portion shall be riveted and side welded on both sides. After riveting, the gap between lapped flat faces should not exceed 0.2 mm. After riveting, each rivet shall be checked by light hammering and in case of any vibration due to slackness, the rivet shall be cut and redone.

In flat type draw bars, the ends shall be reinforced by welding a short piece of plate of 12mm thickness & of size 85mm x 65mm. Flat type Draw Bar shall be used with Tub coupling of serial No.2 only as mentioned in Technical Circular No.1 of 1986.

End fittings shall be manufactured by forging; machining and holes shall be drilled, not punched. Forging shall be such that the fibres of materials are not transverse to the line of pull.

4.0 Heat Treatment

(a) After manufacture, draw bar & end fittings shall be normalized or normalized and tempered, or hardened and tempered in an approved establishment at the following temperatures:

Sl.No.	Designation of steel	Normalizing Temp C	Hardening Temp C	Tempering Temp C	Quenching Agent
1.	11 Mn2	870-910	870-910	550-660	Water or Oil
2	20 Mn2	860-900	860-900	550-660	Water or Oil
3	20 Ni 55 Cr 50 Mo 20	*	820-850	*	Water

* Suitable temperature may be adopted so as to attain the optimum properties.

(b) Certificate of heat treatment from the approved establishment shall be obtained.

5.0 Factor of Safety: The complete draw bar with end fittings shall have a factor of safety of seven (7) with respect to S.W.L.

6.0 Hardness: Hardness for various materials shall be as follows:

(i) 11 Mn ₂	:190 to 220 HV
(ii) 20Mn ₂	:200 to 230 HV
(iii) 20 Ni 55Cr 50 Mo 20	:250 to 280 HV

7.0 Identification: Each draw bar and end fitting shall be legibly marked on non-vital portion with the following:

- (i) Manufacture's name & identification mark.
- (ii) Year of manufacture
- (iii) Material (Symbol M for 11 Mn₂/20 Mn₂, Symbol A for 20 Ni55 Cr 50 Mo 20)
- (iv) Type of heat treatment (N- Normalized, NT Normalized & tempered, HT- Hardened & tempered)

The stamp used for marking shall be of 5 mm. Size. Care shall be taken that the indentation is neither too sharp nor excessive in depth.

8.0 Tests & Examination: After manufacture & heat treatment, at least 10% of the manufactured/ supplied lot of draw bar & its components shall be tested for proof load i.e. for three times the S.W.L.

It shall be further tested magnetically for cracks or any other defect. At least 1% of draw bar with end fittings of manufactured/supplied lot or minimum one number shall be subjected to destructive testing.

A certificate by a competent person making such test and inspection shall be furnished by the Manufacturer.

9.0 Record – A record of each draw bar stating its identification number, date of use with the reference of the tub to which it is fitted should be maintained in a bound paged book.

10.0 Repair & discard: Wear & tear of any component shall not be built up by welding.

Draw bar shall be discarded if it is found to have worn out to the extent so as to reduce the factor of safety to six or if found to have some defect affecting its strength.

In addition, if there is any derailment of tub, then draw bar and its attachment shall be carefully checked for damage any tube is put back into service. Drawbars having permanent deformation/damage shall be replaced.

End fittings shall be discarded when the maximum loss of cross-section due to wear over the original cross- section exceeds 15% with corrosion.

11.0 Life – Normal life of drawbar shall be three years.

DGMS (Tech) Circular No.2 of 2002

Dated the 3rd May, 2002

To
The Owner, Agent and Manager of all the Coal Mines.

Sub: Recommended Code of Practice for operation and Maintenance of Flexible Trailing Cables Associated with Mobile Machines.

The present practice of manual handling of flexible trailing cables is fraught with danger. In view of this it is suggested that where the machines are required to move, manual handling of cables should be avoided/minimized as far as practicable where circumstances permit by the use of properly designed, installed and maintained cable reeling or handling devices.

As the above procedure calls for modification in the design of the machine and will take some time to materialize, the following measures should be adopted to ensure safety in use of flexible training cables with electrically operated loading machines.

- (i) Where flexible cables are not required to move, they should be effectively supported and protected against physical damage.
- (ii) Where they are required to move concerted and focused effort should be made to train machine operators and cable men in safe operation of electrically operated loading machines and handling of the associated flexible trailing cables.
- (iii) Cable men/ cable handlers/ SDL operators are required to handle electrically live Flexible cables. Handling such live cables should be considered a specialized job and as such they should be considered under the category of “competent person” and hence should be properly trained and authorized in conformity with the provisions of the Rule 3 & 36(2) of the Indian Electricity Rules, 1956.
- (iv) Such cable handlers should be provided with suitable personal protective equipment such as hand gloves and other suitable appliances as deemed fit and their use should be ensured to ensure safety of such workmen.

As regards repair of the trailing cables the following measures are considered to be in order.

- (i) Provision should be made in the colliery workshop with requisite equipment/appliances for the efficient maintenance and repair of the trailing cables.

The floor space should be sufficient to permit the cable to be laid out for detailed examination, test and repair and to accommodate the necessary benches and appliances.

- (ii) Puncture in the outer sheath may be located readily by means of ordinary spark Testing appliances or other instruments.

Special spark testing appliances/ Instruments/Meggar Insulation Tester that are available should be used for detecting and locating fault between conductors.

If the bulk of the cable is waterlogged it should be dried out, say by means of a vacuum impregnator such as used for drying armature or by other means before any repairs are attempted. One method of drying out local moisture is by gently warming the cable on each side of the damage. High temperature must be avoided. Another method which is claimed to be very effective is to direct a strong stream of hot air from an electric hair dryer or any other similar apparatus on to the joint and cable near it for about 20 minutes.

While carrying out vulcanization due importance is to be given to the insulation resistance value of the cable at every step/ stage of vulcanization process.

- (iii) Where two or more of the core conductors in a cable are joined, it is essential, in order to preserve flexibility that the joints shall be widely spaced.
- (iv) It must be recognized that there is a limit to the extent to which a particular length of a cable may be repaired and that a stage is reached at which the cable should be scraped and a new one put in service.

The above notes are guidelines for repair and maintenance of flexible cables and is not exhaustive. Relevant Indian standard, manufacturer's instruction and guidelines and the expertise of the skilled workmen should also be taken into consideration for maintenance and repair of flexible cable for mobile machines in mines.

DGMS (Tech.) Circular No.3 of 2002

Dated the 10th May, 2002.

To
The Owners, Agents and Managers
of all Coal and Metalliferous Mines.

Sub: Facilities required at Group Training Centers and standard of training.

Ref.: Rule 6, 7, 8, 9, 10 & 11 of The Mines Vocational Training Rules, 1966.

As you are aware that safety as well as productivity of any establishment is directly dependant on quality of training imparted to the workmen engaged on various jobs, it would be in the interest of both industry and the workmen if the best possible training is imparted to our workmen for all-round growth of the industry and the nation. However, during recent inspections of Group Training Centers across the country owned by various public/private operators following deficiencies shortcomings were observed in spite of various Circulars issued time to time:

1. Provision: Almost all major operators have switched over from Mine Vocational Training Center to Group/Vestibule Training Centers.
2. Accommodation: Adequate required accommodation had not been provided to about 20% of the Group/Vestibule Training Centers (GTCs). Even in cases where suitable accommodation have been provided these were not maintained properly.
3. Staffing: Adequate & duly qualified training staff were not provided at most of the GTCs. In one or two cases even physically handicapped persons were employed who could not deliver lectures. Assistant Training Officer and Instructor(s) for Electrical & Mechanical subjects were not appointed at most of the GTCs.
4. Training Galleries: Training Gallery, which is probably the most important aspect of the training, was not provided at most of the GTCs. In some cases, where these were provided, the same were neither properly equipped nor were being used for training.
5. Training Shop: Training Shop, for an effective and fruitful training to mechanical and electrical work-persons, was not provided at most of GTCs.

6. Training Aids: Even though, OHPs, Film &/or Slide Projectors were provided at most of the G.T.Cs, except for one or two cases, other required input material like transparencies, slides and/or films were not provided. One of the most important tool for communication in to-days world i.e. computer with proper software were not provided except for one or two GTCs in private sector.
7. Course Material: Except for one or two GTCs others were not preparing the required course material either for the trainees or for the instructors. Most of the GTCs even did not have a library with required books and the facility to generate course material of their own.
8. Attitude of Training Staff: In most of the cases training staff including training officers did not have positive attitude and in some cases they felt frustrated as if "they were punished by having been posted at the training center". At most of the GTCs due importance was not given to "hands on" or "on the job" training.
9. Attitude of Trainees: Due to unimaginative & un-impressive training methods adopted by the training staff and in some case inconvenient training schedule (before or after duty hours) most of the trainees, specially those coming for refresher courses, indicated dull response to the training programmes and even had tendency to evade training session(s).
10. Management's Response: Except for few cases, both local as well as higher, management indicated poor response to the training needs/requirements. In most of the cases an impression was conveyed as if expenditure on training was wastage of money & other resources.

To improve performance of GTCs and to ensure effective and gainful training to the workmen and supervisory officials following improvement measure need to be taken immediately:

1. Accommodation: All GTCs to have at least the following accommodation:
 - A V.T.-Manager's / G.T.O's room,
 - Training Officer's / Assistant Training Officer's room,
 - An Instructor's room,
 - A library cum reading room,
 - A Gas-Testing room,
 - An office-staff cum record room,
 - Adequate number of lecture rooms,
 - Model-room cum Training Shop,
 - Training Gallery,
 - Store room,
 - Adequate number of toilets &
 - Ample open parking space.

Preferably a GTC should be housed in a separate campus/block. All rooms should be equipped with the required furniture.
2. Staffing: All GTCs to have at least the following personals:
 - G.T.O. or V.T.-Manager having Ist Class Manager's Certificate of competency as over all in-charge of the training center;
 - Adequate number of Training Officers &/or Assistant Training Officers (fresh Engineering Graduates or II Class Managers Certificate holders with Diploma in Mining/Mechanical/Electrical Engineering) to assist the In-charge in programme formulation as well as generation of course material for different training programmes;
 - Adequate number of trained instructors, at least Diploma in Mining/Mechanical/ Electrical Engineering or Overmen/ Foremen (Mechanical/ Electrical) for Mining as well as Mechanical & Electrical subjects,
 - Adequate number of experienced and safety minded trainers for each specialized or skilled job and
 - Subordinate staff such as librarian, clerks, typists and/or data entry operators, draughtsman or tracer, peon, general mazdoors and sweepers etc.
3. Training Shop: All GTCs must have a well made and well maintained Training Shop equipped with electrical lay-outs of important electrical equipments and working cut-models of different machines for an effective and fruitful training to mechanical and electrical work-persons.
4. Training Galleries: All GTCs must have a well-made and well-maintained Training Gallery depicting general mine condition and important mining operations.

5. Training Aids: All G.T.Cs to be provided with Computers with required software, Over Head Projectors, Slide Projectors & TV + VCP/CD Player combination with required other inputs like transparencies, slides, cassettes or CDs on safety or safe way of doing a job in mines or work-shop. Wall charts/posters, photographs, pictorial diagrams, manufacturer's handout on different equipment used in mines and reference books on various subjects.
6. Course Material: All GTCs must prepare their own course material for all training courses which is to be regularly up-dated and copy of which to be provided to all instructors as well as to all the trainees whether/literate or not.
7. Attitude of Training Staff: To ensure that the training staff must have positive attitude, each one of them should be required to attend class on management as well as on improvement of teaching skill. They should also be treated at par with other officials, if not superior, in the line management. A lot of stress is required to be applied on "hands on" or "on the job" training under the guidance of experienced, well trained & safety minded Trainers for every skilled operation.
8. Attitude of Trainees: To draw full attention/response of the trainees the training programme should be lively, illustrative, interactive and informative in the concerned field and for that use of modern teaching or training tools like Computers, Over Head Projectors, Slide Projectors & TV + VCP/CD Player combination should be generously used in all training schedules.
9. Management's Response: Higher management must indicate their interest in effective training through routine visit to GTCs and by getting sample feed-back report(s). For all training programmes full day release system is to be adopted without any exception.

It is expected from all mine operators to go beyond this circular in up-grading their training centers in the interest of the industry & the Nation. The Directorate would be pleased to note compliance of above circular at all the GTCs of both coal and metal mines.

DGMS (Tech) Circular No.4 of 2002

Dated the 13th May, 2002

To

Owners, Agents and Managers of all Coal & Metalliferous Mines.

Sub: Design of Lashing Chain.

In continuation of DGMS (Tech) Circular No.3 of 1985, it has been decided to allow use of Lashing Chains an attachment between Endless Haulage Rope and Tub or a Train of Tubs in addition to the clips whose designs have already been circulated in the aforesaid circular. It has been observed in past that the accidents of lashing chain were not only due to slipping but most of them were due to failure of hook or chains.

The design and specifications of the Lashing Chain shall conform to there drawing and specification given in the Annexure.

1.0. Material: Specified in the drawing DGMS/ LASHING CHAINM/001.

2.0. General Requirements:

- (i) Lashing chain shall have static factor of safety of not less than 7 in relation to maximum static load attached to the rope.
- (ii) Safe Working Load/ Maximum drawbar pull of lashing chain shall be 1.5 Tonne.
- (iii) Two lashing chains shall be used at a time. One shall be fitted between the rope and the leading tub and other one at the rear most tub and rope.
- (iv) Maximum loaded tubs and empty tubs at a time shall be restricted in such away so that the max draw-bar pull on the lashing chain do not exceed 1.5 Tonne to be calculated on the maximum gradient considering only one lashing chain would take the full load though two lashing chains shall be provided.
- (v) Each mine shall prepare a code of practice for using such lashing chains where the manner of lashing chain around the rope shall be described in details considering various safety aspects.

3.0 Manufacture & Workmanship:

Manufacturer shall be reliable having at his works adequate facilities for proper forging, heat treatment and preferably testing facilities for the product. Forge welding is not desirable. Electrical welding should be done where necessary and wherever welding is done, slag shall be carefully cleaned at each stage, Holes, if any, shall be drilled instead of being punched. Joining shall be done by electric welding and not smithy welding.

- (i) Chain shall be used only of butt welded quality conforming to IS 3948 of 1986.
- (ii) Hook shall be used of die-forged quality and the assembly will give evidence of good workmanship and finish. The material shall conform to Class 3 of IS- 1875 of 1078.
- (iii) The egg shaped link and the end- links known as oval links shall be made from 200 Mn2 Steel Conforming to IS 1570 of 1961.
- (iv) All parts of chain and hook shall be given proper heat- treatment after the Forging and welding operation to relieve the stresses and to achieve proper working hardness.

The user shall also ensure that each lashing chain put in use fully conform to the prescribed specifications and proper care is taken in its use.

4.0: Marking: (i) Manufacturers identification mark (year of manufacture).

(ii) Identification mark bearing with manufacturers certificates of test and Examination.

5.0. Inspection: Fortnightly inspection as prescribed in the regulation should be consciously made and report of each examination should be kept in a bound paged book. Any chain involved in derailment or accident shall be specially inspected at the earliest opportunity and if suspected to have been damaged, it shall not be used unless certified by competent person superior in rank to the one making the inspection and the report of such inspection should be kept.

6.0 Repair & Rejection: Wear and tear of any component shall not be built up through welding. The components shall be discarded when maximum, loss of cross-section due to wear over any portion exceed 10% of the original cross sectional area of the portion.

7. Certificate of Test and Examination: The manufacturer shall provide certificate of test and examination with every consignment.

8.0 Record Keeping: Records of lashing chains in use stating the reference number, date of Manufacture and date of use shall be mentioned. If the same are procured from more than one manufacture, the name, address and other relevant information in respect of each shall be recorded in a bound paged book.

No other design of lashing chains shall be used in mines with immediate effect.

Enclo: Drawing & specification.

DGMS

DGMS (Tech) Circular No.5 of 2002**Dated the 16th May, 2002**

To
The Owner, Agent and Manager of all coal mines.

Sub: Anchorage testing of installed roof bolts

Strata control still remains a major problem, affecting safety and productivity in underground coal mines. To control accidents due to fall of roof, the 8th Conference on Safety in Mines has recommended use of roof bolts as a method of support in coal mines.

Full column grouted bolts are in use for sometime in underground coal mines. For realizing the full potential of bolting system in reinforcing the roof rock and sides, it is imperative to monitor the performance of the installed bolts by anchorage testing and other means.

During the course of workshops on "Roof bolting practices" by an officer of this Directorate, who actually visited underground and demonstrated the testing, observed that the design of bridge assembly of anchorage testing machines used by many coal mines is not conducive to proper and smooth testing of installed roof bolts. In certain cases, the results obtained was not that of the grouted bolt, but the strength indicated was the strength of the machine itself, as the inner bridge assembly would sit on the outer bridge. There was no way of knowing the situation in the machine provided. The S&T division of DGMS had worked with the manufacturers and suggested certain improvements, which if complied with, would go a longway in eliminating such wrong results.

Two sketches (DGMS/S&T/2002, A&B) of the modified bridge assembly are enclosed. It is requested that immediate steps are initiated to ensure that no anchorage testing machine is procured unless those are of proper design and the existing defective ones should be modified without delay.

DGMS

DGMS

To
The Owners, Agents and Managers
of all Coal Mines.

Sub: Accident during dressing operations in coal mines.

An analysis of roof and side fall accidents in coal mines for the year 1999 and 2000 revealed that a good number of accidents and fatalities due to fall of roof and sides are taking place during dressing of roof and sides – an operation being carried out to secure the roof and sides to ensure safe working.

The analysis revealed that percentage of roof fall accidents during dressing operation of all accidents in belowground workings during the year 1999 and 2000 were 21 & 19 respectively. The similar percentage of accidents due to side fall was 20 and 18.

The analysis further revealed that the accidents took place due to one or more of the following reasons –

- A suitable tool for dressing was not provided. In most of the cases, the dressing operations were being carried out by a coal miner's pick at high roof.
- In some cases, a drum was being used for reaching high roof for dressing instead of a suitable buntline or crowbar. The drum when hit by dressed material, fell down injuring the dresser.
- The dresser himself did not take safe position during dressing. The dressing was done from beneath the unsafe roof or from the in-by dip side of the roof where likelihood of getting injury was maximum.
- Suitable class room and on job training were not imparted to the dresser.
- Dressing operations were being undertaken by diverted mazdoors from general pool in the absence of regular dresser. Such mazdoors were not suitable for such skilled job.

Needless to emphasize that all the accidents during dressing operation were avoidable. Based on the experience of the past accidents and in order to avert similar accidents in future, it is desirable that every mine adopts a sound, safe and standard dressing procedure. A brief guideline of which is being given hereunder.

1. Scope:

The procedure will detail the selection of dresser, classroom and on the job training on dressing operation and recess cutting for isolation/sectionalisation/Ventilation stopping, equipping them with proper tools/tackles and making them aware of their responsibilities. This will apply to all parts of underground workings of every mine.

2. Objective:

The objective is to reduce the likelihood of getting injury due to failure in identifying the hazard, taking improper shelter and for improper/inadequate dressing, during and after dressing operation.

3. Selection of persons:

Persons to be newly selected for dressing/recess cutting job shall have a strong physique and good health. However, existing dressers having sufficient experience may continue if they are trained properly.

4. Training:

- Selected dressers shall undergo initial basic training as per VT Rules and specific training modules.

- They are to be appraised of different geological disturbances viz. faults, dykes, slips and fractured/sheared strata, found in coal mine, especially found in the mine they are to be deployed detailing the grumbling sound to detect the bad roof with stick/crow bar/bunton.
- They are to be told on taking personal protection, in way of standing at safe place and guarding the shinbone with basket or other screens, while testing and dressing the roof and sides. They are also to be told about the importance of Deflector Rings on crowbar/bunton.
- Training is to be given on use of proper tools with respect to the situation of workings i.e. pick for low height, crowbar for big and strong overhangs and buntons for high roofs.
- They are to be explained about cleats and how they can take advantage of the weak plane so as to get more result exerting less.
- Importance of geological disturbances including slip planes should be explained to them.
- They are to be appraised about the seals with particular attention to the dimension of the recess for isolation/sectionalisation/ventilation stopping. They are also to be made aware of the manhole size.
- Dressers shall be told on the hazard mechanisms of roof and side fall. They are also to be explained about the method of work being practiced in the mine.
- Sufficient number of persons shall be given training to take care of the absenteeism on account of leave/sick/other reason of the regular dresser.

5. Procedure:

In the beginning of the shift the dresser, accompanied by the Mining Sirdar, will test roofs and sides of every face. Also after every blasting, all places within the zone of influence of blasting as decided by the Manager shall be tested. He shall also test the roof and sides of the traveling roadway and other places of the mine as instructed by the supervisory staff. While dressing, he shall stand at a place where the roof and sides are safe and secured and then dress the roof and sides with proper tools/tackles. Dressing should proceed from outbye to inbye side. He shall leave the face only when the Mining Sirdar declares that the face has been dressed properly.

6. Equipping:

Dressers are to be provided with coal miners' pick, crowbar and Buntons made of $\frac{3}{4}$ inch steel pipe having sharpened and heat treated pick, welded at one end. There should be stock of the same in colliery stores for future need. They shall be given Personal Protective Equipments, which includes Helmet, Mining Shoes and Shin guard.

7. Responsibility:

Dresser is responsible for dressing the roof and sides of the working places assigned to him in such a way that there is no loose coal/stone in the roof, no overhangs and the sides are not loose. He, when engaged in recess or manhole cutting job, shall made recesses to the specified dimension. It is needless to mention that he is responsible for his own safety while dressing the roof and sides or engaged in recess cutting job.

DGMS(Tech/SOMA) Circular No.6 of 2002

Dated the 4th July, 2002

To

Owner, Agent & Manager of All Coalmines.

Sub: Support of roof and side in belowground coalmines.

Roof and side fall accidents still continue to be a major cause of fatality in belowground coal mines inspite of introduction of steel supports in such workings. An exercise was, therefore, undertaken to analyze in detail the accidents caused by fall of roof and side during the year 2000. Frequency distribution of all fatal accidents was carried out to identify the fatalities by major cause group. The analysis revealed that:

1. The roof fall and side fall accidents account for 35 percent of all the fatal accidents and 63 percent of all belowground fatal accidents in coalmines.
2. Only roof fall accidents account for 26 percent of all fatal accidents in coalmines and 48 percent of all belowground fatal accidents.
3. Side fall accidents account for 9.4 percent of all fatal accidents and 14.5 percent of all belowground fatal accidents.

The analysis further revealed that:

- i. 13 percent of roof fall accidents occurred during setting of supports and 3% during withdrawal of supports.
- ii. 63 percent of the roof fall accidents occurred within 10m of development and depillaring faces i.e. in freshly exposed roof area. 33 percent of such accidents occurred in depillaring district while 30 percent in development areas.
- iii. 26 percent of the side fall accidents occurred within 10m. of the working faces.
- iv. All type of strata were involved in roof and side fall accidents. In the roof fall accidents, 40% of the fallen strata were coal, 17 % were shale, 33% sand stone and remaining were combination of coal/shale or sand stone.
- v. The thickness of the fallen strata was up to 1m in 87 percent cases of roof fall accidents.
- vi. The thickness of fallen strata was up to 1m in 81 percent cases of the side fall accidents.
- vii. 70 percent of roof fall accidents occurred due to inadequacy of supports in the workings.
- viii. 73 percent of roof fall accidents and 81 percent of side fall accidents occurred where gallery width was more than 4 m.
- ix. 84 percent of the roof falls and 64 percent of the side fall accidents occurred due to lapses on the part of management and supervision.
- x. 57 percent victims of roof fall accidents were loaders followed by 19 percent support Crewmembers.

It is obvious from the above analysis that most of the accidents were avoidable.

The analysis of the accidents, observations of the officers during inspection of mines and interaction with support crew and subordinate supervisory officials revealed one or more of the following deficiencies:

1. Systematic Support Rules were not being followed strictly.
2. Workmen were sometime going in-bye of the roof supports.
3. A temporary support was not provided in the freshly exposed area before engaging the Support crew for providing permanent support.
4. Inadequate or improper examinations of roof/side manifested into roof/side falls.
5. Proper dressing of roof and sides were not done prior to erection of support.
6. Support crew was not provided with proper tools / tackles.
7. Safety support withdrawer was not provided and supports withdrawal was carried out by hammering on erected supports.
8. A system of side supports was not adopted where the coal had a tendency to spell.
9. Galleries were widened excessively without any purpose.
10. Support crew was not adequately trained. Sometimes loaders and other diverted untrained workers were engaged for bolting operation in the absence of regular support crewmembers.
11. Rope dowels were used in place of ribbed bars.
12. Grout was not able to provide the desired anchorage of 3 tonnes and 5 tonnes after $\frac{1}{2}$ an hour and 2 hours of setting time respectively.
13. Nuts were not compatible with respective bolts resulting into slipping of nuts over threads.
14. Holes were not drilled in right direction and up to desired depth
15. Proper types of support materials as envisaged by tech. Circular No.3 of 1996 were not used.

16. Bolting was not done soon after the exposure of the roof resulting into bed separation.
17. A system of anchorage testing and keeping record was not in vogue.
18. Instead of random anchorage testing, pre-decided bolts were subjected to anchorage testing.
19. A proper type of anchorage testing machine compatible with the bolts was not provided.
20. A system of monitoring of strata behaviour was not in vogue.

In the past, technical circular No.3 of 1993, Circular No.6 of 1994, Circular No.3 of 1995 and Circular No.3 of 1996 were issued in this connection. From the above observations, it appears that very little efforts have been made in this direction. It is, therefore; imperative that every mine adopts a sound, safe and standard supporting procedure, a brief guideline of which is given hereunder:

A. Scope: The procedure will detail selection of support crew members, classroom & on the job training on setting & withdrawal of supports, roof testing, equipping them with proper tools/ tackles, making them aware of their responsibilities and adoption of a system approach to tackle the situation. This will apply to all parts of belowground workings of every coalmine.

B. Objective- The objective is to reduce the likelihood of getting injury due to failure in identifying hazards related to fall of roof & side.

C. Selection of persons: Persons to be newly selected to form members of the support crew shall have a strong physique and good health to work on all man all job principle. However, existing crewmembers having sufficient experience may continue if they are trained properly.

D. Training:

- ❑ Selected members of the support crew shall undergo initial basic training as per V.T. Rules and specific training modules developed for the support crew.
- ❑ They are to be appraised of different geological disturbances viz. faults, dykes, slips, fractured/sheared strata, ledges etc in coal mines, specially found in the mine they are to be deployed, detailing the type and method of supports requirements under different situations.
- ❑ They are to be appraised the significance of ringing/ drummy/ grumbling sound of roof & support when tapped with a stick and other phenomena like development of cracks in the roof and sides, bending or breaking of lids/props or buckling of props, water percolation from roof etc for any sign of weighting on supports.
- ❑ They are to be appraised of proper method of roof testing and dressing and taking personal protection in way of standing at safe place while testing the roof.
- ❑ They are to be appraised of systematic support rules applicable in the different parts of the mine.
- ❑ They are to be trained in proper use of tools/ tackles for supporting the roof, withdrawal of supports, anchorage testing etc.
- ❑ They are to be appraised the significance of providing temporary support before engaging themselves for erecting permanent support.
- ❑ They are to be appraised the significance of supporting the roof as soon after the exposure of the roof as possible to prevent bed separation.
- ❑ They should be told the hazardous mechanism of roof and side fall. They are also to be explained about the method of work being practiced in the mine.
- ❑ Sufficient number of persons shall be given training to take care of absenteeism of the regular crewmember owing to various reasons.
- ❑ They should also be appraised of the phenomena of side spalling and method of providing side supports.
- ❑ They should also be appraised of recommendations of safety conferences on the subject.

E. Procedure:

- i. In the beginning of the shift, the support man accompanied by the Mining Sirdar shall check and test the conventional supports in the development and depillaring

- area and shall assess the requirement of additional supports to be provided during the shift.
- ii. After every round of blasting, support of roof and sides shall be tested at all places within the zone of influence of blasting as decided by the manager.
 - iii. Bolting of roof shall be done as soon as possible after exposure of the roof.
 - iv. 9 % of the bolts shall be subjected to anchorage testing for assessment of prescribed anchorage strength and 1 percent shall be subjected to destructive testing to assess the efficacy of support requirement and a record of such tests shall be maintained in a bound paged register kept for the purpose in the format as prescribed by D.G's Technical Circular No.3 of 1996.
 - v. Separate crew shall be provided for the haulage and the traveling roadways and old workings.
 - vi. Where the coal has a tendency to spall, the sides shall be kept supported systematically in addition to roof supports.

F. Equipping:

As per requirement, support crew shall be provided with hammer, adjustable wrenches, crowbar, suitable buntons, measuring tape, adze/ axe, pusher/stemming rod, etc. A sufficient supply of support materials shall be ensured. Safety support withdrawal machine, anchorage testing machine, tripods etc., shall be provided where required. Crewmembers shall also be given personal protective equipments.

G. Responsibility: A support crew is responsible for providing proper and adequate supports of roof and sides of the working places assigned to him. He is also responsible for checking and resetting the old conventional supports where required and also for safe withdrawal of support materials where required. It is needless to mention that he is also responsible for his own safety while setting, testing and withdrawing the supports.

Sirdar and overman are responsible to ensure that entire operations of roof/side examinations, erection/withdrawal of supports etc are carried out in a safe manner as prescribed.

Manager, Assistant Manager, Under Manager are responsible for providing proper tools/tackles and training to the crew members and also to ensure that entire operations are carried out in a safe manner.

H. Recommendations of the Ninth Conference on safety in mines- Recommendations of the Ninth conference on safety in mine on coal mine supports are also reproduced below for compliance:

- Suitable type of steel/metal supports should be introduced in all the development districts in coalmines within two years.
- Wherever practicable, roof bolting as a method of support in coal mines should be used. Its performance should be monitored regularly. A few conventional timber props may be used as indicator props.
- Coal mining companies should take initiative to select/promote development of suitable type of drills & other accessories for use in various types of roof strata. A task force may be created for the purpose, which may oversee the introduction of steel supports.
- Development of a portable instrument for detecting the hidden slips in the roof of coalmines should be taken up on priority by R&D organizations.

DGMS/(Tech) Circular No.8 of 2002

Dated the 9th July, 2002

To
Owner, Agent & Managers of all Mines.

Sub: Use of Protective foot wears by female workers.

It is obligatory in the part of the management of each mine that they will not allow any person to go into or work in mine unless he/she wears a protective footwear of approved type which shall be supplied free of charge by the mine management at every six months.

This holds good for the female workers who are engaged in surface operation and in quarries. Special types of foot wear as per Indian standard 11225-1985 and duly approved by DGMS for use of female workers are available in the market.

You are once again requested to provide the above type of shoes to the female workers as per the requirement of the statute. You are also requested to ensure that no female workers are engaged in the mine unless she wears a protective foot wears of the type mentioned above.

DGMS (Tech) Circular No.9 of 2002

Dated the 9th July, 2002

To
Owner, Agent & Managers of all Mines

Sub: Calibration of environmental monitoring equipment.

You may be aware that several environmental monitoring equipments like Methanometer, Toximeter, Oxygen monitor and multigas detectors are now being used in the coal mines for monitoring concentration of different gases in the mine atmosphere. Whereas these instruments are convenient in use they require careful handling and regular maintenance, which include periodic testing for accuracy and calibration. Defective and non-calibrated equipments used for monitoring the mine atmosphere will give incorrect and misleading results, which may create confusion during assessment of correct environmental condition and lead to major accidents & disasters.

Recently while inspecting a degree III gassy mine it was observed the concentration of methane in a face when measured with one instrument showed 0.4% while the other of the same make showed 4.0% in the same face. During the same inspection at another face the two instruments indicated 0.4% & 0.1% CH₄ respectively. Obviously the Methanometers were not calibrated. I need not elaborate on the consequences of such faulty measurement.

Checking the accuracy of the instruments and getting them recalibrated at regular interval would bring out any defects in the instruments. As such I would once again like to draw immediate attention of all concerned regarding correct and timely calibration of all monitoring equipments and advise that the following calibration schedule be strictly adhered to:

- a) Methanometer - Every 3 months.
- b) Toximeter, Oxymeter - Every 3 months.
- c) Multigas detectors - Every 3 months.
- d) All other equipments - Every 6 months.

Apart from this whenever any instrument shows maximum deflections or high readings, it shall be immediately recalibrated.

The above instruments should be maintained and calibrated by the manufacturer/suppliers of the instruments or their authorized agents or at an approved laboratory. A record of the above shall be maintained showing the date and the details of maintenance and calibration.

DGMS (Tech) Circular No.10 of 2002

Dated the 19th July, 2002

To
Owner, Agent and Manager of all Mines.

Sub: Safe use of mobile Cranes-Code of practice.

A large number of mobile cranes are used for material handling purposes in most of the mine premises. A few fatal and serious accidents have been reported due to unsafe use of such mobile cranes.

In view of the above, a code of practice for safe use of mobile cranes has been framed based on BIS 4573 of 1982 and BIS 13367 (part I) of 1992. The code of practice is as follows:

1.0 Crane Safety Equipment to be provided with the Crane:

1.1 Automatic Safe load Indicator.

An automatic safe load indicator shall be provided to give warning of an approach to the safe working load and a further warning when an overload occurs.

1.2 Load Radius Indicator:

A load radius indicator shall be provided which shall be clearly visible to the driver and indicate the appropriate safe working load and radius for whatever configuration of the crane is used.

1.3 Motion Limit Devices/Overload Cut Out Devices

Motion limit devices shall be provided to limit hoisting, derricking, slewing, and boom extending or any other crane motion in case of overload or unsafe operation.

1.4 Audio Visual Alarm during reversing

Effective Audio Visual alarm shall be provided to be actuated automatically whenever the crane is being reversed.

1.5 Machinery Guarding

Effective guards shall be provided for gear wheels, chain drives and revolving shafts, couplings, collar's and set screws or similar moving parts, unless those parts are made safe by design or by position or are effectively guarded by parts of the crane structure.

1.6 Design Parameters of the mobile crane:

All parameters should meet the specifications for power driven mobile crane- BIS 4573 of 1982.

1.7. Shackles and slings must conform to the relevant Indian Standard. Test Certificate of the shackles and slings shall be maintained along with the other crane records followed by periodical inspection.

2.0 Appointing various competent persons

2.1 Supervisor

The supervisor must be trained and experienced to plan the total lifting operation safely. He shall ensure that there is an effective procedure for reporting defects and incidents and that adequate maintenance of the equipment is carried out.

He shall be given authority to stop the operation of the crane whenever he considers that danger is likely to arise should be operation continue.

He shall ensure that the crane is not operated in overloading situation.

2.2 Crane Driver

The crane driver shall be responsible for the correct operation of the crane in accordance with the manufacturers instruction book and the plan. The crane driver shall at any one time only respond to the signals from one slinger/signaler who should be clearly identified. He shall ensure that the crane is not operated in overloading situation.

2.3 Slinger

The slinger is responsible for attaching and detaching the load to and from the crane hook and the use of correct lifting gear and equipment in accordance with planning of the

operation. The slinger shall be knowledgeable enough to use the proper sling at the proper place of the load to be lifted.

2.4 Signaller

The signaller shall be responsible for relaying the signal from the slinger to the crane driver. The signaller may be given the responsibility for directing movement of the crane and load instead of the slinger provided that only one person has the responsibility. The signaller must understand the signal code.

3.0. Personal Safety Equipment

All competent person shall use safety gloves, helmet, safety spectacle, and ear defenders during appropriate operation.

4.0 Access and Emergency escape

Safe means of access and emergency escape shall be provided and maintained in good condition. No one shall be permitted to board a crane without first obtaining the driver's inspected and renewed as necessary.

4.1 For the driving position.

4.2 For Inspection, maintenance, repair, erection and dismantling of crane.

5.0 Boarding the Crane

No person shall be permitted to board a crane without first obtaining the driver's agreement.

6.0 Fire Extinguishers

These shall be provided in all the cabins of the crane. They shall be periodically inspected and renewed as necessary.

7.0 Record Keeping

7.1 Records shall be maintained for each crane that are sufficient to enable the condition of the crane to be determined and its fitness for further operation to be properly assessed.

7.2 Records shall also include technical information including maintenance instructions and performance data provided by the manufacturer.

7.3 Records of test certificates and all inspections of ropes and brakes shall be maintained. All significant repairs shall also be recorded.

8.0 Proximity Hazards:

Consideration shall be given to the presence of overhead electric line or conductors, oil/gas/steam pipe lines, nearby structure etc.

Where any part of the crane or its load can not be kept clear of such hazard, the appropriate authority should be consulted.

9.0 Periodic Checks:

Supervisor must ensure that all daily, weekly and monthly checks as recommended by the crane manufacturer are carried out and proper records be maintained.

10.0 Other pre-requisites of the mobile crane:

- 10.1 Different configuration of operation like 'ON TYRE' "ON OUTRIGGER" shall be mentioned in the crane.
- 10.2 Load lifting capacity chart for different configuration like on "TYRE", on 'OUTRIGGER', maximum rope tension etc. shall be available with the crane. Load lifting capacity on TYRE shall actually be much less compared to the load lifting capacity on OUTRIGGER as can be seen from the integrators/load charts supplied by the crane manufacturers.

11.0 Stability

- 11.1 Condition of tipping: The crane is considered to be at the point tipping when balance is reached between the overturning moment of the load and the stabilizing moment of the machine at which point addition of any further load will cause imbalance.
- 11.2 To avoid toppling of crane, the operator should select correct configuration prior to the operation of the crane like telescopic of boom, slewing of super structures, derricking of boom, lifting of load etc.

12.0 Pick and Carry operation.

Normally mobile crane should not be used as transport equipment. However, where pick and carry operation by the manufacturer of the crane has been permitted, the crane driver shall not exceed the maximum recommended load for pick and carry and he shall keep the load either at over front or over rear as mentioned in the crane configuration and lock the slewing operation.

13.0 Training

The competent persons must obtain training for operation and safety in the use of crane in consultation with the crane manufacturer.

Henceforth, the above guidelines may be strictly followed for the use of mobile crane in mines in the interest of safety.

DGMS (Tech)(S&T) Circular No.11 of 2002

Dated the 31st July, 2002

To
All Owner, Agent & Managers of Coal Mines.

During the conduct of an workshop on "Management of roof and sides" for Workman Inspectors, it was revealed that following issues need to be addressed urgently to maintain the efficacy of installed rock reinforcement systems in underground coal mines.

I. Manufacture of roof bolting hard wares confirming to BIS specifications as mentioned in DGMS(Tech) (S&T) Circular No.3 of 1996.

II. Strict appropriate supervision of threading operation on roof bolt rods, by a competent person and, ensure compatibility of roof bolt threads and nuts.

III. Ensure supply of bearing plate of correct dimension and material conforming to BIS specifications.

- IV. (a) In case of –in house production, develop effective mechanism to monitor the quality control aspects of the (i) ingredients/chemicals used in the capsules, and (ii) prepared cement capsules, by deploying a competent person.
- (b) Initiate action to ensure mechanical; mixing of ingredients in preparation of cement capsules.
- (c) Ensure effective supervision of mixing operation in preparation of cement capsules by skilled/experienced person.
- (d) Provide identification number to prepared cement capsules.

V. Ensure maintenance of records detailing the (a) composition of prepared cement capsules and (b) sizing of roof bolt rods including threading, by a competent person, countersigned by manager.

VI. Ensure deployment of personnel in all the three shifts for installation of roof bolts under the supervision of an Under Manager/Overman.

VII. Ensure systematic anchorage testing of installed roof bolts under the direct supervision of Under Manager with special attention to :

- (a) Design of Bridge Assembly (Ref. DGMS (Tech) (S&T) Circular No.5 of 2002.
- (b) Length of the hose (Minimum : 5m)
- (c) Providence of maximum load pointer in the load measuring dial gauge.
- (d) Regular maintenance & calibration of Anchorage testing machine.

VIII. Initiate action for conduct of Training and awareness programmers for supervisors/workmen inspectors and Asset. Managers/Under Managers on " Management of roof and sides", on regular basis.

In the recent past, inquest by S&T Division of DGMS into the incidents relating to roof/side fall causing fatal and serious injuries in coal mines where roof bolting was used as a primary means of roof support, revealed among others, deficiencies relating to one or combination of the above.

As you are aware, the importance of devising a proper strata management system for safe conduct of mining operations in underground coal mines cannot be overemphasized. It is therefore requested to initiate urgent and immediate action to address the issues mentioned above, where rock reinforcement systems are in use as a means of stabilization of strata, under intimation to this Directorate.

DGMS (Tech) Circular No.12 of 2002

Dated the 26th September, 2002

To
Owners of all Coal, Metal and Oil Mines.

Sub: Providing flash back arrestors in gas welding/cutting sets.

Investigation into a few serious accidents revealed that while using gas welding set to cut angles or material there had been incidence of back fire, which caused burn injuries to the welders. When a backfire occurs, the products on explosion will normally go back to the point where gases of the system get- mixed. The explosion generates sufficient heat to explode the forward flowing gases. The phenomena happen very rapidly and can be detected by a sharp bang followed by a high-pitched scream or whistle. Black smoke can be often seen emitting from nozzle. Flash back is actually a back fire where so much energy can be generated that the explosion is forced through the regular to cylinders with a possibility of an accident with even fatal consequence.

In some welding sets a non-return valve had been provided as a safe guard. However, provision of non return valves will only ensure that the gases cannot back feed into the system but will not stop the force generated by a flash back once it has occurred and danger due to explosion cannot be eliminated.

It is therefore recommended that flash back arrested be provided in the gas welding set on the oxygen and fuel gas line in the regulator side as well as Nozzle side.

ISO 5175 of 1987 (E) has dealt with " Equipment used in gas welding, cutting and allied process as- safety devices for fuel gases and oxygen or compressed air- General specifications, requirements and tests".

It is necessary that the flash back arrested to provided should conform to ISO 5175 of 1987(E) (or the latest version as and when published) in all respect. Such flash back arrestors as per the above standard shall be provided with non-return valve, flame arrestor, pressure

relief valve, temperature sensitive cut of valve, pressure sensitive cut off valve and excess flow cut off valve.

The above recommendations may be complied henceforth in all gas welding and cutting processes in the interest of safety.

DGMS (Tech) Circular No.13 of 2002

Dated the 31st December, 2002

To
The Owner, Agent and Manager of all mines

Sub: Safety Management System – A guideline for implementation

You are aware the Ninth Conference on Safety in Mines recommended to adopt Risk Management as a tool for development of appropriate health and safety management systems in Indian mines. It was further suggested that the risk assessment exercise should follow an appropriate process.

The Science & Technology division of this Directorate conducted several workshops on “Risk Management” in Indian mines with the assistance of experts from Australian International Mines Safety Training Co. Pvt. Ltd., under an Indo-Australian Aid Project. Drawing inputs from inferences drawn from the workshops and synthesizing the same with international recommended practices, a document on “Safety Management System – A guideline for implementation” has been prepared and enclosed as Annexure-I. A Risk Management Plan, designed by the officials of a coal mine is given in the Annexure-II for understanding the actual process. This is given as guide only and need to be tailored for specific requirements. You are requested to undertake a formal risk assessment process with the help of above guidelines. It should be followed by preparation of ‘Risk Management Plans’ and implementation thereof, aimed at reducing the likely hood and impact of mishaps of all kinds in Indian Mines.

APPENDIX - I

TYPICAL RISK MANAGEMENT FORMS

1. Hazard Identification & Risk Ranking

Leader _____ Team
_____ Date _____

Ref. No.	Identified Hazard	Existing Controls	Estimate the Risk				Risk Rank
			Likelihood		Consequence	Risk Score	
			Exposure	Probability			

2. Control / Treatment of Risks

Leader _____ Team
_____ Date _____

Ref. No.	Treatment Options	Cost or difficulty to implement	Effectiveness of Treatment			Selected Method
			Likelihood	Consequence	Risk	

3. Action Plan

Leader _____ Team
_____ Date _____

Ref. No.	What is to be Done	Target date	Responsibility	Signed off on completion

APPENDIX - II
Some Case Studies
Mine A

Step 1

INITIAL HAZARD IDENTIFICATION, RISK ASSESSMENT AND PRIORITISE

No.	Description of Hazard	Consequence	Probability	Exposure	Total Risk
1	INUNDATION	5	10	10	500
2	POOR QUALITY OF SUPPLIED MATERIAL	5	10	10	500
3	GEOLOGICAL DISTURBANCE	5	10	10	500
4	IMPROPER STRATA CONTROL	5	7	10	350
5	TRAINING FACILITIES INADEQUATE	5	7	10	350
6	SHORTAGE OF SKILLED PERSON/DEPLOYMENT OF UNSKILLED PERSON	5	7	10	350
7	INADEQUATE COMMUNICATION SYSTEM	5	7	10	350
8	POOR SUPERVISION	5	7	5	175
9	SPONTANEOUS COMBUSTION	5	3	10	150
10	IMPROPER SURVEYING	5	3	10	150
11	EXPLOSIVES / BLASTING	5	3	5	75
11	HAULAGE	1	7	10	70
12	MACHINERY	1	7	10	70
13	LACK OF AWARENESS	1	7	10	70
14	SEALED OFF PANELS	5	3	2.5	37.5
15	INADEQUATE SUPPLY OF SPARE PARTS	0.3	7	10	21
16	USE OF UNCALIBRATED INSTRUMENT	1	7	3	21
17	VENTILATION NOT TO PLAN	0.1	10	10	10
18	OTHER FIRES	0.1	7	10	7

Step 2

IDENTIFYING MECHANISMS CONTRIBUTING PRINCIPAL HAZARDS AND RANKING

No.	Major Hazard	Mechanism	Cons.	Prob.	Expo.	Risk
1	INUNDATION	- River Overflow above HFL - Waterlogged Working U/G - Inrush through subsidence cracks/Bore Hole	5 5 5	7 2 7	10 10 2	350 100 70
2	POOR QUALITY OF SUPPLIED MATERIAL	- Improper procurement procedure - Inspection procedure not followed - Improper Storage	5 5 5	7 7 3	10 10 10	350 350 150

3	GEOLOGICAL DISTURBANCE	- Presence of Fault & Slip planes - Fractured Roof	5 5	10 10	10 10	500 500
4	IMPROPER STRATA CONTROL	- Failure to identify bad roof - Improper Dressing - Improper Supervision - Poor workmanship - Non-superimposition of some pillars in contiguous working - Inadequate Support Design - Poor quality of support material	5 5 5 5 5 5 5	10 7 7 7 7 3 3	10 10 10 10 10 10 10	500 350 350 350 350 150 150
5	TRAINING FACILITIES INADEQUATE	- Non-existence of training schedule for skill development - Untrained trainers - Infrastructure not to the requirement - Non-existence of Feedback / Test	5 5 5 1	7 3 10 10	10 10 10 10	350 150 500 100
6	SHORTAGE OF SKILLED OR AUTHORISED PERSON / DEPLOYMENT OF UNSKILLED PERSON	- Absenteeism - Training. not done as per requirement - Manpower sanction not as per requirement - Examination for workmanship certificate not done regularly	1 1 5 1	7 7 7 10	5 10 10 10	35 70 350 100
7	INADEQUATE COMMUNICATION	- Non-availability of spare parts - Inadequate Capacity of Exchange	5 5	7 10	5 10	175 500
8	POOR SUPERVISION	- Negligence/ Lack of commitment - Not having proper knowledge / experience - Inadequate training - Shortage of Supervisors	5 5 0.3 5	7 3 3 7	3 3 3 5	105 45 2.7 175

9	SPONTANEOUS COMBUSTION	- Panel extraction beyond incubation period - More coal left in goaf - Improper management of subsidence area - Poor construction / maintenance of seals	0.1 0.1 5 5	3 10 2 3	10 10 2.5 10	03 10 25 150
10	IMPROPER SURVEYING	- Calibration of instrument not being done regularly - Non-superimposition of some pillars formed earlier - Surveying not done in time	5 5 5	2 10 3	10 10 3	100 500 45
11	EXPLOSIVES/ BLASTING	- Not taking proper shelter especially with respect to contiguous working - Possibility of Blown through shots	5 5	3 3	5 5	75 75
12	HAULAGE	- Poor quality of existing ropes & rollers - Safety devices not adequate	1 1	3 3	10 10	30 30
13	MACHINERY	- Maintenance schedule not followed - Temporary trailing cable joints - Bye-passing protective devices - Unskilled operators - Moving parts of machines	1 1 5 1 1	7 7 3 3 10	10 10 5 5 10	70 70 75 15 100
14	LACK OF AWARENESS	- Non-existence of documented procedures - Improper / inadequate training - Improper communication - Inadequate Publicity / Objective not explained	1 1 5 1	10 3 3 3	10 5 3 3	100 15 45 09

15	SEALED OFF PANELS	- Improper management of subsidence area - Poor construction / maintenance of seals - Improper supervision - Improper sampling & analysis procedure.	5 5 5 5	2 3 3 2	2.5 10 5 10	25 150 75 100
16	INADEQUATE SUPPLY OF SPARE PARTS	- Improper procurement planning - Delay in procurement action - Importance not given to the indents	1 1 1	7 7 10	5 3 10	35 21 100
17	USE OF UNCALIBRATED INSTRUMENT	- Non-existence of calibration procedures - Non-existence of calibration infrastructure - Non availability of spare Instruments	5 5 5	7 10 7	5 5 3	175 250 105
18	VENTILATION NOT TO PLAN	- Delay in construction of stoppings - Tampering of ventilation devices - Poor construction of stoppings	0.1 0.1 0.1	7 7 3	10 10 10	7 7 3
19	OTHER FIRES	- Conveyor Fire - Electrical Fires - Fire during gas cutting - Spilled Off Lubricants	0.3 5 1 0.3	2 7 3 1	3 5 2.5 2	1.8 175 7.5 0.6

Step 3

CONTROL MEASURES & PROCEDURES FOR RESPECTIVE MECHANISMS CONTRIBUTING HAZARDS

Mechanism	Control	Relevant Statute	Procedure	Existing Procedure Y/N	Responsible Person

INUNDATION					
-River Overflow above HFL	-Embankment -Float, Alarm, Guard & Wireless		-Water danger Procedure		
-Waterlogged Working U/G	-Pumping, Dams & Inspection		-Pumping Procedure		
-Inrush through subsidence cracks / Borehole	-Garland drain, Crack filling & Inspection		-Subsidence management Procedure		
POOR QUALITY OF SUPPLIED MATERIAL					
-Improper procurement procedure	-Agent to appraise competent authority for necessary steps		-To be prepared centrally		
-Inspection procedure not followed			-do -		
-Improper Storage	-Agent to Ensure		-Storage Procedure		
	-Agent to ensure/appraise GM				
GEOLOGICAL DISTURBANCE					
-Presence of Fault & Slip- Planes	-Effective Supervision & Additional Support		-Inspection, Supervision & Monitoring Procedure		
-Fractured Roof	- do -		-Support Procedure		
IMPROPER STRATA CONTROL					
-Failure to identify bad roof	-Effective Supervision		-Inspection, Supervision & Monitoring Procedure		
-Improper Dressing	-Proper dressing & Proper Supervision		-Dressing Procedure		
-Improper Supervision	- Effective Supervision		- Inspection, Supervision & Monitoring Procedure		
-Poor workmanship	-Training, Test & Monitoring		-Training Procedure & Inspection, Supervision & Monitoring Procedure		
-Non-superimposition of some pillars in contiguous working	-Marking such pillars U/G & alert concerned people while extraction				
-Inadequate	-Review		-Survey		

Support Design -Poor quality of support material	Support Design -Corrective Steps		Procedure -Procurement Procedure		

TRAINING FACILITIES INADEQUATE					
-Non-existence of skilled training Schedule -Untrained trainers -Infrastructure not to the requirement -Non-existence of Feedback / Test	-Preparation of skilled training Schedule -Training for trainers -Group VTC to be equipped -To be started		-Training Procedure - do - -do - -do -		
SHORTAGE OF SKILLED PERSON/DEPLOYMENT OF UNSKILLED PERSON					
-Absenteeism -Trg. not done as per requirement -Manpower Sanction not as per requirement -Examination for workmanship certificate not done regularly	-Disciplinary action, Work Programme -Comply Agent to appraise Competent authority - do -		Colliery Standing Order		
INADEQUATE COMMUNICATION SYSTEM					
-Non-availability of spare parts -Inadequate Capacity of Exchange	-Agent to arrange -Agent to appraise competent authority		-Procurement Procedure		
POOR SUPERVISION					
-Negligence/ Lack of commitment -Not having proper knowledge / Experience -Inadequate training -Shortage of Supervisors	-Monitoring, Motivation & Enforcement of discipline -Training,& Feedback -do – -Transfer & Train to become competent		-Inspection. Supervision & Monitoring Procedure -Training Procedure -do- -do-		
SPONTANEOUS COMBUSTION					
-Panel extraction beyond incubation period	-Plan to Extract panel within Incubation period		-Extraction Procedure		

-More coal left in goaf -Improper management of subsidence area -Poor construction / maintenance of seals	-Extract judiciously -Crack filling/ Afforestation & Proper Monitoring -Construct & Maintain Seals as detailed in Sealing Procedure		-do- -Subsidence Management Procedure -Sealing Procedure		

IMPROPER SURVEYING					
-Calibration of instrument not being done regularly -Non-superimposition of some pillars formed earlier -Surveying not done in time	-Regular calibration -Mark such pillars at site & work accordingly -Regular Survey		- -Extraction Procedure -Survey Procedure		
EXPLOSIVES / BLASTING					
-Not taking proper shelter especially with respect to contiguous working -Possibility of Blown through shots	-Monitor the efficacy of taking shelter -Stop one of the approaching faces when within 9m.		-Drilling & Blasting procedure -Survey Procedure		
HAULAGE					
-Poor quality of existing ropes & rollers -Safety devices not adequate	-Procure ropes & rollers in advance & change old one timely. -Install monkey catches in Endless track & maintain all safety devices.		-Machinery Installation & Maintenance Procedure -Conveying & Hauling Procedure		
MACHINERY					
-Maintenance schedule not followed -Temporary trailing cable joints -Bye-passing protective devices -Unskilled operators -Moving parts of machines	-Implement, Monitor & / or take corrective action for non-compliance -Stop doing temporary joints -Stop machine if protective device is not functioning -Stop machine if skilled operator is not present-train more operators -Fence moving parts of machines &		-Maintenance Schedule -Inspection. Supervision & Monitoring Procedure -Unsafe Practices/Unsafe Act & Colliery Standing Order		

	Don't allow people wearing loose dresses				

LACK OF AWARENESS					
-Non-existence of documented procedures -Improper / inadequate training -Improper communication -Inadequate Publicity / Objective not explained	-Document all Procedures & issue to concerned persons -Training & Feedback -Detailed written communication either by letter or on Notice Board -Explain the objective		- -Training Procedure		
SEALED OFF PANELS					
-Improper management of subsidence area -Poor construction / maintenance of seals -Improper supervision -Improper sampling & analysis procedure	--Blanketing / Crack filling & Proper Monitoring -Construct & maintain seals as detailed in Sealing Procedure -Regular supervision -Sampling & analysis as per Sampling Protocol		-Subsidence Management Procedure -Sealing Procedure -Inspection. Supervision & Monitoring Procedure - Sampling Protocol		
INADEQUATE SUPPLY OF SPARE PARTS					
-Improper procurement planning -Delay in procurement action -Importance not given to the indents	-Advance planning considering past requirement & growth -Avoid delay -Agent to send reminders.		-Material Procurement & Storage Procedure		
USE OF UNCALIBRATED INSTRUMENTS					
-Non-existence of calibration procedures -Non-existence of calibration infrastructure -Non availability of spare Instruments	-Develop a system for periodic calibration, document, implement & monitor -Competent authority may be appraised & reminded for need & status.				

VENTILATION NOT TO PLAN					
-Delay in construction of stoppings	-Competent authority may be appraised about the reluctance of contractor for doing jobs at lower rates and may be requested to solve the problem at the earliest.		-		
-Tampering of ventilation devices	-Effective Inspection & Supervision		-Sealing Procedure		
-Poor construction of stoppings					
OTHER FIRES					
-Conveyor Fire	-Clean Spilled coal/dust regularly & maintain drums & rollers properly		-Conveying & Hauling Procedure		
-Electrical Fires	-Maintain as per Schedule & Fire Extinguisher of Dry chemical Powder/CO ₂ /ABC type near electrical appliances. Machines shall not be operated by-passing protective devices or with temporary cable joints. Joint boxes shall be compounded. Use only approved type electrical appliances .		-Maintenance Schedule		
-Fire during gas cutting	-Site of gas cutting must be stone dusted well if combustible material is there & arrangement for water & Fire extinguisher must be kept ready.		-Fire Prevention Procedure		
-Spilled Off Lubricants	-Clean all spilled off oil/lubricants well to make the		-Welding & Gas cutting Procedure		

	site intrinsically safe.				

SAFETY MANAGEMENT SYSTEM – A GUIDELINE FOR IMPLEMENTATION

BACKGROUND

Indian Mining Industry makes a major contribution to the national economy and to the well being of the society as a whole. The country's mineral industry represents a unique mix of very small to medium to large mines. Currently there are 596 coalmines, 40 oil projects and a large number of non-coal mines with more than 6000 being in record under the Mines Act (however the figure is estimated to be much larger). Besides, there are innumerable small quarries restricted to shallow depth and employing a small number of persons that do not fall under the purview of the Mines Act. Total workforce of the mining industry in India consists of about one million. For the continuing viability and stability of the industry, it is important that full advantage be taken of developments in mining methods & procedures, modern machinery & equipments and advances in approaches to management of all mining activities, including health & safety.

While safety in any sphere of activities is important, it has special significance when the risk is greater. Unlike the major industries, mining has high potential risk of accidents. It has a dubious distinction of involving a very high actual hazard as the environment changes continually with the progress of work. It is, therefore, not possible for any external agency to ensure safety of any mine. The principal responsibility for the safety and good health of workers employed in mines rests with the management of that mine.

The present day environment demands to have a fresh look at *Safety Management* as a structured process composed of well defined systems that emphasizes continuous improvement in work quality, health, welfare and productivity of workforce engaged in mineral industry through setting up of improved safety standards and their effective implementation and administration. Because the statutory provisions can never be fully comprehensive, appropriate and site specific and because the process of *Legislation Making* is often slow, these often trail behind the technological innovations. Trend, world over is, therefore, to make the statutory provisions 'Flexible' by switching over from the regime of '*Prescriptive Regulation*' to '*Self Regulatory or Goal Setting Legislation*'. It is now widely accepted world over that the concept of "*Risk management*" through "*Risk assessment*" contributes greatly towards achieving these objectives. Considering the accident scenario in Indian Mining Industry, it has now become essential that risk assessment be undertaken of all hazardous operations, equipment and machinery, taking account of the procedures used, maintenance, supervision and management.

Introduction of risk management as a tool for development of good health and safety management system is a breakthrough in the traditional strategy as it differs from the existing one by involving the entire staff in the realization of safety improvement programme with responsibility and accountability sharing proportionate to the decisions making authority. The system is sure to be an effective tool for improvement of health and safety scenario in our mining industry. The Risk assessment process will identify all the existing and probable hazards in the work environment and in all operations, assess the risk levels of those hazards in order to prioritise which needs immediate attention for redressal, where maintenance of ongoing management will be sufficient and which are of very mild nature. Then for managing these risks, different *Mechanisms* (underlying causes) responsible for these hazards are identified and their control measures, set to timetable, are recorded pinpointing the responsibilities.

Further, the monitoring and auditing at regular interval recommended as a part of the system would ensure that safe operating procedure are followed, evaluated, corrected, standardized and documented training procedures for workers and executives are in place and are carried out regularly, and commitment to health and safety is demonstrated at all levels of organisation. On implementation of the system, an appropriate safety level in each stage of

operation may be obtained by a systematic and documented management system with well-defined responsibility and accountability for safety among the mine employees.

GUIDELINES FOR IMPLEMENTATION

This guideline is structured in the following way:

- Objective,
- Structure (Strategic, Management, Operations)
- Processes for Hazard Identification & Risk Assessment
- Appendices.

OBJECTIVE OF THE GUIDELINE

This Guideline is to assist mines put a renewed focus on managing health and safety in their workplace.

The risk of various hazards arising in any mines ranges from almost zero to very high depending upon the deposit being worked, the complexity & size of mining operation as well as the conditions under which this is done and culture of the mines. Whilst many of these are mitigated by following Standards, the aim of this Guideline is to introduce new methods to assess and manage hazards in mines.

The Safety Management System established by a mine must ensure all risks are identified and critical risks are controlled to ensure long-term health and safety.

A Safety Management System should set the culture, framework and actions necessary to ensure that mining operations are carried out safely.

In order to turn these commonly agreed principals into an effective safety management system for the mine, the system may include the following elements: -

- Health & Safety Policy of the company and the mine
- Roles and Responsibilities of all levels in the organisation
- Specified competencies of staff
- Safety Committee, formation and role
- Method to identify and control high risk
- Forward Program to ensure actions to control hazards are carried out
- Emergency Preparedness to cope with a hazard if it should occur.
- Monitoring processes for all identified hazards with or without residual risks.
- Identification of trigger points and resultant actions if these are reached.
- Safety clearance for new equipment, work methods and materials used.
- Accident Statistics collection, analysis & actions
- Reporting and record keeping Requirements
- Auditing and review processes

STRUCTURE OF THE SAFETY MANAGEMENT SYSTEM

The basis for ensuring safe and healthy production depends primarily on: -

- Attitude of workforce at all levels
- Competent people
- Fit-for-purpose equipment
- Suitable work methods (or processes and procedures)
- Planned and controlled work environments

Good management will set standards to achieve these objectives and a suggested structure for the Safety Management System is summarized below and detailed in Sections 3 to 5.

Strategic Level

The following management strategies are required: -

- Development of organisation mission statement and policy, giving high regard to safety and production, strongly backed by management and owners.
- Have policies made by the organisation that ensures health and safety a critical element in all mining activities.
- Delegate organizational responsibility to appropriate levels.
- Institute formal structures and committees to discuss and implement safety improvements.
- Establishing and maintaining the Safety Management System

Management Level

Management is responsible to follow the strategic lead of the organisation by: -

- Implementing and managing site-specific Safety Management Plans.
- Identification of major hazards and assessment of risks
- Managing hazard reduction plans.
- Defining appropriate roles and responsibilities
- Having personnel with appropriate competencies for the work
- Having site-specific emergency processes in place and tested.
- Providing appropriate guidelines, directives and training.
- Operation of formal structures and committees

Operational Level

At operational level Managers/ Safety officers, workmen inspectors and workers should: -

- Assess risks associated with each step of all work
- Develop and maintain a Manual outlining work safe standards and guidelines
- Ensure personnel are trained to a competent level for each work task
- Follow safe operational processes and procedures.
- Actively participate in safety committees and continuous improvement

STRATEGIC LEVEL

Health & Safety Policy

The Mine Health and Safety Policy is a statement by the organisation of its occupational health and safety philosophy and intentions. It provides a framework for action to achieve safety objectives and targets. The Policy should: -

- Provide a mission and vision of a healthy and safe work place
- Be inclusive and understood by everybody in the mine
- Provide management commitment for: -
 - A healthy and safe work place
 - Regular review of risks
 - Support for a Safety Management System (Safety Committee, Risk Assessment, Continuous Improvement etc)
- Carry the expectation that mine management, supervisory staff and work persons willingly comply with it.

Safety Management - Roles and Responsibilities

Ensuring the safety of a mining operation is a complex task requiring the continued commitment of all personnel associated with the mine, as well as compliance with all safety legislation, guidelines and circulars. The effective management of safety within a mine includes the following: -

- A sound Health & Safety Policy which is supported by all sectors of the mine
- Clear roles and responsibilities of all personnel for safety
- A safety management program and forward plan
- A safe work place design for jobs, equipment and materials
- Induction, training & continuous improvement of staff
- Hazard identification and control management
- Appropriate accident and emergency plans
- Effective accident / incident investigation and reporting
- Auditing of processes and outcomes against Policy
- Review of safety management plans

In the effective management of safety, all mine personnel have different roles to play but still have the same objective. They also share a duty of care to: -

- Provide a safe place of work
- Provide proper equipment and facilities
- Have and follow a safe system of work
- Have competent staff and employees
- Look after fellow workers
- Take appropriate precautions (eg. Use of Personal Protective Equipment)
- Raise safety issues and continuously improve
- Have appropriate emergency procedures

The roles of the following Key Staff in the Safety System should be clearly spelled out in the safety management system as well as in all the lower levels of the plan.

Owner, Agent, Manager, Supervisor, Safety Officer, Workman Inspector, Trade Union Representative, mechanic, operator, Worker, Contractor and Contractor Management, etc.

Safety Committee

The Safety Committee can have a significant role in effective Mine Safety Management. It contains representatives from all aspects of the mine, with a focus on ensuring and improving health and safety in the workplace. Whilst the committee's function is well defined in the Mines Rules, the Safety Plan needs to outline the operation of the Safety Committee to ensure committee members and the mines workforce are quite clear on its role, its responsibilities and objectives.

The types of areas to clarify are: -

- The members of the Committee & their roles
- Key Responsibilities of the Committee to: -
 - Improving health and safety in the workplace
 - Reviewing accident / incident reports & statistics
 - Identify hazards & the review of action plans
- Meeting arrangements for sub-committees, if formed
- Implementing & managing the Plan (schedule of activities)
- Reporting responsibilities and notice boards

Overall Safety Management System and Plans.

Activity	Frequency	Role – Action
Management	Annually	Set and review Mine Health & Safety (H&S) policy
	Annually	Lay basis for Safety and Hazard Management Plans
	Annually	Arrange for internal/external audits
Regular Health and Safety meetings involving representation across the mine.	Annually	Review H & S policy set by Management
	Annually	Implement/manage Safety/Hazard Management Plans
	Annually	Create and manage the Safety Manual
	Annually	Establish high risk areas/issues in mine for review
	Annually	Set program & responsibility for the forthcoming year for hazard review and other issues (eg. training, job analysis, equipment assessment, etc.).
	Quarterly	Review/Participate in new Hazard examinations
	Monthly	Review actions completed against Action Plans; training achievements, work procedures etc
	Monthly	Review accident statistics and accident investigation, adverse incident analysis and make appropriate decisions
	Monthly	Conduct site inspections
	Monthly	Raise matters of H & S concern
	Monthly	Report against Safety and Hazard Management Plan
	Special	Arrange special meetings as required

MANAGEMENT LEVEL

Hazard Identification & Risk Management

The management of the mine should conduct a risk assessment process to identify any hazard that could influence the safety and health of workers of the mine.

For all hazards that pose a potential chance of multiple fatalities at one time and are not fully controlled, a Hazard Management Plan must be drawn up.

To operate mines safely all hazards must be quickly identified and controlled. Using a risk ranking process can assist mine staff to identify the highest risk hazards for attention. This process is summarized below and detailed in Section 7.

- Identify hazards
- Assess the risks posed by these hazards (risk ranking)
- Control or treat hazards to reduce unsafe or unhealthy situations

This technique should be used to assist effective management of safety in the workplace within the Safety Management Plan.

It should be noted that Hazard Identification and Risk Assessment should not be considered to be a once off occurrence but should be done at regular intervals to ensure that the plans to cope with the identified hazards are pertinent and up to date.

Safety Management Plans.

The Safety Management Plan is a working document, which outlines all of the actions to be carried out to ensure the safety and health at the work place. This document is fundamental to the management of safety by the Health and Safety Committee and Management. The sort of issues which should be addressed in the Safety Management Plan include: -

- Important committee or safety related meeting dates
- Dates to review policies, manual or work procedures
- Dates required for major hazard analyses to be completed
- Outcomes or actions following review of hazards, accidents or statistics
- Actions, dates and responsibilities to complete agreed actions
- Achievement of actions

Safety Manual

Accompanying the Safety Management Plan should be a Safety Manual. This manual would outline the operational procedures to comply with the overall and specific hazard management plans.

It is the document that would be available to all workers on site and should enable them to be aware of not only the framework within which they have to do their work but also what is expected from them to ensure a safe and healthy work environment. It could contain: -

- Relevant Acts, Regulations and Circulars
- Emergency Procedures
- Standing Orders
- Individual Job Procedures
- Process for introducing new methods, equipment or materials etc.
- Training Requirements
- Hazard Identification and Risk Management Process
- Safety Management Forms (accident investigation, hazard analysis, reporting etc.)
- Medical examinations
- Entitlements for employees injured or suffering health impacts at the mine

OPERATIONAL LEVEL

Operational processes and safe operating procedures need to be made to suit the site-specific conditions of the mine. These need to be simple and clear whilst meeting the requirements of legislation, regulations, Mine Standing Orders and recognize Hazards associated with that work. These operating procedures must form the basis for training and competency assessment of mine operators.

Typically, safe-operating procedures would be required for the following areas: -

- Work associated with each step of the mine production and maintenance
- Roof Support methods and rules
- Explosives transport, storage, handling and usage
- Ore handling, storage and transport
- Traffic rules and safety on haul roads
- Rules for operating equipment
- Usage of Personal Protective Equipment and critical spots in the mine for dust, noise, heat, vibration, Illumination etc.
- Inspections, supervisions and daily reporting requirements.
- Emergencies.
- Housekeeping rules.

The safety management system should at all time be such that it promotes a process of **continuous improvement**.

Because of their status and immediacy to the job, Managers and Supervisors have a key safety role in the mine to ensure: -

- The work environment is safe for workers
- Planned work methods are safe & followed
- All accidents & near misses are investigated
- Workers are competent & know their duties
- Adequate reporting on shift change-over occur

HAZARD IDENTIFICATION & RISK ASSESSMENT

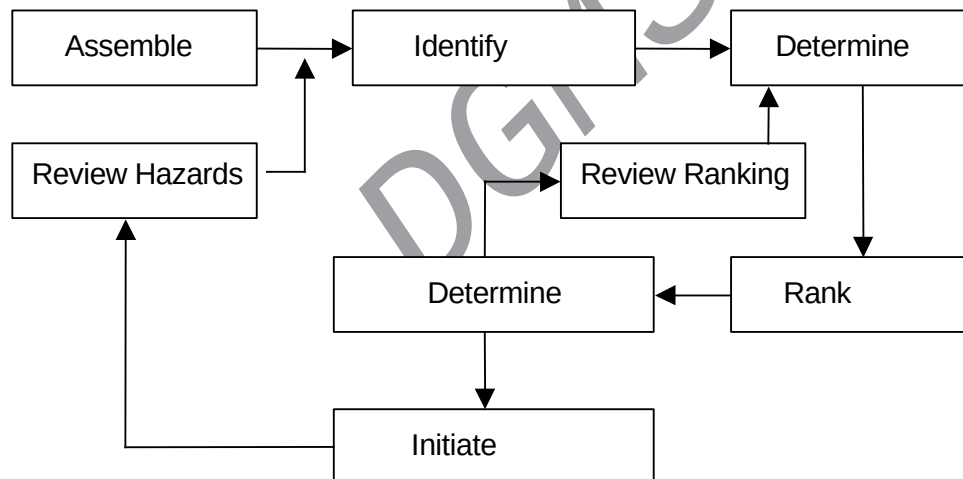
Definitions

Hazard:	Source of potential harm, injury or loss.
Risk:	combination of the likelihood of a specific unwanted event and the potential consequences if it should occur.
Risk Assessment:	Is a process that involves measurement of risk to determine priorities and to enable identification of appropriate level of risk treatment (used also to describe the overall process of risk management).
Risk Control:	Implementation of strategies to prevent or control hazards.
Risk Rating:	The category or level of risk assigned following risk assessment (eg. High, Medium, Low etc.)
Risk Management:	Overall description of the steps taken to manage risk, by identifying hazards and implementing controls in the workplace

Risk Assessment Process

Risk assessment is to be performed on a regular basis. The goal for each risk assessment session is to identify hazards, determine risk ratings and controls, and to review the implementation of risk controls from previous risk assessment sessions.

The following workflow diagram illustrates the areas involved in performing a risk assessment session.



Assemble the Team

A team approach is recommended to establish hazards in the workplace. It is best to use a vertical wedge of employees (e.g. manager, engineer, safety officer, supervisor, worker) as well as workers from different aspects of the operation to provide different perspectives on views, likelihood, consequence and controls that are both practical feasible and cost effective. The members of the team should be varied from session to session to gain a broad perspective of the hazards across a site.

Identifying the Hazards

The process of identifying hazards is possibly the most important part of the whole risk assessment process. This can be done in many ways but the objective is to ensure that all of the possible hazards are identified.

Hazards are only discounted when they have been assessed not to pose a risk. Until that is done all possible hazards should be identified and noted down.

Normally the best process is to proceed step by step through a task. A number of other processes can also be utilised: -

- Previous experience of accidents or occurrences on the mine.
- Work process evaluation
- Consultation with employees who may have experience in the job
- Off-site specialists with experience at other mine sites (consultants).
- Fault tree analysis to determine underlying issues and hazards that might not be evident at first glance.
- Safety statistics for this or other mines.
- Significant incident, near miss or accident reports
- Inspections in the mine

Another method is to consider the hazards that could occur from an unwanted release of energy (e.g. Mechanical, Electrical, Gravity, Fluids or air, Chemical, Nuclear, Heat, Light, Noise)

Decide how to divide up the workplace, e.g.:

- By activities (or processes) e.g. drilling & blasting, load and haul, crushing;
- By equipment, machinery e.g. mobile plant, trucks, conveyors, crushers;
- By geographical areas e.g. pit, compound, workshop;
- By specific job activity;

Look at specific issues and jobs. Break processes up into nodes. Examine each node independently and look at failure modes or things that can go wrong for each node. Examine accident-prone jobs or situations. Carry out a brainstorming exercise and visit the site. Identify all hazards. Hazards will be identified that are likely or less likely, have major and minor impact and importance. At this stage collect do not exclude ideas, be defensive or squash potential hazards that are raised. Record findings.

Notwithstanding whichever method is used for the identification of the hazards, they should all be noted down so that a record of their existence is kept. This can be used to save time and effort when further rounds of risk assessment are being done. Simple forms are provided in the Appendix for use.

There should also be a mechanism for reporting of hazards by staff as they are found which is separate from the formal risk assessment process. Hazards to be recorded before staff forgets about potential hazards, or are not selected for the risk assessment team.

Assessment of the Risk & Ranking

Objectives of risk ranking are to: -

- Identify which risks are most in need of attention, and the options for achieving that risk reduction
- Identify which risks need careful ongoing management, the nature of the ongoing management as well as the indicators that show that the risk is being managed.
- Identify triggers which might be used to monitor that hazard and initiate remedial action if elimination is not feasible

The process of Risk Ranking is carried out by considering both the Likelihood of the occurrence of each Hazard and the potential Consequence should the Hazard occur. Each can be estimated or calculated by engineering principles. This will enable the risk ranking to be carried out. Risks are ranked according to the level of risk i.e. the highest risk to the lowest risk. It is important that the risks are ranked to identify those requiring immediate attention and maximize benefits from the efforts.

The risk of any hazard is dependent upon the chance that it will occur (likelihood) and the impact of an occurrence (consequence): -

Risk Score = Likelihood x Consequence

Consequence is the size of the loss or damage. In terms of health and safety, it is the degree of harm that could be caused to people exposed to the hazard, the potential severity of injuries or ill health and / or the number of people who could be potentially affected. It should be remembered that consequence of a hazard need not only be in terms of safety criteria but could also be in terms of a money loss, incurred costs, loss of production, environmental impacts as well as public outrage.

Likelihood is the chance that the hazard might occur.

In some cases personnel are only exposed to the hazard for part of the time. A more detailed analysis can be carried out of the Risk Ranking by taking this into consideration. Replacing Likelihood by Exposure (% time personnel are present) and Probability (chance that they will be harmed).

Risk score = Probability x Exposure x Consequence

The values used for Likelihood, Consequence, Exposure or Probability needs to be agreed by the risk assessment team.

Risk ranking can be determined by qualitative and quantitative means. It should however be remembered that none of these methods are best. The best choice of method will depend on the circumstances and preferences at the mine at the time the exercise is done. However regardless of the method establishing Risk Ranking will set priorities for Hazard control. The most important purpose in Hazard Identification, Risk Assessment and Ranking is to draw up and implement plans to control these hazards. However, Keeping the acceptance of the participants during workshops conducted at different mines, a criteria table for Quantitative Risk ranking is given in Section 7.

These plans are then included in the Safety Management Plan.

Treatment Controls and Action Plans

Examine the high priority risks. Consider the potential to reduce or eliminate the risk by using the hierarchy of controls. This assists establishing methods to reduce the risk. From experience, the effectiveness of each method is given as a percentage after each of the control descriptions.

Elimination: Remove step to eliminate the hazard completely (100%)

Substitution: Replace with less hazardous material, substance or process (75%)

Separation: Isolate hazard from person by guarding, space or time separation (50%)

Administration: Adjusting the time or conditions of risk exposures (30%)

Training: Improving skills making tasks less hazardous to persons involved (20%)

Personal protective equipment: Used as the last resort, appropriately designed and properly fitted equipment where other controls are not practicable (5%).

Control measures can reduce either the Likelihood or Consequence of the event or both. Depending on the level of reduction of the hazard there could still be a residual risk that needs to be monitored so that a secondary prevention process can be initiated when trigger points are reached.

The team should develop an action plan recommending actions, responsibilities and when it should be completed. Put forward to decision-making authority and review if necessary. Make a decision to proceed.

Allocate tasks, monitor progress. Review implementation effectiveness and determine if other hazards have been created. Pursue continuous improvement.

A number of forms are included for carrying out this activity. Alternatively, the use of software tools will enable the recording of controls and allocation of responsibility for controls. Whichever method is used it should be formalized and controlled periodically.

Induction, Training & Continuous Improvement

Each mine will have training programs for employees, which need to be reviewed against safety criteria. The updating of training requirements should include re-training of existing personnel to the new skill level. This can be performed on-the-job. When the new skill, procedure, etc. has been taught to an individual and they have been assessed to achieve that Competency, this should be recorded. This allows the mine to track staffs that are qualified to perform particular tasks. In some instances, staff should be prevented performing tasks until they have been correctly trained in new procedures and are considered competent to perform a task safely.

Accident / Incident Reporting & Investigation

This would be a Standing Order to ensure compliance with Regulations and to inform mine personnel of responsibilities and reporting requirements. It should cover: -

- Responsibility of those on the site
- Immediate response and Emergency backup
- Notifying key staff of accident
- Securing the site
- Treatment of any injuries
- Investigation and Reporting
- Review of any recommendations and determining actions

Auditing & Review/Revise

Reviewing the effectiveness of programs within the Safety Management Plan. This should be an on-going process. This should show whether policies, Regulations and expectations are being met or where systems can be made more effective. Both internal and external audits should be considered. Auditors need training to be objective and independent. Management Team or the Health and Safety Committee would have to decide how often would audits be done, what systems or areas would be audited and reporting arrangements.

7 PROCESS

Using the equations in Section 6.2.3 the following values can be used to calculate Risk Score for a Hazard.

Risk score = Consequence x Likelihood

Risk score = Consequence x Probability x Exposure

Scale for consequence.

• Several dead	5
• One dead	1
• Significant chance of fatality	0.3
• One permanent disability/ less chance of fatality	0.1
• Many lost time injuries	0.01
• One lost time injury	0.001
• Small injury	0.0001

Scale for exposure

• Continuous	10
• Frequent (daily)	5
• Seldom (Weekly)	3
• Unusual (Monthly)	2.5
• Occasional (Yearly)	2
• Once in 5 years	1.5
• Once in 10 years	0.5
• Once in 100 years	0.02

Scale for probability

• May well be expected	10
• Quite possible	7
• Unusual but possible	3
• Only remotely possible	2
• Conceivable but unlikely	1
• Practically impossible	0.5
• Virtually impossible	0.1

8. CONCLUSION

Management of safety issues based on assessment of risks not only integrates safety with productivity but also can be used as a very good tool for reduction of costs. The systems stand on the premise that all risks need not be eliminated and different control measures can be adopted for different levels of risks. The key here is to aim for ALARA (as low as reasonably achievable), which eventually depends on cost considerations. The system allows prioritization of allocation of scarce resources thereby cutting costs and reducing wastages. This assumes great importance in the current Indian scenario.

The other merits of the system are that it is created by the mine operators themselves through considerable brainstorming. This approach let the mine operators/users feel ownership of the system, something that is not cast upon them by experts, Govt. agencies or outsiders, and hence chances of successful implementation is much more. In this system, grey areas are minimized; responsibilities for action are pinpointed and scopes for auditing and improvements are always present.

For conveniences of the mine operators different forms for risk assessment, its control and audit is enclosed in Annexure-I. A Risk Management Plan, designed by the officials of a coal mine is given in the Annexure-II for understanding the actual process. **This is given as guide only and need to be tailored for specific requirements.**

DGMS (Tech) Circular No. 9

Dated 3rd December, 2003

To,
Owners, Agents and Managers of all Mines

Subject: Provision of proper Audio Visual Alarm during reversing of vehicles.

Occurrence of accidents due to dumpers, tippers, trucks and other surface transportation machineries during reversing, still remains a matter of concern. In the past, attention was drawn vide DGMS(Tech) Circular No. 7 of 1977 and Circular No. 12 of 1999 but it has been revealed during inspections that in many dumpers and tippers, still audio visual alarms (to be actuated automatically while reversing) have not been provided and wherever provided, most of them were found nonfunctional. It is also learnt that audio visual alarm sets can not cope up with the vibration, dusty condition and rain water/other water sources used for cleaning.

It is, therefore, recommended that no dumper and tipper, henceforth, shall be allowed to be in used without providing reliable type of audio visual alarms to be actuated automatically during reversing. The following specification of such audio visual alarm is recommended.

(1) Such audio visual alarm (A.V.A.) shall conform to IS 13947 (Part I) of 1993 for the following protection against dust and water.

<u>Degree of protection</u>	<u>Test conditions as per IS 13947 (Part 1) – See Sub Clause</u>
1. Protected against dust and shall prevent ingress of dust-C 7.5 & C 7.6	
2. Protected against dripping water-----	C 8.1
3. Protected against spraying water-----	C 8.3
4. Protected against splashing water-----	C 8.4

(2) Such audio visual alarm shall also conform to IS 13109 (Part I) of 1991 for the following environmental requirements :-

<u>Test</u>	<u>Test conditions</u>
1. Vibration Test	) As per Table I of IS 13109 (Part1) of 1991
2. Shock Test-	)
3. Bump Test-	)
4. Drop and Topple Test-	)
5. Cold Test-	)

(3) The above tests (as per BIS 13947 & 13109) carried out as per SAE J 994 may also be accepted. In addition, the following Endurance Test of A.V.A. may be carried out as a type test in accordance with SAE J 994.

The details of SAE J 994 is given below :-

(Title- Alarm-Back up – Electric Laboratory- Performance testing,
Publication date - 08-01-1993,
Publisher- Society of Automatic Engineers, U.S.A.)

Test	Test Conditions
a) Endurance Test at High Temperature.)	As per Para 7.1
b) Endurance Test at Room Temperature.)	and Para 7.2
(4) Sound levels to be checked before and after the above tests. Sound level to be checked as described in SAE J 994 Standard. Sound level after the test shall be within +_ 5 dBA of the value for which the equipment is designed.	
(5) Allowable Sound Level :	
The sound of the Audio-visual alarm should be more than the surrounding noise level so that it can be heard distinctly. Since the reversing process takes normally 2 to 3 minutes, 110 dB sound level is recommended for Audio-visual alarm. Self adjusting back up alarm may be preferred where the sound level is automatically maintained at 5 dB higher level than the surrounding noise level.	
(6) protection against splashing of mud and water on the pressure switch shall be provided by the HEMM manufacturer/user industry.	
(7) Mechanical Lock may be provided to prevent unauthorized tampering of the alarm.	
(8) Test facilities for the above tests are available in C.M.R.I., Dhanbad and in other B.I.S. approved test houses. Fresh test report for every major lot should be insisted.	

You are requested to comply to these recommendations in the interest of safety

Sd/-
(R. Sharma)
Director General of Mines Safety,
Dhanbad

No. DGMS (Legis) Circular No. 1 of 2003. Dhanbad, dated the 23 May, 2003.

To,

The Owners/Agents/ Managers of all Mines.

Subject: Certification of First Aid Course conducted by Multi Disciplinary Centre on Safety, Health & Environment, Bhubaneswar - clarification thereof.

Sir,

Your attention is drawn to DGMS (Legis) Circular No, 1 of 1999, dated the 11th February 1999 through which it was brought to notice that the syllabus for First Aid Course prescribed by the Multi Disciplinary Centre on Safety, Health and Environment, Bhubaneswar, an autonomous body sponsored by Govt. of Orissa is of the same standard as prescribed by St. John Ambulance Association (India) for the purpose of Rule 41 of Mines Rules, 1955, Regulation 15(1)(b) of Coal Mines Regulations, 1957 and 15(1)(b) of Metalliferous Mines Regulations, 1961.

This is to clarify further that, the validity of First Aid Certificate issued by MDC-SHE, Bhubaneswar shall be similar to the First Aid certificate issued by St. Johns Ambulance Association, i.e. Senior Certificate for 3 years, Vouchers Certificate for 5 years and Medallion Certificate for life-long.

This is for information and necessary action of all concerned.

Yours faithfully

Director General of Mines Safety

DGMS (Tech)/Circular No. 1

/ Dated Dhanbad, the 28th January, 2003.

To
Owners, Agents and Managers of all Coal Mines.

Sub: Fatal Accident in a direct Rope Haulage while
guiding the Rope for proper booking in the drum.

Recently a fitter helper lost his life while he was guiding the slack rope coils on the drum of a direct haulage with his hand. These slack rope coils were formed as a result of derailment of the empties which were being lowered along a haulage plane dipping at 1 in 48. As the gradient of the haulage plane was mild, the empties were lowered by releasing the brakes fully so that the empties gravitate down. Derailment of one of the tubs resulted in sudden stoppage of the empties. However, due to momentum the haulage drum kept on rotating for some more time which resulted in formation of slack ropes with his hands. In the meantime the tub was re-railed and the empties were set in motion. This resulted in tightening of the slack rope coils on the drum and the fitter helper's hand was trapped in the coils of the rope and he was pulled in it causing his instant death.

The accident focuses the need for guiding rope on to a drum only with a lever or other proper appliance, and persons likely to be endangered need to be warned before the tubs are set into motion as required under the provisions of Regulation 87(2)(b) and 89(2)(a) of the Coal Mines Regulations, 1957.

Attention is also invited to this Directorate's Circular No.8 of 1973 in which a similar accident to an engine driver was highlighted. It is once again reiterated that no person is to be permitted to guide rope on to a drum except with the help of a lever or other proper appliance.

Further attention is drawn to this Directorate's Circular No.13 of 1982 where it was recommended that lowering of tubs shall be done with motor 'ON' without declutching to stop over-speeding of the rake which may lead to derailment/brake failure and other dangerous occurrences. In case of mild gradient, suitable "Dak"/loaded tub may be attached with the rake to develop adequate momentum but the lowering has to be done with motor power 'ON'. Adopting the above system, over-speeding of the down going rake can be effectively controlled and thus chances of derailment due to over-speeding shall be reduced to a great extent.

You are requested to follow the above guidelines in the interest of safety.

(DASHRATH SINGH)
DIRECTOR-GENERAL OF MINES SAFETY

No.DGMS (SOMA)/(Tech)Cir.No.2 of 2003

Dhanbad, Dated the 31st January 2003.

To All Owners, Agents & Managers of mines.

Subject: Dangers due to blasting projectiles.

Accidents due to projectiles ejecting from blasting had been a major source of accident in both below ground and opencast workings. Under the existing provisions of Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations, 1961, before a shot is charged, stemmed or fired the shotfirer/blaster is required, amongst other things to ensure that all persons within a radius of 300m from the place of firing (referred to hereinafter as danger Zone) have taken proper shelter, apart from giving sufficient warning by efficient signals or other means approved by the manager over the entire zone. There had been, however, a number of instances where flying fragments due to blasting had ejected not only within but also beyond the danger Zone, resulting into serious and even fatal accidents.

This Directorate from time to time had drawn the attention of all concerned about the dangers from flying projectiles through issue of DGMS Circulars Viz. Circular Tech. 15/1977 and 8/1982. Recently, however, another fatal accident occurred due to same reason.

Enquiry into the accident revealed that in an open cast coal mine, overburden had been kept dumped against the free face of OB bench, 12 No. first row of holes were left uncharged because of spontaneous heating in the seam below, 17 holes of 150mm 6.5m Depth drilled in 7m x 5m Pattern (spacing & burden) charged with 75 kg/hole and 42 holes of 6.5m depth 250mm dia drilled in 6m x 6m pattern charged with 130 kg/hole were blasted. The projectiles ejected due to blasting travelled for a distance of about 412m in the reverse direction away from the free face and hit a mechanical supervisor. The enquiry further revealed that the deceased had taken proper shelter in a blasting shelter but had come out of the shelter immediately on hearing to the sound of blast and was subsequently hit by the projectiles.

Over years there had been refinement of blasting practices as well as development in explosives and accessories, whereby it is possible to control the throw and prevent ejection of flying fragments within a safe distance, with relative ease. There is, therefore, no reason why such type of accident should continue to occur.

The matter is brought to your attention so that following corrective measures are taken in case similar conditions exists in any mine under your control.

(1) In the interest of safety to treat all the places within a radius of 500m of the place of firing as the danger zone, all persons who are required to remain within the danger zone at the time of blasting should take protection in substantially built shelter.

(2) Formulate a code of practice for controlled blasting Technique with milli-second delay detonators/ electric shock tubes/ cord relays or use of sequential blasting machines or by adequately muffling of holes including precautions to be taken during blasting operation until all clear signal given by blaster.

(3) Training of persons and their helpers engaged in such blasting operation.

(Dashrath Singh)
Director-General of Mines Safety.

DGMS (Tech)/Circular No.3

Dated Dhanbad, the 6th March, 2003.

To

Owners, Agents and Managers of all Coal Mines.

Sub: Safe use of Fluid Coupling in underground coal mines.

A large number of fluid couplings are in use at underground coal mines used for transmission of power in conveyors and other machineries.

It has been brought to my notice that still large number of such fluid couplings in use are made of Aluminium working with Mineral Oil.

There is already a directive that alloys and metals likely to give incendive sparking shall not be used in construction of any underground machinery.

Full iron casting body fluid couplings are now available in the country which can work with either plain water or with 5% Emulsion Type Fire Resistant Hydraulic Fluid as per BIS 10532 Part – I. Such full iron casting body fluid couplings are being used for a long time in coal mines of England and Australia.

Therefore, in the interest of safety, to avoid fire from fluid couplings, all Aluminium body fluid couplings may be replaced by full iron body fluid couplings with Water or 5% Emulsion as mentioned above.

(Ravindra Sharma)
Director-General of Mines Safety.

DGMS(TECH) CIRCULAR No.4 of 2003. Dhanbad, dated the 09/05/2003.

To
Owners, Agents & Managers of all Mines.

In some mines, inclines are opened from the bed of quarry for working deeper horizon by belowground method. These openings are used as haulage roadways, travelling roadways and fan drift etc. This requires deployment of persons and equipment in the vicinity of high benches which have been reduced to final limit and may collapse.

Recently, in a manganese mine, openings to belowground workings had been established from the bed of the quarry at a depth of about 75m. One of the openings was provided with the main mechanical ventilator at a distance of about 5m from foot of the benches on the footwall side. The contact zone between the footwall and ore body, dipping at 55° to 75° consisted of weak formations like muscovite schist, pink gneiss and pegmatite. Subsequently, after a heavy rainfall, a portion of benches on the footwall side measuring about 35m in length, 23m in breadth and 8m in width slid along the weak contact zone between the ore body and the footwall and rested on the opening housing the fan drift. This resulted in collapse of the fan drift and complete damage of the fan house. The mine had to be kept stopped for about a month till a new mechanical ventilator was installed in another opening on hanging wall side.

In order to prevent recurrence of such incidences, it is essential to ascertain the stability of the benches which have been reduced to final limits, especially near weak zones at regular interval. All openings from the edge of the quarry should be made safe by constructing side walls and roofing of substantial strength preferably with RCC so as to sustain the load of the benches, should a collapse of the benches takes place. Such structures should protrude to a distance sufficiently ahead of the edge of the quarry so as not to be affected by any falls of benches at a later date.

The matter is brought to your notice so that adequate corrective measures are taken under similar conditions.

(Ravindra Sharma)
Director-General of Mines Safety.

DGMS (Tech)Circular No. 5 of 2003

Dhanbad, dated the 09/05/2003.

To
The Owners, Agents and Managers
of all coalmines.

Sub: Recommendations of Bagdigi Court of inquiry

The Court of inquiry appointed under section 24 of the Mines Act, 1952 to enquire into the causes and circumstances attending the accident that occurred in Bagdigi Colliery of M/s. Bharat Coking Coal Limited on 2nd February, 2001 causing loss of 29 lives due to inundation, have made the following recommendations.

I. Dewatering of old workings :

By experience, it is learnt that danger from inundation arises due to existing source of water adjoining a mine. The old workings of mines get gradually filled in with water, particularly if they are on dip side and in absence of dewatering, accumulation of water in these old workings considerably increases the volume of water therein. Though the water of such mines is sometimes stored for the purpose of controlling fire or even for the purpose of domestic supply, such accumulated water bodies are definitely potential danger to the dip side workings further down below. Furthermore, the exact extent of these old workings is always doubtful. It is, therefore, necessary that no water should be allowed to accumulate in the old workings of any mine. If water is required to be stored for specific purpose, prior permission from the DGMS should be obtained, who may prescribe safety measures for storing of water as well as the quantity of water that may be stored.

II. Application of latest geophysical methods for providing the barrier/partings:

It has been seen that connection between adjoining old water logged workings and current workings ultimately takes place due to eating away of the prescribed coal barrier between the two. Application of Regulation 127 of the Coal Mines Regulation, 1957, arises only when partings between such workings become less than 60 m. The proving of barrier or parting by actual survey is arduous and time taking, while proving the same by means of long bore holes, drilled by Safety Boring Machines, requires special machines, skilled operators and adequate arrangement at the Colliery. Latest Geo-physical methods of proving the barrier/partings have been developed recently and successfully tried by CMRI, Dhanbad and NIRM, KGF. One of these new Geo-physical methods is based on ground penetration radar system and it has been seen that the method yields near accurate results and is able to give thickness of barrier within an accuracy of few metres. This new method should be applied in cases where the present workings have reached the cautionary zone of 120 m. as per Water Danger Plan.

III. Discontinuance of the practice of having both Agent and Manager for single mine :

The practice of having both Agent and Manager for a single mine should be discontinued and thus the status of the Mine Manager should be restored. An Agent may be appointed for controlling 2/3 mines and not a single mine. Promotions may be granted to the Manager to higher grade, but his designation should continue to remain as Manager as is the practice in Nationalized Banks where a Manager of a big branch may be in the same scale as a Regional Manager of the Area. This would ensure the requisite authority and respectability of the post of Mine Manager.

IV. Vesting of executive power and greater authority to the internal safety organisation (ISO) as per the management structure of Coal India Ltd.

There is an Internal Safety Organisation (ISO) in each subsidiary company of CIL under the charge of Executive Director (Safety and Rescue). The organisation was constituted for the purpose of internal safety and as an internal watch-dog for the mines in respect of safety matters. It appears, however, that this organisation does not have any real and effective powers. It does not require greater emphasis to understand that for ensuring requisite safety measures there has to be a regular and thorough inspection of the workings from the safety point of view. The DGMS has stated that they are unable to carry out general inspection of the individual mines, even once in two years on account of acute shortage of inspecting officers. Therefore, if thorough inspection of the mines is carried out by the ISO at least once in a year and a detailed report of inspection is submitted promptly, the Mine officials will be expected to; rectify the short-comings promptly as pointed out in the reports. With greater authority and executive power vested in ISO, it can ensure prompt compliance of the recommendations given in its inspection reports and non-compliance of the recommendations would attract adverse ratings against the mines officials in their respective Annual Confidential Rolls.

V. Joint Survey and Periodical Check Survey

It has been observed that joint surveys are not conducted properly and there have been occasions where the Manager and Surveyors of the adjoining mines merely endorse their signatures on the joint survey plans prepared not by actual survey, but by comparing field books of other mines. The Area Survey Officer should be entrusted with specific duty to supervise joint survey and he should certify that joint survey was actually carried out and joint survey plan was prepared only after conducting joint survey.

Recommendations by conducting sample check surveys of every operational mine have been given from time to time in the recommendations of the Safety Conferences and Tripartite Safety Committee Meetings and Circulars in this context have also been issued by the DGMS. Need to conduct check surveys particularly in respect of workings which have water logged bodies in its adjoining areas is highly essential. This would ensure that the development of the mine is being correctly made according to the stipulation in the projection plan. Failure to conduct check survey in the instant case had caused failure to detect the extent of deviation, which the workings had undergone. It is, therefore, necessary to conduct Check Surveys of the workings at regular intervals, particularly where the mines where the workings have reached within 120 m. of any adjoining mine which may contain water or any other liquid and no work should proceed without completion of a check survey and subsequent order in writing by the Manager/Agent to that effect.

In addition, a special team should be constituted in the area only for conducting check survey who should not be entrusted with any other non-statutory job.

VI. Improvement in Surveying Organisation on Mine level :

As per the management structure of the BCCL, a Surveyor though appointed for a particular mine, is under the control and authority of the Manager and under the superior control of the agent. It has come to light that superior officers tend to play dominant role side-lining Surveyors who, in fact, are deprived of a free hand in the performance of their duties. The Surveyors are not provided with the requisite survey machines and other facilities and more often than not, they are constrained to perform non-statutory jobs. The Surveyors are thus rendered ineffective and are unable to perform their duties with

sincerity. It is therefore suggested that authorized surveyors should not be given non-statutory jobs as far as possible. The Manager of the Mine should countersign plan prepared after being sure of the accuracy of the survey by checking field books, calculation etc. The Manager may be assisted by Assistant Manager (Survey) appointed on the lines of Ventilation Officer, Safety Officer etc. to help the Manager and to ensure that survey works are being actually conducted.

VII. INSTALLATION OF V-NOTCH: for recording seepage of water :

Abnormal increase of the seepage of water is a definite indication of probable danger from inundation. It is recommended therefore that for measuring the quantity of increase in seepage of water, V-Notch should be installed in roadways leading to faces within 120 m. of water-logged workings. This would promptly indicate any abnormal increase in the seepage with the progress of faces. The recordings and the results obtained from the apparatus should be maintained in a bound paged book counter signed by the Manager.

VIII. GREATER CONSTRUCTIVE ROLE OF TRADE UNIONS :

The involvement and role of trade unions in the industry in general and the coal industry in particular, is basically for ensuring the safety of workers and protection of their rights. It is their responsibility to see that adequate protective measures are taken by the management for the safety of lives of workers at places of work. In respect of mines, a provision has been made for posting a Workman Inspector for every mine, such Inspector being primarily the representative of the labour union. The workman Inspector claimed to have regularly inspected the workings of the 7th seam for the purpose of verifying safety measures. Yet, it transpired that he was not conscious at all of the conditions prevailing in the workings, and consequently had never noticed any defect in the workings. Even the trade unions had never pointed out the glaring defects in the workings of the 7th seam even though the workers had repeated complained about the abnormal increase in seepage of water. It also appears that though occasional meetings of Pit Safety Committee used to be organized and recommendations used to be given by the representative of trade union in respect of safety measures, yet no sincere efforts were made to see that the recommendations were implemented by the management. Had, such steps been taken promptly, the management would have been compelled to take prompt protective measures and the tragedy would have been avoided. It is, therefore, felt that trade unions should show a greater degree of concern and play a more constructive role in sincerely and honestly pointing out defects in safety measures and their rectification.

Proper implementation of these recommendations can bring about definite improvement in the safety standard in the mines.

You are, therefore, requested to take suitable steps to implement the abovementioned recommendation of the Bagdigi Court of Enquiry in all mines under your control.

(Ravindra Sharma)
Director-General of Mines Safety.

DGMS (Tech) Circular No. 4 of 2003

Dhanbad, the 9th Sept. 2003

To:

1. All Owners, Agents and Managers of Coal Mines
2. Manufacturer of Explosives

Subject: Procedure to be followed for approval of a New Permitted Explosive.

Dear Sir,

You are aware that the Chief Inspector of Mines (also designated as Director General of Mines Safety) is empowered to grant approval for the use of Permitted Explosive under the Regulation 2(23) of Coal Mines Regulation 1957 and Regulation 2(24) of the Metalliferous Mines Regulation 1961. In suppression of this Directorate's letter No. 14(26)79-Genl/1956 -63 dated 09/02/1983 the following procedure will be adopted while approving a new permitted explosive:-

- 1 The explosive manufacture shall submit an application to the DGMS in the prescribed format for approval of an explosive composition along with copies of test reports from the Central Mining Research Station, Dhanbad. The test report shall include results of tests for incendivity, COD, Air-gap sensitivity and Fume characteristics for P5 type of explosives.
- 2 On the basis of satisfactory test reports, an approval for conducting field-trials in mines may be granted.
- 3 The explosive manufacturer will intimate well in advance the date of field-trials to the field offices of this Directorate so that an officer of the Directorate may also witness few blasts.
- 4 The field-trials will be conducted jointly by the representatives of the concerned mine management and the explosive manufacture.
- 5 The faces for trial-blasts shall be carefully selected. These faces should be about 30 meters in by of the last ventilation connection. During field-trials normal pattern of shot-holes shall be followed.
- 6 Quantitative measurements shall be made of NO+NO₂ and carbon monoxide in post detonation fumes 5 minutes after blasting.
- 7 During field trials, about 100 kegs of the explosive shall be fired. In case of ordinary electric detonators minimum 500 nos. and in case of delay detonators 200 nos. from each delay types will be blasted during the field trial. On completion of the trials, a report in original on the performance and safety characteristics of the explosive composition shall be submitted in Form –I

along with the blast details (enclosed) jointly signed by the Mine Manager/Agent and the Technical Services Engineer of the explosive manufacture.

- 8 A new explosive composition may be approved if its performance during field trials is found to be satisfactory. The initial approval will normally be for a period of one year. During this period the explosive may be supplied and used at a large number of mines. The explosive manufacture will keep this Directorate and the concerned field offices of the Directorate fully apprised of the details of supplies. Consumer will watch the performance of new explosive composition both from safety and productivity points of view and will submit a reports on the same after six months of introduction of the new explosive composition in the mine. The concerned explosive manufacture shall also submit a consolidated performance report. The performance reports of the explosive composition during period of provisional approval shall be submitted in Form – II (enclosed)
- 9 The approval may be renewed if the performance of the new explosive composition is found to be satisfactory during the period of initial approval.
- 10 Approvals to P -3 types of explosive compositions will normally be granted in stages first for degree I then II and finally for degree III gassy mines.
- 11 The above procedure may be brought to the notice of all concerned for taking necessary action in the matter.

Director General of Mine Safety

Form – I

REPORT ON PERFORMANCE AND SAFETY CHARACTERISTICS OF _____
 _____ EXPLOSIVES COMPOSITION

FIELD TRIAL CONDUCTED AT _____ COLLIERY

- 1
 - (a) Name of the Explosive :
 - (b) Name of Manufacture :
 - (c) Type of explosive :
 - (i) P-1/P-3/P-5
 - (ii) N.G. based
 - (iii) Slurry Emulsion

- 2 Details of DGMS approval (for trials)
 - (a) Letter No. _____ dt _____
 - (b) Valid upto _____
 - (c) For gassy seams of _____ degree(s)

- 3 Details of sites of Trials :
 - (i)
 - (a) Name of Seam
 - (b) Gassiness
 - (ii) Name of District
 - (a) working thickness, gradient of seam etc.
 - (b) Nature of coal (hardness , cleavage, bands etc)
 - (c) Method of work (depillaring or devl., BOS or M/c out/ face) :

- 4
 - (a) Period of Trial
 - (b) Total quantity (in kg) of explosive used during trial blasts
 - (c) No. of shots fired during trials blasts :

- 5 General Remarks
 - (a) Name of DGMS official
Who attended the blast _____ on _____
 - (b) Blast details (appended)
 - (c) Determination of Post detonation fumes by : (apparatus)
 - (d) Comparatives assessment of the performance & Safety characteristics of the explosive with other comparable composition (s) :-
 - (e) Any other remarks

- 6 Conclusion regarding suitability of the explosive .

Signature / Designation / Date
 Explosive manufacture

Signature / Designation / Date
 Mine Manager/ Agent

Form – II**Consolidated report on performance and Safety Characteristics of the Explosive composition during its Regular Approval** (Required for renewal of Approval)

- 1
 - (a) Name of the Explosive :
 - (b) Name of Manufacture :
 - (c) Type of explosive :
 - (i) P-1/P-3/P-5
 - (ii) N.G. based
 - (iii) Slurry/Emulsion

- 2 Details of DGMS approval (for trials)
 - (a) Letter No. _____ dt _____
 - (b) Valid upto _____
 - (c) For gassy seams of _____ degree(s)

- 3
 - (a) Name of Mine(s) with degree of gassiness to which this consolidated report relates :
 - (b) Total quantity of Explosive used during the period

- 4 General Comments on –
 - (a) Explosive Performance
 - (b) Post detonation fumes Characteristics
 - (c) Frequency of Misfires or any other unusual occurrence (Specify)
 - (d) Blasting vibrations effect on roof / sides
 - (e) Safety and ease in handling storage, transport, priming etc.
 - (f) Any other remarks

- 5 Comparative assessment of the performance & Safety characteristics of the explosive with other comparable compositions (s) :

- 6 Conclusion regarding suitability of the explosive.

Date
Place

Signature
Name
Designation

DGMS (Tech)/Circular No 7

/Dhanbad, Dated the 9th October, 2003

To

Owners of all

Coal, Metal and Oil Mines.

Sub : Testing and examination of apparatus under pressure.

The provision of Regulation 183(3) of the Coal Mines Regulations, 1957, Regulation 173(3) of the Metalliferous Mines Regulations, 1961 and Regulation 78(3) of Oil Mines Regulations, 1984, require that when apparatus under pressure is put into commission, the Engineer or other competent person shall subject it to a hydraulic test at a pressure atleast one and half times the maximum permissible working-pressure. It is also required under the same regulation, that a similar test shall be made after every renewal or repair and in any case at intervals of not more than three years. The result of such tests is required to be recorded in a bound-paged book kept for purpose and be signed and dated by the person carrying out the test.

In recent past a few dangerous occurrences due to bursting of compressed air tanks have taken place prior to completion of three years. It seems that at the time of hydraulic test the internal condition of the tank vis-a-vis wall thickness was not inspected/assessed and the permissible safe working pressure in the tank was not calculated keeping all factors in mind.

In view of the above, it is recommended that henceforth whenever hydraulic test is done as required under the law, assessment of the safe working pressure shall also be done based on residual thickness, pitting and corrosions of the wall of such pressure vessels. The present thickness of wall, seam etc. shall be compared with original thickness and a decision to repair/replace the receiver shall be taken. Where it is not possible to Measure the thickness of wall physically, use of ultrasonic thickness gauge is recommended.

The report of the result of every- test/examination made shall be maintained as per proforma given below :

REPORT OF EXAMINATION

1. Name of the Mine:
2. Name, description and distinct number of pressure vessel :
3. Name and address of the manufacturer of the air vessel :
4. Particulars of vessel –
 - (a) Date of construction :
 - (b) Thickness of wall:
 - (c) Date on which the vessel was taken first to use :
 - (d) Safe working pressure recommended by manufacturer:
5. Date of last hydraulic test (if any) and pressure applied :
6. The vessel exposed to weather -
7. What examination and test were made -

(a) Hydraulic testing (pressure applied and duration):

(b) NDT testing (minimum thickness in wall, seam):

(c) Condition of vessel for further use (permissible safe, working pressure as calculated)

8. Date of examination -

9. Repair required and period within which should be executed -

10. Other observation :

State the condition of fittings and appliances provided in the vessel.

11. Mention the type of Ultrasonic Thickness gauge used –

12. Remarks -

Signature of the Competent Person carrying out the
Test & Examination. Name:

Qualification: Date :

The above recommendation shall be followed strictly in the interest of safety.

(R. Sharma)

Director-General of Mines Safety

DGMS (Tech)/ Circular No. 8

Dated

9th October, 2003

To,
Owners, Agents and Managers of
All Coal and Non-Coal Mines

Subject: : Proper layout of workshop located in the precincts of opencast mines.

Enquiry into some of the fatal accidents which had occurred in the precincts of workshop of opencast mines in the recent past has revealed that there was lack of proper parking place for dumpers and other heavy earth moving machineries (HEMM) leading to haphazard parking. Further, canteen, time office, bi-cycle and other two wheeler sheds, site officers, stores etc. were so located that employees and visitors had to regularly use the area frequented by HEMM. All these observations bring to focus the need for proper layout of workshops.

The 7th conference on Safety in Mines has also recommended that adequate attention should be given towards proper layout of repair sheds and workshop to ensure due protection to work persons employed at these places from the movement of heavy earth moving machineries. Each company should ensure that for every mine a scheme is drawn and implemented for proper maintenance, repair, overhaul and erection in respect of HEMM. This scheme should cover places such as sheds and workshops. Every help if required should be obtained from manufactures also.

In order to prevent recurrence of such accidents, besides implementing the relevant recommendation of the Conference on Safety in Mines, following additional steps may be taken in respect of layout of workshop :-

- 1 The path of movement of HEMM and that of other light vehicles shall be completely separate.
- 2 Canteen, time office, site officers, stores, two wheeler shed etc. shall be located where the movement of HEMM is the least.
- 3 Minimum number of persons are required to pass through workshop area.
- 4 Proper parking area for HEMM and earmarked paths for their movement shall be provided.
- 5 Exclusive brake testing area properly demarcated and protected by substantial fencing shall be provided in the precincts of the workshop where the operators may test the brakes of the HEMM as and when required.

The above recommendations shall be implemented strictly in the interest of safety.

sd/-
(R Sharma)
Director General of Mines Safety

NOTIFICATIONS & CIRCULARS

Notifications – 2004

New Delhi the 21st January, 2004

S.O. 108(E) – Whereas an accident has occurred in the colliery of M/s. Singareni Collieries Company Limited more particularly in the Godavari Khani No.8A Mine of Ramagundam Region in District Karimnagar of Andhra Pradesh State, on 17th October, 2003 causing loss of lives.

And where the Central Government is of the opinion that a formal inquiry into the causes and circumstances attending the accidents ought to be held and in addition it is also necessary to fix responsibility for the causes leading to the accidents.

Now, therefore, in exercise of the powers conferred by sub-section (1) of Section 24 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Justice Bilal Nazki, Judge, High Court of Andhra Pradesh to held such inquiry and present a report within a period of three months. The Central Government also appoints the following persons as assessors in holding of the inquiry namely:

1. Shri AK Rudra, Ex-Director-General of Mines Safety, C-2/26, Kendriya Vihar, VIP Road, Kolkata – 52.
2. Shri Kamlesh Sahay, Member, Safety Board (BMS), Bhurkunda Hospital Colony, P.O. Bhurkunda Bazar, Dist. Hazaribagh, Jharkhand.

[F.No.N-11012/7/2003/ISH.II]
D.S Poonia, Joint Secretary.

New Delhi, the 4th February, 2004

S.O. 163(E) – In exercise of the powers conferred by Section 5 of the Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Fund Act, 1976 (61 of 1976) read with sub-rule (2) of rule 3, sub-rule (1) and (2) of rule 4 and rule 16 of the Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Fund Rules, 1978, and in supersession of the notifications of Government of India in the Ministry of Labour, number S.O. 165 dated 11th March, 1999, except as respects things done or omitted to be done before such supersession, the Central Government hereby constitutes as Advisory Committee and appoints the following persons to the said Committee for the State of Orissa to advise the Central Government on the matters arising out of the administration of the aforesaid Act, including matter relating in the application of the Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Fund for a period of three years from the date of publication of this notification in the Official Gazette.

(1)	Minister for Labour Government of Orissa Bhubaneswar	Chairman
(2)	Welfare Commissioner Government of India Bhubaneswar	Vice-Chairman (Ex-officio)

Nominees of the Central Government appointed under rule 3(2)(a)(iii):

(3)	Regional Labour Commissioner (Central), Bhubaneswar	Member (Ex-officio)
(4)	Director of Mines Safety Bhubaneswar	Member (Ex-officio)

Member of Legislative Assembly appointed under rule 3(2)(a)(iv):

(5)	Shri Mohan Chand Majhi MLA, Keonjhar At/Post/Dist. Keonjhar	Member

Representatives of employers' appointed under rule 3(2)(a)(v):

(6)	Shri Srikanta Panda Head, Manganese Ore Group of Mines TISCO At. Bichhakundi Post-Joda, Dist. Keonjhar	Member
(7)	Shri R.S. Sharma, Vice-President S.L. Mining (Iron Ore Mines) At/Post-Barbil District – Keonjhar	Member
(8)	Shri UK Agarwal Vice-President (Mining) Indian Metals and Ferro Aloys Limited At/Post – Chorda Chowk Jajpur Road, Dist. Jajpur	Member

Representative of Workers' appointed under rule 3(2)(a)(vi):

(9)	Shri Muktikanta Satpathy Sanskriti Bhawan, Kashipur Post/Dist – Keonjhar	Member
(10)	Shri Prabhakar Mallik BMS Office At/Post – Tensa Dist. Sundergarh	Member
(11)	Shri Alekh Chandra Tripathy President, Kathapal Mines Labour Union At. Bannasukana, Post, Bhuban Dist. Dhenkanal	Member

Woman representative appointed under rule 3(2)(a)(viii):

(12)	Kumari Soudamini Das CDA, E-198, Sector-7 Cuttack-14, Orissa	Member

Secretary appointed under Rule 3(2)(b):

(13)	Welfare Administrator, Labour Welfare Organisation, Barbil.	Secretary

2. The headquarters of the said Advisory Committee shall be at Bhubaneswar.

[No.U.19012/8/2001-W-II(c)]
Manoharlal, Director-General (Labour Welfare)/Joint Secretary.
New Delhi, the 17th May, 2004

S.O.594(E) – Whereas the Government of India in the Ministry of Labour in their Notification No.S.O.108(E) dated 21.1.2004 appointed Justice Bilal Nazki, Judge, High Court of Andhra Pradesh to hold a formal inquiry into the causes and circumstances attending to the accident that occurred on 17th October, 2003 in the Colliery of M/s.Singareni Collieries Company Limited, more particularly in the Godavarikhani No.8A Mine of Ramagundam Region in District Karimnagar of Andhra Pradesh State, causing loss of lives and present a report within a period of three months.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 21.4.2004 to 20.7.2004 and accordingly the period of appointment of Justice Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri AK Rudra, Ex-Director-General of Mines Safety and of Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a period of three months i.e. upto 20th July, 2004.

[F.No.N-11012/7/2003-ISH.II]
K. Chandramouli, Joint Secretary.

New Delhi, the 22nd May, 2004

S.O. 616(E) – In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri YK Sharma, Deputy Director General of Mines Safety, Dhanbad to be the Chief Inspector of Mines for all the territories to which the said Act extends during the period from 22.5.2004 till the assumption of duties by Shri Ravindra Sharma, Director General of Mines Safety after availing earned leave, which has been granted to him.

[F.No.Z-16025/12/2003-ISH.II]
K. Chandramouli, Joint Secretary.

New Delhi, the 28th May, 2004

S.O. 641(E) – Whereas the Government of India in the Ministry of Labour in their notification No.S.O.971(E) dated 26.8.2003 appointed Justice Shri Bilal Nazki, Judge, High Court of Andhra Pradesh to hold a formal inquiry into the causes and circumstances attending the accident and to fix responsibility for the causes leading to the accident that occurred on 16th June, 2003 in the collieries of M/s. Singareni Collieries Company Limited, more particularly in the Godavarikhani No.7 Life Extension Project Mine in District Karimnagar of Andhra Pradesh State causing loss of lives and present a report within a period of three months.

And whereas it has become necessary to extend the period within which the enquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 25th May, 2005 and accordingly the period of appointment of Justice Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri AK Rudra, Ex-Director-General of Mines Safety and of Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a period of three months from 25th May, 2004.

[F.No.N-11012/5/2003-ISH.II]
K. Chandramouli, Joint Secretary.

Dhanbad, dated the 24th June, 2004

G.S.R. 224 – GSR 31, published in the Gazette of India, Part II, Section 3(i), dated 18th January, 1992. In the said notification –

Item No.19 shall be read as follows:

“Flameproof, Increased Safety and Intrinsically Safety electrical equipment and apparatus”.

[No.1480/EHQ]

Ravindra Sharma, Chief Inspector of Mines
(Also designated as Director General of Mines Safety)

New Delhi, the 16th July, 2004

S.O. 820(E) – Whereas the Government of India in the Ministry of Labour in their Notification No.S.O.108(E) dated 21.1.2004 appointed Justice Bilal Nazki, Judge, High Court of Andhra Pradesh to hold a formal inquiry into the causes and circumstances attending to the accident that occurred on 17th October, 2003 in the Colliery of M/s.Singareni Collieries Company Limited, more particularly in the Godavarikhani No.8A Mine of Ramagundam Region in District Karimnagar of Andhra Pradesh State, causing loss of lives and present a report within a period of three months.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 21.7.2004 to 20.10.2004 and accordingly the period of appointment of Justice Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri AK Rudra, Ex-Director-General of Mines Safety and of Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a period of three months i.e. upto 20th October, 2004.

[F.No.N-11012/7/2003-ISH.II]

K. Chandramouli, Joint Secretary.

New Delhi, the 16th August, 2004

S.O.927(E) – In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri B. Bhattacharjee, Deputy Director-General of Mines Safety, Nagpur to be the Chief Inspector of Mines for all the territories to which the said Act extends during the period from 16.8.2004 till the assumption of duties by Shri Ravindra Sharma, Director General of Mines Safety after availing leave, which has been granted to him.

[F.No.Z-16025/12/2003-ISH.II]

K. Chandramouli, Joint Secretary.

New Delhi, the 24th August, 2004

S.O. 948(E) – Whereas the Government of India in the Ministry of Labour in their notification No.S.O.971(E) dated 26.8.2003 appointed Justice Shri Bilal Nazki, Judge, High Court of Andhra Pradesh to hold a formal inquiry into the causes and circumstances attending the accident and to fix responsibility for the causes leading to the accident that occurred on 16th June, 2003 in the collieries of M/s. Singareni Collieries Company Limited, more particularly in the Godavarikhani No.7 Life Extension Project Mine in District Karimnagar of Andhra Pradesh State causing loss of lives and present a report within a period of three months.

And whereas it has become necessary to extend the period within which the enquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 25th August, 2005 and accordingly the period of appointment of Justice

Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri AK Rudra, Ex-Director-General of Mines Safety and of Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a period of three months from 25th August, 2004.

[F.No.N-11012/5/2003-ISH.II]
K. Chandramouli, Joint Secretary.

New Delhi, the 9th September, 2004

S.O.996(E) – In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri B. Bhattacharjee, Deputy Director General of Mines Safety, Western Zone, Nagpur to be the Chief Inspector of Mines for all the territories to which the said Act extends. This notification shall come into force from the date of its publication in the Official Gazette until further orders.

[F.No.A-32012/03/2004-ISH.II]
D.S. Poonia, Joint Secretary.

New Delhi, the 13th October, 2004

S.O. 1114(E) – Shri Bhaskar Bhattacharjee, Deputy Director General, Directorate General of Mines Safety, Western Zone, Nagpur on his appointment as Director General of Mines Safety in the Directorate General of Mines Safety, Dhanbad has taken over the charge of the post with effect from the forenoon of 29th September, 2004.

2. Therefore, in exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952) the Central Government hereby appoints Shri B. Bhattacharjee, Director General, Directorate General of Mines Safety, Dhanbad to be the Chief Inspector of Mines for all the territories to which the said Act extends.

[F.No.A-32012/03/2004-ISH.II]
K. Chandramouli, Joint Secretary.

New Delhi, the 21st October, 2004

S.O. 1171(E) – Whereas the Government of India in the Ministry of Labour and Employment in their Notification No.S.O.108(E) dated 21.1.2004 appointed Justice Bilal Nazki, Judge, High Court of Andhra Pradesh to hold a formal inquiry into the causes and circumstances attending to the accident and to fix responsibility for the causes leading to the accident that occurred 17th October, 2003 in the Colliery of M/s.Singareni Collieries Company Limited, more particularly in the Godavarikhani No.8A Mine of Ramagundam Region in District Karimnagar of Andhra Pradesh State, causing loss of lives and present a report within a period of three months. The duration of the enquiry was last extended to 20.10.2004.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 21.7.2004 to 20.10.2004 and accordingly the period of appointment of Justice Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri AK Rudra, Ex-Director-General of Mines Safety and of Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a period of three months i.e. upto 20th April, 2005 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

[F.No.N-11012/7/2003-ISH.II]
K. Chandramouli, Joint Secretary.

Circulars – 2004

No.DGMS(Tech)S&T Circular No.1 of 2004

Dhanbad, dated 22.6.2004.

To
The Owners, Agents and Managers of Coal Mines.

Sub: Guidelines for conducting respirable air-borne dust survey in coal mines under Reg.123 of Coal Mines Regulations

Health hazards associated with respirable dust are well known. The Sixth Conference on Safety in Mines in its recommendations No.2, 4,5 recommended for conduct of air born dust survey on a regular basis in each mine. Accordingly, Guidelines for conducting air borne dust survey was prepared by DGMS and circulated vide circular No.Tech 5/1988.

Regulation 123 of CMR, 1957 was also substituted in 1990 and the requirement for conduct of air borne dust survey in coal mines, was described in details.

Eighth Conference on Safety in Mines further recommended under clause 4.2 Part B of its recommendation for ensuring adequate organization and arrangements for carrying out air borne dust survey in each mine.

In view of the above, an exclusive scheme for conducting air-borne dust survey in coal mines has been prepared by a committee consisting experts from Indian School of Mines, Central Mining Research Institute and this Directorate. The guideline is enclosed hereby in the appendix.

This is being brought to the notice of all concerned for ensuring effective compliance, as regards to conduct of air borne dust survey in coal mines.

Appendix

Guidelines for conducting air-borne dust surveys in coal mines

This guideline covers all installations of coal mines under the purview of Mines Act, 1952.

1.0 Instrument & Accessories:

1.1 Sampling instruments:

As stipulated under Reg.123(2) of CMR, 1957, sampling of air is to be done by a gravimetric dust sampler of a type approved by Chief Inspector of Mines (CIM). For this purpose the Gravimetric Dust Sampler type MRE 113A manufactured by Casella London Ltd., has been approved by CIM subject to the conditions as mentioned in the DGMS Circular No.Approval 1/1990. This instrument follows the British Medical Research Council (BMRC) cut-off curve for respirable portion of air-borne dust, which was approved by the Johannesburg Conference on, Pneumoconiosis (1959), which simulates the human respiratory system. Any other instrument, not following the BMRC Curve, may be used only with approval from CIM and the conversion factor to obtain the equivalent Mining Research Council (MRE) concentration is to be determined in a manner approved by CIM. Personal dust samplers of an approved type may be used for assessing the exposure of any category of workers to the risk from inhalation of mine dust.

1.2 Weighing Balance:

The balance to be used for measuring the weight of dust filters before and after sampling should be very sensitive and capable of weighing up to one tenth of a milligram and is to be maintained properly.

1.3 Calibration:

The sampling instrument and the balance shall be calibrated as per manufacturer's instructions but on a date, which is not later than one year.

Adequate number of approved type dust sampling instruments and accessories should be maintained in a mine or a group of mines so that the requirement of dust survey as required under Reg.123 of CMR, 1957 can be fulfilled.

2.0 Laboratory for determining dust content:

As required under Reg.123(3)(d) of CMR, 1957, respirable dust content or the Quartz content shall be determined within 14 days of collection of the dust sample at a laboratory approved in writing by CIM for the purpose. Central Fuel Research Institute Laboratory, Dhanbad has been approved for determination of Quartz content in air borne dust samples vide DGMS Circular No.Approval 2/1993.

Determination of quartz content shall be made at least once for each seam being worked in the mine or when there is a substantial change in the coal property.

3.0 Air-borne Dust Survey Incharge:

Air-borne dust survey in a mine shall be conducted by suitable persons, designated as Air Borne Dust Survey Incharge, in a manner specified in the Reg.123 of CMR, 1957 and the provisions of the guidelines. Manager of every mine shall appoint Air Borne Dust Survey Incharge assisted by suitable number of trained Dust Survey Assistant, if required, having the minimum qualification and experience as mentioned below and trained as per the training schedule given below for the purpose of carrying out air-borne dust survey in the mine.

3.1 Minimum Qualification: Holder of Overman's Certificate of Competency (Coal)

3.2 Experience: Minimum of 3 years as Overman of which minimum one year in that mine.

3.3 Training of Air borne dust survey incharge.

3.3.1 Training Course: The course for the training of air borne dust survey incharges should cover, among others, the following major subjects or areas:

- Detailed procedure for conducting air borne dust survey in mines covering location and duration of sampling, types of sampling and instruments/accessories used for survey.
- Details about the checking and calibration of the instruments and operation of the instruments.
- Method of determination of air borne dust concentration including method of weighing filter papers, collection of dust.
- "Permissible Limit" and other statutory provisions regarding air borne dust survey in mines.
- Various dust content measures.

4.0 Sampling procedure

4.1 Places to be samples:

4.1.1 General: As required under Reg.123(3)(a)&(c) of Coal Mines Regulations, 1957, all the work places in a mine, where respirable dust is evolved, shall require to be sampled to ascertain the air borne dust concentration of that area and the dust exposure profile for different categories of work persons working in that area.

In view of the above, Manager of every mine shall identify such places in the mine and mine air of that area shall be sampled by “static sampling” method by a fixed type sampling instrument. This shall be cross checked by measuring the dust exposure of selected workers, whose exposure is deemed to be representative of their groups, by “portal personal monitoring” by using personal dust samplers.

4.1.2 Fixed point or static sampling for underground working.

The following places shall be sampled by fixed type samplers or static samplers:

(a) For B&P or R&P workings: The sampler shall be positioned on the return side of the point of dust generation (and within 1 m. of the normal working position of but not behind the operator or worker) in the following places:

- i. Within 30 m. outbye of the first working faces in the intake side of the district.
- ii. 30m outbye of the last working face in the return side of the district.
- iii. Working faces
- iv. Loading/Unloading/Transfer points
- v. Bunkers/Chutes

(b) For Longwall working:

- 30 m. outbye of the face in the intake air way
- 10 m from the intake end at the face
- 10 m inbye from the return end of the face
- At the centre of the face
- 30 m outbye of the face in the return air way
- Loading/Unloading/Transfer points
- Bunkers/Chutes

(c) For mechanized longwall gate roads:

- 10 m outbye of the face
- 30 m outbye of the face
- Loading/Unloading/Transfer points
- Bunkers/Chutes

4.1.3 Personal Dust Sampling for underground workings

In addition to the static sampling as above, dust exposure of following categories of persons shall be determined by personal dust sampler.

- Loaders
- Shorfirers and helpers
- Drillers/Dressers
- Operators and helpers of loading machines (SDL, LHD, Shuttle Cars, Gathering arm loaders or other mechanical loaders)
- Operators of cutter loaders (Shearer, Plough, Continuous miners, Road headers, etc.)
- Longwall face crews
- Conveyor, Bunker or chute operators

4.1.4 Fixed point or static sampling for opencast workings and other surface operations:

For fixed-point sampling in opencast workings or other surface operations, direction of air current should be kept in mind and the instrument in placed on the return side of the point of dust generation. It is suggested that more than one fixed-point sampler

shall be installed along the circumference of concentric circles of 5 m & 10 m radius around the point or equipment generating dust. The samplers shall be installed along the direction of wind or air current and the samplers may change their location during sampling with change of direction of air current.

However, in opencast workings, sampling by personal samplers is considered more reliable than sampling by fixed-point samplers.

4.1.5 Personal Dust Sampling for opencast workings and other surface operations:

Dust exposure of following categories of persons shall be determined by personal dust sampler.

1. Driller & helpers
2. Operators of excavators/loaders (Shovel, Back-hoe, Dragline, Frontend loaders).
3. Dumper & Tipper operators & helpers
4. Dozer/Grader operators & helpers
5. OHP crews, crusher operators & helpers, wagon loaders
6. Any other machine operators.

4.2 Position of samplers (Static)

Sampling with MRE or its equivalent should be carried out with the air inlet of the instrument facing the air current keeping the instrument in horizontal condition, if the velocity of air is less than 4 metre per second and perpendicular to the air current, if the velocity of air is more than 4 metre per second. The instrument shall be placed at about breathing level with normal posture of the operator and located centrally and away the side, as far as practicable. Safety of the instrument and interference of the normal work shall be kept in mind for positioning the instrument.

4.3 Frequency of dust sampling

- (a) As required under Reg.123(3)(a) of CMR, 1957, every place as mentioned above shall be sampled by fixed point samplers, at least once in every six months.

Provided that if any measurement of any work place shows the concentration in excess of 50% of the permissible limit the subsequent measurement shall be carried out at intervals not exceeding 3 months.

Provided that if any measurement of any work place shows the concentration in excess of 75% of the permissible limit the subsequent measurement shall be carried out at intervals not exceeding one month.

- (b) Such measurement shall also be carried out immediately upon the commissioning of any plant, equipment or machinery or upon the introduction of any new work practice or upon any alteration therein that is likely to bring about any substantial change in the levels of airborne respirable dust.
- (c) If respirable dust concentration exceeds the permissible limit, then the area shall be sampled again for 5 times in the next 7 successive normal working shifts according to the provision of Reg.123(4) of CMR'1957 and continue till the concentration comes within permissible limit. Once the respirable dust concentration fall to permissible limit or below, the places to be sampled as required under clause 4.3(a).

4.4 Sampling by personal dust sampler shall also be carried on along with fixed point sampling to have a cross check.

4.5 Rejection of samples

A samples shall be rejected in the following cases:

- If the instrument was not working throughout the entire shift of 8 hours.
- If duration of operation in that area including operation of the machine, which causes generation of dust, in that particular shift is less than 80% of normal duration of operation in a shift (average duration of operation of previous one month) of the area.
- In case of 'portal to portal' sampling if the person to whom the personal dust sampler is attached, does not do his normal work in that shift.

5.0 Recording of results

All results of measurements of air borne respirable dust and all the relevant particulars shall be recorded in accordance with Reg.123(3)(f) of CMR,1957.

5.1 A plan in a suitable scale should be maintained showing clearly all the places where sampling for air borne dust has been conducted. Date of last sampling should be indicated on the plan.

5.2 Results of air borne dust survey shall be maintained in the format as enclosed in Annexure I & II.

5.3 Record of respirable dust content and the Quartz content shall be maintained in the enclosed format and kept in a bund paged book.

5.4 Details of the weighing balance used shall be recorded along with sampling data.

6.0 Preservation of filter papers

The filter papers used for a particular sampling shall be preserved properly along with its serial number and date of sampling. These filter papers shall be preserved atleast for a period of 3 years and readily available to the Inspector of Mines, if so desired.

7.0 Report on Air Borne Dust Survey

After conducting the air borne dust survey as per the above guidelines a report has to be prepared giving the following details:

- i. Introduction
- ii. Methodology of dust sampling
 - (a) Sampling strategy for static sampling
 - (b) Sampling strategy for personal sampling
 - (c) Instrumentation
- iii. Observation
 - (a) Tables showing the results of air borne dust survey for static and personal sampling.
 - (b) Maximum dust concentration and Time Weighted Average (TWA) for different locations and operations.
- vi. Conclusion
- vii. Recommendations.

ANNEXURE-IRESULTS OF RESPIRABLE AIR BORNE DUST SURVEYSTATIC SAMPLED

Name of Mine:

Name of Seam:

Name of District/Panel/Section:

Balance Details.

Sl.No.

Type:

Make:

Accuracy:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sl. No.	Date	Location of sampling	Sl. No. of filter paper	Initial wt. of filter paper (mg)	Final wt. of filter paper (mg)	Diff. in wt (mg) (6) – (5)	Sampling time (min)	Flow rate of the instrument (Ltd/min)	Vol. of air (m3) $\frac{(8) \times (9)}{1000}$	Dust cons. (mg/M3) $\frac{(7)}{(10)}$	8 Hrs. TWA (Mg/M3) $\frac{(11) \times (8)}{480}$	Work Duration (min)	Remarks

ANNEXURE-II**RESULTS OF RESPIRABLE AIR BORNE DUST SURVEY****STATIC SAMPLED**

Name of Mine:

Name of Seam:

Name of District/Panel/Section:

Balance Details.

Sl.No.

Type:

Make:

Accuracy:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sl. No.	Date	Category of persons attached with sampler	Sl. No. of filter paper	Initial wt. of filter paper (mg)	Final wt. of filter paper (mg)	Diff. in wt (mg) (6) – (5)	Sampling time (min)	Flow rate of the instrument (Ltd/min)	Vol. of air (m3) $\frac{(8) \times (9)}{1000}$	Dust cons. (mg/M3) $\frac{(7)}{(10)}$	8 Hrs. TWA (Mg/M3) $\frac{(11) \times (8)}{480}$	Work Duration (min)	Remarks

No.DGMS(Tech) Circular No.2 of 2004

Dhanbad, dated 4.2.2004.

To
All Owners, Agents and Managers of Opencast Mines
Coal and Non-Coal mines.

Sub: Accidents due to tippers in Opencast Mines

Accidents due to tippers in small and medium sized opencast mines specially where the vehicles are plying over hilly terrain have considerably increased in the recent past. Enquiries into the above accidents have revealed that:

Most of the accidents took place while going down the gradient with load, in dumpers, retarders are provided to slow down the speed of the engine in such cases. In tippers, manufacturers are now providing exhaust brake as an extra fitment which on application, closes the exhaust of the engine and simultaneously the fuel systems to the engine is stopped. The engine starts behaving like compressor which reduces the engine speed considerably. Fitment of exhaust brake shall be henceforth be made mandatory in all tippers. The new tippers to be procured shall be fitted with exhaust brake and action shall be taken to fit exhaust brakes in the existing tipper within a specified time frame but not later than one year from the date of issue of the circular.

In addition, parking brake and service brake of tippers shall be maintained in safe working order as per the guideline circulated vide DGMS(Tech) Circular No.3 of 1981. The following precautions/actions shall also be taken:

- (i) While going down the gradient, driver must lower the tipper with engine 'ON' and gears be kept in maximum speed reduction stage. All drivers should be given adequate vocational training about driving in hilly areas/downhill movement.
- (ii) Management must take proper responsibility for the roadworthiness of all contractors' vehicle before deploying them in the mines.
- (iii) Ramps with 1 in 10 gradients should not be more than 10 mtrs. At one strength.
- (iv) Starting of the tipper by self-starter is mandatory. Push starting shall be totally prohibited.

I am of the opinion that the above mentioned precautions may help reduction of accidents due to tippers. Hence, the recommendation may be strictly complied with in the interest of safety.

No.DGMS(Tech) Circular No.3 of 2004

Dhanbad, dated 22.3.2004.

To
Owners, Agents, Managers of
All Coal and Non-coal Mines.

Sub: Quality of brake liner

Investigation into incidents of over-winding/rough-landing of cages in the winding system in the mines has revealed that the brakes of such winders did not functions properly due to use of substandard brake liner.

It is obvious that use of sub-standard brake liner can cause non-functioning of brakes in the haulages used widely in the mines. Therefore, brake liners conforming to the following standard shall be used in winding and haulage brake system:

1. General description and construction : Flexible, solid woven, asbestos based friction material made from yarn spun around brass wires.
2. Physical properties:
 - (a) Specific gravity – $1.65 \text{ gm/cc} \pm 0.1 \text{ gm/cc}$

- (b) Tensile strength – $246 \text{ Kg/cm}^2 \pm 4 \text{ Kg/cm}^2$
- (c) Compressive strength - $630 \text{ Kg/cm}^2 \pm 5 \text{ Kg/cm}^2$
- (d) Rivet holding capacity - $895 \text{ Kg/cm}^2 \pm 5 \text{ Kg/cm}^2$
- (e) Co-efficient of friction – $0.36 \pm .02$

- 3. Suitable for the service condition where –
 - i. Operating temperature – 260°C
 - ii. Maximum continuous temperature – 125°C

While procuring, user industry shall ensure test certificate from the manufacturers. The test certificate should mention the batch numbers of the product supplied and each brake liner roll should be marked with -

- (i) Name of the manufacturer
- (ii) Type
- (iii) Batch No.

As a quality check, user industry may insist for testing of such brake liner at any test house as agreed between the User Industry and the Manufacturer.

The above recommendations shall be complied with strictly in the interest of safety.

No.DGMS(Tech) Circular No.4 of 2004

Dhanbad, dated 11.5.2005.

To
Owners of all coal and metal mines.

Sub: Provision of Wiper cum Dust Collector Trolley at tail end drum of conveyor belt.

A number of fatal accidents take place with conveyor belt both belowground and aboveground at the tail end of the conveyor belt. The enquiry into these accidents has revealed that accidents take place primarily for the following reasons:

- 1. Non, provision of suitable guards, fences at the drive head and tail end of belt conveyor, in contravention of the provisions of Regulations 184(2)/ Regulation 174(2) of the Coal Mines Regulations/Metalliferous Mines Regulations.
- 2. Cleaning of belt and conveyor drums while the machinery is in motion in contravention of the provisions of Regulation 184(3)/174(3) of the Coal Mines Regulations/Metalliferous Mines Regulations.

Technical Circular No.11 of 1974 and No.12 of 1983 were issued for taking suitable steps to prevent occurrence of such accidents in future. However, a number of accidents at tail end of conveyors continues to occur which is a matter of concern.

As the tail end drum is accident prone, limit switch needs to be provided with a tail end guard or the fencing. When the guard or fencing is removed, the limit switch trips the main switch and the belt cannot be started. However, in most of the mines, either the limit switch is not provided or is made defunct. A wiper cum dust collecting trolley at the tail end along with an additional limit switch has been provided at the tail end of belt conveyors in a few mines of M/s. Western Coalfields Limited which is working quite satisfactorily.

The arrangement consists of a trolley prepared from half portion of 16" Dia. MS pipe which acts as a container for the dust collection. This half portion of 16" Dia. Pipe is fitted with 4 nos. of wheels for sliding along a fixed fame, located in between the carrying and return belt adjacent to tail end drum as shown in the enclosed drawing. This dust collecting container is mounted on a frame having a pivoted arrangement, with the help of which this container can be titled on either side for cleaning of dust collected inside. It has a wiper belt at the opposite side of tail end drum, which allows the dust to collect inside the container. There is a gate provided on one side of the system for taking out the trolley for cleaning purpose. This gate is attached with one limit switch, which activates for tripping off the control circuit of complete

No.DGMS(Tech) Circular No.5 of 2004

Dhanbad, dated 11.5.2004.

To
The Owner/Agent/Manager of all marble mines.

**Sub: Precautions to be observed during the operation and maintenance
Of Derrick Cranes.**

An accident occurred recently in a marble mine where a derrick crane, while lifting load, fell down into a pit, along with its operator, killing him instantly. Enquiry into this accident revealed that cracks had developed in the welded joint of jib plates of derrick crane. About 50% of the joint was found to be rusted. The plate therefore came out of the joint and crane fell down in the pit.

Fabrication of derrick cranes involves welding of structures and in due course of time cracks are likely to develop at welded joints due to fatigue and shock loads.

The enquiry further revealed that although the manufacturers had recommended that the jib should not be lowered beyond 15 degrees, this was not complied and this accident occurred when the jib was almost horizontal in the process of lifting the load.

In order to avoid similar accidents in future, you are advised to implement the following:

1. The welded joints of the structure of derrick crane should be examined by 'Diepenetration Test' method, once in atleast three months and by 'Magnetic Particles' testing method, once in a year. These tests shall be conducted by any Govt. Test house or any other DGMS approved test houses.
2. Limit switches should be provided to restrict movements of jib within the safe permissible limits.
3. While lifting the marble blocks, it should be ensured that these are not dragged along the ground, during the process of lifting by the derrick crane so as to prevent additional stress on the structure and swinging of marble blocks after lifting.

You are requested to comply with the above recommendations in the interest of safety.

No.DGMS/SOMA/(Tech) Circular No.6 of 2004

Dhanbad, dated 22.6.2004

To
The Owners, Agents and Managers of
all coal mines.

**Sub: Monsoon preparation and Precaution against danger of inundation from
surface water.**

Precautions against inrush of water into the mine or part thereof has been provided under Regulation 126(1)(a) of CMR 1957.

Identification of possible sources of danger due to surface water and remedial measures to avoid such danger was also emphasized in DGMS Tech. Circular No.2 of 1978.

In spite of above guide lines and caution letters issued from this Directorate time to time, there have been cases of inundation in underground and opencast mines, mainly because adequate precautions were not observed. It is pertinent to mention that seasonal water bodies are more dangerous than the perennial one because of sudden rise in water level due to rains in or around the catchment area and heavy current of water which cuts across the bunds and barriers deviating its normal course of water thereby flooding low lying areas including mines etc. Again it is reiterated that evolving a system is not enough, it is required to ensure that no link fails at critical moment.

Apart from ensuring the system as comprised in DGMS Cir.No. 2 of 1978 following additional arrangements shall also be made.

1. Surface cracks, pot holes and subsidence area shall be filled up and levelled; and bore holes if any shall be plugged/covered effectively.
2. Surface garland drains shall be made around the mine especially in hilly terrain and in ground sloping towards mine openings so that water flows away from the mine.
3. Water dams and pumping capacities shall be suitably enhanced to accommodate increase in seepage water.
4. Additional pumps and delivery lines of suitable capacity shall be maintained for group of mines in each area.
5. Two separate power lines shall be ensured for pumping, wherever possible Diesel Generator sets with independent power lines shall be maintained.
- 6(i) In opencast mines, wherever pontoon pump are installed, it shall be ensured that pontoons of adequate design are properly maintained.
- 6(ii) Standing order for safe operation and maintenance of pontoons and pumps shall be formed and strictly enforced.
- 6(iii) Mock rehearsals shall be held at regular interval prior to monsoon so that all concerned are familiar with the standing order.
7. Detailed precautionary measures against danger of inundation shall be laid down while working beneath or in the vicinity of rivers and surface water bodies, particularly during rainy season. The other precautions as recommended by the Gaslitand court of enquiry which were circulated vide DGMS circular No.1 and 2 of 2001 shall also be followed.

I solicit your co-operation towards effective implementation in the interest of safety of persons employed in the mines.

DGMS (Tech)(SOMA) Circular No.7 of 2004

Dhanbad, dated 15.7.2004

To
The Owners, agents and
managers of all mines.

Sub: Accident due to side fall and fall of persons in opencast mines during monsoon season.

Analysis of 288 fatal accidents that occurred in non-coal mines during last five years (1999-2003) has revealed the following:

Cause	No. of accidents	Percentage
Dumpers and trucks	74	25
Fall of persons	51	18
Side fall	46	16
Explosive	31	11
Fall of objects	13	5
Roof fall	7	2
Other	66	23

From the above, it is observed that **fall of side** and **fall of person** together accounts for 97 accidents i.e. 34% of all accidents, which occurred mostly during monsoon months. Such accidents occur mainly due to –

- (1) Non-formation of proper benches and non-maintenance of slopes, especially in overburden consisting of alluvial soil, morum, gravel, clay, debris or other similar ground.
- (2) Formation of undercuts causing overhangs.
- (3) Working near the edges of high benches without wearing safety belts.

It has been observed that during normal season high benches are stable and tolerate certain amount of under-cut. But during rainy season, specially after the first shower, the ground is likely to be soaked with rainwater. Cracks and crevices which are created by mining also get filled with water. The slope faces are subjected to high water pressure leading to collapse of side causing accidents to persons engaged at the bottom of the bench and/or persons engaged at the edge of the quarry.

The persons engaged thereat are ignorant about the dangers about the changed situation due to routine nature of job and sense of complacency and try to work in normal way ending up with accident.

In few cases loose boulders/rocks which are not cleared and kept away from the edges of the quarry have rolled over and fallen on the person engaged at the bottom of the bench. Similar is the case with those who are engaged at the edge of the high benches.

To avoid such accidents, adequate provisions have been provided under Regulation 106 of MMR, 1961 and Reg.98 of CMR, 1957, which are not generally being followed wherever such accidents have occurred. Therefore, once again it is impressed upon all concerned, of open cast coal and non-coal mines, particularly small mine operators, working in stone, marble, clay, sandstone, slate, limestone, iron ore etc. to pay adequate attention to:

- (1) Formation of proper benches as specified under Regulation 106 of MMR 1961/ 98 of CMR 1957.
- (2) Dressing and making the sides of benches secure before employing persons.
- (3) Clearing loose stones and debris lying within 3 m. from the edge of the benches.
- (4) Not allowing any persons to work at the edge of the bench/quarry without wearing a safety belt fully secured.
- (5) Not allowing any persons to do under cutting of the face/side so as to form overhang.
- (6) Caution all persons working at the quarry regarding failure of benches due to rain water and its consequences.
- (7) Construction and maintenance of garland drains around the excavation before the onset of monsoon to divert the rain water away from the pit.

It is expected that if above precautions are taken and efforts are made to ensure strict compliance of law, accidents due to side fall and fall of persons from the benches in open cast mines can be prevented.

No.DGMS(Tech) Cir.No.8 of 2004

Dhanbad, dated the 15.7.2004.

To
All Owners/Agents/Managers of all Oil Mines.

**Sub: Shot-firer's Certificate for transport, handling and use of explosives
in seismic survey and well perforation operation in oil mines.**

You are well aware that the transport, handling and use of explosives is regulated under the Explosive Rules, 1983 framed under the Explosives Act, 1884. Various types of explosives that are being used in oil mines for seismic survey and well perforation operations are also covered under these provisions. Rule 144 of the Explosives Rules, 1983 requires that "no person shall use explosives for blasting unless he employs a qualified shot-firer holding shot-firer's Permit provided that for blasting operations in mines coming under the purview of the Mines Act, 1952, such shot-firer shall have qualifications prescribed in the regulations framed under the said Act."

Representations have recently been made by ONGC that Department of Explosives have pointed out to them that since the oil mines are within the purview of the Mines Act, their officials engaged in transport, handling and use of explosives need to have shot-firer's certificate issued under the Oil Mines Regulations, 1984.

The use of explosives for well perforation is regulated under Regulation 49 of the Oil Mines Regulations, 1984 but there is presently no statutory provision to regulate issue of shot-firer's certificate under the Oil Mines Regulations.

In order to overcome this gap in legislation, it will be necessary to suitably amend the Oil Mines Regulations, 1984 and necessary action in this regard is being taken. In the interim period, you are advised to adopt the following procedure:

(1) A provisional shot-firer's certificate shall be issued to candidates who -

- Is not less than 23 years of age and is medically fit,
- Holds a valid first-aid certificate of the standard of St.John's ambulance Association (India),
- Has passed Intermediate or equivalent examination of a recognized Board or a diploma in engineering of a recognized Board,
- Have at least six month's experience and practical training in connection with use of explosives, and
- Passes an oral examination conducted by the DGMS.

(2) Application for an examination shall be made by the candidate in a form given at Annex-I and shall be forwarded by the Manager to the Director of Mines Safety concerned. Particulars of Practical Experience obtained by the candidate shall be given in the form at Annex-II. Performa for Certificate of Practical experience to be issued to the candidate by the Manager shall be in form at Annex-III.

(3) A fee of Rs.25 shall be paid in form of a Postal Order/Bank Draft payable to the Director-General of Mines Safety at Dhanbad.

No.DGMS(Tech) Circular No.9 of 2004

Dhanbad, dated 26.7.2004.

To
The Owner, Agent and manager
of all coal and non-coal mines.

Sub: Design of 'C' type coupling of 5 tonne drawbar pull.

The attachment between any two tubs in a set or train of tubs is required to be a type approved by the Chief Inspector as required under Reg.89(1)(c) of the Coal Mines Regulations, 1957/Reg.97(1)(c) of the Metalliferous Mines Regulations, 1961.

DGMS(Tech) Circular No.1 of 1986 recommended design of four types of tub couplings namely:

1. Hook coupling
2. Two shackles and pin 'R' type
3. Shackle and pin
4. 'C' type coupling

These four types of couplings conforming to DGMS(Tech) Circular No.1 of 1986 can be used in haulage system in mines and no separate DGMS approval is necessary.

Amongst the above type of couplings, 'C' type couplings are being used extensively in most of the haulage systems and there had been a feedback from the industry that the couplings are opening out under load.

In view of the above, a few fresh prototype samples were tested and it has been decided to change the dimensions of the couplings and to specify the material suitably to achieve higher factor of safety.

Henceforth the 'C' type coupling of 5 tonne capacity shall be of the following specifications:

1. Dimensions – All dimensions must conform to the enclosed drawing DGMS/'C' type coupling/011/04.
2. Material – All 'C' type couplings shall be made from 20 Ni 55 Cr 50 Mo 20 conforming to IS 4432 of 1967.
No other material shall be allowed.
3. Hardness – 250 to 280 BHN
4. Heat treatment –
The coupling after all forging and welding operations shall be hardened and tempered or normalized and tempered at suitable temperature to achieve the desired hardness.

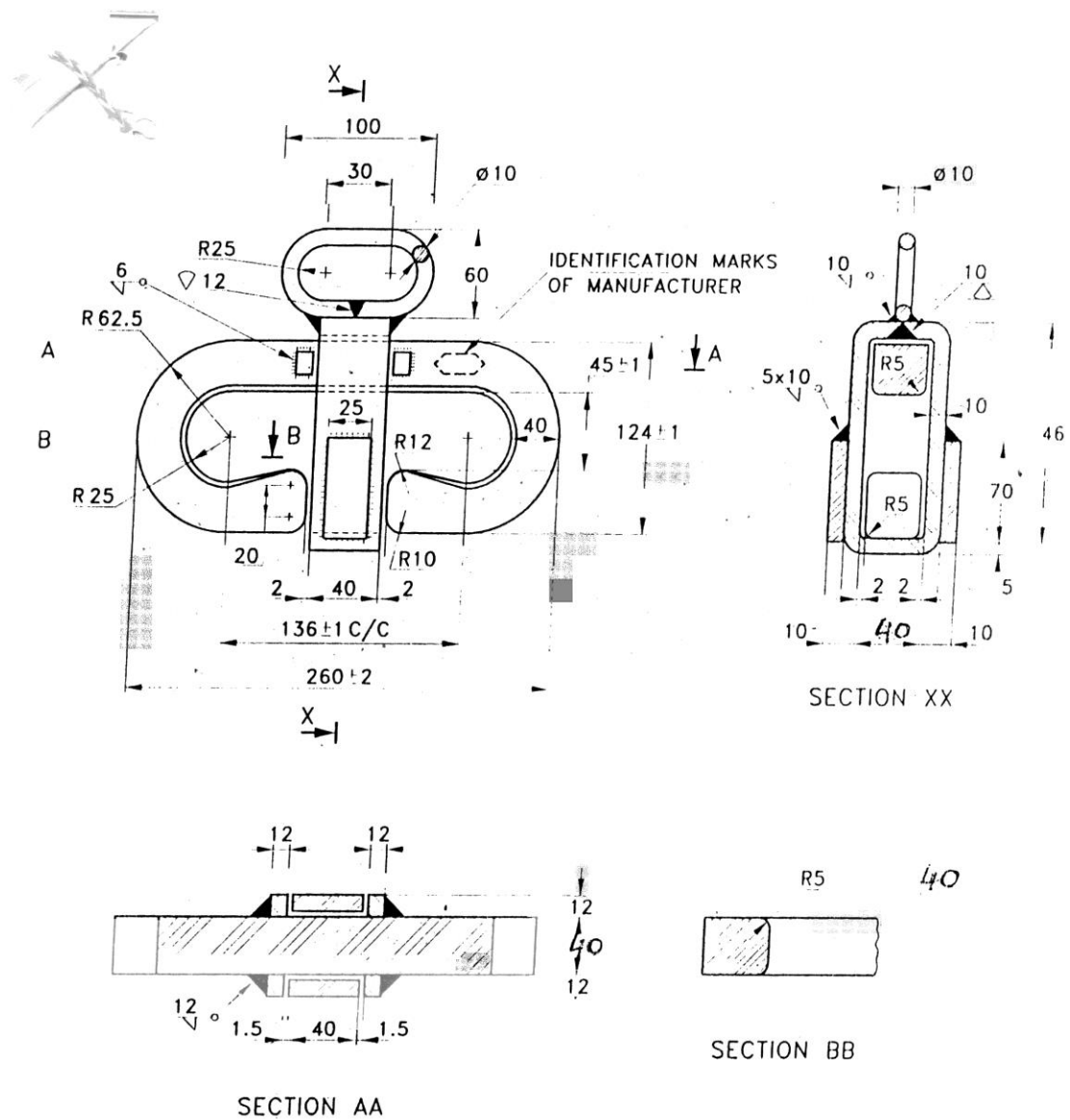
The following guideline may be followed:

Designation of steel	Normalizing °C Temp	Hardening °C Temp	Tempering °C Temp	Quenching Agent
20 Ni 55 Cr 50 Mo 20	*	820-850	*	Oil

* Suitable temperature may be adopted so as to attain the optimum properties.

All other stipulations and conditions shall be as stipulated in DGMS (Tech) Circular No.1 of 1986.

Henceforth, you are requested to use only modified design of "C" type couplings. "C" type couplings conforming to DGMS (Tech) Circular No.1 of 1986 which are already in use in the mines shall be replaced by the modified design at the earliest but not later than one year from the date of issue of this circular.



All dimensions in millimetres.

FIG. 1 'C' TYPE COUPLING

DGMS DRAWING / C TYPE COUPLING / 001

No.DGMS(Tech) Circular No.10 of 2004**Dhanbad, dated 30.7.2004.**

To
The Owners/Agents/Managers
of all coal and Metalliferous mines.

Sub: Preventing fires in Heavy Earth Moving Machineries

In the recent past there have been instances and reports of fire in HEMM. With the increase in output, use of costly and large size HEMM has become imperative. Installation of automatic fire fighting systems in such Heavy Earth Moving Machines as required by Circular No.3 of 1981 needs no emphasis.

In a recent fire incident in HEMM that took place in a heavily mechanized OC mine it was revealed that while a 35T articulated dumper was hauling load of ore from the face to the top on the haulage road, the hydraulic oil from the return hose in the engine house spilled on to the hot exhaust pipe and it caught fire. The carriage and the cabin of the dumper were burnt.

Had the oil carrying hoses in the engine house been housed separately and away from the hot parts of the engine the incident would have been averted. The costly articulated dumper met the fate because neither the oil bearing hoses were compartmentalized nor the hot parts of the engine room were insulated in a manner not to ignite oil.

To avoid/fight such fire, the following recommendations are being made:

1. This incident highlights that the oil-bearing hosepipes should be housed separately and away from the hot parts of the engine like turbocharger, exhaust and manifold. Simultaneously the hot parts of the engine should be insulated in a manner so that even if oil is spilled on them, it does not come in contact with the hot parts of the engine.
2. User Industry should also ensure that henceforth OEM of HEMM should provide proper type of automatic fire detection and suppression system (AFDSS) in all HEMM with recommendations for periodical testing procedure and maintenance schedule. In all existing shovels and dumpers for 50 tonne capacity and above, user industry must provide suitable AFDSS where OEM has not supplied AFDSS with the equipment. All AFDSS shall be maintained in safe working order in such dumpers/HEMM. Maintenance of such automatic fire detection and suppression system be carried out by the experts specially trained for the purpose.
3. In small dumpers and other HEMM like excavator etc. where OEM may not be in a position to provide automatic fire fighting arrangement with the equipment in near future, user Industry shall provide semi automatic fire fighting arrangement in such dumpers/HEMM. Such system has been locally developed by M/s. Sesa Goa Iron Ore Mines and M/s. Western Coalfields Limited by providing 4/5 discharge nozzles at the vulnerable points in the engine room of the machine using dry chemical powder propelled by Nitrogen or Carbon dioxide of system. In case of fire, the operator has to actuate a knob located near his sitting arrangement. Such semi automatic fire fighting arrangements are also available indigenously.
4. All high pressure hydraulic hose fitted in the engine room must conform to the specification as laid down by the OEM and their quality to be ensured. The hoses shall be replaced at the prescribed interval or earlier if there is any sign of deterioration.
5. User industry shall henceforth report any incident of fire in HEMM to the Regional Inspector of Mines Safety so that the matter is studied in depth to take corrective actions.

6. Although some of the manufacturers of Heavy Earth Moving Machineries have tried to cover this potent source of danger in the inherent manufacturing process, nevertheless such fires highlight the need to review from design as well as maintenance angle.

The above stipulations shall be complied strictly in the interest of Safety.

No.DGMS(Tech) Circular No.11 of 2004

Dhanbad, dated 6.8.2004

To
The Owner/Agent/Manager
Of all coal, Metalliferous and oil mines.

Sub: Intimation of accidents causing burn injuries due to electric flash/spark

It has been observed that while handling electrical apparatus, work persons are getting burn injuries due to electric flash/spark which some time turn into serious and fatal accident.

The provisions of Regulation 9 of the Coal Mines Regulations, 1957; 9 of the Metalliferous Mines Regulations, 1961 and 7 of the Oil Mines Regulations, 1984 require intimation of serious and fatal accidents due to electricity to the Electrical Inspector of Mines.

Since intimation of accident due to electrical burn has not been included in the above said Regulations intimation of the same is not sent to DGMS unless it is serious/fatal. However, it is felt that such accidents should also be enquired into to ascertain the cause of accidents for taking the remedial measures to prevent such type of accidents in future.

It is, therefore, requested that intimation of all accidents caused due to electric flash/spark in the mines be sent to the Electrical Inspector of Mines within the time stipulated under above Regulations.

No.DGMS(Legis) Circular No.1 of 2004

Dhanbad, dated 16.2.2004.

To
Owners/Agents and Managers of all Oil Mines

Notification No.16(38)79-Genl/2448 dated 5th August, 2003, published in the Gazette of India, Part-II Sec 3(i) on 16.8.2003 vide GSR 296 is reproduced below for information and taking necessary steps to comply with the requirements of the same:

“In exercise of the powers conferred on me under sub-regulation (1) of Regulation 73 of Oil Mines Regulations, 1984, I, Ravindra Sharma, Chief Inspector of Mines also designated as Director-General of Mines Safety hereby declare 1st September, 2003 as the date from which all type of gas detectors to be used Oil Mines will be of such types standard and make as approved by me by a general or special order in writing.”

No.DGMS(Legis) Circular No.2 of 2004

Dhanbad, dated 21.4.2004.

To
All Owners, Agents and Managers.

Sub: Amendment to Regulations 15(2), 15(3), 16(1) & 16(2) of the Metalliferous Mines Regulations, 1961

1. The provisions of Regulations 15(2), 15(3), 16(1) & 16(2) of the Metalliferous Mines Regulations, 1961 relating to qualifications and practical experience of candidates for certificates granted by the Board have been amended vide Government of India Notification No.GSR 823(E) dated 5th November, 2001 published in the Gazette of India, Extra-ordinary Part II, Section 3(i) of even date. The provisions of these amended regulations have come into effect from the date of their publication as

indicated above (i.e. 5th November, 2001) with certain relaxations for three years from coming into force of these amendments (i.e. upto 5th November, 2004).

2. Amended provisions of these regulations are reproduced below:

Regulation 15(2)

No person shall be admitted as a candidate to any examination for Manager's, Surveyor's, Foreman's Certificate unless he has passed the "Senior Secondary School Examination or Intermediate Examination or its equivalent from a recognized Board or University or Diploma in Engineering or Degree in Mining Engineering or other equivalent qualifications approved in that behalf by the Central Government" and for Mate's, Engine-driver's or Blaster's Certificate unless he satisfies the Board that he is literate:

"Provided that nothing in this sub-regulation shall be deemed to debar a person, not satisfying the provisions thereof, from being admitted at any of the aforesaid examinations from the date of commencement of the Metalliferous Mines (Amendment) Regulations, 2001, if he had been admitted at such examinations for the said certificates before such commencement;

Provided further that nothing in this sub-regulation shall be deemed to debar a person not satisfying the provisions thereof from being admitted at any of the aforesaid examinations for the said certificates for three years from the date of commencement of the Metalliferous Mines (Amendment) Regulations, 2001 including the date of such commencement."

Regulation 15(3): Omitted

Regulation 16. Practical experience of candidates for Manager's examination.

(1) No persons shall be admitted as a candidate at any examination for a First or Second Class Manager's Certificate (other than an Exchange Certificate to which the provisions of regulations 22 apply) unless he has satisfied the Board that he has had practical experience in a Metalliferous Mine for a period of not less than six and five years respectively:

"provided that, -

- (a) in the case of a candidate who has received a Diploma in Mining or Mining Engineering or other equivalent qualification approved in that behalf by the Central Government, such period shall be reduced to "five" and "four" years, respectively.
- (b) In case of a candidate who has received a Degree in Mining Engineering or other equivalent qualification approved in that behalf by the Central Government, such period shall be reduced to "two" and "one" years, respectively; and
- (c) In case of a candidate who has received a degree in Applied Geology, Civil, Mechanical or Electrical Engineering or other equivalent qualifications approved in that behalf by the Central Government, such period shall be reduced to "four" and "two and half" years, respectively.

Provided further that each of the aforementioned periods of practical experiences shall have been obtained after receiving the requisite Diploma, Degree or other equivalent qualification, as the case may be"

(2) The nature of the practical experience required of a candidate for Manager's Certificate shall be approved by the Board and gained in one of the following capacities in a Metalliferous mine having an average employment of not less than 60

in workings belowground or not less than 160 in all in the mine [or in such other mines] as the Board may approve in this behalf.

No.DGMS(Legis) Circular No.3 of 2004

Dhanbad, dated 21.4.2004

To

All Owners, Agents and Managers.

Sub: Amendment to Regulations 15(2), 16(1), (2) & 21(1) of the Coal Mines Regulations, 1957

- 1.0 The provisions of Regulation 15(2), 16(1),(2) and 21(1) of the Coal Mines Regulations, 1957 relating to qualifications and practical experience of experience of candidates for certificates granted by Board have been amended vide Government of India Notification No.GSR 824(E) dated 5th November, 2001 published in the Gazette of India, Extraordinary Part-II, Section 3(i) of even date. The provisions of these amended regulations have come into effect from the date of their publication as indicated above (i.e. 5th November, 2001) with certain relaxation's for three years from coming into force of these amendments (i.e. upto 5th November, 2004).
- 2.0 Amended provisions of the Regulations are reproduced below:

Regulation 15(2):

No person shall be admitted as a candidate to any examination for Manager's, Surveyor's, Overman's or Sirdar's Certificate unless he has passed the "Senior Secondary School Examination or Intermediate Examination or its equivalent from a recognized Board or University or passed a diploma in Engineering or Degree in Mining Engineering or other equivalent qualifications approved in that behalf by the Central Government" and for an Engine-Driver's or Shotfirer's Certificate unless he satisfies the Board and he is literate:

Provided that nothing in this sub-regulation shall be deemed to debar a person not satisfying the provisions thereof from being admitted at an examination for "any of these certificates for three years from coming into force of the Coal Mines (Amendment) Regulations, 2001", if he had been admitted at an examination for the said certificate earlier.

Regulation 16: Practical experience of candidates for manager's examination –

(1) No person shall be admitted as a candidate at any examination for a First or Second Class Manager's Certificate 'other than an exchange certificate to which the provisions of regulation 21 apply' unless the Board is satisfied that he has had practical experience in coal mine for a period of not less than six and five years respectively.

"Provided that a candidate:

- (a) who has received a diploma in mining or mining engineering or other equivalent qualification approved in that behalf by the Central Government, such period shall be reduced to five and four years respectively, and
- (b) who has passed a degree in mining engineering or other equivalent qualification approved in that behalf by the Central Government, such period shall be reduced to two and one year respectively,

Provided further that aforementioned period of experiences mentioned in the above shall be obtained after acquiring the relevant academic qualifications".

(2) The nature of the practical experience required of a candidate for a Manager's Certificate shall be experience approved by the Board gained in workings belowground in one or other of the following capacities in a coal mine having an average monthly output of not less than 1,000 [tones] –

- (a) as a workman, or a mining apprentice having direct practical experience of getting coal and stone work, timbering and repairing; or
- (b) as an underground official.

Provided that the Board may approve a part of the period of practical experience which has been obtained in any of the aforementioned capacities in an open cast mine or in a mine other than a coal mine or in any mine which is under development, or part of the period of the experience gained while engaged in inspection, rescue, research, planning or any other work, connected with mining operations, upto a period not exceeding 'six months' in case of Second Class and 'one year' in case of First Class Manager's Certificate.

Regulation 21: Exchange Certificates –

(1) The Board may grant to any person, holding a Manager's, Surveyor's, Engine-Driver's, Foreman's, Mate's or Blaster's certificate granted under any law for the regulation of mines in force in any other country or under the Metalliferous Mines Regulations made under this Act, a corresponding certificate of similar class under these regulations if he possesses such 'qualification', experience and passes such examination as the Board may stipulate.

The amended portions of Regulations have been highlighted.

You are requested to give wide publicity amongst all the persons working in your area for information and compliance.

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DGMS

APPENDIX-VI

NOTIFICATIONS & CIRCULARS

Notifications – 2005

New Delhi the 25th January, 2005

S.O.91(E) – In exercise of the powers conferred by sub-regulations (1), (2), (3) and (4) of Regulation 11 of the Metalliferous Mines Regulations, 1961 and in supersession of the notification of the Government of India in the then Ministry of Labour number S.O. 450(E) dated 22nd May, 2001, the Central government hereby constitutes the Board of Mining Examinations and appoint the following persons as members of that Board for a period of three years from date of publication of this notification, namely –

1.	Chief Inspector of Mines (Since designated as Director-General of Mines Safety)	Chairman (Ex-Officio)
2.	Prof. Dr. Sovind Bihari Srivastava, Professor of Mining Engineering, Indian School of Mines, Dhanbad-826001	Member
3.	Shri Bhashyakarla Ramesh Kumar, Chairman-cum-Managing Director, National Mineral Development Corporation Ltd, Khanij Bhawan, 10-3-311/A, Masab Tank, Hyderabad -500028	Member
4.	Shri Ramendra Gupta, Chairman and Managing Director, Uranium Corporation of India Ltd., P.O. Jaduguda Mines, Dist. Singhbhum (East), Jharkhand	Member
5.	Shri Kan Singh Choudhary, Additional Executive Director (Mining Operation), Hindustan Zinc Ltd, Yashad Bhawan, Udaipur – 313004	Member
6.	Shri Paidi Mahipal Reddy, Chairman and Managing Director, Manganese Ore India Limited, 3, Mount Road Extension, Nagpur	Member

[F.No.S-66012/1/2004/ISH.I]
K. Chandramouli, Joint Secretary

New Delhi the 17th October, 2005

S.O. 1494(E) – Whereas an accident has occurred in the colliery of M/s. Central Coalfields Limited, more particularly in the Central Saunda Colliery in Hazaribagh District of Jharkhand State, on 15th June, 2005 (III shift of 14th June, 2005) causing loss of lives.

And whereas the Central Government is of the opinion that a formal inquiry into the causes and the circumstances attending the accidents ought to be held.

Now, therefore, in exercise of the powers conferred by sub-section (1) of Section 24 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Dr. PD Shenoy, former Secretary, Ministry of Labour and Employment to hold such inquiry and present a report within a period of three months. The Central Government also appoints the following persons as assessors in holding of the inquiry, namely:

- (1) Shri R. Sharma, Ex-Director-General of Mines Safety, Dhanbad.
- (2) Shri Rajendra Prasad Singh, President, Rashtriya Colliery Mazdoor Sangh.

[F.No.N-11012/1/2005-ISH.II]
K. Chandramouli, Joint Secretary

New Delhi the 26th October, 2005

S.O. 1536(E) – Whereas the Government of India in the Ministry of Labour and Employment in their notification No.S.O.108(E) dated 21.1.2004 appointed Justice Bilal Nazki, Judge, High Court of Andhra Pradesh to hold a formal inquiry into the causes and circumstances attending the accident and to fix responsibility for the causes leading to the accident that occurred on 17th October, 2003 in the collieries of M/s. Singareni Collieries Company Limited more particularly in the Godavarikhani No.8A Mine of Ramagundam Region in District Karimnagar of Andhra Pradesh State causing loss of lives and present a report within a period of three months. The duration of the enquiry was last extended upto 20.10.2005.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of six months from 21st October, 2005 to 20th April, 2006 or till the day/date on which the report of the inquiry is submitted, whichever is earlier. Accordingly the period of appointment of Justice Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri A.K. Rudra, Ex-Director-General of Mines Safety and Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a further period of six months i.e. upto 20th April, 2006 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

[F.No.N-11012/7/2003-ISH.II]
K. Chadramouli, Joint Secretary

New Delhi the 30th December, 2005

S.O. 1845(E) – This is to certify that, in exercise of the powers conferred by Section 84(1) of the Mines Act, 1952 (35 of 1952), the Central Government have decided to rescind the certificate issued earlier vide Notification No.S-29014/5/82-MI dated 4.1.1985, and to say that the pellet plant, filtration plant and connected facilities of Kudremukh Iron Ore Mine at Mangalore in the State of Karnataka are no longer a mine within the meaning of the Mines Act, 1952, subject to the condition that the iron ore produced at Kudremukh Iron Mine will not be used as ore for filtration/pelletization at the plant.

[F.No.S-29016/1/2005-ISH.II]
K. M. Sahni, Secretary.

Circulars – 2005

No.DGMS(Tech) Circular No.1 of 2005

Dhanbad, dated 3.1.2005.

To
The Owners, Agents and Managers
of all Coal Mines and Oil Mines.

Sub: Electric Motors with Aluminium Die Cast Rotors.

While interacting with the manufactures of electric motors it has come to the notice of this Directorate that now a day with advancement of technology electric motors are being manufactured with Aluminium Die Cast Rotors. The Aluminium Die Cast Rotors are housed in a steel enclosure both for flameproof and non-flameproof motors. The use of electric motor with Aluminium Die Cast Rotor may not cause any danger so long the rotor is inside the steel structure of the motor but if the Aluminium Die Cast Rotor is dismantled, assembled or exposed to explosive gas atmospheres this may cause danger, due to incensive sparking.

It is, therefore, required to take adequate precaution and not to dismantle, assemble or expose the Aluminium Die Cast Rotor of a motor in the explosive gas atmosphere in underground coal mines and hazardous areas in oil mines to prevent incensive sparking.

No.DGMS(Tech) Circular No.2 of 2005

Dhanbad, dated 27.1.2005.

To
All Owners, Agents and Managers of Mines

Sub: Use of mobile phones and two-way radio transmitters during charging of explosives and infilling stations.

There can be substantial risk of premature firing of detonators and explosives from transmitted radio frequency (RF) energy and precautions are necessary against it. The common source of hazardous radio frequency (RF) transmission includes inter-alia mobile citizen band (CB) or side band radio transmitters, VHF (FM) radio transmission, VHF cellular telephones and radar transmitters.

In our country cellular telephones are widely being used, including the mine sites. It has been observed that even during charging and preparation of explosives in opencast workings cellular telephones and two-way transmitters are used for communication. There is, therefore, risk of accidental firing of explosives with serious consequences.

Similar type of risk exists while using cellular telephones and two-way transmitters in fuel oil filling stations in the mines.

Therefore, in the interest of safety, I request you to restrict the use of cellular phones and two-way transmitters while handling the explosives including preparing and charging of the same and in fuel filling stations in the mines under your control.

No.DGMS(Tech) Circular No.3 of 2005

Dhanbad, dated 4.3.2005.

To
Owners, Agents and Managers of all belowground mines.

Sub: Use and maintenance of Cap Lamps

The statute requires that every person employed belowground shall be provided with a light or lamp adequate to enable him to perform his duties in a proper and thorough manner. Accordingly the mining companies are providing cap lamps to each worker employed in belowground workings.

Some of the recent inspections of the cap lamp rooms had shown serious shortcomings in the upkeep and maintenance of such lamps in the following areas:

A. 102 type Static Charger -

1. The Charging Voltmeters (D-7.5V D.C.) were found defective.
2. A separate earthing system is required for the cap lamp room, and all the metallic body of the charger is required to be earthed. However, most of the cap lamp rooms did not have this system.
3. The required output voltage for charging (5.1 V) was not available in most of the transformers/chargers as many were old and require overhauling.
4. The cap lamp room staff did not adjust the charging voltage to take care of the voltage fluctuation.

B. 102 Type Charging Frame –

Most of the charging frames were more than 25 years old and required replacement due to the following defects:

1. Wooden planks were damaged
2. Charge indicates meters were out of order. In many cases the meters did not show any reading at all.
3. Charging contacts were worn-out.

C. Cap Lamp.

1. In most of the cap lamp the cap lamps were not provided with original fuse made of silver wire. In some cases it was observed that locally made fused and ordinary copper wires were used as fuse which is very dangerous as the silver wire fuse is the main safety feature of the Cap Lamp assembly.
2. The length of the cable was less than 1.5 meter making it extremely difficult to use while working.
3. Due to shortage of the lamps some of the lamps were being issued in two shifts in a day without proper charging which is against the recommendations of the manufacturer.
4. Proper sealing at three places as per manufacturer's recommendation (Head Piece Moulding, Lock Pin, Lock Clamp & Bush assembly and securing nut) which is an important safety feature was not being provided.
5. Regular inspection of the Cap lamp rooms were not being carried out by the controlling officers.
6. Spare parts in sufficient quantity and of standard quality were not available in the lamp rooms.

D. Cap lamp room staff

1. It was observed that within 2/3 years most of the trained cap lamp incharge/fitters will retire from service. It is needless to say that the new staff should be developed and trained to replace them for which the manufacturer can organize training on maintenance, testing and issue certificate to trained staff.

E. Lamp Cabin

Most of the lamp cabins were in a bad shape, particularly in terms of sufficiency of light and ventilation and equipped with inadequate tools/testing devices for maintenance.

Cap lamps are the vital equipment for the persons working belowground. Proper maintenance and charging at a proper voltage of the same will definitely enhance the life of the lamp and safety of the persons working belowground. The matter is brought to your notice so that adequate corrective measures can be taken and availability of lamps is ensured in the mine for use of the persons working belowground mines.

No.DGMS(Tech) Circular No.4 of 2005

Dhanbad, dated 18.5.2005.

To
Owners, Agents & Managers of all belowground coal mines.

Sub: Recommendations of Godavarikhani No.7(LEP) Court of Inquiry.

The Court of Inquiry appointed under Section 24 of the Mines Act, 1952 to inquire into the causes and circumstances attending the accident that occurred in Godavarikhani No.7 (LEP) Colliery of M/s. Singareni Collieries Co. Ltd on 16th June, 2003 causing loss of 17 lives due to inundation, had made, inter-alia, the following recommendations:

1. "As it is not possible to check the efficacy of stowing once the mouth of a gallery or mouth of a district is filled with sand, it is essential to devise a system to ensure proper effective stowing and fix the accountability. It is recommended that the Assistant Manager and Overman apart from the Surveyors, should record the actual amount of void filled up together with the efficacy of the stowing. When stowing in a district is completed, the Asstt. Manager and Manager should certify in writing the actual status of stowing in the district. The volume of sand stowed in should invariably be recorded at the time of closing the District.
2. Before starting a new district, clearance from the Internal Safety Organisation must be taken in writing by the local mine management.
3. Detailed planning for production in different districts must be done at corporate level and projections given should not be altered at the mine level.
4. Owners must monitor important safety functions including stowing in district at regular intervals.
5. Safety in mine is a very complex phenomenon and support from the highest quarter is needed for implementation of safety measures in the mines. If the person with the maximum power does not have the highest responsibility for safety, there is always a possibility of miscued stress on the production, sometimes at the cost of safety. So it is recommended that the Chief Executive of the company should be nominated as the owner under Section 76 of the Mines Act, 1952.
6. Key personnel in the mines like agents, managers and surveyors, who have a strong bearing on the safety in mine should not be transferred frequently. Before positing such key personnel due diligence should be undertaken to ascertain the suitability of the persons for the post, so that they do not have to be transferred after a short time except on rare occasions.
7. During our deliberations we were of the view that information technology could be used for efficiency, increasing production and also mine safety. But we are of the view that this is altogether a different subject, a different subject, although we are convinced that information technology can be used for mine safety, but it needs a detail study and experts need to be granted into a study team, which could study the subject Singareni Collieries are being operated by adjoining the old age methods of mining almost 100 years and there are not significant changes either in management or in mining. Information technology is being used successfully in every field. Therefore we have no doubt in our mind that a proper information technology is used, mine would be much safer."

Proper implementation of this recommendation can bring about definite improvement in the safety standards in the mines, especially against the danger of inundation.

You are requested to take suitable steps to implement the above mentioned recommendations of the Godavarikhani No.7(LEP) Court of Inquiry in all mines under your control.

No.DGMS(Tech) Circular No.5 of 2005

Dhanbad, dated 21.6.2005

To
All Owners/Agents/Managers of all mines.

Sub: Use of approved type of fuel in Velox – GL 7 and GL 50 Safety Lamps

Velox-GL7 and GL 50 flame safety lamps manufactured by M/s. JK Dey and Sons have been approved by DGMS for detection and measurement of inflammable gas and deficiency of oxygen in mine atmosphere. One of the conditions of approval is that no fuel other than ESSO Solvent BP 1425 or its equivalent or motor spirit shall be used in the lamp.

It has been observed in most of the mines kerosene oil is being used as fuel in the lamp leading into poor flame which can lead to error in detection of gas. With use of ESSO Solvent BP 1425, or its equivalent or motor spirit, instead of kerosene:

- (i) a steady flame is observed;
- (ii) testing flame can be easily seen;
- (iii) length of flame varies sharply with varying percentage of inflammable gas; and
- (iv) as the fuel is highly volatile with low flash point and less viscosity the relighting mechanism of GL 7 lamp works smoothly.

Use of kerosene oil as fuel also causes the cotton absorbent inside the oil vessel of flame safety lamp to solidify within a year or so making it inactive to absorb any further oil which result in spillage of oil, low duration of flame and improper formation of testing flame. A steady flame is not formed and the flame gets extinguished with slight jerk, the oil vessel becomes hot, and the gas cap may not be formed at all.

A study was also carried out in CMRI, Dhanbad with three types of fuel namely ESSO solvent 1425, petrol and kerosene. The report also confirms that the length of the blue flame in different percentage of inflammable gas is least when kerosene is used.

Therefore may I request all concerned not to use any fuel other than ESSO Solvent BP 1425 or its equivalent or motor spirit in the Velox-GL7 and GL 50 Safety lamps for effective functioning of the flame safety lamps in mines.

No.DGMS(Tech) Circular No.6 of 2005

Dhanbad, dated 8.8.2005

To
The Owner, Agent and Manager
of all Mines and Oil Fields.

Sub: System of earthing in Power Supply System for underground mines and Oil fields.

You were aware that Rule 116(1) of the Indian Electricity Rules, 1956 amended in the following manner:

“In the interest of safety, appropriate equipment shall be suitably placed in the mines for automatically disconnecting supply to any part of the system where a fault including an earth fault occurs. Fault current shall not be more than 750 milliamps in 550/1100 volt systems for underground oil fields and 50 amps in 3.3 KV/6.6 KV systems in open cast mines. The magnitude of the earth fault current shall be limited to these specified values by employing suitably designed, restricted neutral system of power supply.”

The matter had been brought to the notice of all concerned through DGMS(Tech) Circular No.9 dated 20.9.2001.

From time to time doubts had been raised about the applicability of this Rule to installations with voltage other than 550V and places of its applicability. This is to clarify that the Rule 116(1) of the Indian Electricity Rules, 1956 is applicable to all electrical installations of medium voltage and 1100 voltage used in underground mines and hazardous areas of oil mines as defined in Regulation 74 of the Oil Mines Regulations, 1984.

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NOTIFICATIONS & CIRCULARS

Notifications – 2006

New Delhi, the 19th January, 2006

S.O.57(E) – Whereas the Government of India in the Ministry of Labour and Employment in their notification No.S.O.1494(E) dated 17th October, 2005 appointed Dr. P.D. Shenoy, former Secretary, Ministry of Labour and Employment to hold a formal inquiry into the causes and circumstances attending the accident and to fix responsibility for the causes leading to the accident that occurred on 15th June, 2005 in the collieries of M/s. Central Coalfields Limited, more particularly in the Central Saunda Colliery in Hazaribagh District of Jharkhand State, causing loss of lives and present a report within a period of three months. The duration of the enquiry was upto 16.1.2006 which was extended upto 16.4.2006.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 17th January, 2006 to 16th April, 2006 or till the day/date on which the report of the Inquiry is submitted, whichever is earlier. Accordingly the period of appointment of Chairman, Dr. P.D. Shenoy to conduct the inquiry and present the report and the period of appointment of Shri R. Sharma, Ex-Director-General of Mines Safety and Shri Rajendra Prasad Singh, President, Rashtriya Colliery Mazdoor Sangh, as assessors is also extended for a further period of three months, i.e. upto 16th April, 2006 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

Dhanbad, the 20th March, 2006

GSR 73 – In exercise of the powers conferred on me under Sub-Regulation (2) of Regulation 75 of the Oil Mines Regulations, 1984 and in supersession of the Notification GSR 192 dated 16th April, 1992 published in the Gazette of India on 2nd May, 1992, I, B. Bhattacharjee, Chief Inspector of Mines (also designated as Director-General of Mines Safety) hereby required that only the electrical apparatus, appliances, equipment, machinery and cables as specified in column 2 of the Table below with the type of protection specified against each in column 3 shall be used in hazardous areas of Oil Mines specified in column 1, and the same shall be of such type, standard and make as approved by me by a general or special order in writing.

TABLE

Electrical apparatus, appliances, equipment, machinery and cables for explosive gas atmospheres with type of protection for use in Zone 1 and Zone 2 hazardous areas of Oil Mines.

Hazardous Area	Electrical apparatus, appliance, equipment, machinery and cables for explosive gas atmospheres	Type of protection
1	2	3
Zone 1 and Zone 2	(A) Electrical Apparatus (a) Intrinsically safe circuits and apparatus category 'i' and 'i'.	(a) Intrinsic safety 'i' IS:5780:2002 (b) Flame proof enclosures "d" IS 2148:2004 (c) Pressurized enclosures "p" IS 7389:2004 (d) Type of protection "q" IS 7724:2004
	(B) Cables All cables including flexible	Only copper conductor cable

	cables and control cables used for high, medium and low voltage electrical system.	manufactured as per the latest edition of the relevant Indian Standards shall be used in Zone 1 and Zone 2 hazardous areas of oil mines.
	(C) Electrical Apparatus (e) Increased Safety apparatus with additional features as far as lighting fittings are concerned. (f) Non-sparking Apparatus (g) Oil Immersed Apparatus.	(e) Increased safety "e" IS 6381:2004 (f) Type of Protection "n" OS 8289: 1976 (g) Oil immersion "o" IS 7693:2004

New Delhi, the 3rd April, 2006

S.O. 483(E) – Whereas the Government of India in the Ministry of Labour & Employment in their notification No.S.O.1494(E) dated 17th October, 2005 appointed Dr. PD Shenoy, Former Secretary, Ministry of Labour and Employment to hold a formal inquiry into the causes and circumstances attending the accident that occurred on 15th June, 2005 in the collieries of M/s. Central Coalfields Limited, more particularly in the Central Saunda Colliery in Hazaribagh District of Jharkhand State, causing loss of lives and present a report within a period of three months. The duration of the enquiry was upto 16.1.2006 which was extended upto 16.4.2006.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 17th April, 2006 to 16th July, 2006 or till the day/date on which the report of the Inquiry is submitted, whichever is earlier. Accordingly the period of appointment of Chairman, Dr. P.D. Shenoy to conduct the inquiry and present the report and the period of appointment of Shri R. Sharma, Ex-Director-General of Mines Safety and Shri Rajendra Prasad Singh, President, Rashtriya Colliery Mazdoor Sangh, as assessors is also extended for a further period of three months, i.e. upto 16th July, 2006 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

[F.No.N-11012/1/2005-ISH.II]
K. Chandramouli, Joint Secretary

New Delhi, the 10th April, 2006

S.O. 522(E) – In exercise of the powers conferred by Section 5 of the Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Fund Act, 1976 (61 of 1976) read with sub-rule 3, sub-rule (1)(a) and (2) of rule 4 and rule 16 of the Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Fund Rules, 1978, the Central Government hereby constitutes an Advisory Committee and appoints the following persons to the said Committee for the State of Goa to advise the Central Government on the matters arising out of the administration of the aforesaid Act, including matters relating to the application of the Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Fund, for a period of three years from the date of publication of this notification in the Official Gazette, namely:-

1. Minister for Labour, Government of Goa, Secretariat, Porvorim-Goa	Chairman
2. Welfare Commissioner, Government of India, Nagpur	Vice-Chairman (Ex-officio)
3. Regional Labour Commissioner (Central), Mumbai	Member (Ex-Officio) Central Government Representative
4. Director, Mines Safety, Directorate of Mines Safety, Goa Region, Margao, Goa	Member (Ex-officio) Central Government

5. Shri Aleixo Sequeira, MLA (Loutolim), Near Raicho Ambo, Raia Salcete, Goa

Representative
Member of the
Legislative Assembly

Representative of Employers':

6. Shri Shivanand Salgaonkar, M/s. VM Salgaonkar and Bros., Vasco-da-Gama, Goa
7. Shri Vijay Chowgule, M/s. Chowgule and Company Ltd., Chowgule House, Mormugao, Goa
8. Shri Shrinivas Dempo, M/s. Dempo Group of Companies, Campal, Panaji, Goa

Representative of Employers':

9. Shri Christopher Fonseca, Secretary, (AITUC), Goa Mining Labour Welfare Union, Velho's Building, 2nd Floor, Panaji, Goa
10. Shri P. Gaonkar (BMS), General Secretary, Gomantak Mazdoor Sangh, Kamakshi Krupa, Khadpabandh, Ponda, Goa.
11. Dr (Mrs.) Luiza Pereira, Secretary (CITU), All Goa, General Employer's Union, Post Box No.90, Vasco-da-Gama, Goa
12. Assistant Welfare Commissioner, Labour Welfare Organisation, Goa.

Secretary.

2. The Headquarters of the said Advisory Committee shall be at Panaji.

[No.U-19012/7/2005-W.II(C)]

Manohar Lal, Director-General (Labour Welfare)/Joint Secretary.

New Delhi, the 26th April, 2006

No.S.O.615(E) – whereas the Government of India in the Ministry of Labour and Employment in their notification No.S.O. 108(E) dated 21.1.2004 appointed Justice Bilal Nazki, Judge, High Court of Andhra to hold a formal inquiry into the causes and circumstances attending the accident and to fix responsibility for the causes leading to the accident that occurred on 17th October, 2003 in the collieries of M/s. Singareni Collieries Company Limited, more particularly in the Godavarikhani No.8A Mine of Ramagundam Region in District Karimnagar of Andhra Pradesh State causing loss of lives and present a report within a period of six months. The duration of the enquiry was last extended upto 20.4.2006.

And whereas it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of six months from 21st April, 2006 to 20th October, 2006 or till the day/date on which the report of the Inquiry is submitted, whichever is earlier. Accordingly the period of appointment of Justice Bilal Nazki to conduct the inquiry and present the report and the period of appointment of Shri AK Rudra, Ex-Director General of Mines Safety and Shri Kamlesh Sahay, Member, Safety Board (BMS), as assessors is also extended for a further period of six months i.e. upto 20th October, 2006 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

[F.No.N-11012/7/2003-ISH.II]

J.P. Pati, Jt. Secretary.

New Delhi the 17th May, 2006

S.O. 2100 – In exercise of the powers conferred by sub-section (1) of Section 5 of Mines Act, 1952 (35 of 1952), the Central Government hereby appoints the following officers as Inspectors of Mines subordinate to the Chief Inspector of Mines, until further orders, namely:

1. Shri RT Mandekar, Deputy Director of Mines Safety (Mining)
2. Shri MK Malviya, Deputy Director of Mines Safety (Electrical)
3. Shri Madhukar Sahay, Deputy Director of Mines Safety (Electrical)

[F.No.S-29013/1/2006-ISH.II]
J.P. Pati, Joint Secretary.

New Delhi the 18th May, 2006

S.O. 778(E) – In exercise of the powers conferred by Section 12 of the Mines Act, 1952 (35 of 1952) and in supersession of the notification of the Government of India in the Ministry of Labour, number S.O. 102 (E) dated the 12th February, 1999, except as respects things done or omitted to be done before such supersession, the Central Government hereby constitutes, for the purpose of the said Act, with effect from the date of the publication of this notification in the Official Gazette, a Committee consisting of the following, namely:

1. Additional Secretary, Ministry of Labour and Employment, New Delhi (Ex-officio)	Chairman [Appointed by the Central Government under clause (a) of sub-section (1) of Section 12]
2. Chief Inspector of Mines, Directorate-General of Mines Safety, Dhanbad (Ex-officio)	Member [Appointed by the Central Government under clause (b) of sub-section (1) of Section 12]
3. Shri Deepak Jiswal, General Secretary, RCMC, P.O. North Jharkhand Collilery, District Korea-69644	Member [Appointed by the Central Government under clause (c) of sub-section (1) of Section 12].
4. Shri Ramendra Kumar, General Secretary, Indian Mine Workers Federation, C/o United Coal Workers union. P.O. Bhurkunda-825301, District. Hazaribagh, Jharkhand.	Member [Appointed by the Central Government under clause (c) of sub-section (1) of Section 12]
5. Shri VK Singh, Chairman and Managing Director, Northern Coalfields Ltd., Singrauli District, Spondhi, MP	Member [Appointed by the Central Government under clause (d) of sub-section (1) of section 12]
6. Shri Ramesh Kumar, Chairman and Managing Director, National Mineral Development Corporation Limited, Khanij Bhawan, 10-3-311/A, Castle Hills, Masab Tank, Hyderabad-500028	Member [Appointed by the Central Government under clause (d) of sub-section (1) of Section 12].
7. Prof. DC Panigrahi, Department of Mining Engineering, Indian School of Mines, Dhanbad-826004, Jharkhand.	Member [Appointed by the Central Government under clause (e) of sub-section (1) of Section 12].
8. Controller General, Indian Bureau of Mines, Nagpur (Ex-officio)	Member [Appointed by the Central Government]

New Delhi, the 12th October, 2006

S.O. 1756(E) – Whereas an accident has occurred in the colliery of M/s. Bharat Coking Coal Limited, more particularly in the Bhatdee Colliery in Dhanbad District of Jharkhand State, on 6th September, 2006 causing loss of lives.

And whereas the Central Government is of the opinion that a formal inquiry into the causes and the circumstances attending the accident ought to be held.

Now, therefore, in exercise of the powers conferred by sub-section (1) of Section 24 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoint Shri PC Parakh,

former Secretary, Ministry of Coal to hold SUCH INQUIRY AND PRESENT A REPORT WITHIN A PERIOD OF THREE MONTHS. The Central Government also appoints the following persons as assessors in holding of the inquiry, namely –

- (i) Shri Ravindra Sharma, Ex-Director-General of Mines Safety, Dhanbad.
- (ii) Shri OP Lal, Ex-Minister for Mines, Bihar and Organizing Secretary, INTUC

[F.No.N-12020/1/2006/ISH.II]
S.K. Srivastava, Joint Secretary.

New Delhi, the 31st October, 2006

S.O. 1863(E) – In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri MM Sharma, Deputy Director General of Mines Safety, in the Directorate-General of Mines Safety Organisation to be the Chief Inspector of Mines for all the territories to which the said Act extends with immediate effect till the appointment of the new Director-General as per the extant Rules.

[F.No.A-32012/17/2006-ISH.II]
S.K. Srivastava, Joint Secretary

DGMS

No. DGMS(Tech) Circular No.8 of 2006

Dhanbad, dated 28.12.2006

To

The Owner, Agent and Manager of all mines and
All Manufacturers of Electrical Equipment.

Sub: Setting value of Earth Leakage/Fault relays with restricted neutral system of supply in belowground mines, oil mines and opencast mines.

1. With the amendment of sub clause 1 of Rule 116 of the Indian Electricity Rules, 1956, it is mandatory that earth fault current shall not be more than 750 milli-ampere for system voltages upto 1100 V in respect of belowground mines and oil fields and not more than 50 amperes in 3.3 KV/6/6V system in opencast mines. To limit the magnitude of earth fault current, restricted earthed neutral system of supply need to be employed.
2. By restricting the prospective earth fault current to the values mentioned above, adequate tripping ratio between the prospective earth fault current and operating value of earth leakage relay is necessary to ensure that sufficient earth fault current is available for detection, when an earth fault occurs.
3. When a cable, connected to a typical mining supply system is subjected to a two phase short circuit and earth fault, the voltage available to drive earth fault current is reduced by upto 68% particularly when the system is supplying a large motor load at the time the fault occurs. Fault current flowing to earth is not more than 110 milli-ampere in such condition.
4. Hence, to ensure operation of earth fault protection under conditions of two phase short circuit and earth fault with a large connected motor load, it is necessary to employ a tripping ratio of at least 7:1.
5. To ensure operation of earth fault protection for a ground fault of a Delta/Star transformer covering 90% of the star connected winding, a tripping ratio of 10:1 is necessary.
6. The tripping value, thus selected shall be above the system charging current. The system charging current is the fault current that will flow when one phase is faulted in an isolated neutral/free neutral system of supply.
7. Considering the above, the standard practice is to set the tripping value of all the earth leakage/fault relays between 80-100 milli-ampere for belowground and oil mine installations for a system voltage upto 1100V and between 5 to 7 amperes in 3.3KV/6/6KV system in opencast mines.
8. With the above tripping value, selective relaying cannot be achieved by increasing the operating value of upstream earth leakage/fault relays, but can only be accomplished by increasing the operating time of upstream relays. By doing so, if the tripping mechanism of the GEBs or field switches or the intermediate switchgears fails to operate, the main breaker of the transwitch unit/transformer will be tripped after a short delay.
9. It is therefore, necessary to ensure that:
 - a. Tripping value of all the earth leakage/fault current shall be set between 80 to 100 milli-ampere for belowground installations with a clearance time less than 600 millisecond for transwitch unit/transformer secondary main, less than 400 millisecond for intermediate switchgears and less than 200 millisecond for the Gate End Boxes and the switchgears controlling drills panels.

- b. Tripping value of all the earth leakage/fault relay shall be set between 80-100 milli-ampere for oil mines, with a clearance time less than 600 millisecond for the transformer secondary main, less than 400 millisecond for the switchgears controlling motor starters, and
 - c. Tripping value of all the earth leakage/fault relays shall be set between 2 to 5 amperes for opencast mines, with a clearance time less than 600 millisecond for the transformer secondary main, less than 400 millisecond for intermediate switchgears and less than 200 millisecond for the field switches.
10. Earth leakage relays incorporated with electrical apparatus used in belowground mines and oil mines for a system voltage upto 1100V, shall have current settings from 50 to 250mA having set values at 50mA, 80mA, 100mA, 150mA, 200mA and 250mA with time lag between 0 to 1 sec, in steps of 100ms.
11. Earth leakage relays for opencast mines shall be of core balance transformer operated relays having current settings between 2 to 5Amps with time lag between 0 to 1 sec in steps of 100 ms.
12. Further, neutral resistance monitoring relay shall be incorporated with every transformer/transwitch unit to prevent the shifting of restricted earthed neutral system of supply to isolated neutral system of supply, in case of resistance fails.

It is needless to mention that earth leakage relays, resistance and resistance monitoring relay shall be of high quality and subjected to relevant tests as per the relevant Indian Standard or IEC to ensure satisfactory performance.

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No. DGMS (Legis) Circular No. 1 of 2006

Dhanbad, dated 10.11.2006

To,
Owners, Agents and Managers of all mines

Subject: Notice of Occurrence of Notified disease.

Section 25(1) of the Mines Act, 1952 read with Regulation 10 of Coal Mines Regulations, 1957 and Metalliferous Mines Regulations, 1961 provides that the mine management within three days being informed give notice of Notified disease to Chief Inspection, Regional Inspector and the Inspector of Mines (Medical) and other authorities in a prescribed form (form V). Additionally Section 25(2) of Mines Act, 1952 provides that when a medical practitioner attends a person who is employed in a mine and suffering from any of the notified disease; the medical practitioner is required to inform DGMS about the person with detailed information.

Unfortunately, despite the above clear provisions of the statute regular information is not being received from many mines including those of public sector undertakings who are regularly conducting medical examination and health surveillance program for their employees. It has also been observed that even when the cases of Notified diseases are detected they are not being notified to this Directorate.

The above informations are required to take corrective action and build up a data base of the notified disease at national level. You are therefore, directed to ensure that all cases of Notified diseases detected during medical examination and health surveillance programs are reported forthwith to this Directorate.

Sd/-
(M.M. Sharma)
Chief Inspector of Mines

भारत सरकार Government of India
श्रम एवं रोजगार मंत्रालय Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय Directorate General of Mines Safety
विद्युत मुख्यालय धनबाद Electrical Head Quarter: Dhanbad

DGMS (Tech) Circular No. 1 of 2006

To,

The Owner, Agent & Manager / Installation Manager of all Coal Mines and all Oil Mines.

Sub: Use of intrinsically safe insulation tester where flammable gas exists under Rule 126 of the Indian Electricity Rules, 1956.

You are aware that insulation tester commonly called megger is extensively used in mining industries for measurement of insulation resistance of the electrical apparatus and cables in mines. It has been observed that often ordinary insulation tester is being used in belowground coal mines including near coal face and hazardous areas in oil mines. Use of ordinary insulation tester may cause open spark at the connecting leads or inside the instrument during measurement. The open spark may be incendive in nature which may ignite flammable gas, if any, present in the surrounding atmosphere.

Whereas technically there may not be any objection in use of such instrument in areas other than restricted areas of belowground coal mines and oil mines, possibility of inadvertent use in these restricted areas cannot be ruled out when the same set of instruments are used.

Therefore in the interest of safety, insulation tester used in all places in belowground coal mines irrespective of gassiness of the seam and in hazardous areas of oil mines must be intrinsically safe and approved by this Directorate.

Sd/-
(B Bhattacharjee)
Director General of Mines Safety

भारत सरकार	Government of India
श्रम एवं रोजगार मंत्रालय	Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय	Directorate General of Mines Safety
विद्युत मुख्यालय धनबाद	Electrical Head Quarter: Dhanbad

खासुमनि (तकनीकी) परिपत्र संख्या- 1 ऑफ 2006

सेवा में,
समस्त कोयला खानों,
तेल खानों के मालिक,
ऐजन्ट तथा प्रबंधक / प्रस्थापन प्रबंधक

विषय – भारतीय विद्युत नियम, 1956 के नियम 126 के तहत खानों में ज्वलनशील गैस वाले स्थानों पर आंतरिक विद्युत उष्मारोधी टेस्टर (Intrinsically Safe insulation tester) लगाने के सम्बन्ध में।

आपको ज्ञात होगा है कि विद्युत उष्मारोधी टेस्टर (Intrinsically Safe insulation tester) जिसे आमतौर पर मेगर (Megger) कहा जाता है, का व्यापक उपयोग खनन उद्योग में विद्युतीय उपकरण तथा केवल के विद्युत उष्मारोधी प्रतिरोध को मापने में किया जाता है। ऐसा देखा गया है कि, भूमिगत कोयला खानों के कोल फेस के समीप तथा तेल खानों के जोखिम वाले स्थानों में (hazardous areas) आमतौर पर साधारण विद्युत उष्मारोधी टेस्टर के प्रयोग से मापन के दौरान कनेक्टिंग लीड या उपकरण के अन्दर खुली चिनगारी के कारण आग लगने की संभावना बनी रहती है। यह खुली चिनगारी अग्निपोषक होती है, जो आसपास मौजूद ज्वलनशील किसी भी तरह के गैस में आग उत्पन्न कर सकती है।

यद्यपि तकनीकी तौर पर भूमिगत कोयला खानों तथा तेल खानों के निषिद्ध क्षेत्रों के अतिरिक्त इस प्रकार के उपकरण को व्यवहार में लाने के लिए कोई आपत्ति नहीं होनी चाहिए, तथापि निषिद्ध क्षेत्र में उन्ही उपकरणों के असावधानी पूर्वक प्रयोग को नजरअंदाज नहीं किया जा सकता है।

अतएव सुरक्षा की दृष्टि से भूमिगत कोयला खानों के सीम, जो कोई भी गैसीनेस का हो तथा तेल खानों के जोखिमपूर्ण क्षेत्रों (hazardous areas) के सभी स्थानों पर व्यवहृत होनेवाले इन्सुलेसन टेस्टर निश्चित तौर पर उष्मारोधी (intrinsically safe) होगा, जो इस महानिदेशालय द्वारा अनुमोदित हो।

ह0/-
(भाष्कर भट्टाचार्य)
खान सुरक्षा महानिदेशक



भारत सरकार
 Govt. of India
 श्रम एवं रोजगार मंत्रालय
 Ministry of Labour & Employment
 ज्ञान सुरक्षा महाविदेशालय
 Directorate-General of Mines Safety

DGMS (Tech.) Circular 2 of 2006

Dhanbad dated, 12th June, 2006

To
 The Owner, Agent and Manager of all Mines

Sub: Sampling of Airborne Respirable dust levels in mine atmosphere

DGMS (Tech.) Circular No. 5 of 1988 specifies guide lines for conducting air-borne dust surveys in mines. As per the guide lines NCB/MRE dust sampler type 113A or its approved equivalent is to be used for fixed/static dust sampling which will mainly give the assessment of airborne respirable dust in work place environment. Apart from static sampling, Personal dust samplers are also used for assessing the dust dose of an individual during a shift.

It has been brought to the notice of the undersigned that M/s Casella, London, the only manufacturer of MRE-113A Gravimetric dust sampler had stopped manufacturing and as such procurement/maintenance of this sampler is becoming difficult. At present no other approved type of static sampler is available in the market.

The matter has been examined, in light of present non-availability of any approved type of static sampler in the market. In order to tide over the problem as of now, it has been decided to temporarily permit use of Personal dust samplers for the purpose of carrying out airborne respirable dust survey in mines as static sampler as required under Regulation 123 of the Coal Mines Regulations, 1957 and Regulation 124 of the Metalliferous Mines Regulations, 1961 for a period of two years.

The Personal dust samplers to be used for the purpose shall function on the principle of gravimetric separation and shall be able to give an equivalent concentration as measured with an MRE-113A Gravimetric dust sampler. Such personal dust samplers shall be of a type approved under Regulation 123 of the Coal Mines Regulations, 1957 and Regulation 124 of the Metalliferous Mines Regulations, 1961.

Director General of Mines Safety



भारत सरकार
Govt. of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
ज्वाला सुरक्षा महाविदेशालय
Directorate-General of Mines Safety

DGMS(SOMA)(Tech) Circular No. 3 of 2006. Dhanbad, dated 12th June 2006.

To
 The Owners, Agents & Managers of all mines.

Sub: Accident due to fall of persons while working at height.

Increasing number of fatal accidents due to fall from height has been a matter of concern for quite some time. Recently, a worker engaged by contractor lost his life by falling from a height of 10.8m while he was engaged in painting purlin at the roof level of a workshop in an opencast coal mine. While at work with a safety belt the deceased who was standing precariously on a projected bamboo fixed at its end to a steel truss, lost his balance and fell down. The resultant jerks several the safety belt causing his free fall.

Inquiry into the accident revealed failure to comply with some elementary safety precautions like providing platform/stage or scaffold, ensuring use of approved and well-maintained safety belt etc.

In order to prevent such type of accident in future you are requested to take following steps in addition to the prevalent practices and procedures.

- (i) A working platform/stage or scaffold of adequate width with proper fencing shall be provided. A safe means of access to the working platform shall be provided.
- (ii) Only approved type of safety belt or life line conforming to Indian Standard IS:3520-1999 shall be used which shall be properly maintained and checked for its fitness before every use.
- (iii) A code of safe procedure shall be prepared and implemented for such type of dangerous jobs which amongst others may include training of persons, supervision before engaging contractual persons etc.

The matter may be brought to the notice of all concerned under your charge for strict compliance.

Director-General of Mines Safety.



भारत सरकार
Govt. of India
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Ministry of Labour & Employment
ज्वाला सुरक्षा महाविदेशालय
Directorate-General of Mines Safety

DGMS(Tech) Circular No. 4 of 2006 Dated, 12th June, 2006

All Owner, Agent & Managers of Coal Mines

Sub: Firing of Shots in fire areas/in vicinity of hot strata in
opencast coal mine

Firing of Shots in fire areas/in vicinity of hot strata is fraught with danger. Detailed precautionary measures while charging and firing shots in such areas had been recommended by DGMS (Tech.) circular no. 2 of 1985.

Recently, in a mechanized opencast coal mine, where extraction of developed pillars by deep hole blasting was being carried out, one of the shot holes left charged prematurely detonated after a lapse of two and half hours. Fortunately no person was involved as the holes were unstemmed and there was no one in the vicinity.

Inquiry into the incident revealed that the holes were drilled upto the roof of the seam in solid pillars and upto 2 m above the roof of the gallery. There was no system of measurement of temperature in the shotholes in coal or overburden. The holes were charged with SMS explosives, cast boosters and non electric shock tube with down-the-hole detonators and were allowed to sleep without stemming. The temperature of the strata along a radius of 20 m. of the prematurely detonated holes was subsequently measured and found to be around 1010 C. The heated condition in the particular hole resulted in premature detonation of down-the-hole detonator and subsequent firing of the charge.

Experience had shown that there may be occurrence of localized pockets of fire or heating in a developed seam which may remain undetected and create such dangerous situation. Thus while extracting developed pillars by opencast method in conjunction with deep hole blasting, following additional precautionary measures may be taken over and above the measures stipulated vide DGMS(Tech.) circular no.2 of 1985.

i. The blasting officer shall ensure accurate measurement of temperature at the bottom of the shotholes drilled in coal benches and in overburden benches immediately above the coal seam and other fiery areas to determine whether fire exists. The measurement shall be recorded in a bound paged book kept for the purpose. For this purpose the temperature shall be measured initially after completion of the hole and thereafter at least once every shift. No hole shall be charged if the temperature in the hole exceeds 80° C.

ii. As a precaution against presence of pocket fires in coal benches in developed seams, overburden benches immediately above such coal seams and other fiery areas in the mine, the explosive charge shall be fired by detonator attached to the detonating cord at the surface and not within the shot hole.

iii. All explosives, cast boosters, detonators, detonating cord and shock tubes shall be subjected to proper testing in an approved laboratory in respect of temperature sensitivity, impact sensitivity for safe handling in mines. A certification to that effect shall be supplied for each batch.

iv. Sleeping of holes shall not be permitted in coal benches where fire or spontaneous heating has been detected and in overburden benches lying immediately above such seam and at all places where there is likelihood of fire or spontaneous heating.

v. No PETN/TNT based cast booster shall be used for initiating non-cap sensitive slurry/emulsion explosive in coal benches and overburden benches of a fiery coal seam.

Director General of Mines Safety

DGMS

DGMS (Tech) Circular No. 5

Dhanbad,

dated the 9th November, 2006

To

Owner, Agents & Managers of Oil Mines.

Subject: Precautions to be taken in oil mines during work-over/drilling operations.

Sir,

Recently, there was an explosion followed by fire at the mud tank and mud pump, driven by an internal combustion engine fitted on the same skid mounted chassis, during work-over operations at an oil mine.

Investigation into the accident revealed that, though an exhaust conditioner was provided, the explosion & fire were primarily caused due to contact of accumulated flammable vapours near the internal combustion engine with its un-shield hot exhaust pipe.

Thus, in order to prevent such incidences of fire & explosion, following measures are suggested to be taken at all drilling/work-over rigs:-

1. Internal combustion engines, with or without exhaust conditioner shall be located at such a distance from the mud tank that there may not be any presence of the flammable vapours/gasses around the same.
2. Suitable arrangements for regular monitoring of flammable gases/vapours shall be provided where an internal combustion engine is required to operate and whenever presence of flammable gases/vapours are observed to be 1.5% or more such internal combustion engines shall be stopped immediately and the same shall not be re-started till the area is found free from flammable gases/vapours.
3. Discharge from bleed off lines shall in no case be allowed in mud tanks.
4. Effective steps shall be taken to keep mud tanks free from oil and gas.
5. Exhaust pipe of internal combustion engines shall be insulated/ shielded to prevent its contact with flammable liquids, gases or vapours.

You are requested to take suitable steps to comply with the above recommendations in the interest of safety.

Sd/-

(M.M. Sharma)

Chief Inspector of Mines

DGMS (Tech) Circular No. 6 of 2006

Dhanbad dated 10.11.06

To,
The Owners, Agents and Managers of all mines

Sub: Recommendations of Central Saunda Court of Inquiry.

The Court of enquiry appointed under Section 24 of the Mines Act. 1952 to inquire into the causes and circumstances attending the accident that occurred in Central Saunda Colliery of M/s Central Coalfields Ltd., on 15.06.2005 causing loss Of 14 lives due to inundation, had made the following recommendations; interalia.

- 1.0 Most of the accidents take place essentially due to human failure in complying with the provisions of statute. Recurrence of such failures from time to time is disturbing. Therefore, it is felt that proper and regular training of Officers and supervisory staff is urgently needed to inculcate awareness among them regarding statutory provisions vis-à-vis their duties.
- 2.0 During the hearing sessions of this "Court, the issue of shortage of statutory manpower in mines came into force time and again. Supervision of work in mines has direct bearing on safety of workers and hence it must be ensured that a clear policy of regular recruitment of statutory manpower be framed and implemented by the mine management.
- 3.0 In a company consisting of large number of mines, it becomes very difficult for one person to pay proper attention to safety aspects in all mines. Therefore, the Court is of the opinion that in such companies nomination of ownership may be shared by two or three directors. This will enable them to deal with safety matters, in mines more effectively.
- 4.0 Role of Internal Safety Organization (ISO): Arising out of the recommendations of the 5th Conference on Safety in Mines, most of mining companies have since formulated their safety policy and created ISO to translate the principle of self regulation into practice. The Court feels that though ISO was existing, it had been very effective. Their role could be more purposeful if –
 - a) Work in a new district is commenced only after clearance from ISO,
 - b) The head of ISO should either be on the Board of the company or he should report to a Director not directly connected with production.

You are therefore requested to take suitable steps to implement the above mentioned recommendation of the Central Saunda Court of Inquiry in all mines under your control.

sd/-
(M.M. Sharma)
Chief Inspector of Mines

No. DGMS (Tech.) (DRMS) Cir. No.7 of 2006, Dhanbad, dated the 21st December, 2006.

To
The Owner, Agent and Manager
of All Mines.

Sub:- Provisions of additional equipments at mines Rescue Stations/Rooms.

Sir,

You are aware that under the existing provisions of the Mines Rescue Rules, 1985, rescue stations/rooms are minimally equipped to cater the emergencies caused by fire & explosions only. Therefore, in case of the emergencies arising out of strata failure and other causes the rescue personnel are unable to help the mine personnel in an effective way. Even in case of a major fire they do not have sufficient tool to fight it out.

Therefore, it is advised to provide following equipments (in addition to those required under Annexure I/II) at all Rescue Stations/Rooms to enable the rescue personnel to help us in a better way in case of any emergency:

1. Portable Gas Chromatograph and Portable Generator & Lighting Units;
2. Lifting Air Bag set with compressed Air Cylinders Air/Hydraulic hand pumps & connecting hoses etc.
3. Hydraulic Combi Tools (cutters cm spreaders) with Hydraulic Power Packs;
4. Concrete Cutter and Rescue Rams/Jacks
5. Fire fighting monitors with hose reel, nozzles & pumps;
6. Personal Protective Suits (e.g. Nomex fire suits, fire fighting boots, gloves & helmets etc) and florescent stripped suits for rescue personals;
7. Fall Arrest System including Fall Arrest Harness & Hoisting system.
8. Rope Descender and Retractable Fall Arrester
9. Portable power-packs with manifolds & Hose reels.
10. Fire bandages/sheets (to be applied as first aid in case of burn injuries)
11. Trapped Miner Locator.

Actual number of these equipments may be assed as per the requirement with respect to the type of mines being served by the rescue station/room.

Yours faithfully,

Sd/-
(M.M. Sharma)
Chief Inspector of Mines

NOTIFICATIONS & CIRCULARS

Notifications – 2007

New Delhi, the 28th March, 2007

S.O. 459(E) – Whereas, the government of India in the Ministry of Labour & Employment in their notification No.S.O.1756(E) dated 12th October, 2006 appointed Shri PC Parakh, former Secretary, Ministry of Coal to hold a formal inquiry into the causes and circumstances attending the accident that occurred on 6th September, 2006 in the collieries of M/s. Bharat Coking Coal Limited, more particularly in the Bhatdee Colliery in Dhanbad District of Jharkhand State, causing loss of lives and present a report within a period of three months. The duration of the enquiry was upto 11.1.2007.

And, whereas, it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of six months from 12th January, 2007 to 11th July, 2007 or till the day/date on which the report of the Inquiry is submitted, whichever is earlier. Accordingly the period of appointment of Chairman, Shri PC Parakh to conduct the inquiry and present the report and the period of appointment of Shri R. Sharma, Ex-Director-General of Mines Safety and Shri O.P. Lal, Ex-Minister for Mines, Bihar and Organizing Secretary, INTUC as assessors is also extended for a further period of six months i.e. upto 11th July, 2007 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

[F.No.N-12020/1/2006/ISH.II]
Gurjot Kaur, Joint Secretary

Dhanbad, the 22nd May, 2007

G.S.R. 98 – In exercise of the power conferred on me under Sub-Regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare 1.7.2007 as the date from which following items will not be used in below ground Coal Mines unless the same has been approved by me by a general or special order in writing.

1. Noise level meter
2. Stemming plug

[No.14(16)79-Gen/2413]
Man Mohan Sharma,
Director-General of Mines Safety.

Dhanbad, the 25th May, 2007

G.S.R. 106 – In exercise of the power conferred on me under Sub-Regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare 1.7.2007 as the date from which following items will not be used in below ground Coal Mines unless the same has been approved by me by a general or special order in writing.

1. Pit Bottom Buffer.

[No.14(16)79-Gen/2413]
Man Mohan Sharma,
Director-General of Mines Safety.

New Delhi, the 5th June, 2007

S.O. 877(E) – In exercise of the powers conferred by Sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri J.P. Kashyap, Deputy Director-General of Mines Safety, in the Directorate-General of Mines Safety Organization to be the Chief Inspector of Mines for all the territories to which the said Act extends with immediate effect from 9.6.2007 to 17.6.2007 as per the extant Rules.

[F.No.Z-16025/96/2006-ISH.II]
Gurjot Kaur, Joint Secretary

New Delhi, the 22nd June, 2007

S.O. 1006(E) – Whereas the Government of India in the Ministry of Labour & Employment in their notification No.S.O.1756(E) dated 12th October, 2006 appointed Shri PC Parakh, former Secretary, Ministry of Coal to hold a formal inquiry into the causes and circumstances attending the accident that occurred on 6th September, 2006 in the collieries of M/s. Bharat Coking Coal Limited, more particularly in the Bhatdee Colliery in Dhanbad District of Jharkhand State, causing loss of lives and present a report within a period of three months. The duration of the enquiry was upto 11.1.2007.

However, vide Notification S.O. 459(E) dated 28.3.2007, the tenure of the said Court of Inquiry was extended for a further period of six months i.e. upto 11.7.2007.

And, whereas, it has become necessary to extend the period within which the inquiry is to be conducted and report presented.

Now, therefore, the Central Government do hereby extend this duration for a further period of three months from 12th July, 2007 to 11th October, 2007 or till the day/date on which the report of the Inquiry is submitted, whichever is earlier. Accordingly the period of appointment of Chairman, Shri PC Parakh to conduct the inquiry and present the report and the period of appointment of Shri R. Sharma, Ex-Director-General of Mines Safety and Shri O.P. Lal, Ex-Minister for Mines, Bihar and Organizing Secretary, INTUC as assessors is also extended for a further period of three months i.e. upto 11th October, 2007 or till the day/date on which the report of the Court of Inquiry is submitted, whichever is earlier.

[F.No.N-12020/1/2006/ISH.II]
S.K. Srivastava, Joint Secretary

New Delhi, the 24th July, 2007

S.O. 1204(E) – In exercise of the powers, conferred by Sub-regulation (1), (2), (3) and (4) of Regulation 11 of the Metalliferous Mines Regulations, 1961 and in continuation of the Notification of the Government of India in the Ministry of Labour & Employment No.S.O.91(E) hereby appoints Shri V.K Mitra, Vice-President, J.K. Lakshmi Cement Limited in Rajasthan, as member of the Board of Mining Examinations (Metal) in place of Shri K.S. Choudhary, Additional Executive Director (Mining Operation), Hindustan Zinc Limited, Udaipur for a period upto 24.1.2008.

[F.No.S-66012/1/2004-ISH.II]
S.K. Srivastava, Joint Secretary

New Delhi, the 6th August, 2007

S.O.1366(E) – In exercise of the powers conferred by Sub-regulations (1), (2) and (3) of Regulation 11 of the Coal Mines Regulations, 1957 and in supersession of the notification of the Government of India in the Ministry of Labour and Employment number S.O.92(e) dated 25th January, 2005, the Central Government hereby re-constitutes the Board of Mining Examinations (Coal) and appoints the following persons as members of the Board for a period of three years or till their successor is appointed, whichever is later, namely:-

1. Chief Inspector of Mines (Since designated as Director-General of Mines Safety) Ex-officio. - Chairman
2. Shri Ashok Kumar Singh, Director (Technical)/Operations, M/s. Central Coalfields Limited, Dharbanga House, Ranchi-834001. - Member
3. Shri Mukh Pada Dikshit, Director (Technical), South Eastern Coalfields Limited, Seepat Road, Bilaspur. - Member
4. Shri Shree Ramji Upadhyay, Director (Technical)/Operations, Western Coalfields Limited, Coal Estate, Civil Lines, Nagpur-440001. - Member
5. Shri Jammalamadaka V. Duttatreyulu, Director (Operations), M/s. Singareni Collieries Company Limited, Kothagudem Collieries, P.O. Khammam District, Andhra Pradesh-507101. - Member
6. Dr. Ashis Bhattacharjee, Professor & Head of the Deptt., Department of Mining Engineering, Indian Institute of Technology, Kharagpur-721302 (WB). - Member

[F.No.S-66012/1/2007-ISH.II]
S.K. Srivastava, Joint Secretary

New Delhi, th 25th October, 2007

S.O. 1816(E) – Whereas the Government of India in the Ministry of Labour & Employment in their notification No.S.O.1756(E) dated 12th October, 2006 appointed Shri PC Parakh, former Secretary, Ministry of Coal to hold a formal inquiry into the causes and circumstances attending the accident that occurred on 6th September, 2006 in the collieries of M/s. Bharat Coking Coal Limited, more particularly in the Bhatdee Colliery in Dhanbad District of Jharkhand State, causing loss of lives and present a report within a period of three months. The duration of the enquiry was upto 11.1.2007.

However, vide Notification S.O. 1006(E) dated 22.6.2007, the tenure of the said Court of Inquiry was extended for a further period of six months i.e. upto 11.10.2007.

And, whereas, it has become necessary to extend the period of the Court of Inquiry, as the Chairman, Court of Inquiry submitted the report to the Hon'ble Minister of State (Independent Charges) of Labour and Employment on 17th October, 2007.

Now, therefore, the Central Government do hereby extend this duration for a further period from 12th October, 2007 to 20th October, 2007. Accordingly the period of appointment of Chairman, Shri PC Parakh to conduct the inquiry and present the report and the period of appointment of Shri R. Sharma, Ex-Director-General of Mines Safety and Shri O.P. Lal, Ex-Minister for Mines, Bihar and Organizing Secretary, INTUC is extended for a further period upto 20th October, 2007.

[F.No.N-12020/1/2006/ISH.II]
S.K. Srivastava, Joint Secretary

Dhanbad, the 14th November, 2007

G.S.R. 260 – In exercise of the power conferred on me under Regulation 182(B) of the Metalliferous Mines Regulations, 1961 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare the following safety items to be used in Metalliferous mines to protect the persons employed therein from undue hazardous conditions like noise, dust, visibility and for proper identification of persons with visibility harness, with immediate effect, in a kit form for easy carrying:

1. Safety Goggles.
2. Reusable Earplug.
3. Visibility Harness and
4. Dust Respirator

[No.16(38)79-Genl/5102]
Man Mohan Sharma,
Director-General of Mines Safety.

Dhanbad, the 14th November, 2007

G.S.R. 261 – In exercise of the power conferred on me under Regulation 191(B) of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare the following safety items to be used in coal mines to protect the persons employed therein from undue hazardous conditions like noise, dust, visibility and for proper identification of persons with visibility harness, with immediate effect, in a kit form for easy carrying:

1. Safety Goggles.
2. Reusable Earplug.
3. Visibility Harness and
4. Dust Respirator

[No.16(38)79-Genl/5102]
Man Mohan Sharma,
Director-General of Mines Safety.

New Delhi, the 14th December, 2007

S.O.2134(E) – In exercise of the powers conferred by Sub-section(1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Deepak Gupta, Deputy Director-General of Mines Safety (Mining), Northern Zone, Ajmer to be the Chief Inspector of Mines for all the territories to which the said Act extends with effect from 15.12.2007 to 27.12.2007 as per the extant Rules.

[F.No.T-15011/02/2007-ISH.II]
Gurjot Kaur, Joint Secretary

Circulars – 2007**No. DGMS(Legis) Circular No.1 of 2007****Dhanbad, dated 30.7.2007**

To
Owners/Agents/Managers of all Coal Mines.

Notification No.14(16)79-Genl/2413 dated 22nd May, 2007, published in the Gazette of India, Part-II, Section 3(i) on 16.6.2007 vide GSR-98 is reproduced below for information and taking necessary steps to comply with the requirement of the same:

“In exercise of the power conferred on me under Sub-Regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare 1.7.2007 as the date from which following items will not be used in below ground Coal Mines unless the same has been approved by me by a general or special order in writing”.

1. Noise level meter
2. Stemming plug

No. DGMS(Legis) Circular No.2 of 2007**Dhanbad, dated 13.9.2007**

To
Owners/Agents/Managers of all Coal Mines.

Sub: Approval of Safety Goggles, Reusable Earplug and Visibility Harness

Notification No.14(16)79-Genl/3102 dated 10th July, 2007, published in the Gazette of India, Part-II, Section 3(i) on 28.7.2007 vide GSR-154 is reproduced below for information and taking necessary steps to comply with the requirement of the same:

“In exercise of the power conferred on me under sub-regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare 25.8.2007 as the date from which the following safety items to be used in coal mines unless the same has been approved by me by a general or special order in writing”.

1. Safety Goggles.
2. Reusable Earplug.
3. Visibility Harness.

No. DGMS(Approval) Circular No.1 of 2007**Dhanbad, dated 11.5.2007**

To
All Owner, Agent & Manager of all mines.

Sub: Approval of Full Body Harness/Safety Belt use in Mines.

Vide DGMS Circular No.1 of 1993, it was informed that the Safety Belts conforming to IS:3521-1983 covered under BIS Licence to use IS specification mark shall be considered at par with the Safety Belt accorded approval by DGMS in past.

The BIS specification IS:3521-1983 has since been amended as IS:3521-1999 in which the Full Body Harness is also included. In view of the above it is inform to all concerned that the Safety Belts/Full Body Harness shall be used in the mines after the same has been approved by DGMS and possess valid BIS Licence to use IS specification mark.

No.DGMS(Approval) Circular No.2 of 2007**Dhanbad, dated 1.7.2007**

To

The Owner, Agent and Manager of all Mines.

Sub: Life of Flame Safety Lamp

Velox GL-7 & GL-50 type Flame Safety Lamps are extensively used in mines for determination of presence of CH₄ and deficiency of Oxygen in the mine atmosphere. It is noticed that the lamps are not maintained properly. The recommended fuel is not used in the lamps. Proper type of wire gages filaments etc. is not provided. The re-lighting arrangement does not work at times. Worn out parts are used in this lamps.

The manufacturer has informed about the life of different parts of the lamp. According to manufacturer the life of a Flame Safety Lamp should be 5 to 6 years during their normal use and if they are subjected to proper maintenance.

In view of the above, it is suggested that the life of the Lamps shall be fixed as per the manufacturer's recommendation, which may vary from 5 to 6 years. During these periods replacement of the parts manufactured by the original manufacturer may be used so that the lamps give the desired result.

No.DGMS(Approval) Circular No.3 of 2007**Dhanbad, dated 2.7.2007**

To

The Owner, Agent and Manager of all Coal Mines having winding in shaft.

Sub: Provision of Pit Bottom Buffers

A no. of hard landing had occurred while persons were being lowered in a shaft by Winding Engine, causing serious injuries to persons and even death in a few cases. To avoid such injuries, use of Pit Bottom Buffer was recommended vide DGMS (Tech) Circular No.3 of 1993 dated 27th April, 1993.

A Notification No.14(16)79-Gen/2484 dated 25th May, 2007 had been forwarded to published in the Gazette of India is reproduced below for information and taking necessary step to comply with the requirements of the same.

"In exercise of the power conferred on me under Sub-Regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare 1.7.2007 as the date from which following items will not be used in below ground Coal Mines unless the same has been approved by me by a general or special order in writing".

1. Pit Bottom Buffer.

No.DGMS(Approval) Circular No.4 of 2007**Dhanbad, dated 24.7.2007**

To

The Owner, Agent and Manager of all Coal Mines having winding in shaft.

Sub: Provision of Pit Bottom Buffers

A no. of hard landing had occurred while persons were being lowered in a shaft by Winding Engine, causing serious injuries to persons, disablement at many cases and even death in a few cases. Hence provision of Pit Bottom Buffer at man winding shaft is felt essential to avoid such injuries.

This circular is issued in continuation of our earlier circular No.DGMS (Approval) Circular No.3 dated 2nd July, 2007.

A Notification No.14(16)79-Genl/2484 dated 25th May, 2007 published in the Gazette of India Part-II Sec 3(i) on 16.6.2007 vide GSR-106 is reproduced below for information and taking necessary step to comply with the requirements of the same.

"In exercise of the power conferred on me under Sub-Regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, M.M. Sharma, Chief Inspector of Mines also designated as the Director-General of Mines Safety declare 1.7.2007 as the date from which following items will not be used in below ground Coal Mines unless the same has been approved by me by a general or special order in writing".

1. Pit Bottom Buffer.

No.DGMS(Technical) Circular No.1 of 2007

Dhanbad, dated 5.1.2007

To
All Owner, Agent & Manager of Coal Mines.

Sub: Use of integrated steel support and steel props in coal mines

Roof bolting is extensively used as a system of support in Indian coal mines. However, in certain areas of depillaring workings and other development workings, conventional supports are also being used. In view of several fatal accidents due to fall of roof in roof bolted workings including depillaring areas, a committee was constituted comprising mine management, trade union, Central Mining Research Institute and Directorate-General of Mines Safety to look into the issue at depth.

It has been suggested to strengthen the goaf edge support effectively and quickly. One such option is to provide integrated steel support and steel props as and when the situation demands. Before using the supports in coal mines they need to be tested to ascertain the efficacy. A general minimum test standard for such supports has been detailed in Annexure-I & II.

You are requested to give wide publicity amongst all concerned persons working in your area about the same for information and compliance.

Annexure-I

Test requirement for square steel cog stool/chock

1. At least two prototype samples shall be tested for type test by a duly approved testing body.
2. 0.5% of the production shall be subjected to routine test or production tesst.
3. Axial Load test.

The Square Steel Cog Stool/Chock shall be set vertically in a testing machine and the designed load is applied. The load-yield characteristics shall be obtained.

4. Eccentric Load test

The test shall be conducted on the Square Steel Cog Stool/Chock by putting the Square Steel Cog Stool/Chock with an eccentricity of about 54 mm at the upper end.

5. Overload test

An overload test shall be conducted by subjecting the Square Steel Cog Stool/Chock to a load equal to one and half time the nominal load. The test shall be conducted for at least five observations.

6. Minimum performance requirements

There shall be no abnormal wear, distortion or failure of any part of the Square Steel Cog Stool/Chock.

The load bearing capacity of Square Steel Cog Stool/Chock shall not be less than 500 kN.

7. Marking

Square Steel Cog Stool/Chock shall be marked with the manufacturers name and/or registered trade mark, serial number, size and nominal load of the square steel cog stool/chock.

Annexure-II

Test requirement for Steel Pit Prop/Rigid Prop

1. At least two prototype samples shall be tested for type test by a duly approved testing body.
2. 0.5% of the production shall be subjected to routine test or production test.
3. Axial Load test.

The Steel Pit Prop/Rigid Prop shall be set vertically in a testing machine and the designed load is applied. The load-yield characteristics shall be obtained.

4. Eccentric Load test

The test shall be conducted on the Steel Pit Prop/Rigid Prop by putting the Steel Pit Prop/Rigid Prop with an eccentricity of about 54 mm at the crown.

5. Overload test

An overload test shall be conducted by subjecting the Steel Pit Prop/Rigid Prop to a load equal to one and half time the nominal load. The test shall be conducted for at least five observations.

6. Minimum performance requirements

There shall be no abnormal wear, distortion or failure of any part of the Steel Pit Prop/Rigid Prop.

The load bearing capacity of Steel Pit Prop/Rigid Prop shall not be less than 200 kN.

7. Marking

Steel Pit Prop/Rigid Prop shall be marked with the manufacturers name and/or registered trade mark, serial number, size and nominal load of the Steel Pit Prop/Rigid Prop.

No.DGMS(Technical) Circular No.2 of 2007

Dhanbad, dated 23.3.2007

To

The Owners, Agents and Managers of all Coal Mines,
Manufacturers/Suppliers of Approved type of Self-Contained Self-Rescuers
All Inspecting Officials of the Directorate.

Sub: Protocol on use, care, maintenance, sampling & testing of Self-contained Self-Rescuer (SCSR) under Regulation 191D (2) & (3) of the Coal Mines Regulations, 1957.

In view of the limitations of the Filter Self Rescuer as escape device and in pursuance to the recommendation of the Ninth Conference on Safety in Mines as well as the New Kenda Court of Enquiry, a meeting of users, regulators, scientific institutions, academicians and manufacturers/suppliers was held on 16th March, 2004 to consider introduction of SCSR in Indian mines. As decided in the meeting a “committee” representing users, regulators, scientific institutions and academicians was constituted to recommend mode of introduction of SCSR.

The committee recommended “use of Self contained or Oxygen type Self Rescuer (SCSR) in all degree III and degree II gassy mines and in all fiery mines to be enforced with immediate effect”. Based on the recommendations of the said committee a Statutory Order under Regulation n191D of the Coal Mines Regulations, 1957 was issued on 5th January, 2007.

To ensure proper quality of supply, efficient use, care and maintenance of SCSR a comprehensive protocol on its use, care, maintenance sampling and testing, as suggested by the working group constituted for the purpose and the manufacturer/suppliers, has been formulated as mentioned below. It is expected that the “protocol” would be religiously implemented by all concerned:

A. USE, CARE & MAINTENANCE:

1. The Owner, Agent and Manager of a mine with below ground workings, upto the travel time of one hour, shall ensure that the rated duration of the Self Contained Self Rescuer (SCSR), provided to any person, is not less than one hour. However, in respect of workings with more than one hour travel time adequate number of SCSR (not less than the maximum attendance of the largest shift) shall be placed at suitably designed “Safe Haven” or “Refuse Chambers” located at convenient point(s).
2. Contrary to the above, use of SCSR of rated duration less than 60 minutes and upto 30 minutes for a specific district or panel of the mine may be permitted, on request of the Owner/Agent/Manager of the mine in writing, by the concerned Regional Inspector of Mines.
3. Every person required to go down the mine shall be provided with a belt/harness of suitable design to enable him to carry the SCSR as well as other gadgets conveniently on his body.
4. Special racks of suitable design shall be provided for storage. The storage area should be away from heat source. Units shall be cleaned regularly with wet cloth in no case organic solvents shall be used for cleaning of the SCSR.
5. Every unit in use shall be subjected to “daily visual check” for the seals (intact or not), leakage indicator (change in colour), clamps (for any damage), belt loop (for any damage) and container (for any damage or dent). Units found O.K. in visual check only shall be issued and used. Damaged/defective unit shall be immediately withdrawn from use and be kept separately.
6. Every SCSR on roll of the mine shall be subjected to “Leak Tightness Test”, as least once in a quarter by a competent person duly authorized by the manager for the purpose, in the following manner:
 - i. Place the apparatus inside the test box;
 - ii. Put the lever down to the slotted place;
 - iii. Close the lid of the box tightly;
 - iv. Release lever to its original place to create vacuum of about 20 mb as displayed in the attached pressure/cacuum gauge &

- v. Watch the pressure/vacuum gauge for a minute, if the drop in the reading is less than 5 mb the unit is considered to be leak tight and is fit to use or else the unit shall be treated as failed and shall be withdrawn from the use.
- 7. Test result in respect of “daily visual check” and “Leak Tightness Test” with regard to each & every unit shall be recorded in a bound-paged register kept for the purpose. Every entry shall be signed by the person who has conducted the test and to be counter signed by the Manager or any other official authorized by him in this regard.
- 8. The Manager shall prepare a code of practice for storage, use, care and maintenance of the SCSR based on the model code provided by the Owner.
- 9. As far as practicable use of one type of SCSR shall be preferred in a mine.

B. SAMPLING & TESTING:

- 1.1 At the time of supply: Before a batch SCSR units are put to use samples at the rate of three percent (3%) subject to a minimum of nine unit, for every batch of supply shall be drawn at random for the testing by a joint sampling team comprising of representatives from manufacturer/supplier and user at the user's site.
- 1.2 Fifty percent (50%) of the above drawn sample (subject to a minimum of six units) shall be sent to any of the approved/accredited laboratories for full bench test as per EN 401 or equivalent Indian Standard and rest of the sample units (subject to a minimum of three) shall be subjected to practical performance test for the rated duration and the users comfort at the nearest rescue station.
- 1.3 The batch of supply for which all the test result of the samples (100%) are found satisfactory shall only be put to use. In case of unsatisfactory test result even for a single sample, either at the laboratory or in the practical performance test, the entire batch of supply shall not be accepted for use.
- 1.4 Results of the above stated laboratory test as well as practical performance test, duly counter signed by the mine owner or any person authorized by him for this purpose shall be recorded at owner's office. A copy of the said test result shall also be kept at the mine office and shall be made available for inspection, upto the shelf life of the apparatus. All test results with unsatisfactory performance of a sample, whether in the laboratory or in the practical performance test, shall also be forwarded by the concerned mine owner and the concerned manufacturer to the Chief Inspector of Mines (also designated as Director-General of Mines Safety).
- 2.0 To ensure functional ability:
 - 2.1 To ensure the functional ability 1% of the total units under use of a particular make and type shall be drawn randomly every year for test subject to a minimum of one unit for each make and type.
 - 2.2 The sample thus collected shall be tested at any of the approved/accredited laboratories for the following parameters as per the specifications of EN 401 or equivalent Indian Standard (at 35 liter/min. during the rated duration):

Parameter	Acceptance Level
Rated duration (as per label)	Not less than 90% of specified duration
Inhalation Oxygen concentration (% by vol.)	Not less than 21*
Inhalation Carbon Dioxide Concentration (% by vol.)	Not more than 2.5#
Maximum inhalation air Temperature dry bulb	Not more than 55° C
Inhalation breathing resistance	Not more than 12 mbar
Exhalation breathing resistance	Not more than 12 mbar

* A short term deviation to a level of not less than 17% for a period of not more than two minutes at the beginning of the test is permissible.

through out the rated duration of the apparatus the carbon dioxide concentration of the inhaled air shall not exceed an average value of 2.5% (by volume) and at no time shall exceed 3.0% (by volume).

3. Results of the above stated functional ability test, duly counter signed by the mine manager, shall be recorded at the mine office and shall be made available for inspection, upto two years of reporting.
4. In case of unsatisfactory test result(s), during the above functional ability test, all SCSRs of the batch whose sample had failed shall be immediately withdrawn from the use under intimation by the Owner, Agent or Manager to the Regional as well as Chief Inspector of Mines. Immediate steps shall also be taken to meet the shortage of SCSRs, if any, created due to such withdrawal.

C. TRAINING

1. Every worker required to work in belowground workings shall undergo an initial training on SCSR covering following subjects:
 - i. Role of SCSR as an escape apparatus in emergency;
 - ii. Theory of working of a SCSR;
 - iii. Construction details of a SCSR;
 - iv. Way to use SCSR;
 - v. Limitations while using SCSR like its duration, inhalation and body temperature during use and
 - vi. Hands on training on donning of SCSR in poor visibility.
2. A team of trainers shall be created from V.T.O. Safety Officer, Ventilation Officer, Asstt. Manager, Engineer, Workman Inspector and Rescue Trained Persons to impart weekly Pit-top/Incline-Mouth Training/Re-training of workers.
3. Video Clippings, audios & posters on use of SCSR and sufficient number of dummies, subject to a minimum of 5% of the average daily underground attendance, shall be provided to every mine with below ground workings.
4. The training module for initial and refresher training of miners, at the VTS, shall be suitably modified to incorporate training on need, importance and use of SCSR.
5. Apart from training to users the trainers and persons required to issue and maintain SCSRs shall also be trained for their respective work.
6. A competition on SCSR during Safety Week and Rescue Competitions shall be organized to promote awareness of workers in this regard.

No.DGMS(Technical) Circular No.2A of 2007

Dhanbad, dated 30.6.2007

To

The Owners, Agents and Managers of all Coal Mines,
Manufacturers/Suppliers of Approved type of Self-Contained Self-Rescuers
All Inspecting Officials of the Directorate.

Sub: Protocol on provision and use of Self-Contained Self-Rescuer (SCSR) under Regulation 191D (2) & (3) of the Coal Mines Regulations, 1957 – Addendum thereof.

In view of the expected difficulties in carrying and keeping the SCSR of one hour duration on a person's body and do clarify other confusions it is proposed to amend clause A 1.0 of the "Protocol" as following:

A. USE, CARE & MAINTENANCE

- 1.0 The Owner, Agent and Manager of a mine, with travel time of more than 30 minutes in below ground workings, shall ensure that adequate number (not less than the maximum attendance of the largest shift) of Self-Contained Self-Rescuer (SCSR) with the rated duration of one hour shall be placed at suitably designed "Safe Haven" or "Refuse Chambers" located at convenient point(s). Whereas every person required to work, supervise or visit below ground workings are provided with and carries with them a SCSR of 30 minutes duration on their belt wherever they go or work.
- 2.0 The mine management may construct "Safety Haven" or "Refuse Chambers" at convenient location(s) in below ground with prior approval of the Director-General of Mines Safety. A copy of application, for such approval, with complete details shall also be forwarded to the concerned Director of Mines Safety and the Dy. Director-General of Mines Safety.

All other provision of the "Protocol" issued vide DGMS (Tech) Circular No.2 of 2007/999-1600 dated the 23rd March, 2007, shall be followed as it is.

No.DGMS(Technical) Circular No.3 of 2007

Dhanbad, dated 1.5.2007

To

The Owners, Agents and Managers of all mines.

Sub: Noise Levels and Noise Induced Hearing Loss among mine workers.

In continuation to DGMS Technical Circular No.18 of 1975 and NO.5 of 1990 on "Protection of Workers against noise", it is brought to the knowledge of all concerned that Noise is emerging as an important and challenging health hazards for mine workers. With increasing mechanization of mining operations and use of heavy machinery the noise level in mines have increased over the years. Surveys conducted by this Directorate and other institutions have shown that noise levels in majority of the mining operations are higher than the recommended limit of 90 dB(A).

In an occupational health survey conducted in an belowground metal mine more than 80% of workers showed evidence of Noise Induced Hearing Loss of 27.7% and 13.1% had severe and profound hearing impairment. Noise Induced Hearing Loss was observed among all category of mine workers but the prevalence was highest among workers engaged in drilling operations. The occurrence and severity of NIHL was related to the degree of exposure to noise and years of service in the mine.

In order to prevent occurrence of Noise Induced Hearing Loss among mine workers every mining company should formulate long term strategies and comprehensive hearing conservation programme which should have following components:

1. Noise Level Surveys including Noise Exposure Dose Profile of workers
2. Engineering and Administrative Controls
3. Awareness and Health Promotion Programmes on Noise and its effects
4. Personal Hearing Protection
5. Audiometric Examination of workers
6. Maintenance of comprehensive records of Noise Level Surveys
7. Periodic monitoring and review of Hearing Conservation Programme

All concerned are therefore advised to take necessary measures to prevent Noise Induced Hearing Loss among mine workers and to conduct Noise Level Surveys including Noise Dose Exposure Profile of workers.

No.DGMS(Technical) Circular No.4 of 2007**Dhanbad, dated 11.5.2007**

To
The Owners, Agents and Managers of all mines.

Sub: Specifications for X-ray view box and viewing facilities in PME centres

A good quality x-ray view box and proper viewing facilities are absolutely essential for evaluation and classification of chest radiographs in accordance with ILO classification.

It has been observed during inspection of PME centres that x-ray view box and viewing facilities in most PME centres are extremely inadequate. All concern are therefore directed to take necessary action to provide x-ray view box and viewing facilities in PME centres with following specifications:

1. The x-ray view box for screening and evaluation for chest radiographs should be able to accommodate at least four (4) chest radiographs of 14" x17" size.
2. The x-ray view box should be free from partitions and have uniform illumination.
3. The perspex sheet should be atleast 2 mm in thickness and Ivory White in color.
4. The perspex sheet should be replaced whenever it shows signs of discoloration or improper illumination.
5. The x-ray view box should be illuminated by fluorescent tubes and the depths of view box should be such that illuminating tubes are not visible through the perspex sheet.
6. The illumination level at the centre of view box should be at least 500 Lux measured at a distance of 15 centimeters from the view box.
7. The illuminating tubes should be replaced at regular intervals.
8. Wherever voltage fluctuation is a problem, a constant voltage supply mechanism should be provided for the view box.
9. Adequate space should be available so that the radiographs can be viewed from a distance of 15 as well as 100 centimeters.
10. A set of ILO International Classification of Radiograph of Pneumoconiosis, 2000 should always be available at PME centers for screening of chest radiographs.

No.DGMS(Technical) Circular No.5 of 2007**Dhanbad, dated 11.5.2007**

To
The Owners, Agents and Managers of all mines.

Sub: Screening of Chest Radiographs for Pneumoconiosis and Silicosis by Using ILO Classification, 2000.

It has been observed during inspection of PME Centers that Chest Radiographs of Initial and Periodical Medical Examinations conducted under Rule 29B of Mines Rules, 1955 are not being screened and classified for Pneumoconiosis or Silicosis in accordance with ILO Classification.

Attention is drawn to the recommendations of 8th and 9th Conferences on Safety in Mines on Occupational Health Surveillance and all concerned are hereby directed to get the chest radiographs of medical examinations of workers screened and evaluated for Pneumoconiosis and Silicosis in accordance with ILO International Classification of Radiographs of Pneumoconiosis, 2000. The standard set of ILO Classification, 2000 can be procured on payment from:

Sales Department
International Labour Organisation
Core-4B, 3rd Floor
India Habitat Centre, Lodhi Road
New Delhi – 110003
Phone No.011-24602101

You are also advised to get PME Medical Officers trained in use of ILO International Classification of Radiographs of Pneumoconiosis, 2000 so that cases of pneumoconiosis and silicosis are detected at an early stage and necessary action is taken for prevention and rehabilitation.

No.DGMS(Technical) Circular No.6 of 2007

Dhanbad, dated 28.5.2007

To
All Owners, Agents and Managers of
Indian Coal and Non-coal Mines.

Sub: Damage of belowground structures due to blast induced vibration in nearby opencast mines.

As you are aware, stability of belowground coal mine openings, coal pillars, water dams and ventilation & isolation stoppings in close proximity to operating opencast mines are likely to be affected from blast induced vibration. In India, presently an increasing trend has been observed to win top coal seams, whether it is virgin or developed and standing on pillars, by opencast method wherever it is economical. The blast dimensions are also large with high explosive density as well as quantum of explosives per blast, generating seismic disturbances which may in turn affect the stability of roof and pillar, support system, ventilation/isolation stoppings, water dams in belowground etc.

As the blast – induced vibration is likely to have an impact on the stability of the belowground structures as mentioned above, it is imperative to assess the magnitude of the effect and formulate a guideline for controlling damages to belowground structures due to surface blasting.

A study in this regard was carried out by CMRI in a number of coal mines under varying geo-mining conditions. A committee was constituted by the undersigned, comprising representatives from mining industry, academic and research institutions and DGMS to discuss the deliberations on the inferences of CMRI report and forward their suggestions regarding framing guidelines on this issue.

With due consideration of the recommendations made by the committee, the methodology for conducting trial blast, instrumentation strategy for measurement of blast induced vibration, damage etc. and the threshold limits of vibration for different ranges of RMR are finalized, and furnished as a guideline in Annexure-I.

It is suggested that the mine operators will take adequate measures to optimize and blast design parameters in such a way that blast induced vibration in no way endanger the stability and safety of the belowground workings and structures.

Annexure-I

Guidelines for Stability of Belowground Coal Mine Workings due to opencast blasting.

1.0 Introduction

The safety and stability of belowground coal mine openings, coal pillars, water dams, ventilation and isolation stopping in close proximity to operating opencast mines are often endangered from blast induced vibrations. The serious concern is possible damage to above belowground structures from nearby large surface blasts. Any vibration produced rock fall or minor cracks in isolation stoppings would be recognized as an unacceptable hazard.

2.0 Damage Criteria

Peak particle velocity has so far been considered as the best criterion for evaluating blast vibrations in terms of its potential to cause damage. Extensive studies on the problem have established that frequency of the wave has no significant impact on damage to belowground

coal mine openings. The damage to the belowground openings in reference to opencast blasting is generally classified into four categories.

1. No appreciable damage:	No visible damage
2. Threshold damage:	Formation of superficial cracks in pillars, roof, isolation and/or ventilation stoppings, air crossings, dams and other belowground structures.
3. Minor damage:	Detachment of loosened chips from roof and/or pillars, opening and lengthening of old cracks, loosening of joints.
4. Major damage:	Fall of rock/coal blocks from roof and/or pillars, cracks in isolation/ventilation stoppings, serious weakening of belowground structures.

3.0 Responses of roof and pillars

The roof of the belowground working vibrates with higher amplitudes of vibrations compared to pillars. The attenuation of vibration in roof is fast that that in pillars. This indicates that the pillars of belowground working experiences vibration for a longer period compared to the roof.

4.0 Measurement of blast induced vibrations

4.1 Instrumentation

The seismograph selected for monitoring blast-induced vibration shall be simple, light, compact, easily portable, battery operated, digital output, triggering by geophone etc. Tri-axial transducers for recording blast vibrations shall have a linear frequency range from 2 Hz to 250 Hz and capable of recording particle velocity upto 250 mm/s.

4.2 Methodology

The transducer of seismograph shall be placed in the junction of the roof with the help of attachment provided by the manufacturer of the seismograph. It may also be placed in the pillars at 1-2 m below the roof at a depth of 05-06 m inside the pillar. A minimum of a 20 observations corresponding to a minimum of 10 blasts shall be made for better prediction with a high index of determination.

4.3 Predictor equation

The least mean square method of regression analysis shall be used for interpreting the data. Since, the blasting has been performed on surface and the measurements are taken in belowground, the square root scaling law shall be used for analysis and interpretation of data.

5.0 Guidelines on experimental blasting

5.1 Factors

Major factors affecting particle velocity of ground vibration are type and amount of explosives charge used, distance from the blast site to the location of belowground workings, geological, structural and physical properties of the rock that transmits the vibration and blast geometry. Use of safe maximum explosives per delay, in-hole delays with Nonel systems, proper burden, spacing and proper stemming of holes reduces blast induced ground vibrations.

5.2 Plan

A plan showing the opencast workings above the belowground coal mine n different prominent shades shall be prepared. The plan shall incorporate all the belowground structures including isolation/ventilation stoppings, different working faces, water dams etc. Plan should also show the place of and location of vibration monitoring transducers in roof and pillars.

5.3 Study/Observations

In a particular mining area where opencast blasting is to be performed above the belowground structures, experimental blasting shall be carried out, prior to commencement of drilling and blasting operations by any research/Academic Institute for optimizing the blast design parameters to restrict the vibrations in belowground workings within safe limit. The type of instruments, the methodology and predictor norms as recommended in para 4.0 shall be followed in measurement of blast induced vibrations. Based on the study, the safe charges for the safety of belowground structures shall be determined and recommendations should be made in the report.

5.4 Monitoring

In order to ensure effective control over the vibration and related damage there is a need of regular in-house monitoring and the management should train the blasting personnel during the experimental study and start observations on their own during the regular blasting operations.

6.0 Recommended permissible standards of vibrations

6.1 Technical considerations

The degree of damage observed in the belowground openings is influenced by the RMR of the roof rock. Thus, the damage criterion for belowground coal mine workings is based on RMR, because it includes the parameters like layer thickness, structural features, rock weather-ability and strength of the roof rock and groundwater seepage.

6.2 Permissible standards

The junctions of the belowground coal mine workings are more susceptible to blast produced cracking than the galleries away from the junctions. The threshold values of vibration at the junctions in terms of peak particle velocity has been given in Table-1 for different RMR of roof rocks for the safety of belowground coal mine workings. The limiting values of vibration in the pillar are also given below in Table-2.

Table-1: Threshold values of vibration for the safety of roof in the belowground workings for different RMR.

RMR of roof rock	Threshold values of vibration in peak particle velocity [mm/s]
20-30	50
30-40	50-70
40-50	70-100
50-60	100-120
60-80	120

Table-2: Threshold values of vibration for the safety of pillar in the belowground workings for different RMR.

RMR of roof rock	Threshold values of vibration in peak particle velocity [mm/s]
20-30	20
30-40	20-30
40-50	30-40
50-60	40-50
60-80	50

In view of complexities of the problems it is hoped that mine management would take adequate measures as recommended above to ensure that the blasts performed near the belowground workings are carried out with utmost care and precautions. The blast induced ground vibrations should be within the permissible limits as specified above.

No.DGMS(Technical) Circular No.7 of 2007

Dhanbad, dated 6.12.2007

To
The Owners, Agents and Managers of all coal mines

Sub: Blast-hole drilling for Opencast Coal Mines

It has been observed, during inspection of opencast coal mines, that some of the contractual machinery used for blast-hole drilling operations, are truck mounted drills designed for tube well drilling for sources of water. The following shortcomings have been observed with these drills, when deployed in opencast coal mines for drilling in overburden and coal.

1. No inbuilt dust collection/suppression system is provided.
2. These water well drills, being truck mounted, require better infrastructure of road and are less stable than Crawler mounted drills, which can march even in muddy roads due to better gripping.
3. Drill operational control switches are located as the rear end of the truck and no cabin is provided to operate it. Operators and helpers are required to be present in dusty atmosphere.

Therefore, for safe drilling operations in opencast coal mines, if tyre mounted drills are deployed, they should comply with the following:

All control switches for all drilling operations including tramming and setup, should be centralized in a properly designed operator's cabin, located at the drilling end. Drill should be provided with hydraulically operated carousel/rod changer. Suitable hydraulic jacks, with controls from operator's cabin, should be provided for leveling of the machine. The drilling machine should have efficient dust collection system.

Only proper type of blast-hole drill machine, designed for mining purpose should be used.

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NOTIFICATIONS & CIRCULARS

Notifications – 2008

New Delhi, the 4th January, 2008

No.A-32012/01/2007-ISH.II – The President is pleased to appointing the following officers to the post of Deputy Director-General of Mines Safety (Mining) in the pay scale of Rs.18,400-500-22400/- in the Directorate-General of Mines Safety, Dhanbad with effect from the date shown against their names and until further orders:

SN	Name of Officer	Date of appointment in the Grade of Deputy Director-General of Mines Safety (Mining)
1.	Shri SI Hussain	6.11.2007(F/N)
2.	Shri RB Chakraborty	7.11.2007 (F/N)
3.	Shri Debasish Sengupta	1.12.2007 (F/N)

M.S. Azad, Under Secretary

New Delhi, the 28th February, 2008

S.O.40(E) – In exercise of the powers conferred by sub-section(1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Deepak Gupta, Deputy Director-General of Mines Safety, in the Directorate-General of Mines Safety Organization to be the Chief Inspector of Mines for all the territories to which the said Act extends with immediate effect from 18.2.2008 to 19.3.2008 as per the extent Rules.

[F.No.Z-16025/96/2006-ISH.II]
S.K. Srivastava, Joint Secretary

New Delhi, the 19th March, 2008

S.O.534(E) – In exercise of the powers conferred by sub-section(1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Deepak Gupta, Deputy Director-General of Mines Safety, in the Directorate-General of Mines Safety Organization to be the Chief Inspector of Mines for all the territories to which the said Act extends with immediate effect from 20.3.2008 to 31.3.2008 as per the extent Rules.

[F.No.Z-16025/96/2006-ISH.II]
S.K. Srivastava, Joint Secretary

New Delhi, the 28th March, 2008

G.S.R. 236(E) – The following draft of certain regulations further to amend the Metalliferous Mines Regulations, 1961, which the Central Government proposes to make on the recommendation of the Committee constituted under Section 12 of the Mines Act, 1952 (35 of 1952) and in exercise of the powers conferred by Section 57 of the said Act, is hereby published as required by sub-section (1) of Section 59 of the said Act, for information of all persons likely to be affected thereby and notice is hereby given that the said draft regulations will be taken into consideration after expiry of a period of three months from the date on which copies of the Official Gazette in which this notification is published, as made available to public;

Any objection or suggestion, which may be received from any person in respect of the said draft regulations within the period specified above, will be considered by the Central Government;

The objections and suggestions, if any, may be addressed to Shri Subhash chand, Under Secretary, Ministry of Labour & Employment, Shram Shakti Bhawan, Rafi Marg, New Delhi – 110001.

Draft Regulations

- (1) These regulations may be called the Metalliferous Mines (Amendment) Regulations, 2008.
- (2) They shall come into force on the date of their final publication in the Official Gazette.
- (3) In regulation 124 of the Metalliferous Mines Regulations, 1961, in sub-regulation (2), for clause (ii), the following clause shall be substituted, namely:-

“in case of respirable asbestos fibres, exceeds one fibre per milliliter of air sampled by an open membrane filter and measured by a phase contrast optical microscope of a type approved by an in accordance with the procedure as specified by the Chief Inspector by a general or special order”.

[F.N.H-11012/03/2006-ISH.II]
S.K. Srivastava, Joint Secretary.

New Delhi, the 4th April, 2008

S.O.837 – In the Notification S.O. No.3833 in English and S.O. No.3822 in Hindi published in the Gazette of India Part-II, Section 3(ii) dated 7th December, 2002, the name of Shri S.K. Bagchi, DDMS (Mining) of Sl. No.30 may be read as “Shri S. Bagchi”.

[F.N.S-29025/5/2002-ISH.II (Part File)]
Subhash Chand, Under Secretary.

Dhanbad, dated the 7th April, 2008

G.S.R.65 – In pursuance of the provisions of Regulations 13(4) of the Metalliferous Mines Regulations, 1961 the bye-laws for the conduct of examination and grant of certificate of Competency so far as they related to penalty for misconduct are hereby amended as follows:

SN	Certificate of Competency	Bye-law No.	Existing bye-law	Amended bye-law
(1)	Manager's Certificate	11	Penalty for misconducts: Any candidate who submits a false certificate or counterfeits certificate or makes a false declaration or adapts unfair means during the examination, may be disqualified by the Board and also debarred from appearing at any subsequent examination for a specified period not exceeding three years depending upon the facts of the case.	Penalty for misconducts: Any candidate who submits a false certificate or counterfeits certificate or makes a false declaration or adapts unfair means during the examination, may be disqualified by the Board and also debarred from appearing at any subsequent examination for a specified period depending upon the facts of the case.
(2)	Mine Surveyor's Certificate	9		
(3)	Mine Surveyor's Certificate Restricted to mines having opencast workings only.	9		
(4)	Mine Foreman's Certificate	9		
(5)	Mining Mate's Certificate	3		
(6)	Blaster's Certificate	1(5)		
(7)	Blaster's Certificate Restricted to mines having opencast working only.	1(4)		
(8)	Winding Engineman's 1 st Class and 2 nd Class Certificate	5(2)		
(9)	Gas Testing Certificate	9(1)		

[No.Board/Metal/1123/2008]

M.M. Sharma, Director General of Mines Safety & Chairman.

Dhanbad, dated the 7th April, 2008

G.S.R.66 – In pursuance of the provisions of Regulations 13(4) of the Coal Mines Regulations, 1957 the bye-laws for the conduct of examination and grant of certificate of Competency so far as they related to penalty for misconduct are hereby amended as follows:

SN	Certificate of Competency	Bye-law No.	Existing bye-law	Amended bye-law
(1)	Manager's Certificate	11	Penalty for misconducts: Any candidate who submits a false certificate or counterfeits certificate or makes a false declaration or adapts unfair means during the examination, may be disqualified by the Board and also debarred from appearing at any subsequent examination for a specified period not exceeding three years depending upon the facts of the case.	Penalty for misconducts: Any candidate who submits a false certificate or counterfeits certificate or makes a false declaration or adapts unfair means during the examination, may be disqualified by the Board and also debarred from appearing at any subsequent examination for a specified period depending upon the facts of the case.
(2)	Mine Surveyor's Certificate	9		
(3)	Overman's Certificate	11		
(4)	Mining Sardar's Certificate	11		
(5)	Shot-firer's Certificate	11		
(6)	Winding Engineman's 1 st Class and 2 nd Class Certificate	10		
(7)	Gas Testing Certificate	9		

[No.Board/Coal/1124/2008]

M.M. Sharma, Director General of Mines Safety & Chairman

Dhanbad, dated 22nd April, 2008

G.S.R.99 – In exercise of the powers conferred on me under Sub-regulation (1) of Regulation 73 of Oil Mines Regulations 1984, I, M.M. Sharma, Chief Inspector of Mines also designated as Director-General of Mines Safety hereby declare 1st June, 2008 as date from which all type of Emergency Escape Device and Escape Line for installation on derrick to be used in Oil Mines will be of such type standard and make as approved by me by a general or special order in writing.

[No.16(38)79-Genl/1104]

M.M. Sharma, Director General of Mines Safety

New Delhi, the 14th May, 2008

S.O. 1140 – In exercise of powers conferred by sub-section (1) of Section 162 of the Electricity Act, 2003 (36 of 2003) read with Rule 4(A) of the Indian Electricity Rules, 1956 and in supersession of Government of India, Ministry of Power Notification No.S.O.464 dated 24th January, 2003, the Central Government hereby appoints the following officers of the Directorate-General of Mines Safety as Chief Electrical Inspector and Electrical Inspectors for the said purpose of the said Act, who shall exercise the powers and perform the functions of a Chief Electrical Inspector and an Electrical Inspector in relation to a mine, within the local limits of their respective jurisdiction except the State of J&K.

Chief Electrical Inspector:

1. Shri R. Ramchandiran, Deputy Director-General of Mines Safety (Electrical)

Electrical Inspectors:

1. Shri BN Mishra, Director of Mines Safety (Electrical)
2. Shri Dharmendra Kumar, Director of Mines Safety (Electrical)
3. Shri BK Panigrahi, Director of Mines Safety (Electrical)
4. Shri SK Talukdar, Director of Mines Safety (Electrical)
5. Shri BK Lama, Deputy Director of Mines Safety (Electrical)
6. Shri MK Das, Deputy Director of Mines Safety (Electrical)
7. Shri KM Ghosh, Deputy Director of Mines Safety (Electrical)
8. Shri Mukesh Srivastava, Deputy Director of Mines Safety (Electrical)
9. Shri GP Rao, Deputy Director of Mines Safety (Electrical)
10. Shri UN Pandey, Deputy Director of Mines Safety (Electrical)
11. Shri GL Kanta Rao, Deputy Director of Mines Safety (Electrical)
12. Shri SK Thakur, Deputy Director of Mines Safety (Electrical)
13. Shri Radheshyam, Deputy Director of Mines Safety (Electrical)
14. Shri BS Nim, Deputy Director of Mines Safety (Electrical)
15. Shri KS Yadav, Deputy Director of Mines Safety (Electrical)
16. SHRI MK Malviya, Deputy Director of Mines Safety (Electrical)
17. Shri M. Sahay, Deputy Director of Mines Safety (Electrical)

[F.No.42/4/2001-R&R]
I.C.P. Keshri, Joint Secretary.

New Delhi, the 11th August, 2008

S.O. 2035(E) – In exercise of the powers conferred by sub-regulations (1), (2), (3) & (4) of Regulation 11 of Metalliferous Mines Regulations, 1961 and in supersession of the notification of the Government of India in the Ministry of Labour and Employment number S.O. 91(E) dated 25.1.2005 and S.O. 1204(E) dated 24.7.2007, the Central Government hereby constitutes the Board of Mining Examination and appoint the following persons as members of the Board for a period of three years from date of publication of this notification, namely:

1. Director General of Mines Safety	Chairman
2. Dr. Bal Krishna Srivastava, Coordinator, Centre of Advanced Studies, Department of Mining Engineering, Institute of Technology, Baranas Hindu University, Varanasi-221005	Member
3. Shri Akhilesh Joshi, Vice President, Rampura Agucha Mines, Hindustan Zinc Ltd., P.O. Agucha-311029 District: Bhilwara (Rajasthan)	Member
4. Shri Diwakar Acharya, Director (Technical), Uranium Corporation of India Limited, P.O. Narwapahar Mines Singhbhum (East), Jharkhand-832107	Member
5. Shri Vinay Kumar Agarwal, Sr. Vice President, Indian Metals and Ferro Alloys, IMFA Building, Near Police Station, At Chorda Chhak, P.O. Jajpur Road-755019	Member
6. Shri Upendra Kumar Singh, Professor and Head, Department of Mining Engineering, Indian School of Mines University, Dhanbad-826001	Member

[F.No.S-66012/1/2004-ISH.II]
S.K. Srivastava, Joint Secretary.

New Delhi, the 14th August, 2008

G.S.R. 159 – In exercise of the power conferred on the Chief Inspector of Mines also designated as Director-General of Mines Safety under sub-regulation (3) of Regulation 181 of the Coal Mines Regulations, 1957, as well as sub-regulation (1) of regulation 73 of the Oil Mines Regulations, 1984, I hereby, declare 1st November, 2008 as date from which all types

of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression systems in mines both on surface and below ground including oil and gas mines/field will be of such type, standard and make as approved by a general or special order in writing.

[No.DGMS/S&T/FFS/696]

M.M. Sharma, Director-General of Mines Safety

New Delhi, 14th August, 2008

G.S.R.160 – In exercise of the power conferred on the Chief Inspector of Mines also designated as Director-General of Mines Safety under sub-regulation (3) of Regulation 181 of the Coal Mines Regulations, 1957, I hereby declare 1st November, 2008 as the date from which all types of steel supports, roof bolts, cement and resin grouts to be used for the purpose of supporting roof and sides of the workings in a mines, shall be of such type, standard and make as approved by me by a general or special order in writing.

[No.DGMS/S&T/SS/702]

M.M. Sharma, Director-General of Mines Safety

New Delhi, the 14th August, 2008

G.S.R. 161 – In exercise of the power conferred on the Chief Inspector of Mines also designated as Director-General of Mines Safety under sub-regulation (3) of Regulation 181 of the Coal Mines Regulations, 1957, I hereby declare 1st November, 2008 as the date from which all types of Chemical Dust Suppressant including the additives used therein, to be used for suppressing dust in mines, shall be of such type, standard and make approved by me by a general or special order in writing.

[No.DGMS/S&T/DSS/699]

M.M. Sharma, Director-General of Mines Safety

New Delhi, the 5th September, 2008

S.O.2593 – In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints the following officers as Inspector of Mines sub-ordinate to the Chief Inspector of Mines, until further order:

1. Shri Bhushan Prasad Singh
2. Shri Deo Kumar
3. Shri Shyam Sunder Prasad
4. Shri Rajib Pal
5. Shri Bipul Bihari Satiar
6. Shri Kamal Kumar Sharma
7. Shri Ramwatar Meena
8. Shri Monoranjan Doley

[F.No.S-29025/1/2008-ISH.II]

Subhash Chand, Under Secretary.

New Delhi, the 30th September, 2008

G.S.R.701(E) – Whereas the draft of certain regulations further to amend the Metalliferous Mines Regulations, 1961, which the Central Government proposes to make on the recommendation of the Committee constituted under Section 12, of the Mines, 1952 (35 of 1952) was published as required by sub-section (1) of section 59 of the said Act in the Gazette of India, Extraordinary, Part II, section-3, sub-section (i), dated the 28th March, 2008 under the notification of the Government of India in the Ministry of Labour and Employment

No.G.S.R.236(E), dated the 28th March, 2008, inviting objections and suggestions from all persons likely to be affected thereby, till the expiry of a period of three months from the date of publication of the said notification in the Official Gazette.

And whereas the copies of the said Gazette were made available to the public on 28th March, 2008.

And whereas no objection or suggestion has been received from the public on the said draft.

Now, therefore, in exercise of the powers conferred by Section 57 of the Act, the Central Government, after referring the said draft to the Committee constituted under the said Act and after giving it a reasonable opportunity of reporting as to the expediency of amending of the said Regulations and as to the suitability thereof, as required by sub-section (4) of Section 59 of the said Act, hereby makes the following regulations, further to amend the Metalliferous Mines Regulations, 1961, namely:-

1. (1) These regulations may called the Metalliferous Mines (Amendment) Regulations, 2008.
(2) They shall come into force on the date of their publication in the Official Gazette.
2. In regulation 124 of the Metalliferous Mines Regulations, 1961, in sub-regulation (2), for clause (ii), the following clause shall be substituted, namely:-

“(ii) in case of respirable asbestos fibres, exceeds one fibre per milliliter of air sampled by an open membrane filter and measured by a phase contrast optical microscope of a type approved by and in accordance with the procedure as specified by the Chief Inspector by a general or special order.”

[F.No.H-110/3/2006/ISH.II]
S.K. Srivastava, Jt. Secretary.

Dhanbad, the 25th November, 2008

G.S.R. 215 – In exercise of the powers conferred on me under sub-regulation 123(6)(b)(ii) of Coal Mines Regulations, 1957 and regulation 124(6)(b)(ii) of Metalliferous Mines Regulations, 1961, I, M.M. Sharma, Chief Inspector of Mines also designated as Director-General of Mines Safety hereby declare 31st December, 2008 as date from which following item will not be used in Coal Mines and Metalliferous Mines unless the same has been approved by me by a general or special order in writing:

1. Dust Suppression/Prevention device in drilling and boring equipment.

[No.16(38)79-GenI-6095]
M.M. Sharma, Director-General of Mines Safety.

New Delhi, 5th December, 2008

No.A-32012/5/2008-ISH.II – The President is pleased to appoint Shri HK Srivastava to the post of Director of Mines Safety (Mechanical) in the Directorate-General of Mines Safety, Dhanbad in the pre-revised pay scale of Rs.14,300-400-18,300/-, with effect from 1.11.2008 (F/N) and until further orders.

Subhash Chand, Under Secretary.

Circulars – 2008

No. DGMS(Approval)Circular No./01 Dhanbad Dated the 12th Feb. 2008

To

Owner / Agent / Manager of all Coal Mines

Sub. : Calibration & maintenance of Oldham make Gas Detectors, Environmental Monitoring Systems type CGA etc.

M/s industrial Scientific Corporation, USA has taken over M/s Oldham France, SA including all liabilities as informed to DGMS vide their letter dated 28.6.2007. M/s Industrial Scientific Corporation, USA has further informed that they have appointed M/s Respo Products, Agra as their authorized agent in India in respect of supply of spare parts, maintenance and calibration of Gas Detection equipments like digital oxymeter, explosimeter, digital toximeter, multi gas detector and Environmental Monitoring system, type CGA. They have also informed that M/s Respo Products, Agra has full fledged office at Dhanbad, Asansol and Nagpur employing Oldham trained personnel capable of executing any support at the site.

You may therefore, like to make use the facilities rendered by M/s Respo Products in respect of all gas detection equipments manufactured by the then M/s Oldham France, SA.

No. DGMS(Approval)Circular No./02 Dhanbad Dated the 22nd April, 2008

To

Owner / Agent / Manager of all Oil Mines

Sub. : Emergency Escape Device & Escape Line

It is mandatory under Reg 28(1) of Oil Mines Regulation 1984 that on every derrick there shall be installed and maintained an Emergency Escape Device along with properly secured escape line so that persons can come down safely from monkey board to ground level in an emergency situation. It should be of adequate strength and safe to travel.

A Notification NO. 16(38)79-Gen/1104 dated 22nd April, 2008 had been forwarded to publish in the Gazette of India is reproduced below for information and taking necessary step to comply with the requirement of the same.

“In exercise of the powers conferred on me under sub-regulation (i) of Regulation 73 of Oil Mine Regulation 1984, I, M M Sharma, Chief Inspector of Mines also designated as Director General of mines Safety hereby declare 1st June 2008 as date from which all type of Emergency Escape Device and Escape Line for installation on derrick to be used in Oil Mines will be of such type standard and make as approved by me by a general of special order in writing.”

You are being informed in advance to take necessary action to see that it is implemented.

No. DGMS(Approval)Circular No./03 Dhanbad Dated the 22nd July 2008

To

Owner / Agent / Manager of all Oil Mines

Sub. : Emergency Escape Device & Escape Line

It is mandatory under Reg 29(1) of Oil Mines Regulation 1984 that on every derrick there shall be installed and maintained an Emergency Escape Device along with properly secured escape line so that persons can come down safely from monkey board to ground level in an emergency situation. It should be of adequate strength and safe to travel.

This circular is issued in continuation of our earlier circular No. DGMS (Approval) circular No. 2 dated 22nd April 2008.

A Notification NO. 16(38)79-Genl/1104 dated 22nd April, 2008 published in the Gazette of India Part II Sec 3 (i) on 17.5.2008 is reproduced below for information and taking necessary step to comply with the requirement of the same.

“In exercise of the powers conferred on me under sub-regulation (i) of Regulation 73 of Oil Mine Regulation 1984, I, M M Sharma, Chief Inspector of Mines also designated as Director General of mines Safety hereby declare 1st June 2008 as date from which all type of Emergency Escape Device and Escape Line for installation on derrick to be used in Oil Mines will be of such type standard and make as approved by me by a general of special order in writing.”

A copy of Gazette notification is enclosed herewith.

No. DGMS(Approval)Circular No./04 Dhanbad Dated the 22nd July 2008

To

Owner / Agent / Manager of all Coal and Metal Mines

Sub. : Audio Visual Alarm for surface transportation Machineries & other Heavy earth Moving Machineries.

A no. of accidents had occurred during reversing of surface transportation machineries like dumpers, truck, tippers and other HEMM like payloaders, shovels etc. Attention to mining industries was drawn vide circular no. 7 of 1977, circular no. 12 of 1999, DGMS(Tech)Circular No. 9 of 2003 recommending specifications of Audio-Visual – alarm but it revealed during inspection that in most of the machineries Audio-visual-Alarm have not been provided and where ever provided most of them were non functioning.

Hence, it has been decided that to have a better quality products in mines the Audio visual-alarm should be of approved type and make.

A Notification No. 16(38)79-Genl/1973 Dated 22nd July 2008 had been forwarded to publish in the Gazette of India is reproduced below for information and taking necessary step to comply with the requirement of the same.

“In exercise of the powers conferred on me under sub-regulation 3 of Regulation 181 of Coal Mines Regulation, 1957, I, M M Sharma, Chief Inspector of Mines also designated as Director General of mines Safety hereby declare 1st September 2008 as date from which “Audio Visual Alarm” for reversing of surface transportation machineries & other Heavy Earth Moving Machineries will not be used in mines unless the same has been approved by me by a general or special order in writing.”

You are being informed in advance to take necessary action to see that it is implemented.

No. DGMS(Approval)Circular No./05 Dhanbad Dated the 25. 11. 2008

To

Owner / Agent / Manager of all Coal and Metal Mines

Sub. : Approval of Dust Suppression/Prevention system in Drilling Machines used in mines.

During any operation of drilling or boring on surface or underground a device shall be provided for dust suppression / prevention in equipments and kept in operation to prevent liberation and accumulation of air borne dust in the atmosphere.

During the inspections it was observed that the devices used for Dust Suppression / Prevention Systems dose not function effectively and properly.

Hence, it has been decided that to have a better quality products in mines the Dust Suppression/Prevention System in Drilling and boring machines use in mines should be of approved type and make.

A Notification No. 16(38)79-Genl/6095 dated 25.11.2008 had been forwarded to publish in Gazette of India is reproduced below for information and taking necessary step to comply with the requirement of the same.

GSR In exercise of the powers conferred on me under Regulation 123(6)(b)(ii) of Coal Mines Regulation, 1957 and Regulation 124(6)(b)(ii) of Metialliferous Mines Regulation 1961, I, M M Sharma, Chief Inspector of Mines also designated as Director General of mines Safety hereby declare 31st December 2008 as date from which following item will not be used in Coal Mines and Metalliferous Mines unless the same has been approved by me by a general or special order in writing.

1. Dust Suppression / Prevention device in drilling and boring equipment.

You are being informed in advance to take necessary action to see that it is implemented.

No. DGMS(Legis.)Circular No.1 of 2008 Dhanbad Dated the 12.02. 2008

To

Owner / Agent / Manger of all Coal Mines

Sub. : Approval of Safety Goggles, Reusable Earplug, Visibility Harness and Dust Respirator.

Notification no. 16(38)79-Genl/5102 dated 14.11.2007, published in the Gazette of India, Part-II Sec 3(i) on 01.12.2007 vide GSR-261 is reproduced below for information and taking necessary steps to comply with the requirements of the same.

"In exercise of the powers conferred on me under Regulation 191(B) of the Coal Mines Regulations, 1957, I. M M Sharma, Chief Inspector of Mines also designated as Director General of mines Safety hereby declare the following safety items to be used in coal mines to protect the persons employed therein from undue hazardous conditions like noise, dust, visibility and for proper identification of persons with visibility harness, with immediate effect, in a kit form for easy carrying".

1. Safety Goggles.
2. Reusable Earplug.
3. Visibility Harness and
4. Dust Respirator.

No. DGMS(Legis.)Circular No.2 of 2008 Dhanbad Dated the 12.02. 2008

To

Owner / Agent / Manger of all Metalliferous Mines

Sub. : Approval of Safety Goggles, Reusable Earplug, Visibility Harness and Dust Respirator.

Notification no. 16(38)79-Genl/5102 dated 14.11.2007, published in the Gazette of India, Part-II Sec 3(i) on 01.12.2007 vide GSR-260 is reproduced below for information and taking necessary steps to comply with the requirements of the same.

“In exercise of the powers conferred on me under Regulation 182(B) of the Metalliferous Mines Regulations, 1961, I. M M Sharma, Chief Inspector of Mines also designated as Director General of mines Safety hereby declare the following safety items to be used in coal mines to protect the persons employed therein from undue hazardous conditions like noise, dust, visibility and for proper identification of persons with visibility harness, with immediate effect, in a kit form for easy carrying”.

1. Safety Goggles.
2. Reusable Earplug.
3. Visibility Harness and
4. Dust Respirator.

DGMS (Tech)(SOMA) Circular No.1 of 2008 Dhanbad, dated 4.1.2008

To,

The Owner, Agent and Managers,
of all mines.

Sub: Recommendations of 10th National Conference on Safety in Mines held on 26th & 27th December 2007 at New Delhi.

You may be aware that the 10th National Conference on Safety in Mines held on 26th & 27th December 2007 at New Delhi. Besides reviewing the status of implementation of the recommendations of Ninth Conference on Safety in Mines, the conference had deliberated upon and had made valuable recommendations on the following subjects:

1. Contractor Work Vis-à-vis Safety.
2. Safety Issues in Mines in Unorganized Sector.
3. Occupational Health Surveillance & Notified Diseases.
4. Mechanization with a view to Phase-out Manual loading & to improve Safety Standards.
5. Reduction of Risk from Roof and Side Falls in Coal Mines.
6. Safety of contractor's workers and Implementation of "Cold Work Permit" in Oil Mines.
7. Belowground Communication and Tracking System.
8. "Safety Management System" Strategies for Implementation and Path Forward.
9. Implementation of ILO Convention No. 176 in Mines.

The recommendations of the conference are hereby being brought to your attention for information and necessary action.

**RECOMMENDATIONS OF THE TENTH CONFERENCE ON SAFETY IN MINES HELD ON 26th
AND 27th November 2007, AT NEW DELHI.**

- 1.0 Review of Status of Implementation of Recommendation of the 9th Conference on Safety in Mines:
- 1.1 Necessary facilities for monitoring the environmental parameters in respect of Methane & Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy coal mines and in such other mines having active underground fire. Indigenous manufacturers should be encouraged to manufacture necessary equipments. Time bound programme is to be made, which should be decided in a tripartite committee at company level.
- 1.2 In mines where long or arduous travel is involved, arrangement for transport of men should be made. Time bound programme is to be made, which should be decided in a tripartite committee at company level.
- 1.3 In respect of small-mechanized mines, which are operating in non-coal sector, it may not be feasible for a small organization to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mines operators creates common facilities and infrastructure for occupational health services. Creation of such facilities is specially needed for asbestos, manganese and mica mines.

Simultaneously with creation of facilities for occupational health services, it is also necessary to improve quality of life of employees working in mining industry by provision of well planned housing colonies provided with all modern facilities such as good drinking water, good sanitation, drainage and recreational facilities. DGMS should collect complete information as adequate feed back has not been received.
- 1.4 Development of a portable instrument for detecting the hidden slips in the roof of coalmines should be taken up on priority by R&D organizations. The instrument should be developed by a S&T project which should be guided by a committee consisting of an officer from DGMS and others from Coal Industry and Research Organizations.
- 1.5 All front-line supervisory officials like Sirdars / Mates, Overmen /Foremen, Surveyors, Electrical/ Mechanical supervisors/Chargemen / Foremen as well as persons supervising other surface operations should be imparted structured training in safety management, for at least two weeks, once in every five years, covering about 20% strength every year.
- 1.6 The recommendations of DGMS (Tech) Circular No.18 of 1975 shall be implemented forthwith. (Protection of workers against Noise & Vibration in Working Environment.)
- 1.7 Audiometry should be introduced, as a part of mandatory medical examination, for persons seeking employment in mines and for persons engaged in operations/areas where noise level exceeds 90 dB(A).
- 1.8 (a) Before the valid gate pass is issued for entry of trucks and other vehicles not belonging to management into the mine, the mine engineer should check the road-worthiness of such vehicles.

(b) In order to check entry of unauthorized vehicles in mine premises, each mine should establish properly manned check gate(s) at the entrance(s) where record of entry and exit of each such vehicle should be maintained.

- 1.9 Persons engaged in surface operations and, in particular, the contractors' workers, who incidentally are often inexperienced and least informed about job-safety matters, need closer and more competent supervision. To minimize accidents due to surface operations it would be ensured that:

(a) All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".

(b) Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.

(c) In case of smaller mines, such arrangement may be made by association of mine operators.

1.10 Preventing Mine Disasters from Inundation

1.10.1 Recommendations of 6th Conference on Safety in Mines –

- (a) to evolve suitable cadre structure for mine surveyors and up gradation of their skill by availing facilities at various institutions, appointment of qualified surveyors.
- (b) providing infrastructure including computerized facility at area level to oversee survey work of the mine etc. may be implemented.

1.10.2 R&D efforts should be continued to develop a system for construction of water-tight chamber as last refuge below ground in case of inundation.

1.11 Preventing Mine Disasters from Fire, and Effective Emergency Response

1.11.1 Considering the risk of fire, all coal mine companies shall rank its coalmines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining companies.

1.11.2 Each mining company shall formulate and implement structured training programme for development of awareness and increasing effectiveness of emergency response in case of fire amongst work persons, officials and management.

1.12 Quality Control for Improving Safety

1.12.1 Each large mining company may setup quality control cell or strengthen where the same exist, identify critical items which require testing for quality assurance at the time of procurement and during use and arrange testing of the same. Testing facilities may be setup wherever feasible

1.12.2 Any defect or failure of approved items or those having BIS certification may be promptly brought to the notice of the appropriate authority for further action.

1.13 Safety in Oil mines – Blowout and Fire hazards

1.13.1 Precautions Against Blowout:

Each oil company shall frame an action plan to provide following safety devices in all the drilling rigs:

- (a) Pit level indicator registering increase or reduction in the drilling mud volume with an audio-visual warning device near the driller's stand,
- (b) A gas detector or explosimeter at the primary shale shaker with audio-visual warning device near the driller's stand,
- (c) A device to accurately measure the mud required to keep well filled at all the time, and
- (d) A device to ensure filling of the well with mud when string is being pulled out.

1.13.2 Precautions Against Fire

Plans of pipe lines of flowing wells connected with group gathering stations shall be updated showing villages, surface features, location of valves etc. and copy of such plans shall be displayed at every group gathering station.

1.14 Occupational Health Surveillance in Mining Industry

- 1.14.1 All chest radiographs of Initial and Periodical Medical Examinations in private mines shall be classified for detection, diagnosis and documentation of pneumoconiosis in accordance with ILO classification for pneumoconiosis.
- 1.14.2 The PME Medical Officer in every PME centre of private mines shall be trained in occupational health and use of ILO classification for pneumoconiosis.
- 1.14.3 Each mining company operating mechanized mines shall set up an Occupational Diseases Board consisting of one occupational Health Physician, one radiologist and one general physician

1.15 Increasing Effectiveness of Worker's Participation in Safety Management

- 1.15.1 All private mechanized mines and mines using heavy earth moving machinery for exploitation of minerals, where 100 (hundred) or more number of workers are employed, should appoint Workmen's Inspectors.
- 1.15.2 In large mines sectional/departmental safety committees under the main safety committee may be constituted for specific area of operation.

2.0 Contractor work vis-a-vis Safety

2.1 Employer's responsibilities

- (a) Incorporate suitable clauses (in consistence with risk of the work allotted) shall be included in tender document (including NITs) stating how the risk arising to men & material from the mining operation / operations to be done by the contractors shall be managed.
- (b) Ensure that contractors are familiar with the relevant parts of the statute, health and safety management system and are provided with copies of such documents prior to commencing work.
- (c) Ensure that contractor's arrangements for health and safety management are consistent with those for the mine owner. All the rules, regulations and bye-laws as applicable to the mine owner are also applicable to the contractor. Details of the contractors' workmen should be maintained in the owner's Form-B Register. Whereas, C, D & E Registers for contractor men may be maintained independently by the owner. All the above Registers shall be kept in the mine office of the manager.

- (d) Ensure that contracts should preferably be of longer period (three years), so that there is adequate scope of management of safety by the contractor.
- (e) Ensure that contractor's provide the machinery, operator and other staff with written safe work procedures for the work to be carried out, stating clearly the risk involved and how it is to be managed.
- (f) Monitor all activities of the contractors to ensure that contractors are complying with all the requirements of statute and the system related to safety. If found non-compliant of safety laws directing the contractor to take action to comply with the requirements, and for further non-compliance, the contractor may be suitably penalized. Clause to this affect may be a part of the agreement between the employer and the contractor.
- (g) Where a risk to health or safety of a person arises because of a non-compliance directing the contractor to cease work until the non-compliance is corrected.

2.2 Contractor's responsibilities

- (a) Prepare written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with it/them.
- (b) Provide a copy of the SOP to the person designated by the mine owner who shall be supervising the contractor's work.
- (c) Keep an up to date SOP and provide a copy of changes to a person designated by the mine owner.
- (d) Ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner.
- (e) For work of a specified scope/nature, develop and provide to the mine owner a site specific code of practice.
- (f) Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring compliance all safety laws by the sub or sub-sub contractors.
- (g) All persons deployed by the contractor for working in a mine must undergo vocational training, initial medical examination, PME. They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of VT & IME.
- (h) Every person deployed by the contractor in a mine must wear safety gadgets to be provided by the contractor. If contractor is unable to provide, owner/agent/manger of the mine shall provide the same.
- (i) The contractor shall submit to DGMS returns indicating – Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment of work persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons. The return shall be submitted quarterly (by 10th of April, July, October & January) for contracts of more than one year. However, for contracts of less than one year, returns shall be submitted monthly.

2.3 Employee's responsibilities

- (a) An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.
- (b) An employee must, while at work, cooperate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

3.0 Safety Issues in mines in unorganized sector

- 3.1 The States in general may grant mining/quarrying leases of a size not less than ten hectares each for an appropriate period, depending on technical feasibility, so that the lessee can make medium to long-term plan for investment in infrastructure and work the mines in a safe and scientific manner. In case smaller lease needs to be granted, it should be ensured that the Central Laws, including the Mines Act are complied with.
- 3.2 In case of stone quarries on hillocks, whole of the hillock should be given out as a single lease so that necessary development could be done from top-downwards after making approach road to reach to top of the hillock before starting extraction of stone. A condition to this effect may be incorporated before granting such leases.
- 3.3 In the lease document, reference should be made to the Mines Act and the Rules and Regulations made there under for compliance. The DGMS may prepare, in consultation with Ministry of Mines a model document for grant of leases by the state governments so that the conditions of leases are such that there is a uniformity and compliance with central laws.
- 3.4 A copy of the lease document should be sent to the DGMS and lessees explicitly asked to send notice of opening of mine to DGMS in accordance to the Provisions of the Mines Act.
- 3.5 The Conference has noted that there have been instances where leases have been granted in some States in close proximity of inhabited area and within 45 m of Railway acquired land and land acquired for National and State highways, public works without consulting the appropriate statutory authority. The conference recommends that the States may grant mining leases in conformity of Central Laws.
- 3.6 DGMS should organize Orientation Programmes for officers of State Mines and Geology Departments to inform them about safety laws.

4.0 Occupational Health Surveillance and Notified Diseases.

- 4.1 Noise mapping should be made mandatory of various work places in the mine premises based on the various machines being used in concerned mines along with personal noise dosimetry of individual workmen exposed to noise level above 85 dbA.
- 4.2 *Vibration studies of various mining machinery required to be done before their introduction in mining operations as per ISO standards. .*
- 4.3 Ergonomical assessment of all latest machines, before their introduction into mining operation as per ISO standards. Ergonomical assessment should include:
 - * Assessment of work process.

- * Assessment of working Aids/tools
- * Assessment of working posture

- 4.4 Potability test of drinking water supplied to the mine employees, to be made mandatory once in a year irrespective of its source, preferably after Rainy seasons, the sample of water should be collected from the points of consumption
- 4.5 Initial medical examination is shall be made mandatory for all mining employees whether permanent, temporary or contractual, before they are engaged in any mining job.
- 4.6 The frequency of periodic medical examinations should be brought down from existing five years to three years for the mining employees above 45 years of age. This should be implemented in three years.
- 4.7 Standards of medical examinations for both Initial and Periodic should be modified as mentioned below in order to ensure early diagnosis of more diseases caused or get aggravated due to employment in mines.
 - (a) In addition to measurement of blood pressure detailed cardiovascular assessment of employees should be done. This should include 12 leads electrocardiogram and complete lipid profile.
 - (b) Detailed neurological examinations including testing of all major superficial and deep reflexes and assessment of peripheral circulation to diagnose vibrational syndromes.
 - (c) In addition to routine urine, fasting and post-parandial blood sugar should be included for early diagnosis of diabetes mellitus.
 - (d) Serum Urea and Creatinine should be included for assessment of Renal function.
 - (e) Haematological tests like Total count, Differential count, Haemoglobin% and Erythrocyte Sedimentation Rate should be included to diagnose Blood Dyscrasias.
- 4.8 Special tests should be included in the PME for employees exposed to specific health hazard;
 - a. For employees exposed to manganese, special emphasis should be given to behavioral and neurological disturbances such as speech defect, tremor, impairment of equilibrium, adiadochokinesia H₂S and emotional changes.
 - b. For persons exposed to lead, PME should include blood lead analysis and delta aminolevulinic acid in urine, at least once in a year.
 - c. Employees engaged in food handling and preparation and handling of stemming material activities should undergo routine stool examination once in every six months and sputum for AFB and chest radiograph once in a year.
 - d. Employees engaged in driving/ HEMM operation jobs should undergo eye refraction test at least once in a year.
 - e. Employees exposed to ionizing radiation should undergo Blood count at least once in a year.
- 4.9 It is proposed to include following diseases in the list of Notified diseases under Section 25 (1) of Mines Act, 1952.

- (a) All other types of Pneumoconiosis excluding Coal workers pneumoconiosis, Silicosis and Asbestosis. This includes Siderosis & Berilloyosis.
 - (b) Noise induced hearing loss.
 - (c) Contact Dermatitis caused by direct contact with chemicals.
 - (d) Pathological manifestations due to radium or radioactive substances.
- 4.10 For smaller mines where PME facilities are not existing, medical examinations can be done through other competent agencies.

5.0 Mechanization with a view to phase-out manual loading & to improve safety standards.

- 5.1 Keeping in view the objective of phasing out manual loading, all coal companies shall identify appropriate technology suitable for the prevailing geo-mining conditions and introduce the same in such a manner so as to phase out manual loading operations completely within a period of five years in coal seams with gradient of 1 in 5 or less, and within a period of seven years in coal seams with gradient steeper than 1 in 5.
- 5.2 While formulating the strategies for face mechanization in underground workings, it shall be ensured that back up facilities like coal evacuation, support system, ventilation arrangements etc. are compatible with face mechanization
- 5.3 The scheme of face mechanization shall be based on proper scientific investigation. The scheme shall also include arrangements for monitoring strata behavior and environmental conditions
- 5.4 Possibility of deployment of multi-skilled miners in the face shall be explored to reduce the exposure at hazardous area without affecting employment
- 5.5 Suitable training for efficient & safe operation of machinery shall be imparted to all concerned.
- 5.6 While planning for face mechanization, due considerations shall be given for long term sustainability of the technology
- 5.7 A policy document shall be framed by each coal mining company within a period of six months for addressing the implementation issues. It shall also be ensured that all safety features are inbuilt into the system.

6.0 Reduction of risk from roof and side falls in coal mines

- 6.1 In every coal mining company, STRATA CONTROL CELL shall be established at corporate and area levels within a period of one year, to assist mine managers, for formulation of Systematic Support Rules, monitoring strata control measures in a scientific way to ensure efficacy of support system and for procurement/supply of quality supporting materials. Such cell shall be manned by adequate number of technical personnel headed by a senior official not below the rank of General Manager at Corporate level and Dy. General Manager at Area level.
- 6.2 Roof bolting shall be used as a primary means of support for freshly exposed roof in development as well as depillaring districts. For the roof category "Poor", having value of RMR of 40 or less, or where there is excessive seepage of

water from the roof strata, roof bolts exclusively with resin capsules shall be used to ensure adequate & immediate reinforcement of the strata

- 6.3 Due emphasis shall be given to support the sides of galleries while framing Systematic Support Rules.
- 6.4 Suitable steps shall be taken by the mining companies to inculcate a culture of "no work at face" other than supporting work, till the roof is supported by roof bolts up to at least 0.6 meter from the face.
- 6.5 To ensure proper drilling for roof bolting in all types of roof strata, suitable fit-for-use roof bolting machines shall be introduced in all mines within a period of one year. Such machines shall be capable of being operated from a distance or be provided with suitable canopy to protect the supporting personnel during drilling or bolting operations.
- 6.6 Risk assessment exercise shall be carried out in the mines for assessing the risk from the hazards of roof & side falls and identifying the control mechanism with specific responsibility for implementation. This exercise shall be reviewed at regular intervals not exceeding a year
- 6.7 Each company shall take steps to impart structured training to officers, supervisors and support personnel on roof bolting

7.0 Safety of Contractor Workers and Implementation of "Cold Work Permit" in Oil mines.

7.1 Contractor workers:

- (a) Before the commencement of the work by the contractor the job shall be thoroughly assessed for potential hazards and risks to the contractor worker and appropriate measures shall be taken to mitigate them.
- (b) Adequate supervision by the management shall be provided for the work to be carried out by the contractor.
- (c) Frequent change of contractual employee shall not be allowed.

7.2 Issue of cold work permit

- (a) Where the risk arising from the work to be performed under given circumstances at the installation, demands a stringent system of control to ensure safety of work persons, the management shall ensure that such work is carried out only by issuing a cold work permit.
- (b) The cold work permit shall be in a standardized format specifying place, time, date, duration of such work, the precautions to be taken and other relevant details.
- (c) Relevant training shall be imparted to all concerned for successful implementation of cold work permit

Definition: "Cold work" means any work which is of non-routine nature so identified by the manager.

8.0 Belowground Communication and Tracking System

- 8.1 All belowground mines shall be provided with efficient voice communication from the working districts/places to the surface,
- 8.2 Mining companies in collaboration with research institutions/ equipment manufacturers shall initiate and fund for, suitable research initiatives for establishment of appropriate communication system for below ground mines including to locate the trapped miners,

- 8.3 Mine management in collaboration with equipment manufacturers shall evolve a system of proximity warning device in HEMM and initiate measures for its implementation,

All the recommendations should be complied within a period of four years.

9.0 “Safety Management System”: Strategies for Implementation and Path Forward

- 9.1 Every mine should employ a sound risk analysis process, should conduct a risk assessment, and should develop a safety management plan to address the significant hazards identified by the analysis/ assessment.
- 9.2 The managements of every mining company should adopt the process of safety management system and commit itself for proper formulation and implementation of the same in totality. Necessary resources should be allocated for implementation of the control measures identified by the risk assessment process.
- 9.3 Necessary training of all employees of mining companies should be organized with the help of experts, both national and international, for optimal adoption of the safety management system.

10.0 Implementation of ILO Convention No.176 in mines

The Committee decided that a separate discussion be held by the Govt. of India in a tripartite forum to deliberate on the implications arising out of ILO Convention No.176.

DGMS (Tech)(SOMA) Circular No.02

Dhanbad, Dated 12th Feb. 2008

To,
The Owner, Agent and Managers of all mines.

Sub: - Corrigendum to DGMS (Tech)(SOMA) Circular No. 1 dated 04.01.2008 on Recommendations of 10th National Conference on Safety in Mines held at New Delhi.

The recommendations of 10th National Conference on Safety in Mines held at New Delhi were circulated vide above Circular. However due to oversight, the dates of the conference were wrongly mentioned. The dates of the conference should be read as 26th & 27th November, 2007 instead of 26th & 27th December, 2007 both in the subject as well as in the body of the circular.

It is once again requested to ensure the compliance of the Recommendations at the earliest.

No. DGMS(Tech.) (S&T)/Circular No.1/697 Dhanbad, dated the 14.08. 2008.

To
The Owner, Agent & Manager of Coal and Oil Mines

Sub: Fire Suppression and Control System to be used in Mines.

Sir,

As we all are aware that Underground or surface fires, spontaneous heating or combustion in coal Mines as well as fires in machinery, plants and other installations pose not only serious threats to the life and property of the mines but also disrupts the normal operation of the mine resulting in immense loss to the organization. Adequate statutory provisions regarding precautions against spontaneous heating and fires have been made in the Coal Mines Regulations, 1957, Oil Mines Regulations 1984 including the Mines Rescue Rules, 1985.

Based on various accidents and dangerous occurrences in mines both belowground as well as on surface, a number of technical circulars have been issued from this Directorate to guard against dangers due to spontaneous heating and fire. During the recent past, the use of heavy earth moving machineries (HEMMs), in large numbers and capacities, for excavating, loading and transport of minerals including coal has exponentially increased resulting in increase in number of accidents due to fires in HEMMs in opencast mines. Various types of fire fighting arrangements and equipments are being used in mines in accordance with the provisions of regulations.

The fire fighting technologies and fire suppression systems have advanced further which are more fast and effective to deal with fires either on surface or belowground including heavy earth moving machinery. A few of such technology is backpacked and handheld High Pressure Water Mist cum CAFs based fire fighting system which is applicable to quench not only oil fires but even electrical fires upto 36 KV line. Automatic Fire Detection and suppression system based on Fall of Pressure principle of detection and actuation is also a fail safe system. Similarly, Nitrogen mixed aqueous foam at pressure is applicable to quench both active and passive fires belowground as well as surface. Similar technologies are being used for various purposes.

The use of improved diesel engines with efficient and effective fuel injection system integrated with modern electronic or electro mechanical control systems in the vehicles and also different types of motors used as drives in machinery and plants have made the system more complex. In order to detect fire at initial stages, various techniques of automatic fire detection and suppression system have been developed and being used in the mines, machinery and plants. However the proper functioning of such fire detection and suppression system is not ensured due to which a number of accidents have been reported resulting in loss of human lives and property. A number of circulars have also been issued from this Directorate to provide automatic fire detection and suppression system in every earth moving machinery and plants. This subject was also deliberated and discussed during 8th and 9th Conference on Safety in Mines. However the compliance has been reported to be not encouraging.

It has also been reported that a number of toxic and non biodegradable chemicals are being used as ingredients in the fire fighting and suppression systems by various companies which are not only dangerous to human lives but also harmful to soil, water, flora and fauna in and around the mining areas. In view of the above, it is required that the use of fire fighting and suppression systems should be checked and controlled before being allowed to be used in the mines, Oil and Gas Fields.

It is, therefore decided that all the fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMS, materials and chemicals to be used in fire fighting or suppression systems in mines both on surface and belowground including oil and gas mines/fields should be of a type and make approved in writing from this Directorate.

A Notification No. DGMS/S&T/FFS/696 dated 14th August 2008 in this regard has been forwarded to be published in the Gazette of India and the subject matter thereof is reproduced below for information and taking necessary actions to comply with the requirement.

"In exercise of the power conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation of 181 of the Coal Mines Regulation, 1957 as well as sub regulation (1) of regulation 73 of the Oil Mines Regulations 1984, I hereby declare 1st November, 2008 as the date from which all types of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression systems in mines both on surface as well as belowground including oil and gas mines/fields, will be of such type, standard and make as approved by me by a general or special order in writing."

You are being informed in advance to take necessary steps in this regard and requested to ensure that it is implemented and complied with.

DGMS(Tech.) (S&T)/Circular No.2/700 Dhanbad, dated 14.08.2008

To

The Owner, Agent & Manager of Coal Mines

Sub: Use of Chemical Additives for Dust Suppression in Coal Mines

Sir,

Dust in coal mines is the primary cause of concern due to its being not only hazardous to human health but also dangerous due to being catalyst for ignition and explosion in coal mines. Coal Workers Pneumoconiosis as well as Silicosis is the two major occupational diseases notified under the Mines Act, 1952, the exposure of workers to airborne respirable dust leads to such diseases. A number of statutory provisions against dangers from airborne respirable dust have been made in the Coal Mines Regulations, 1957. medical examination of workers as well as study of personal exposure to dust profiles is normally carried out to ascertain the conditions of health of workers exposed to airborne respirable dusty environment.

To prevent dust getting airborne and dangerous to persons working in the mines, many companies have developed chemical additives to be used as dust suppressant. Such chemical additives were tried in India also for dust suppressing in mines. However, it is reported that some toxic and hazards chemicals are being used in such dust suppressant materials.

In order to prevent use of such type of hazardous chemicals in mines, Ministry of Environment and Forest, Government of India, constituted a committee to examine environmental issues pertaining to the use of chemical additives for suppression of dust in coal mines. The recommendations of the committee were forwarded to the Ministry of Coal, Ministry of Labour and Employment and other concerned. Thereafter, it was decided by the Ministry of Environment and Forest that the Director General of Mines Safety would be the nodal agency to issue national certification/technical certificate to the industry regarding toxic effect of chemicals. The Ministry further recommended that the manufacturers of chemicals used in suppression of dust in coal mines would apply to the Director General of Mines Safety in the prescribed format, along with a copy of test report to be obtained from the identified national laboratories on the chemical composition of additives. Manufacturers are therefore required to seek approval of the Director General of Mines Safety before their products are use in mining areas. This matter was referred to this Directorate vide letter No. Z-16011/2/2000-CPA dated 30.05.2001 enclosing therewith a copy of the committee's report. The silent points of observations and recommendations of the committee are reproduced below:

Places and operations where dust is generated in open-cast mines are mainly drilling and blasting operations, working faces, shovel loading, dragline operations, coal transportation corridor, loading and transfer points, coal handling plants, coal stockpiles, overburden dumps and coal crushing. In underground mines, the places where dust is generated are extraction faces, transfer points, belt conveyors, drilling and blasting operations.

Most difficult and important areas of dust control are the haul roads in open cast mines. The influencing factors are vehicle speed, concentration of traffic, weight and pay load of trucks, type of material transported, weather conditions and also the condition of the haul roads.

Construction, repair and maintenance of the haul roads in opencast mines are extremely important for dust control. Paving of haul roads can prevent dust generation to a great extent. Water spraying is the most common method of dust control. However, this not so effective in case of coal dust, which is hydrophobic in nature. To reduce the requirement of water and for better dust suppression, chemical additives in water solution could be used for spraying purposes.

Some chemicals are simple wetting agents that enhance water penetration into the soil and increase water retention time, which helps in better dust control whereas some organic chemical form a bond by cementing the loose particles together which helps in suppressing the dust raised along the haul roads.

Some wetting agents are blend of surfactants that can enhance water's ability to 'wet' and suppress the road dust. In most of the coal producing countries such as in Europe, Australia and USA biodegradable and non-toxic substances are permitted for the purpose.

Other set of chemicals are emulsion of semi-liquid resins (60%) and wetting solutions (40%). When mixed with water and applied to dust/soil, forms a strong attachment, which is resistant to leaching or percolation. Such formulations are marketed under various trade names, such as-Penn Suppress EC, Top Sheild, Environkleen, Coherex etc.

The chemicals when sprayed lead to polymeric dust control by forming chains of polymer molecules that are cross-linked in grid-like patters, cementing loose particles together.

Recently, some chemicals extracted from orange peels have made their place in the market. These citrus-based dust control agents are used in water solution and they reduce the surface tension and penetrate deeper into the road surface. They also have humic properties to promote retention of water in the treated material.

Chloride based dust control chemicals are not recommended due to corrosion potential. Waste oil based dust suppressants have been banned in the US and European countries. In Europe, phenol based chemicals have been banned for its harmful effects to human being.

In India, untreated water is most commonly used for suppression of dust in coal mines. Some chemicals are also being marketed, the efficacy of which has not been fully established. Since composition of these chemicals is not disclosed, their side effects, if any, on human being and on the soil as well as ground water are not evaluated before application.

Aspects other than the use of chemical additives to control fugitive dust emissions like compactness of all the roads should also be looked unto by the coal mines to reduce the concentration of SPM in coal mines. Some coal mines have carried trials with water chemicals for dust suppression.

The recommendations of the Committee with regards to the specific terms of reference are a follows:

- (1) Environmental issues pertaining to the use of chemical additives for dust suppression

The toxic and hazardous chemical additives can adversely affect the environmental quality and their exposure can be harmful to the human beings if inhaled. Such chemical additives can also affect the surface and ground water quality. Hence, it is essential that only

environment friendly chemical additives are used. This will promote water conservation and enhances the efficiency of dust suppression, the use of chemical additives for dust suppression in coal mines may be permitted provided the chemicals are properly tested and certified.

(2) Testing procedure of chemicals and to identify institutions for testing

At present, there is no laid out procedure for granting certification to the manufacturers for the use of dust suppression chemical additives. In order to streamline the procedure for testing and certification of such chemicals, the Committee recommends the following measures:

- (i) The Director General of Mines Safety should serve (DGMS) as the nodal agency to issue necessary certification;
- (ii) The manufacturers may be advised to apply to the DGMS in the prescribed form, along with a copy of the test report on the chemical characteristics of the additives;
- (iii) The test report should indicate the concentration of all the elements, required as per limit prescribed in the RCRA (Resource Conservation and Recovery Act) of USA or equivalent recognized standards till national standards are developed.

The manufacturers/suppliers should be responsible to provide test reports on compliance of RCRA limits. The testing should be done in any of the following institutions:

- National Chemical Laboratory, Pune
 - Industrial Toxicology Research Centre, Lucknow
 - Indian School of Mines, Dhanbad
 - Central Institute of Mining & Fuel Research, Dhanbad
- (iv) The manufacturer/supplier of the chemical additives should provide the following characteristics of their products for seeking clearance from DGMS:
- Specification details like appearance, specific gravity, solid contents etc (sp. Gravity-1.10 to 1.40)
 - Solubility-(100% soluble in normal water of pH ranging from 6.5 to 8.0 at NTP)
 - Wetting-(The chemical and its admixed form on application at surface body should have minimum of 70% water holding capacity up to 24 hours of applications at N.T.P.)
 - Agglomeration-(The chemical or its admixed form on application should be capable for developing agglomeration on the surface bed with minimum of 2mm layer after three consecutive applications.)
 - Methods of application including mixing ratio and frequency
 - Hazardous and toxic ingredients-(As per R.C.R.A norms, The US environmental Protection Agency (USEPA) under the Resource Conservation & Recovery Act(RCRA), 1976) governs land disposal of solid wastes which generally required testing for 8 elements of concern (Arsenic, Barium, Cadmiums, Chromium, Lead, Mercury, Selenium, Silver etc.)
 - Precaution for use and personal safety
 - Safety measures for storage, transportation, handling of spills, container disposal, fire/explosion hazards
 - Contact Telephone nos. and address for other information etc.

According to EPA guidelines, a waste is categorized possessing toxic or hazardous characteristics, if it produces a leachate that contains any of the above elements in concentration more than 100 times the primary drinking water standards.

The RCRA limits (mg. per liter) are given below:-

Arsenic (As)	:	5
Barium (Ba)	:	100
Cadmium (Cd)	:	1
Chromium (Cr)	:	5
Lead (Pb)	:	5
Mercury (Hg)	:	0.2
Selenium (Se)	:	1
Silver (Ag)	:	1
Ph Value	:	Should be within the range of 6.5 to 8.0 pH
Flash Point	:	Should be more than 175 ^o C
Self Life	:	Minimum 6 months.

Air Permeability : (For underground used only)

As per BIS Specification No. 4335/19678 under Clause 3.2.9.3 test for Air/Gas permeability for Product characteristics of Air/Gas absorption which is 1.5 m

Chemical Additives material for dust suppression should have ionizing properly as defined in the "Principal of Operation" of DGMS Tech. Circular No. 8, 1997.

(3) Remedial measures to avoid adverse impacts on the environment

In view of the fact that opencast mining is increasing almost by six to seven percent per year, the measures for dust control deserve serious attention.

- (i) To prevent and mitigate adverse impacts on the environment, that above stated measures as recommended by the Committee require strict compliance.
- (ii) As a preventive measure, the haul roads should be paved, to the extent possible, for minimizing the generation of dust.
- (iii) The chemical additives (including chloride based chemicals, water oil and phenol based chemicals) which are banned in other countries should be permitted for use in India.
- (iv) The coal companies should commission systematic studies to assess the effectiveness of chemical additives in reducing the SPM levels and water consumption. Studies should also be commissioned to determine the environmental and health effects. If any, due to use of chemical additives.

In the light of the above, the Directorate General of Mines Safety is issuing no-objection certificate to the manufacturers who apply for certification to their products for use in mines. This is being adopted due to the reason that there does not exist any statutory provision regarding approval of such item in the manifold in the country and more and more number of large capacity loading and transport machinery are being deployed in the mines causing problems of dust hazards. Therefore, it is essential to have a statutory provision for approval of chemical additives to be used in dust suppressant materials.

In view of the above, it is decided to bring this material under the ambit of approval to be granted by the Chief Inspector of Mines before use in the mines in accordance with the provisions contained under regulation 181(3) of the Coal Mines Regulations, 1957.

A Notification No. DGMS/S&T/DSS/699 dated 14th August 2008 in this regard has been forwarded to be published in the Gazette of India and the subject matter thereof is reproduced below for information and taking necessary actions to comply with the requirement.

"In exercise of the power conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation 181 of the Coal Mines Regulations, 1957, I hereby declare 1st November, 2008 as the date from which all types of Chemical Dust Suppressant including the additives used therein to be used for suppressing dust in mines, shall be of such type, standard and make as approved by me by a general or special order in writing."

You are being informed advance to take necessary steps in this regard and requested to ensure that it is implemented and complied with.

DGMS(Tech.) (S&T)/Circular No.3/703 Dhanbad, dated the 14.08.2008

To
The Owner, Agent & Manager of Coal Mines

Subject: Approval of Steel Supports, Roof Bolts, Cement and Resin Grouts to be used in Mines.
Sir,

In any underground excavations, the stability of roof and sides, not only depends on the nature of rocks but also on the system of supports used therein. Most of the underground accidents especially in coal mines occur due to fall of roof and sides. Almost thirty five to forty percent of the underground fatal accidents occur due to fall of roof and sides. Now a day, timber supports are being replaced by steel supports in the form of props and cogs/chocks in addition to roof bolts with cement or resin grouts.

As per the statutory provisions made in the Coal Mines Regulations, 1957 as well as the Metalliferous Mines Regulation, 1961, the systematic support rules are to be framed by the manager of the mines and the requirement as well as the system of support is to be planned and specified in the SSRs. A number of technical circulars regarding type of supports, code of practices for setting of support, testing, examination and withdrawal of supports have been issued from this Directorate from time to time. However, the fatal accidents due to fall of roof and sides are still recurring of and on in most of the underground coal mines in the country. During the course of inspections as well as enquiries into the accidents due to fall of roof and sides, it has been observed that :-

- Either the required support is not being provided at the working places or the quality of support including support materials such as type of steels used in props/chocks/cogs were not of required strengths and dimensions.
- The welding done to join the cogging members of the cock/cog was not of required standard resulting in failure of cogs/chock at lower loads during use.
- The quality of steel used in the roof bolts was not of required strengths and dimensions. The threading done on the roof bolt was also not treated properly resulting weakness in the rock bolt causing failure from threads during loads.
- Cement Grout is being used in watery strata without assessing the water quality and compatibility with cement grouts in respect of its strength variation with respect to time. In number of cases, the roof falls had occurred along with roof bolts and after testing of the installed bolts in the area it was observed that the bolts were failing at loads varying from 2 to 6 Tonnes.
- The quality of cement grouts used for grouting of the roof bolts was also not checked for required strength and thereby the roof bolts have reportedly failed at less than the required load. In most of the cases, the failure occurred either in the cement steel contact or cement rock contact or at thread of the rock bolt. It has also further been observed that proper pull

tests were not being carried out in the mine to ascertain the quality of roof bolts and the grouts before putting in use in the mine. A number of fatal accidents have occurred due to failure of the roof bolts in the working places.

- In some cases, itching and irritations have also been reported due to cement grout solution falling on to the body or into the eyes of the roof bolts grouting crews.
- It is also observed during the course of inspection and enquiry at the mines that no quality checks and procedures are being followed to ensure good quality roof bolts, cement and resin grouts as well as steel cogs and props.
- Resin is also now being used for grouting the roof bolts which provides fast support at the working places especially in the green roof areas. Various types of resins including slow and fast setting types are being used in roof bolting. Since this is a quick setting type of supports suitable for green roof area, it is desired that the quality of the roof bolts and the resins should be ensured to have an effective support in active working areas/places. Short encapsulation pull test is to be conducted to ascertain the load bearing capacity of the support before use of every lot of resin capsules. During the course of inspection and testing of resin bolts, it has been found that-
 - I. The roof bolts has failed from their threads.
 - II. The roof bolts were pulled at very low load due to non setting of the resin.
 - III. The resin grouts had weathered and crumbled into powder form after elapse of 2 to 3 months thereby making the roof bolts ineffective.
 - IV. The Shelf Life of the resin capsule was less than the specified period.
 - V. Expired resin capsules were being used in roof bolting resulting in improper grouting thereby reducing the strength of the roof bolts.

This reveals that a good quality control measures is required to ensure the quality of resin as well as its strength characteristic profile with respect to time.

In order to standardize the system of supports, it is essential to have uniform scale and standard for type of steels to be used for steel props, chocks and cogs including roof bolts. The similar standards would also be required to ensure the quality of cement as well as resin to be used as grouting materials for the support system. Non-toxic and biodegradable chemicals can only be used grouting materials.

It is therefore, decided to include all types of steel supports, roof bolts, cement and resin grouts under item to be approved from this Directorate before use in mines.

A Notification No. DGMS/S&T/SS/702 dated 14th August 2008 in this regard has been forwarded to be published in the Gazette of India and the subject matter thereof is reproduced below for information and taking necessary actions to comply with the requirement.

“In exercise of the power conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation 181 of the Coal Mines Regulations, 1957, I hereby declare 1st November, 2008 as the date from which all types of steel supports, roof bolts, cement and resin grouts to be used for the purpose of supporting roof and sides of workings in a mine, shall be of such type, standard and make as approved by me by a general or special order in writing.”

You are being informed in advance to take necessary steps in this regard and requested to ensure that it is implemented and complied with.

DGMS(Tech.) Circular No.6**Dhanbad, dated the 26.09.2008.**

To

The Owner, Agent & Manager of Open Cast Coal and Non Coal Mines

Subject: Separate road for Light Motor Vehicles in the Mine Premises of Mechanized Open Cast Coal and Non Coal Mines.

Sir,

It has been observed that a considerable number of fatal accidents occurred in the mine premises of Mechanized Open Cast Mines when Dumpers of high capacity ran over Light Motor Vehicles on the haul roads.

Enquiry into the above accidents revealed that while Light Motor Vehicles plying on the haul roads, enter into the blind zone of the moving Dumpers and the Dumper Drivers unable to spot the Light Motor Vehicles and as a result Dumpers run over the Light Motor Vehicles. Range of Blind zone of the Dumpers varies with the height of Driver's cabin.

Front line Supervisors and Executives traveling in the Light Motor Vehicles along with their drivers are fatally injured in the accidents occurred due to run over of Light Motor Vehicles by the Dumpers on the haul roads.

Not only that, Dumpers are left hand driven whereas Light Motor Vehicles are right hand driven and this create lot of confusions between the Drivers and lead to accidents.

Enquiry also revealed that these accidents could have been averted if the Light Motor Vehicles would not have been allowed to ply on the haul roads and a separate road for Light Motor Vehicles would have been provided and maintained in the mines premises.

Therefore, in the interest of the safety of the persons employed in mines, I request you to provide and maintain a separate road in the mine premises for the Light Motor Vehicles used for inspection and transportation. This road will not cross the Haul Road at any place in the Mine premises.

This is for strict compliance in all Mechanized Open Cast mines where dumpers of capacity 35 tonne or more are used for transportation of mineral and removal of over burden in the mines.

DGMS(Tech.) Circular No.7**Dhanbad, dated the 27.10.2008**

To

The Owner, Agent & Manager of Coal Mines, Metal Mines & Oil Mines/Oil Fields

Subject: Advanced Early Steamer Emission Type Lightning Protection System.

Sir,

You are aware that existing Mines operations are minimally equipped to take care of man/machine against Lightning/Surges.

Places which are high thunder prone do not have adequate facilities for protection.

Therefore, it is advised that protection be implemented in Oil Mines/Oil Fields, Open Cast Mines, CHP's & workshops for Lightning/Surges with advances Early Steamer Emission type Lightning Protection to take care of an area by aerial radial method, where by a very large area can be covered. The system should work without support of any Electrical Power.

The down conductor to be used should be of High Voltage Shielded cable having insulation resistance at 20 Degree of 1830 Meg Ohm/cm and thermal short circuit current (I Sec) should be 7.15 KA.

The earth pit should be of maintenance free type & with CPRI tested certificates.

DGMS(Tech.) Circular No.08

Dhanbad, dated the 27.10.2008.

To

The Owner, Agent & Managers of all Coal Mines,
Manufacturers/Suppliers of Approved type of Self Contained Self Rescuers,
All Inspecting Officers of the Directorate.

Subject: Protocol on use, care, maintenance, sampling & testing of Self Contained Self Rescuer (SCSR) under Regulation 191D (2) & (3) of the Coal Mines Regulations, 1957.

Sir,

In view of the limitations of the Filter Self Rescuer as an escape device and in pursuance to the recommendation of the ninth conference on safety in mines as well as the New Kenda Court of Enquiry, a meeting of users, regulators, scientific Institutions, academicians and manufactures/suppliers was held on 16th March, 2004 to consider mode of introduction of SCSR in Indian mines.

The committee recommended "use of Self Contained or Oxygen type Self Rescuer (SCSR) in all degree III & degree II gassy mines and in all fiery mines to be enforced with immediate effect. "Based on the recommendation of the said committee a Statutory Order under Regulation 191D of the Coal Mines Regulations, 1957 was issued on 5th January, 2007.

Thereafter, a working group was constituted to formulate a comprehensive protocol to ensure proper quality of supply, efficient use & care, maintenance, sampling & testing of SCSR. The protocol in detail as mentioned below shall be implemented by all concern.

This protocol supersedes the previous protocol issued vide DGMS (Tech) Circular No. 2 of 2007 dated 23.03.2007.

A. USE, CARE & MAINTENANCE:

1. The owner, Agent and Manger of all belowground mines having travel time up to one hour, shall ensure that the rated duration of the Self Contained Self Recuer (SCSR), provided to any person, is not less than one hour. However, in respect of workings with more than one hour travel time adequate number of SCSR (not less than the maximum attendance of the largest shift) shall be placed at suitably designed "Safe Haven" or "Refuse Chambers" located at convenient point(s).
2. Contrary to the above, use of SCSR of rated duration less than 60 minutes and up to 30 minutes for a specific district or panel of the mine or mine may be permitted, on request of the Owner/Agent/Manager of the mine in writing, by the concerned Regional Inspector of Mines.
3. Every person required to go down the mine shall be provided with a belt/harness of suitable design to enable him to carry the SCSR as well as other gadgets conveniently on his body.
4. Special racks of suitable design shall be provided for storage. The storage area should be away from source of heat. Every unit of SCSR shall be cleaned regularly with wet cloth and in no case organic solvents shall be used for cleaning of the SCSR.

5. Every unit in use shall be subjected to “daily visual check” for the seals (intact or not), leakage indicator (change in colour), clamps (for any damage), belt loop (for any damage) and container (for any damaged or dent). Unit's of SCSR found O. K. in visual check shall only be issued and used. Damaged/defective units shall be immediately withdrawn from use and be kept separately.
6. Every SCSR on roll of the mine shall be subjected to “Leak Tightness Test”, at least once in a quarter by a competent person duly authorized by the manager for the purpose, in the manner as prescribed in the IS: 15803-2008 (Annexure E&F). The apparatus should have a suitable leak tightness indicator.
7. Test result in respect of “daily visual check” and “Leak Tightness Test” with regard to each & every unit shall be recorded in a bound-paged register kept for the purpose. Every entry shall be signed by the person who has conducted the test and shall also be countersigned by the Manager or any other official authorized by him in this regard.
8. The Manager shall prepare a code of practice for storage, use, care and maintenance of the SCSR based on the model code provided by the Owner.
9. Only one type of SCSR shall be preferred in a particular mine.

B. SAMPLING & TESTING

- 1.1 Before a batch of SCSR is put into service, Fifteen samples for a batch size of 150 and Twenty samples for a batch size of 151 and above for every batch of supply shall be drawn at random for testing by a joint sampling team comprising of representatives from Manufacturer/supplier and users.
- 1.2 Fifty percent (50%) of the above drawn sample (subject to minimum of six units) shall be sent to any of the approved/accredited laboratories for full bench test as per IS 15803-2008 and rest of the sample units shall be subjected to practical performances test as per IS: 15803-2008 for the rated duration and the users comfort at the nearest rescue station.
- 1.3 The batch of supply for which all the test results of the samples (100%) are found satisfactory shall only be put into service. In case of unsatisfactory test result even of a single sample, either at the laboratory or in the practical performances test, the entire batch of supply shall not be accepted for use.
- 1.4 Result of the above stated laboratory test as well as practical performances test, duly countersigned by the mine owner or any other person authorized by him for this purpose shall be kept at owner's office. A copy of the said test result shall also be kept at the mine office and shall be made available for inspection. Up to the shelf life of the apparatus. All test results with unsatisfactory performance of a sample, whether in the laboratory or in the practical performance test, shall also be forwarded by the concerned mine owner and the concerned manufacturer to the Chief Inspector of Mines (also designate as Director General of Mines Safety).
- 2.0 Functional Ability:
 - 2.1 One percent of the total units of a particular make and type of SCSR under service shall be drawn randomly every year for tests subjects to a minimum of one unit of each make and type for functional ability.
 - 2.2 The sample thus collected shall be tested at any of the approved/accredited laboratories for the following parameters as per the IS: 15803:2008 (at 35 liter/min. during the rated duration):-

Parameter	Acceptance Level
Rated duration(as per label)	Not less than 90% of specified duration
Inhalation Oxygen concentration (% by vol.)	Not less than 21*
Inhalation Carbon Dioxide concentration (% by vol.)	Not more than 1.5◇
Maximum inhalation air temperature dry bulb	Not more than 55° C
Inhalation breathing resistance	Not more than 10 mbar
Exhalation breathing resistance	Not more than 10 mbar

* A short term deviation to a level of not less than 17% for a period of not more than two minutes at the beginning of the test is permissible.

◇ Through out the rated duration of the apparatus the carbon dioxide concentration of the inhaled air shall not exceed an average value of 1.5% (by volume) and at no time shall exceed 3.0% (by volume)

3. Results of the above stated functional ability test, duly countersigned by the mine manager, shall be recorded at the mine office and shall be made available for inspection, up to two years of reporting.
4. In case of unsatisfactory test result(s), during the above functional ability test, all SCSRs of the batch whose sample had failed shall be immediately withdrawn from the use under intimation by the Owner. Agent of Manager to the Regional as well as Chief Inspector of Mines. Immediate steps shall also be taken to meet the shortage of SCSRs, if any, resulted due to such withdrawal.

C. TRAINING

1. Every worker required to work in belowground workings shall undergo an initial training on SCSR covering following aspects:
 - i. Role of SCSR as an escape apparatus in emergency;
 - ii. Theory of working of a SCSR;
 - iii. Construction details of a SCSR;
 - iv. Way to use SCSR;
 - v. Limitations while using SCSR like its duration, inhalation and body temperature during use and
 - vi. Hands on training on donning of SCSR in poor visibility
2. A team of trainers shall be created from V. T. O., Safety Officer, Ventilation Officer, Asstt. Manager, Engineer, Workman Inspector and Rescue Trained Persons to impart weekly Pit-top/Incline-mouth training/re-training of workers.
3. Video Clippings, audios & posters on use of SCSR and sufficient number of dummies, subject to a minimum of 5% of the average daily underground attendance, shall be provided to every mine with belowground workings.
4. The training module for initial and refresher training of miners, at the VTC, shall be suitably modified to incorporate training on need, importance and use of SCSR.
5. A part from training to users, the trainers and persons required to issue and maintain SCSRs shall also be trained for their respective work.
6. A competition on SCSR during Safety Week and Rescue Competitions shall be organized to promote awareness of workers in this regard.

DGMS(Tech.) Circular No.08A**Dhanbad, dated the 18th Dec.,2008.**

To

The Owner, Agent & Managers of all Coal Mines,
Manufacturers/Suppliers of Approved type of Self Contained Self Rescuers,
All Inspecting Officers of the Directorate.

Sub: Protocol on provision and use of Self Contained Self Rescuer (SCSR) under Regulation 191D (2) & (3) of the Coal Mines Regulations, 1957-modifications thereof.

Sir,

In view of the expected difficulties in carrying and keeping the SCSR of one hour duration on a person's body and to clarify other confusions the sub-clause 1.0 of clause A of the protocol issued vide DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 is modified as under:-

A. USE, CARE & MAINTENANCE:

- 1.0 In the 6th line of point 1.0 of the protocol issued vide DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 the word "Refuse Chambers" shall read as "Refuge Chambers".
- 2.0 The Owner, Agent and Manager of a mine, with travel time of more than 30 minutes in below ground workings, shall ensure that adequate number (not less than the maximum attendance of the largest shift) of Self Contained Self Rescuer (SCSR) with the rated duration of one hour shall be placed at suitably designed "Safe Haven" or "Refuge Chambers" located at convenient points(s). Whenever a person is required to work, supervise or visit below ground workings he shall be provided and carry with him a SCSR of 30 minutes duration on his belt wherever he goes or works.
- 3.0 The mine management may construct "Safe Haven" or "Refuge Chambers" at convenient location(s) in below ground with prior approval of the Director General of Mines Safety. A copy of application, for such approval, with complete detail shall also be forwarded to the concerned Director of Mines Safety and the Dy. Director General of Mines Safety.
- 4.0 All other provisions of the "Protocol" issued vide DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 shall remain unaltered.

DGMS(Tech.) Circular No.09**Dhanbad, dated the 02.12.2008.**

To

The Owners of All
Coal and Metalliferous Mines.

Sub: Modified standard condition stipulated under regulation 98 of Coal Mines Regulation-1957 and regulation 106 of Metalliferous Regulation 1961 for using HEMM in Open Cast Mines.

Sir,

The condition for adopting a system of deep-hope blasting and or working opencast mines with the help of heavy machinery for digging, excavation and removal of ore etc. under Reg. 106 (2)(b) of MMR 1961 and regulation 98 of Coal Mines Regulation-1957 were issued vide circular No. 36 of 1972 and 17 of 1977. These were framed way back in seventies where the capacities of dumpers were limited. With changing scenario and introduction higher capacity equipment this needs review.

Number of incidence and accidents has taken place due to-

1. Head on collision of dumper on haul road due to poor clear view.
2. Front and rear collision of dumpers on haul road.
3. In advertent movement of steering wheel along with tyre while maintenance of dumper where engine is ON.
4. Due to work person crossing the blind space in and around.
5. Dumper getting off haul road due to inadequate parapet wall/embankment.
6. While dumper being reversed.

In order to prevent accident the standard condition are modified. These are addition to be standard condition issued earlier and not the substitute.

1. HEIGHT AND WIDTH OF HAUL ROAD

- a. No road shall be of width less than three times plus 5m width of the largest Vehicle playing on road.
- b. All corner and bends shall be made in such a way that operator of vehicle have clear view of distance of not less than 3 times the breaking distance of largest HEMM working at 40 Km/hour.
- c. Where it is not possible to ensure a visibility for a distance as mention in (b) there shall be provided with two roads of width not less than 2 times plus 3m of largest vehicle plying on the road with a strong road divider at centre with adequate lighting and reflector along the divider.
- d. Where any road existing above level of surrounding area it shall be provided with strong parapet wall/embankment of following dimensions.
 - i. Width at top-not less than 1 m.
 - ii. Width at bottom-not less than 2.5m
 - iii. The height not less than diameter of tyre of largest vehicle plying on road

It may be noted that just dumping of mud or OB shall not treated as strong parapet wall.

- e. No road shall have gradient more than 1 in 16. Ramps with 1 in 10 gradients should not be more than 10m at one stretch and permission shall be obtained from Directorate.

2. DUMPER : The following Safety feature shall be provided in dumper.

- i. Mechanical steering locking to prevent untoward movement of steering wheel and tyre work persons working below the cabin while engine is running.
- ii. Blind spot mirror apart from rear view mirror to enable operator to have clear visibility of blind spot in and around dumpers.
- iii. Mechanical type Anti collision device to avoid head to tail collision on haul road such as tail gate, bumper extension or any other strong device.
- iv. Fire resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conducts where cable/wire are passed shall be fire resistant.
- v. Seat belt for operator.
- vi. The maximum speed of vehicle shall be restricted to 30Km/hours by blocking higher gear or any other automatic means.
- vii. Proper shaft guard.
- viii. Proximity working device.

3. Excavators : The following safety feature shall be provided

- i. All functions cut off switch
- ii. Swing Motor Brake

- iii. Fire resistant hydraulic hoses in place of ordinary hoses to decrease the chance of Fire. All the sleeves and conducts where cable/wire are passed shall be fire resistant.
 - iv. Turbo charge Guard
 - v. Seat belt
 - vi. Vent valve on top of hydraulic tank should be able to be removed without any tool
 - vii. A baffle plate between cold zone and hot zone.
 - viii. Provision for Limiting of hydraulic cylinders-Stoppers.
4. DRILLS : The following Safety feature shall be provided
- 1) Approved type of dust prevention or suppression system
 - 2) Each moving parts of the machinery shall be guarded/fenced and also ensure its effectiveness all the time.
 - 3) i) Emergency of push bottom in
 - a) Operator's cabin
 - b) Main frame.
 - c) Propeller pendent
 - d) Rear end
 - ii) Tripping device to trip the field switch.
 - 4) Thermostat motor protection relay in winding temperature and other related parts.
 - 5) Explosive vent in transformer.
 - 6) Propel interlock (an electric interlock between drilling and propeller operation)
 - 7) High air discharge temperature switch
 - 8) Low lube oil pressure switch
 - 9) Oil stop valve (electric solenoid valve in compressor lubrication line.
 - 10) No pump circuit
 - 11) Tower lock and lock check valve
 - 12) Propel joystick-spring loaded type to return to neutral (dead man safety)
 - 13) Disk-brake and brake valve and its testing parameters.
 - 14) Lock check valve for preventing creeping in drill
 - 15) Seat belt
 - 16) Fire resistant hydraulic hoses and wiring near hot zone
 - 17) Turbo charge guard
 - 18) Cabin for the operator
5. DOZERS
- 1) Roll over protection
 - 2) Turbo charge guard
 - 3) Fire resistant hydraulic hoses and wiring near hot zone
 - 4) Seat belt
6. GENERAL
- 1) The approved type of audio visual alarm shall be provided in all equipment
 - 2) The approved type of fire suppression system shall be provided in all equipment
 - 3) The stability of HEMM shall be carried out at least in year and after every major over haul by an independent agency
 - 4) The crane and overhead crane shall be subject to proof load test and NDT test once in a year from a competent authority
 - 5) The pressure vessel receiver are subjected to hydraulic and NDT test and shall be carried out by a competent authority
 - 6) In case of any defect in equipment such as brake, steering, and safety device the equipment shall be immediately taken out of use and a record shall be kept

I am of the opinion that the above modified condition may help in reducing incidence and accidents in mines. Hence the recommendation may be strictly complied in the interest of safety.

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DGMS

NOTIFICATIONS & CIRCULARS

Notifications – 2009

New Delhi, the 12th January, 2009

S.O. 119 (E) In exercise of the powers conferred by sub-section (8) of Section 24 of the Code of Criminal Procedure, 1973 (2 of 1974), the Central Government hereby appoints the following officers in the Directorate General of Mines Safety/Ministry of Labour and Employment, as Special Public Prosecutors for the conduct of cases instituted under the Mines Act, 1952 (35 of 1952), in trial courts, cases, revisions and other matters arising out of these cases of provisional or appellate Courts, established by Law in any State or Union Territory to which the provisions of the aforesaid section apply :-

- (1) Shri Tapan Kumar Barman, Senior Law Officer
- (2) Shri Anand Swrup Singh, Law Officer, Gr. I

[F.No.S-29026/3/2007-ISH.II]

S.K. SRIVASTAVA, Jt. Secy.

New Delhi, the 06th May, 2009

S.O.1176 (E). Shri S.J. Sibal, Deputy Director General of Mines Safety, (Mining), Directorate General of Mines Safety (Headquarters), Dhanbad on his appointment as Director General of Mines Safety in the Directorate General of Mines Safety, Dhanbad has taken over the charge of the post with effect from the forenoon of 1st May, 2009.

2. Therefore, in exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby, appoints Shri S.J. Sibal, Director General, Directorate General of Mines Safety, Dhanbad to be the Chief Inspector of Mines for all the territories to which the said Act extends.

[No. A-32012/02/2008-ISH-II]

S.K. SRIVASTAVA, Jt. Secy.

New Delhi, the 13th January, 2009

G.S.R. 9. In exercise of the powers conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation of 181 of the Coal Mines Regulations, 1957 and sub-regulation (1) of Regulation of 73 of the Oil Mines Regulations, 1984, I hereby declare 1st March, 2009 as the date from which all types of lights, lighting Fixtures and system including lights on board mobile machinery, in HEMMs, Machinery and Plants, Indicators or Signal lights to be used in mines both on surface and belowground including oil and gas mines/fields will be of such type, standard and make as approved by me by a general or special order in writing.

[No.N-12019/2/2009/S&T(HQ)/16]

M.M. SHARMA, Director General of Mines Safety.

New Delhi, the 08th May, 2009

No.A-32012/01/2008-ISH.II. The President is pleased to appoint the following officers to the post of Deputy Director General of Mines Safety (Mining) in the pre-revised pay scale of Rs. 18,400-500-22,400/- in the Directorate General of Mines Safety, Dhanbad with effect from the dates shown against their names and until further orders.

Sl. No.	Name of the Officers	Date of appointment in the Grade of Deputy Director General of Mines Safety (Mining)
1	Sh. P.K. Sarkar	23.02.2009 (FN)
2	Sh. Utpal Saha	01.05.2009 (FN)

SUBHASH CHAND, Under Secy.
New Delhi, the 29th May, 2009

No.Q-16012/2/2009-ESA (NLI)-Whereas the V.V. Giri National Labour Institute, Sector-24, Noida has been registered as a Society under the Societies Registration Act, 1860 (Punjab Amendment Act, 1957).

And Whereas Rule-III, of the Rules & Registration of the said society provides for its constitution.

Now the term of the existing General Council of V.V. Giri National Labour Institute, Noida, with the approval of the Hon'ble LEM, has been extended for a period of three months beyond 29.05.2009 or until further orders.

PRADEEP GAUR, Under Secy.
New Delhi, the 27th May, 2009

No. Law/G-22/09/319-I, Surinder Jit Sibal, Chief Inspector of Mines and also designated as Director General of Mines Safety, by virtue of powers conferred on me under Section 75 of the Mines Act, 1952 (35 of 1952) and in supersession of all the notifications published earlier in any mine situated within their respective Inspection Jurisdiction as declared under sub-section (3) of section 6 of the said Act.

SURINDER JIT SIBAL, Chief Inspector of Mines &
Director General of Mines Safety
New Delhi, the 11th June, 2009

No. A-12025/05/2006-ISH-II. The President is pleased to appoint the following officers to the post of Deputy Director of Mines Safety (Mining) in the pre-revised Pay Scale Rs. 12,000-375-16,500/- in the Directorate General of Mines Safety, Dhanbad with effect from the date shown against their names and until further orders :-

Sl. No.	Name of the Officers	Date of appointment in the Grade of Deputy Director General of Mines Safety (Mining)
1	Shri Vir Pratap	31/10/2008 (F/N)
2	Shri Supriyo Chakraborty	07/05.2009 (F/N)
3	Shri Chandramouli S.	12/02/2009 (F/N)
4	Shri T.R. Kannan	02/03/2009 (F/N)
5	Shri Niraj Kumar	04/05/2009 (F/N)
6	Shri Muralidhar Bidari	26/02/2009 (F/N)
7	Shri Saifuliah Ansari	06/03/2009 (F/N)
8	Shri Vinodanand Kalundia	27/02/2009 (F/N)

SUBHASH CHAND, Under Secy

New Delhi, the 08th October, 2009

S.O. 2552 (E). In exercise of the powers conferred by Section 12 of the Mines Act, 1952 (35 of 1952) read with rule 3 of the Mines Rules, 1955, and in supersession of the notification of the Government of India in the Ministry of Labour and Employment, number S.O. 778 (E), dated the 18th May, 2006 except as respects things done or omitted to be done before such supersession, the Central Government hereby constitutes, for the purposes of the said Act, a Committee consisting of the

following members, with effect from the date of publication of this notification in the Official Gazette, namely :-

Appointed under clause (a) of sub-section (1) of Section 12

1. The Special Secretary or Additional Secretary in the Ministry of Labour and Employment - Chairman

Appointed under clause (b) of sub-section (1) of Section 12

2. The Chief Inspector of Mines, Directorate General of Mines Safety, Dhanbad - Member

Appointed under clause (c) of sub-section (1) of Section 12

3. Shri Hare Krishna Nayak, President, Akhil Bhartiya Ispat Mazdoor Mahasangh, Qr. No. Rly/8-A. At and P.O. Meghahatuburu – 833233, District West Singhbhum (Jharkhand). - Member
4. Shri Assem Das, South Eastern Koyla Mazdoor Congress, 109, MIG, Rajendra Prasad Nagar, Korba, Chattisgarh - Member

Appointed under clause (c) of sub-section (1) of Section 12

5. Shri Vinay Kumar Singh, Chairman-cum-Managing, Director Northern Coalfields Limited, Singrauli District – Sidhi, (M.P.) - Member
6. Shri N.K. Nanda, Director (Tech), National Mineral Development Corporation Limited, Khanji Bhawan, 10-3-311/A, Castle Hills, Masab Tank, Hyderabad- 500028.

Appointed under clause (c) of sub-section (1) of Section 12

7. Prof. D.C. Panigrahi, Department of Mining Engineering Indian School Of Mines, Dhanbad - Member
8. Dr. Amalendu Sinha, Director Central Institute For Mining and Fuel Research Barwa Road, Dhanbad,

[F.No. U-15011/03/09-ISH-II]
S.K. SRIVASTAVA, Addl. Secy.

6th November 2009

S.O 3177 – I, S. J. Sibal, Chief Inspector of Mines and also designated as Directorate General of Mines Safety, under the powers conferred on me under sub-section 3 of Section 6 of the Mines Act, 1952, and in supersession of all the previous notifications and all circulars issued on this subject, hereby declare the area of jurisdiction of Zones, Regions and Sub-Regions with respect to which Inspectors appointed under Sub-section 1 of Section 5 of the Mines Act, 1952 shall exercise their respective powers, as given in the 'appendix' enclosed.

[No. S-29022/1/2009-Genl/3423]

S.J. Sibal, Chief Inspector of Mines & Director General of Mines Safety

Gaziabad Region, HQ at Gaziabad in the State of Uttar Pradesh

Northern Zone with Headquarters at Gaziabad (Uttar Pradesh) comprising of Gaziabad Region, Ajmer Region, Gwalior Region and Varanasi Region.

Northern Western Zone with Headquarters at Udaipur (Rajasthan) comprising of Ahmedabad Region, Udaipur Region, and Surat Region

Ahmedabad Region, HQ at Ahmedabad in the State of Gujrat

State of Gujrat

All Mines in the districts of Kutch, Patan, Jamnagar, Porbandar, Rajkot, Junagarh, Amreli, Bhavnagar, Surendra Nagar, Ahmedabad, Anand, Kheda, Gandhinagar & Mehsana

Union Territory of Daman, Diu, Dadra & Nagar Haveli

All Mines in Diu

Udaipur Region, HQ at Udaipur in the State of Rajasthan

State of Rajasthan

All Mines in the districts of Jalor, Sirohi, Rajsamand, Udaipur, Dungarpur, Chittorgarh, Pratapgarh, Banswara

State of Madhya Pradesh

All Mines in the districts of Neemach, Mandsaur, Ratlam, Ujjain, Shajapur, Dewas & Indore

State of Gujrat

All Mines in the districts of Banaskantha &

Sabarkantha

Surat Region, HQ at Surat, in the State of Gujrat

State of Gujrat	All Mines in the districts of Panchmahal, Dahod, Vadodra, Bharuch, Narmada, Surat, Navsari, Valsad & Dangs
State of Madhya Pradesh	All Mines in the districts of Jhabua, Dhar, West Nimar, East Nimar & Badwani
State of Maharashtra	All Mines in the districts of Nandurbar, Dhule, Nasik & Jalgaon
Union Territory of Daman, Diu, Dadra & Nagar Haveli	All Mines in Daman, Dadra & Nagar Haveli

Western Zone with Headquarters at Nagpur (Maharashtra) comprising of Nagpur Region 1, Nagpur Region 2, Jabalpur Region, and Bilaspur Region***Nagpur Region No.1, HQ at Nagpur in the State of Maharashtra (including Parasia Sub Region)***

State of Madhya Pradesh	All Mines in the districts of Betul, Chindwara, Seoni & Balaghat
State of Maharashtra	All Mines in the districts of Akola, Amravati, Wardha, Nagpur, Bhandara & Gondia

Parasia Sub Region, HQ at Parasia in the State of Madhya Pradesh

State of Madhya Pradesh	All Mines in the district of Chindwara

Nagpur Region No.2, HQ at Nagpur in the State of Maharashtra

State of Maharashtra	All Mines in the districts of Buldana, Washim, Yavatmal, Chandrapur, Garhchiroli, Aurangabad, Jalna, Hingoli, Beed, Parbhani, Nanded, Osmanabad & Latur

Jabalpur Region, HQ at

Jabalpur in the State of Madhya Pradesh

State of Madhya Pradesh	All Mines in the districts of Rewa, Satna, Panna, Damoh, Katni, Umaria, Shahdol, Anuppur, Sagar, Jabalpur, Mandla, Dindori, Raisen, Narsingpur & Sihore

Bilaspur Region, HQ at Bilaspur in the State of Chhattisgarh

State of Chhattisgarh	All Mines in the districts of Korea, Korba, Bilaspur, Kawardha, Rajnandgaon, Durg, Raipur, Dhamtari, Kanker, Bastar & Dantewada

South Central Zone with Headquarters at Hyderabad (Andhra Pradesh) comprising of Hyderabad Region 1, Hyderabad Region 2, and Goa Region

Hyderabad Region No.1, HQ at Hyderabad in the State of Andhra Pradesh

State of Andhra Pradesh	All Mines in the districts of Karimnagar, Warangal, Khammam, Krishna, West Godavari, East Godavari, Visakhapatnam, Vizianagaram & Srikakulam

Hyderabad Region No.2, HQ at Hyderabad in the State of Andhra Pradesh, (including Nellore Sub Region)

State of Andhra Pradesh	All Mines in the districts of Adilabad, Nizamabad, Medak, Rangareddy, Hyderabad, Nalgonda, Mahboobnagar, Guntur, Prakasam, Cuddappah & Nellore
State of Karnataka	All Mines in the districts of Bidar & Gulbarga

Nellore Sub Region, HQ at Nellore in the State of Andhra Pradesh

State of Andhra Pradesh	All Mines in the districts of Guntur, Prakasam, Cuddappah & Nellore

Goa Region, HQ at Madgaon

in the State of Goa

State of Goa	All Mines
State of Karnataka	All Mines in the districts of Bijapur, Belgaum, Dharwad, & Uttar Kannad
State of Maharashtra	All Mines in the districts of Thane, Ahmadnagar, Raigarh, Mumbai, Pune, Satara, Ratnagiri, Solapur, Sangli, Kolhapur, & Sindhudurg

Southern Zone with Headquarters at Begaluru (Karnataka) comprising of Bengaluru Region, Bellary Region, and Chennai Region***Bengaluru Region, HQ at Bengaluru in the State of Karnataka***

State of Karnataka	All Mines in the districts of Shimoga, Udipi, Chikmaglur, Dakshin Kannad, Chitradurga, Tumkur, Hassan, Kolar, Bangaluru, Mandya, Mysore & Chamraj Nagar
State of Tamil Nadu	All Mines in the districts of Krishnagiri, Salem, Erode, Coimbatore & Nilgiris
State of Kerela	All Mines
UT of Lakshadweep Islands	All Mines

Bellary Region, HQ at Bellary in the State of Karnataka

State of Andhra Pradesh	All Mines in the districts of Kurnool & Anantapur
State of Karnataka	All Mines in the districts of Raichur, Koppal, Bellary, Devangere, Bagalkot, Haveri & Gadag

Chennai Region, HQ at Chennai in the State of Tamil Nadu

State of Andhra Pradesh	All Mines in the district of Chittoor
State of Tamil Nadu	All Mines in the districts of Kanchipuram, Vellore, Trichy, Tiruvannamalai, Villupuram, Cuddalore, Ariyalur, Karur, Perambalur, Puddukotai, Dindigul, Sivaganga, Madurai, Theni, Virudhnagar, Tuticorn, Tiruneveli, Kanyakumari, Tiruvallur, Thanjavur, Thiruvannur, Nagapattinam & Ramanathapuram
Union Territory of Pudhuchery	All Mines

Southern Eastern Zone with Headquarters at Ranchi (Jharkhand) comprising Of Ranchi Region, Chaibasa Region, Raigarh Region and Bhubaneswar Region

Ranchi Region, HQ at Ranchi in the State of Jharkhand (including Ramgarh Sub Region)

State of Jharkhand

All Mines in the districts of Garhwa, Palamu, Chatra, Latehar, Lohardaga, Gumla, Simdega, Ranchi, Ramgarh & Hazaribag

Ramgarh Sub Region, HQ at Ramgarh in the State of Jharkhand

State of Jharkhand

All Mines in the districts of Ramgarh & Hazaribag

Chaibasa, HQ at Chaibasa in the State of Jharkhand

State of Jharkhand

All Mines in the districts of East Singhbhum, West Singhbhum & Saraikela Kharsawan

State of Orissa

All Mines in the districts of Sundergarh, Mayurbhanj & Keonjhar excluding Anandpur Division

Raigarh Region, HQ at Raigarh in the State of Chattisgarh

State of Chattisgarh

All Mines in the districts of Raigarh, Jashpur, Surguja, Janjgir & Mahasamand

Bhubaneswar Region, HQ at Bhubaneswar in the State of Orissa

State of Orissa

All Mines in the districts of Jharsuguda, Sambalpur, Deogarh, Angul, Dhenkanal, Jajpur, Keonjhar (Anandpur Division only), Bhadrak, Baleswar, Kendrapara, Jagatsinghpur, Cuttack, Khurda, Puri, Nayagarh, Boudh, Bargarh, Sonepur, Nuapara, Bolangyr, Phulbani, Ganjam, Gajapati, Rayagada, Kalahandi, Navrangpur, Koraput & Malkangiri

Eastern Zone with Headquarters at Sitarampur (W.B.) comprising of Sitarampur

Region I, Sitarampur Region II, Sitarampur Region III, and Guwahati Region

**Sitarampur Region I, HQ at
Sita-rampur in the State of
West Bengal**

State of Jharkhand
State of West Bengal

All Mines in the districts of Jamtara & Dumka
All mines in the District of Burdwan situated south of GT Road and bounded by Burnpur Road leading from GT Road on the east & Neamatpur, Radhanagar & Chinakuri Ghat Road on the west. All mines in the District of Burdwan situated in the area bound by GT Road on the south, road leading from Andal turning on GT road to Khandra, Ukhra, Haripur, Krishnagaar, Jamuria & Chanda More on GT road

**Sitarampur Region II, HQ at
Sita-rampur in the State of
West Bengal**

State of West Bengal

All Mines in the districts of Burdwan except those included in Sitarampur Region No.I & Sitarampur Region No.III

All Mines in the districts of Purulia, Bankura, Birbhum, Murshidabad, Nadia, North 24 Parganas, South 24 Parganas, Howrah, Hoogli & Mednipur

Union Territory of
Andaman & Nicobar
Islands

All Mines

**Sitarampur Region III, HQ at
Sita-rampur in the State of
West Bengal**

State of Jharkhand

All Mines in the districts of Godda, Deoghar, Pakur & Sahebganj

State of West Bengal

All Mines in the district of Burdwan situated on the south of GT Road except those included in Sitarampur Region No. I.

All mines in the District of Burdwan bounded by road leading from Pandaveswar Ghat to Haripur, Krihnanagar, Jamuria & Darbardanga

**Guwahati Region, HQ at
Guwahati in the State of
Assam**

State of Assam	All Mines
State of Arunachal Pradesh	All Mines
State of Manipur	All Mines
State of Mizoram	All Mines
State of Meghalaya	All Mines
State of Nagaland	All Mines
State of Tripura	All Mines
State of Sikkim	All Mines
State of West Bengal	All Mines in the districts of Jalpaiguri, Uttar Dinajpur, Darjeeling, Cooch Bihar, Dakshin Dinajpur, & Malda
State of Bihar	Oil pipeline and its installations extending from Oil fields in the State of Assam up to refineries situated in the State

Central Zone with Headquarters at Dhanbad (Jharkhand) comprising of Dhanbad Region I, Dhanbad Region II, Dhanbad Region III, and Koderma Region

Dhanbad Region I, HQ at Dhanbad in the State of Jharkhand

State of Jharkhand	All Mines in the district of Dhanbad lying in the area bound by NH 32 starting at Gobindpur upto Mohuda More on eastern and southern sides, Rajganj-Mohuda More road on the Western Side and, NH 2 between Gobindpur and Rajganj on the northern side,
	All Mines in the district of Dhanbad lying in the area bound by Kari Jore, road connecting Buragarh & Pootki and NH 32
	All mines in the district of Dhanbad lying in the area north of NH 2 and west of Giridih – Tundi – Gobindpur road.

Dhanbad Region II, HQ at Dhanbad in the State of Jharkhand

State of Jharkhand	All Mines in the district of Dhanbad lying east of Giridih – Tundi – Gobindpur road and lying east of Dhanbad – Jharia – Jealgora – Mohulbani Road.

Dhanbad Region II, HQ at Dhanbad in the State of

Jharkhand

State of Jharkhand

All Mines in the district of Dhanbad except those included in Dhanbad Region No.I and Dhanbad Region No.II

All Mines in the district of Bokaro except those included in Koderma Region

Koderma Region, HQ at Koderma in the State of Jharkhand

State of Bihar
State of Jharkhand

All Mines
All Mines in the districts of Koderma & Giridih
All mines situated in the district of Bokaro lying west of Hirak Ring road and all mines lying west of NH 32 & south of Chas – Chandankyari – Rangnathpur Road

New Delhi, the 04th May, 2009

G.S.R. 60. – In pursuance of the provisions of Regulation 13(4) of the Metalliferous Mines Regulations, 1961, the bye-laws for the conduct of examination and grant of Manager's Certificate of Competency restricted to mines having Opencast workings only so far as they relate to Syllabus for Examination, for First Class Manager's Certificate (Appendix – I) and for Second Class Manager's Certificate (Appendix – II) is being substituted by the following :-

APPENDIX – I

**SYLLABUS FOR EXAMINATION FOR FIRST CLASS MANAGER'S
CERTIFICATE OF COMPETENCY RESTRICTED TO MINES HAVING
OPENCAST WORKING ONLY**

(Under Metalliferous Mines Regulations, 1961)

(a) Winning and Working

Geology :- Characteristics and classification of mineral deposits; application of geology to mining; geological structures; folds, faults, fractures, fissures etc. methods of exploration and delineation of the ore bodies; boring through disturbed strata; bore hole survey; sampling; estimation of cut-off grade and ore reserve; losses of mineral in mining; net smelter return (NSR) to mill and mine; mine valuation; quality control, interpretation of geological maps.

Opencast Mining: Opencast of deposits and preparation for excavation; box cut, types; selection of site; formation of production benches; ripping; types of rippers; concept of rippability and cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and problems of blasting side casting; environment friendly non-blasting techniques; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; applicability of electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; side cast diagram; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; types; methods of work; push pull operation etc., bucket wheel excavator; operational methods (lateral block, half block and full block etc.) productivity calculation; continuous surface miner; operational methods (wide/full base methods, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; mode of operation etc., OITDS (operator independent truck dispatch system); in-pit crushing and strip-mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Design and stability of structures in rock; design of support and reinforcement for open pits; rock bolts, cable bolts; wire mesh; monitoring of rock mass performance, mechanics of rock fragmentation; slope stability; slope angle, benches, berms, factors affecting slope stability, design criteria and monitoring systems; dump stability; dump management.

Use and safe handling of explosives; blasting techniques and their relative efficiency; total cost concept safety precautions.

Sources of danger from water; precautions to prevent inundation; water dams; water danger plans.

Application of numerical modeling in mine design application of computers in mine design and operational controls.

(b) Mining Machinery

Strength of materials; applied mechanics; fluid mechanics.

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); scraper winches, aerial rope-ways, man riding systems; comminution equipment; in-pit crushers, feeder breaker etc., mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; ore handling plants; rail wagon loading plants.

Pumps :- Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Mine electrical engineering :- Transmission and distribution of electrical power in mines; radial and ring main distribution; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays;

circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power economics; industrial tariffs; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures; use of high voltage operational equipment in mines.

Generation, transmission and utilization of power, steam, electricity and compressed air; air compressor and auxiliary equipment; air turbines and air engines; efficiency of power, electricity and steam systems; safety aspects.

Automation in mines :- Armchair mining (tele-operations of mining equipments)

Maintenance Systems :- Monitoring and reporting tribology – corrosion, planned maintenance, Preventive, periodical and total maintenance systems in mines. Condition based monitoring and related maintenance system.

(c) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Dials; loose and fast needle surveying; plan table surveying and micro-optic alidade.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; tacheometry.

Lavelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; temporary and permanent adjustment of levels; problems solving.

Use, care, testing and adjustment of instruments.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north.

Surveys of flat, moderately and steeply inclined and vertical workings; traversing along steep working with or without auxiliary telescopes; 3D laser profiling of bench walls in opencast working.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Photogrammetry :- Introduction; scale of a vertical photograph; photograph versus maps; application of photogrammetry in mining.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves.

Sampling, and valuation of mineral deposits; reserve calculations.

Dip, strike, fault and outcrop problems, borehole surveying and calculations, determination of azimuth, latitude and longitude.

Types of plans and sections for opencast workings and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

(d) Mine Management : Legislation : Environmental Management and General Safety.

Mine Management :-

Introduction :- Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management :- Selection; training and development of human resources for mining enterprises; leadership; study of traditional leader traditional; autocratic; democratic and Laissez-Faire behaviors.

Production Management :- Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity; concepts and measurements; application of Ergonomics in mine operation.

Financial Management :- Capital budgeting; techniques for mining project; project evaluation; payback period and IRR; methods of cost analysis and cost control; breakeven charts; working capital management.

Mining Environment:- EIA (Environment Impact Assessment), EMP (Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management; mine closure plan; R&R (rehabilitation and re-settlement).

Economic Impact of Mining Economics of mining effect on community – before, during and after mining.

Materials Management for mining sector.

Behavioural Sciences for Management :- Conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth; Individual motivation; two way personal communication.

Industrial Accident :- Study of human factors of industrial accidents; their causes and remedies.

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Metalliferous Mine Regulation, 1961, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Duty of care; occupational hazards of mining; causes and prevention; accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; TRAP (take responsibility in accident

prevention); cost of accident; safety management system; contribution of human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees; role of information technology in safety management.

Risk Management :- Theory and application, baseline, continuous and issue based risk assessment, how they are applied to technical areas, risk management techniques, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management, due diligence, application of risk assessment and risk management with reference to due diligence.

Disaster management :- Emergency services, equipments and procedures, emergency control rooms, rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response, investigations and reports; assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

APPENDIX – II

SYLLABUS FOR EXAMINATION FOR SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY RESTRICTED TO MINES HAVING OPENCAST WORKING ONLY

(Under Metalliferous Mines Regulations, 1961)

(a) Winning and Working

Geology :- Characteristics and classification of mineral deposits; exploration and delineation of the ore bodies; boring through disturbed strata; bore hole survey; geological structures; folds, faults, fractures, fissures etc interpretation of geological maps.

Opencast Mining: Opencast of deposits; preparation for excavation; box cut, types; site selection; formation of benches; ripping; rippability; types of rippers; cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibrations; secondary blasting and related problems; non-blasting techniques; safety aspects.

Methods of excavation and transport :- Shovel dumper operation; electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; bucket wheel excavator; (lateral block, half block and full block method etc.) productivity calculation; continuous surface miner; operational methods (wide/full base, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; in-pit crushing and strip-mining; operator independent truck dispatch system, safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Design and stability of structures in rock; design of support and reinforcement for open pits; rock bolts, cable bolts; wire mesh; monitoring of rock mass performance, mechanics of rock fragmentation; slope stability; slope angle, benches, berms, factors affecting slope stability, dump stability; dump management.

Use and safe handling of explosives; blasting techniques and their relative efficiency; total cost concept safety precautions.

Sources of danger from water; precautions to prevent inundation; water dams; water danger plans.

(b) Mining Machinery

Strength of materials; Applied mechanics; Fluid mechanics.

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trials; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); scraper winches pumps, (Characteristics, motor power, capacity and calculations) aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; ore handling plants; rail wagon loading plants; comminution equipment; laying of water mains; dealing with acid water; drainage lodgements.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Mine electrical engineering :- Transmission and distribution of electrical power in mines; radial and ring main distribution; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; trans witch; symmetrical fault and circuit breaker rating; mine signaling; power economics; industrial tariffs; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures; and intrinsic safety; use of high voltage operational equipment in mines.

Generation, transmission and utilization of power, steam, electricity and compressed air in mines; safety aspects.

Automation in mines :- Armchair mining (tele-operations of mining equipments)

Preventive, periodical and total maintenance systems in mines.

(c) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Dials; loose and fast needle surveying; plane table surveying and micro-optic alidade.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; Gyro theodolite; principle and determination of Gyro north; determination of true bearing by equal altitude method; tachemetry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; temporary and permanent adjustment of levels.

Use, care, testing and adjustment of instruments.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Surveys of flat, moderately and steeply inclined and vertical workings; traversing along steep working with or without auxiliary telescopes; 3D laser profiling of bench walls in opencast working.

Theory of errors and adjustments: Causes and classification of errors; indices of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves.

Sampling, and reserve calculations.

Dip, strike, fault and outcrop problems, borehole surveying and calculations.

Types of plans and sections for opencast workings and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

(d) Mine Management : Legislation : Environmental Management and General Safety.

Mine Management :-

Introduction :- Principles of scientific management; management functions; planning; organization and control; structure of organization for mining enterprises.

Personal Management :- Selection; training and development of human resources; conflict management; sources of conflict; dealing with conflict, motivation and two way personal communication.

Production Management :- Production planning; scheduling and control; short term and long term planning; productivity; concepts and measurements.

Environmental Management :- Mine environment monitoring and control, EMP; mine closure plan; R&R (rehabilitation and re-settlement).

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Metalliferous Mine Regulation, 1961, Mines Rescue Rules, 1985, Provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Causes and prevention; and their classification; frequency rate and severity rates; cause-wise analysis, investigation into accidents and accident report; in-depth study into various causes of accidents; measures for improving safety in mines; risk assessment and risk management; cost of accident; safety management system; human elements in mine safety; workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees.

Disaster management :- rescue and recovery; investigations and reports; investigation after surface mine fires; fire lighting plan.

First aid and ambulance work.

Silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

[No.Board/Metal/944/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Metal)

New Delhi, the 04th May, 2009

G.S.R. 61. – In pursuance of the provisions of Regulation 13(4) of the Metalliferous Mines Regulations, 1961, the bye-laws for the conduct of examination and grant of Surveyors Certificates of Competency restricted to mines having Opencast workings only so far as they relate to Syllabus for Examination, (Appendix – I) is being substituted by the following :-

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINES SURVEYORS CERTIFICATES OF COMPETENCY RESTRICTED TO MINES HAVING OPENCAST WORKING ONLY

(Under Metalliferous Mines Regulations, 1961)

Linear measurement :- Instruments for measuring distance and ranging, chain surveying; errors in chaining and plotting; optical square.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Plan Table Surveying; methods contouring using plane table and micro-optic alidade.

Miners' dials and other compass instruments; dialing; loose and fast needle surveying.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment.

Levelling :- Levelling instrument types of leveling; booking and reduction methods; temporary and permanent adjustment of levels; geometrical, trigonometric and physical leveling; characteristics and uses of contours; methods of contouring; traverse; co-ordinates and leveling problems.

Tachometry:- Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Use, care, testing, and adjustments of instruments.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates, vertical projections; mine models.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Photogrammetry :- Introduction; scale of a vertical photograph; photograph versus maps; application of photogrammetry in mining.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

Traversing along steep topography with or without auxiliary telescope.

Area and volume calculation; different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves; determination of azimuth latitude and longitude.

Borehole surveying and calculations; dip, strike, outcrop and fault problems.

Development sampling :- Channel and block averaging milling widths; observe plans.

Types of plans for opencast workings; their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Geological map reading.

Application of computers in mine surveying and preparation of plans. 3D laser profiling of bench walls in opencast mine.

[No.Board/Metal/945/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Metal)

New Delhi, the 04th May, 2009

G.S.R. 62. – In pursuance of the provisions of Regulation 13(4) of the Metalliferous Mines Regulations, 1961, the bye-laws for the conduct of examination and grant of Foremans Certificates of Competency restricted to mines having Opencast workings only so far as they relate to Syllabus for Examination, (Appendix – II) is being substituted by the following :-

APPENDIX – II
SYLLABUS FOR EXAMINATION FOR MINES FORMAN'S CERTIFICATES
OF COMPETENCY RESTRICTED TO MINES HAVING OPENCAST
WORKING ONLY

(Under Metalliferous Mines Regulations, 1961)

(a) General Safety and Legislation

Duties and responsibilities of workmen, competent persons and officials (excluding managers, assistant managers); discipline amongst workers and control of staff.

Provisions of the Metalliferous Mines Regulations, 1961, relating to mine working; explosives and blasting; haulage; precautions against danger from fire, dust, gas and water and of other provisions and Rules, the enforcement of and compliance with which is the responsibility of mine foremen.

Writing of reports required to be made by mine foreman under the regulations.

Dangerous occurrences in mines and dealing with the same; accidents, their causes and preventions; accident reports; not disturbing the place of accident.

First Aid.

Sanitation and health; miners' diseases, their symptoms and preventions.

(b) Methods of Working.

Nature of occurrence of mineral deposits; geological disturbances and their effects on working conditions; dangers and precautionary measures while approaching geological disturbances.

The purposes and utility of boreholes in estimation and proving mineral reserves.

Opencast methods of mining; mechanized and manual methods; deep hole drilling and blasting; shovel and dumpers; dragline; bucket wheel excavators; surface continuous miner; benching; maintenance of haul roads; other safety precautions; methods of reclamation; dump management.

Suppression and treatment, sampling and analysis of mine dust.

Safe handling and use of explosives; deep hole drilling and blasting; safety precautions.

Sources of danger from surface water; precaution to prevent inundation and irruption of water; water dams water danger plans.

Gates and fencing, different kind of fences.

Inspection of opencast workings.

Reading of statutory plans.

(c) Elements of Mining Machinery.

Safety aspects and safe use of different kinds of machinery used in mines e.g. blast hole drills, rippers; scrappers; shovels; draglines; dumpers; road graders; dozers; wheel loaders; bucket wheel excavators; spreaders; surface continuous miners; brakes (including service and parking brakes); generation and use of compressed air; use of steam and internal combustion engines in mines.

Use of electricity in mines; safety precautions.

Haulage and transport; types of haulage; rope haulage and locomotives; self-acting haulages; haulage roads; rails and tracks; their maintenance and inspection; tubs; signaling; safety devices; codes of practices; traffic rules; unsafe practices; derailments.

Different types of pumps; principles and use of siphons; drainage and water lodgments.

Code of practice for transport, installation, use and shifting of opencast machinery.

Belt conveyors and safety appliances.

[No.Board/Metal/946/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Metal)

New Delhi, the 04th May, 2009

G.S.R. 63. – In pursuance of the provisions of Regulation 13(4) of the Metalliferous Mines Regulations, 1961, the bye-laws for the conduct of examination and grant of Manager's Certificates of Competency so far as they relate to Syllabus for Examination, for First Class Manager's Certificate (Appendix – I) and for Second Class Manager's Certificate (Appendix – II) is being substituted by the following :-

APPENDIX – I
SYLLABUS FOR EXAMINATION FOR FIRST CLASS MANAGER'S
CERTIFICATE OF COMPETENCY
(Under Metalliferous Mines Regulations, 1961)

(a) Winning and Working

Geology :- Characteristics and classification of mineral deposits; application of geology to mining; geological structures; folds, faults, fractures, fissures etc. methods of exploration and delineation of the ore bodies; boring through disturbed strata; bore hole survey; sampling; estimation of cut-off grade and ore reserve; losses of mineral in mining; net smelter return (NSR) to mill and mine; mine valuation; quality control, interpretation of geological maps.

Opening of mineral deposits; Legal requirement about outlets; siting; vertical and inclined shaft; adits; declines; shaft sinking and deepening; methods of sinking; mechanized sinking; in ordinary and water logged grounds, in running sand etc.; freezing, cementation and other special methods; shaft supports, temporary and permanent, tubings etc., recent developments.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of developments and stopping and factors affecting the same; statutory provisions.

Primary and secondary Development; Choice of level interval and back/block length; main haulage drifts and tunnels; high speed drifting; excavation and equipping of grizzly (conventional and mechanized), ore/waste bin, main ore-pass system, underground crushing, loading and hoisting stations, underground service chambers, sump and other subsidiary excavations.

Cross-cut and drifts; raises and winzes; ground breaking; mucking; ventilation and support; extension of track and other services; modern drilling and loading equipment; Alimark and Jora-lift raising, long-hole and vertical crater retreat (VCR) raising; Raise boring systems; mechanized winzing.

Stopping :- Classification, selection of stopping methods and applicability; slope layouts, stope preparation and production operation ground breaking, mucking, ventilation, supports, haulage and dumping; stopping of narrow and wide ore bodies;

mining of parallel veins; open, supported, filled and caving methods; combined systems and special methods; underhand, overhand, breast, long-hole and raise, resuing, room & pillar, sublevel, large diameter blast hole (DTH), cascade, shrinkage, vertical crater retreat, horizontal cut and fill, square set, top slicing, sub-level caving, block caving methods, combined open room, shrinkage and cut-fill and subsequent filling systems; hydraulic, thermal, hydro chemical, bio chemical and nuclear device mining system; design and construction of draw points; mechanics of draw and draw control procedure; recovery and dilution; problems of deep mining and the remedial measure; design and layout of stopes in rock burst prone mines, mining sequence and rationale.

Opencast Mining: Opening of deposits and preparation for excavation; box cut, types; selection of site; formation of production benches; ripping; types of rippers; concept of rippability and cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and problems of blasting side casting; environment friendly non-blasting techniques; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; applicability of electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; side cast diagram; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; types; methods of work; push pull operation etc., bucket wheel excavator; operational methods (lateral block, half block and full block etc.,) productivity calculation; continuous surface miner; operational methods (wide/full base methods, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; mode of operation etc., OITDS (operator independent truck dispatch system); in-pit crushing and strip-mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; stress, strain, uniaxial and tri-axial strength, Poisson's Ratio, Young's Modulus, convergence, elasticity, litho static and hydrostatic pressure; rock mass classification, strength of pillars (crown/rib/sill/post) and shaft pillar; protection of surface structures; design and stability of structures in rock; design of support and reinforcement for underground excavations support resistance, yielding and non-yielding supports, dynamic and static loading, measuring instruments, consolidated and unconsolidated fills, rock bolts, cable bolts, latest developments in mine supports, economics of support design, cost benefit analysis subsidence; caving of rock mass; problems of deep mining; rock burst; monitoring of rock mass performance; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Use and safe handling of explosives; blasting techniques and their relative efficiency; total cost concept.

Application of numerical modeling in mine design application of computers in mine design and operational controls.

(b) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; flame safety lamp; monitoring of different gases; inflammability of fire damp; fire damp explosions.

Flame safety lamps and their design; use and maintenance; testing of safety lamps; lamp house and organization.

Heat and humidity :- Sources of heat in mines; geothermal gradient; heat flow in deep mines; effects of heat and humidity; psychometrics; computation of thermodynamic properties of mine air; basic modes of heat transfer in mines; methods of calculation of heat flow and temperature rise in mine airways; heat and moisture transfer in stopes; Computation of heat load due to various machines in development working and stopes e.g. drills, road headers/tunnel bores, LHDs, low profile dumpers locomotives, lump breakers, crushers, belt conveyors underground sub-stations, etc.; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure; thermodynamic principles and other short-cut methods.

Mechanical ventilation :- Theory of different fans; characteristics and suitability of fan; selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; ventilation of heading and sinking shafts; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; Hardy Cross methods of iterative analysis and application of linear theory; thermodynamic network analysis and computer application; application of numerical modeling; estimation of pressure requirement; ventilation survey; ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of mine dust.

Mine fires:- Types; causes; detection; prevention and control of mine fires; spontaneous heating; dealing with mine fires; sealing off fire-areas, build-up of extinctive atmosphere; fire fighting organization; reopening of sealed off fire areas.

Firedamp and sulphide dust explosion :- Cause and prevention; stone dust barrier; water barrier and other methods.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements water danger plan.

Recovery of mine after explosion, fires and inundation and investigation after the same; rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Recent development in mine ventilation; use of numerical modeling in ventilation planning.

Risk Assessment and analysis with reference to mine environment, management of environmental risks.

(c) Mining Machinery

Strength of materials; applied mechanics; fluid mechanics.

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal

combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment.

Underground machinery :- Pneumatic and hydraulic drilling hammers, jumbo drills, Roof bolters, quadro bolters, road headers, raise climbers; tunnel, raise and shaft borers, LHDs, LPDTs, booster compressors, DTH and ITH drilling machines.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); scraper winches, aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; ore handling plants; use of diesel equipments in underground mines.

Pumps :- Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Mine electrical engineering :- Transmission and distribution of electrical power in mines; radial and ring main distribution; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power economics; industrial tariffs; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures; use of high voltage operational equipment in mines.

Generation, transmission and utilization of power, steam, electricity and compressed air; air compressor and auxiliary equipment; air turbines and air engines; efficiency of power, electricity and steam systems; safety aspects.

Automation in mines :- Armchair mining (tele-operations of mining equipments)

Maintenance Systems :- Monitoring and reporting tribology – corrosion, planned maintenance, Preventive, periodical and total maintenance systems in mines. Condition based monitoring and related maintenance system.

(d) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Dials; loose and fast needle surveying; plan table surveying and micro-optic alidade.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; tacheometry.

Lavelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels; problems solving.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development and stone surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts, tunnels, raises and winzes; traversing along steep working with or without auxiliary telescopes; 3D laser profiling of bench walls in opencast working.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry in mining.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves, surface and underground.

Dip, strike, fault and outcrop problems, borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

(e) Mine Management : Legislation : Environmental Management and General Safety.

Mine Management :-

Introduction :- Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management :- Selection; training and development of human resources for mining enterprises; leadership; study of traditional leader behavior; autocratic; democratic and Laissez-Faire behaviors.

Production Management :- Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity; concepts and measurements; application of Ergonomics in mine operation.

Financial Management :- Capital budgeting; techniques for mining project; project evaluation; payback period and IRR; methods of cost analysis and cost control; breakeven charts; working capital management.

Mining Environment:- EIA (Environment Impact Assessment), EMP (Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management; mine closure plan; R&R (rehabilitation and re-settlement).

Economic Impact of Mining Economics of mining effect on community – before, during and after mining.

Materials Management for mining sector.

Behavioural Sciences for Management :- Conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth; Individual motivation; two way personal communication.

Industrial Accident :- Study of human factors of industrial accidents; their causes and remedies.

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Metalliferous Mine Regulation, 1961, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Duty of care; occupational hazards of mining; causes and prevention; accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; safety management system; contribution of human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees; role of information technology in safety management.

Risk Management :- Theory and application, baseline, continuous and issue based risk assessment, how they are applied to technical areas, risk management techniques, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management, due diligence, application of risk assessment and risk management with reference to due diligence.

Disaster management :- Emergency services, equipments and procedures, emergency control rooms, rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response, investigations and reports; assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

APPENDIX – II

SYLLABUS FOR EXAMINATION FOR SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY

(Under Metalliferous Mines Regulations, 1961)

(a) Winning and Working

Geology :- Characteristics and classification of mineral deposits; exploration and delineation of the ore bodies; boring through disturbed strata; bore hole survey; structural geology; interpretation of geological maps.

Opening of mineral deposits; vertical and inclined shaft; adits; declines; shaft sinking and deepening; methods of sinking; mechanized sinking; in ordinary and water logged grounds, other special methods; shaft supports, temporary and permanent.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of developments and stopping and factors affecting the same; statutory provisions.

Primary and secondary Development; Level interval; block length; main haulage drifts high speed drifting; excavation and equipping of grizzly (conventional and mechanized), ore/waste bin, main ore-pass system, underground crushing, loading and hoisting stations, underground service chambers, sump etc.

Cross-cut and drifts; raises and winzes; ground breaking; mucking; ventilation and support; extension of track and other services; modern drilling and loading equipment; Alimak and Jora-lift raising, long-hole and vertical crater retreat (VCR) raising; Raise boring systems; mechanized winzing.

Stopping :- Classification, selection of stopping methods and applicability; stope layouts, stope preparation; production; operation ground breaking, mucking, ventilation, supports, haulage and dumping; stopping of narrow and wide ore bodies; mining of parallel veins; underhand, overhand, breast, long-hole and raise, resuing, room & pillar, sublevel, large diameter blast hole (DTH), cascade, shrinkage, vertical crater retreat, horizontal cut and fill, square set, top slicing, sub-level caving, block caving methods, combined open room, shrinkage and cut-fill and subsequent filling systems; design and construction of draw points; mechanics of draw and draw control procedure; recovery and dilution; problems of deep mining and the remedial measure; design and layout of stopes in rock burst prone mines.

Opencast Mining: Opening of deposits; preparation for excavation; box cut, types; site selection; formation of benches; rippability; types of rippers; cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and related problems; non-blasting techniques.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrapers bucket wheel excavator; (lateral block, half block and full block method etc.) productivity calculation; continuous surface miner; (wide/full base, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; in-pit crushing and strip-mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; strength of pillars (crown/rib/sill/post) and shaft pillar; protection of surface structures; design and stability of structures in rock; design of support and reinforcement for underground excavations support resistance, yielding and non-yielding supports, dynamic and static loading, consolidated and unconsolidated fills, rock bolts, cable bolts, subsidence; caving of rock mass; problems of deep mining; rock burst; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Use and safe handling of explosives; blasting techniques and their relative efficiency; total cost concept.

(b) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; flame safety lamp; monitoring of different gases; inflammability of fire damp.

Flame safety lamps; design; use and maintenance; testing of safety lamps; lamp house and organization.

Heat and humidity :- Sources of heat in mines; geothermal gradient; effects of heat and humidity; heat transfer in mines airways and stopes; methods of calculation of heat flow and temperature rise; heat load due to various machines; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure.

Mechanical ventilation :- Mechanical ventilators; characteristics and selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; thermodynamic network analysis and computer application; estimation of pressure requirement; ventilation survey; ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of mine dust.

Mine fires:- Types; causes; detection; prevention and control of mine fires; spontaneous heating; dealing with mine fires; sealing off fire-areas, build-up of extinctive atmosphere; fire fighting organization; reopening of sealed off fire areas.

Firedamp and sulphide dust explosion :- Cause and prevention; stone dust barrier; water barrier and other methods.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged workings; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements water danger plan.

Recovery of mine after explosion, fires and inundation and investigation after the same; rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Recent development in mine ventilation.

(c) Mining Machinery

Strength of materials; applied mechanics; fluid mechanics.

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment.

Underground machinery :- Pneumatic and hydraulic drilling hammers, jumbo drills, Roof bolters, quadro bolters, road headers, raise climbers; tunnel, raise and shaft borers, LHDs, LPDTs, booster compressors, DTH and ITH drilling machines.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track super elevation; track fitting and safety appliances; self acting inclines; ore handling plants; rail wagon loading plants; use of diesel equipments in underground mines.

Pumps :- Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Mine electrical engineering :- Transmission and distribution of electrical power in mines; radial and ring main distribution; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives;

electrical breaking; earthing; flameproof enclosures; use of high voltage operational equipment in mines.

Generation, transmission and utilization of power, steam, electricity and compressed air in mines; safety aspects.

Automation in mines :- Armchair mining (tele-operations of mining equipments)

Preventive, periodical and total maintenance systems in mines.

(d) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment. Gyro theodolite principle and determination of Gyro north; determination of true bearing by equal altitude method; tachometry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels; problems solving.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development and stone surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts, tunnels, raises and winzes; traversing along steep working with or without auxiliary telescopes.

Theory of errors and adjustments: Causes and classification of errors; indices of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformatric of coordinates.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves, surface and underground.

Dip, strike, fault and outcrop problems, borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

(e) Mine Management : Legislation : Environmental Management and General Safety.

Mine Management :-

Introduction :- Principles of scientific management; management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management :- Selection; training and development of human resources.

Production Management :- Production planning; scheduling and control; short term and long term planning; productivity; concepts and measurements.

Environmental Management:- Mine environment monitoring and control; EMP (Environment Management Plan), mine closure plan; R&R (rehabilitation and re-settlement).

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Metalliferous Mine Regulation, 1961, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Causes and prevention of accidents and their classification; frequency rate and severity rates; cause-wise analysis, investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; risk assessment and risk management; cost of accident; safety management system; human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees.

Disaster management :- rescue and recovery; mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

[No.Board/Metal/941/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Metal)

New Delhi, the 04th May, 2009

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINE SURVEYORS CERTIFICATES OF COMPETENCY (Under Metalliferous Mines Regulations, 1961)

FIRST PAPER

Linear measurement :- Instruments for measuring distance and ranging, chain surveying; errors in chaining and plotting; optical square.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Plan Table Surveying; methods contouring using plane table and micro-optic alidade.

Miners' dials and other compass instruments; dialing; loose and fast needle surveying.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment.

Levelling :- Levelling instrument types of leveling; booking and reduction methods; temporary and permanent adjustment of levels; geometrical, trigonometric and physical leveling; characteristics and uses of contours; methods of contouring; traverse; co-ordinates and leveling problems.

Tachometry:- Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Use, care, testing, and adjustments of instruments.

SECOND PAPER

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates, vertical projections; mine models.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry in mining.

Correlation :- Method of correlation surface and underground including Gyro-Laser combination.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

Control of direction and gradient in inclined shafts, shifts, tunnels, raises and winzes; surveying of flat, moderately and steeply inclined, and vertical ore bodies.

Area and volume calculation; different methods and their limitations; earth work and building estimation; laying out of rail curves on surface and underground; measurement of depths of incline roadways and shafts; determination of azimuth latitude and longitude.

Borehole surveying and calculations; dip, strike, outcrop and fault problems.

Development sampling :- Channel and block averaging; stope sampling; averaging of stope-face boundaries; valuation of block roof tonnages; milling widths; observe plans.

Types of plans their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Geological map reading.

Application of computers in mine surveying and preparation of plans. 3D laser profiling of bench walls in opencast mine.

[No.Board/Metal/942/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Metal)

New Delhi, the 04th May, 2009

G.S.R. 65. – In pursuance of the provisions of Regulation 13(4) of the Metalliferous Mines Regulations, 1961, the bye-laws for the conduct of examination and grant of Foreman's Certificates of Competency so far as they relate to Syllabus for Examination, (Appendix – I) is being substituted by the following :-

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINE FOREMAN'S (UNRESTRICTED) CERTIFICATES OF COMPETENCY (Under Metalliferous Mines Regulations, 1961)

(a) General Safety and Legislation

Duties and responsibilities of workmen, competent persons and officials (excluding managers, assistant managers); discipline amongst workers and control of staff.

Provisions of the Metalliferous Mines Regulations, 1961, relating to mine working; explosives and blasting; haulage; ventilation; precautions against danger from fire, dust, gas and water and of other provisions and Rules, the enforcement of and compliance with which is the responsibility of mine foremen.

Writing of reports required to be made by mine foreman under the regulations.

Dangerous occurrences in mines and dealing with the same; accidents, their causes and preventions; accident reports; not disturbing the place of accident.

Mine rescue; physiological effect of mine gases; rescue equipment and First Aid.

Sanitation and health; miners' diseases, their symptoms and preventions.

(b) Methods of Working.

Nature of occurrence of mineral deposits; geological disturbances and their effects on working conditions; dangers and precautionary measures while approaching geological disturbances areas.

The purposes and utility of boreholes in mines; shaft sinking; safety devices; temporary and permanent supports in sinking and working shafts; estimation of shafts and outlets.

Opencast methods of mining; mechanized and manual methods; deep hole drilling and blasting; shovel and dumpers; dragline; bucket wheel excavators; surface continuous miner; benching; maintenance of haul roads; other safety precautions; methods of reclamation; dump management.

General principles of primary and secondary development; stopping methods; manual and mechanized stone drifting.

Elements of roof control; mechanism of rock bolting; support of roadways; face supports and their types, setting, testing and withdrawal; systematic timbering rules; packing and stowing; protection of surface structures; working beneath statutorily restricted areas and surface structures.

Safe handling and use of explosives; deep hole drilling and blasting; safety precautions.

Inspection of workings; inspection and maintenance of haulage and travelling roadways; man riding system and return airways; gates and fences.

Reading of statutory plans.

(c) Ventilation and Precautions against Explosives: Fires and Inundation

Natural and mechanical ventilation ; ventilation of headings and sinking shafts; siting of auxiliary and booster fans; distribution, measurement and control of air in mines; estimation of air quantity requirements; methods of coursing of air; anemometer; hygrometer; maintenance of ventilation appliances.

Pollution of air; irruption/occurrence of gases in mines; properties of gases; detection and measurement of firedamp and noxious gases; sampling of air; determination of environmental condition; standards of ventilation.

Design and construction of flame and electric safety lamps; their use, examination and maintenance.

Suppression and treatment, sampling and analysis of mine dust.

Elementary knowledge of causes and prevention of firedamp and sulphide dust explosion, limits of inflammability of fire-damp.

Fires and spontaneous heating; prevention, detection and control of mine fire; sealing off fire areas; fire stopping and their examination; precautions against outbreak of surface fires; fire fighting on surface and belowground.

Inspection of old workings.

Sources of danger from surface and belowground water, precaution, to prevent inundation and irruption of water; precautionary measures while approaching abandoned and water logged areas, boring machines for exploratory work; water dams; water danger plan.

Recovery of mines after explosions fires and inundation; precautionary measures during re-opening and dewatering of mines.

(d) Elements of Mining Machinery.

Safety aspects and safe use of different kinds of machinery used in underground and opencast mines including blast hole drills, rippers; scrappers; shovels; draglines; dumpers; road graders; dozers; wheel loaders; bucket wheel excavators; spreaders; surface continuous miners; brakes (including service and parking brakes); generation and use of compressed air; use of steam and internal combustion engines in mines.

Application of electricity in mines; safety precautions.

Winding equipments; ropes and guides; signaling and decking arrangements; safety devices; examination of winding equipments and shaft fittings.

Haulage and transport; types of haulage; rope haulage and locomotives; self-acting inclines; haulages; roads in underground and opencast working; rails and tracks; their maintenance and inspection; tubs; signaling; safety devices; codes of practices; traffic rules; unsafe practices; derailments.

Different types of pumps; principles and use of siphons; drainage and water lodgments.

Code of practice for transport, installation, use and shifting of underground and opencast machinery.

Belt conveyors and safety appliances.

[No.Board/Metal/943/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Metal)

New Delhi, the 04th May, 2009

G.S.R. 66. – In pursuance of the provisions of Regulation 13(4) of the Coal Mines Regulations, 1957, the bye-laws for the conduct of examination and grant of Manager's Certificates of Competency so far as they relate to Subject and Syllabus for Examination, for First Class Manager's Certificate (Appendix – I) and for Second Class Manager's Certificate (Appendix – II) is being substituted by the following :-

Certificate of competency	Bye law No.	Existing Provisions	Substituted Provisions

Managers Certificate of Competency	5	Subjects and syllabus for Examination (a) Winning and Working. (b) Mine Management, Legislation and General Safety. (c) Mine Ventilation, Explosions, Fires and Inundation. (d) Mine Surveying. (e) Mining Machinery	Subjects and syllabus for Examination (a) Mine Management, Legislation and General Safety (b) Winning and Working. (c) Mine Ventilation, Explosions, Fires and Inundation. (d) Mining Machinery and Electricity (e) Mine Surveying.

APPENDIX-I

SYLLABUS FOR THE EXAMINATION FOR FIRST CLASS MANAGER'S CERTIFICATE OF COMPETENCY (Under Coal Mines Regulations, 1957)

(a) **Mine Management : Legislation and General Safety.**

Mine Management :-

Introduction :- Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management and Organizational behavior Selection; training and development of human resources for mining enterprises; leadership; study of traditional leader behaviour; autocratic; democratic and Laissez-Faire behaviors; conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth individual motivation; two way personal communication.

Production Management :- Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity; concepts and measurements; application of Ergonomics in mine operation.

Financial Management :- Capital budgeting; techniques for mining project; project evaluation; payback period and IRR; methods of cost analysis and cost control; breakeven charts; working capital management; ERP (Enterprise Resources Planning).

Mining Environment:- EIA (Environment Impact Assessment), EMP (Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management; mine closure plan; R&R (rehabilitation and re-settlement).

Economic Impact of Mining Economics of mining effect on community – before, during and after mining corporate social responsibility (CSR).

Materials Management for mining sector; ABC analysis, Inventory Management.

Industrial Accident :- Study of human factors of industrial accidents; their causes and remedies.

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Coal Mine Regulation, 1957, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Duty of care; occupational hazards of mining; causes and prevention; accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; safety management system; contribution of human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees; role of information technology in safety management.

Risk Management :- Theory and application, baseline, continuous and issue based risk assessment, risk management techniques and application, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management, due diligence, application of risk assessment and risk management with reference to due diligence.

Disaster management :- Emergency services, equipments and procedures, emergency control rooms, rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response, investigations and reports; assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

(b) Winning and Working

Geology :- Nature and occurrence of coal seams; description of Indian coalfields; application of geology to mining; geological structures; folds, faults, fractures, fissures etc. boring through disturbed strata; bore hole survey; indicated and proved coal reserves; interpretation of geological maps.

Opening of coal seams: Legal requirement about outlets; siting; vertical shaft; inclines shaft; inclines; shafts sinking and deepening; drift drivage; mechanized sinking; in ordinary and water logged grounds, in running sand etc.; freezing, cementation and other special methods; shaft supports, temporary and permanent, tubings etc., recent developments.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of mining coal seams and factors affecting the same; statutory provisions.

Board and Pillar method :- Schemes of development; design of bord and pillar working; statutory provisions selection of equipment for development mechanized loaders, continuous miners etc., preparatory arrangement for depillaring; statutory provision for depillaring; designing the system of pillar extraction with caving and stowing; mechanization in depillaring operation; types of loading machines; continuous miners etc.; roof management; local fall and main fall; indications of roof weighting; air blasts and precautions against the same; precautions against fire and inundation during depillaring; multi-section and contiguous working; liquidation of developed pillars.

Longwall mining :- Method of driving gate roads; single and multiple heading gate roads; longwall face layout advancing and retreating faces; orientation of longwall face; support system for longwall gate roads; powered support; face transfer, operation of shearer and plough; roof management and hard roof management; periodic and main fall; design of high productive longwall panel; mini/short wall mining; communication and telemonitoring.

Thick seam mining :- Board and pillar and longwall methods in multi-section; multi-slice methods; inclined slicing; horizontal slicing and cross slicing in ascending and descending orders; under winning methods; sublevel caving; integral caving; blasting gallery and descending shield methods; hydraulic mining; special methods of thick seam mining.

Other special methods of mining :- Wide stall method; methods of mining thin seams; underground coal gasification, coal bed methane/ coal mine methane etc.

Opencast Mining: Opening of deposits and preparation for excavation; box cut, types; selection of site; formation of production benches; ripping; types of rippers; concept of rippability and cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and problems of blasting side casting; environment friendly non-blasting techniques; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; applicability of electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; side cast diagram; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; types; methods of work; push pull operation etc., bucket wheel excavator; operational methods (lateral block, half block and full block etc.,) productivity calculation; continuous surface miner; operational methods (wide/full base methods, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; mode of operation etc., OITDS (operator independent truck dispatch system); in-pit crushing and strip-mining; opencast mining over developed coal seams; high-wall mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; stress, strain compressive and tensile, shear strength uniaxial and tri-axial strength, Poisson's Ratio, Young's Modulus, convergence, elasticity, lithostatic and hydrostatic

pressure; rock mass classification, strength of stooks; shaft pillar; protection of surface structures; design and stability of structures in rock; design of support and reinforcement for underground excavations support resistance, yielding and non-yielding supports, dynamic and static loading, measuring instruments, consolidated and unconsolidated fills, rock bolts, cable bolts, latest developments in mine supports, economics of support design, subsidence; caving of rock mass; bumps; monitoring of rock mass performance; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Development of safe explosives; permitted explosives; composition and testing of safe explosives Milli-second detonators; alternatives of explosives. Use and safe handling of explosives in coal and stone drivages in gassy and non-gassy mines, blasting techniques and their relative efficiency, total cost concept.

Application of numerical modeling in mine design application of computers in mine design and operational controls.

(c) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; methane content; methane drainage; flame safety lamp; methanometers and multi-gas detectors; gas chromatograph; methane layering; monitoring of different gases; telemonitoring; coal bed methane/coal mine methane.

Heat and humidity :- Sources of heat in mines; geothermal gradient; heat flow in deep mines; effects of heat and humidity; psychometrics; computation of thermodynamic properties of mine air; basic modes of heat transfer in mines; methods of calculation of heat flow and temperature rise in mine airways; heat and moisture transfer in bord and pillar and longwall workings; Computation of heat load due to various machines e.g. belt conveyor, power pack stage loader, lump breaker, armoured flexible conveyor, shearer etc. in longwall gate roads and face and road header, continuous miner and underground sub-stations etc. in the mine; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure; thermodynamic principles and other short-cut methods.

Mechanical ventilation :- Theory of different fans; characteristics and suitability of fan; selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; ventilation of heading and sinking shafts; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; Hardy Cross methods of iterative analysis and application of linear theory; thermodynamic network analysis and computer application; application of numerical modeling; estimation of pressure requirement; ventilation survey; recent development in mine ventilation, ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of mine dust; properties of stone dust; sampling and analysis of mine dust.

Mine fires:- Cause of mine fires, spontaneous combustion, mechanism and susceptibility indices detection and prevention of spontaneous heating and mine fires; dealing with mine fires; sealing off fire-areas; build-up of extinctive atmosphere;

pressure balancing; fire fighting organization; gas ratios and their limitations; modified gas ratios; reopening of sealed off fire areas; fires in quarries over developed pillars; coal stack and waste dump fires.

Mine explosions :- Fire damp and coal dust explosions; cause and prevention; stone dust barrier; water barrier and other methods.

Explosion in quarries over developed pillars. Water gas explosion.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements; monsoon preparations, water danger plan.

Recovery of mine after explosion, fires and inundation rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Risk Assessment and analysis with reference to mine environment, management of environmental risks.

(d) Mining Machinery and Electricity

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment, non destructive testing.

Underground machinery :- Coal drills; jumbo drills; roof bolters; quad bolters; UDM; shearers; ploughs; AFC; road headers; ding headers; continuous miners; shuttle cars; SDLs; LHDs.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; coal handling plants; rail wagon loading; plants; use of diesel equipments in underground coal mines, free steered vehicles.

Pumps :- Types, Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Generation, transmission and utilization of power, steam, compressed air; air compressor and auxiliary equipment; air turbines and air engines; efficiency of power, electricity and steam systems; safety aspects.

Maintenance Systems :- Monitoring and reporting tribology – corrosion, planned maintenance, Preventive, periodical and total maintenance systems in mines. Condition based monitoring and related maintenance system.

Mine electrical engineering :- Generation, Transmission and distribution of electrical power in mines; radial and ring main distribution; power economics; industrial tariffs; power factor improvement; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures and intrinsic safety; use of high voltage operational equipment in mines.

(e) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Dials; loose and fast needle surveying; plan table surveying and micro-optic alidade.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; tachemetry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels; problems solving.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north. Astronomical triangle; conversion of time system and precise determination of azimuth by astronomical methods.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development and stone surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts and roadways traversing along steep working with or without auxiliary telescopes; 3D laser profiling of bench walls in opencast working.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry and remote sensing in mining.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail curves and haul road curves, surface and underground.

Dip, and strike problems; outcrop problems; borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

APPENDIX – II

SYLLABUS FOR THE EXAMINATION FOR SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY (Under Coal Mines Regulation, 1957)

(a) **Mine Management : Legislation : and General Safety.**

Mine Management :-

Introduction :- Principle of scientific management; management functions; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management:- Selection; training and development of human resources for mining enterprises;

Production Management :- Production planning, scheduling and control; short term and long term planning; productivity; and its measurements.

Environmental Management :- Mine Environment monitoring and control; EMP (Environment Management Plan); mine closure plan; R&R (rehabilitation and resettlement).

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Coal Mine Regulation, 1957, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Vocational Training Rules, 1966, other rules and legislation applicable to coal mines.

General Safety in Mines

Safety in Mines :- Causes and prevention of accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; risk assessment and risk management; cost of accident; safety management system; human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees.

Disaster management :- rescue and recovery; mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

(b) Winning and Working

Geology :- Nature and occurrence of coal seams; description of Indian coalfields; geological features of coalfields; methods of boring; boring through disturbed strata; bore hole survey; interpretation of geological maps.

Opening of coal seams: shafts sinking and drift drivage; methods of sinking; mechanized sinking; in ordinary and water logged grounds, and other special methods; shaft supports, temporary and permanent; mechanized stone drifting etc.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of mining coal seams and factors (depth, seam thickness, inclination etc.) affecting the same; statutory provisions.

Board and Pillar method :- design of board and pillar working; statutory provisions mechanized loaders, continuous miners etc., depillaring and applicable statutory provision pillar extraction with caving and stowing; mechanization in depillaring; local fall and main fall; indications of roof weighting; air blasts and precautions against the same; precautions against fire and inundation; multi-section and contiguous working.

Longwall mining :- Method of driving single and multiple heading gate roads; orientation of longwall face; advancing and retreating faces; support system for longwall gate roads; powered support; face transfer, operation of shearer and plough; periodic and main fall; mini/short wall mining; communication and telemonitoring.

Thick seam mining :- Board and pillar and longwall methods in multi-section; multi-slice methods; inclined slicing; horizontal slicing and cross slicing in ascending and descending orders; under winning methods; sublevel caving; integral caving; blasting gallery and descending shield methods; hydraulic mining; special methods of thick seam mining.

Other special methods of mining :- Wide stall method; methods of mining thin seams; underground coal gasification, coal bed methane/ coal mine methane etc.

Opencast Mining: Opening of deposits and preparation for excavation; box cut, types; site selection; formation of benches; rippability; types of rippers; cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and related problems; surface miners; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; bucket wheel excavator; (lateral block, half block and full block etc.,) productivity calculation; continuous surface miner; (wide/full base, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; in-pit crushing and strip-mining; opencast mining over developed coal seams; high-wall mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; strength of stooks; shaft pillar; protection of surface structures; design and stability of structures in rock; rock mass rating; design of support and reinforcement for underground excavation consolidated and unconsolidated fills, rock bolts, cable bolts, subsidence, caving of rock mass; bumps monitoring of rock mass performance; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Use and safe handling of explosives; blasting techniques and their relative efficiency, total cost concept.

(c) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; occurrence, properties, characteristics, detection and measurement of firedamp; methane drainage; flame safety lamp; methanometers and multi-gas detectors; gas chromatograph; methane layering; monitoring of different gases; telemonitoring; coal bed methane/coal mine methane.

Flame safety lamps and their design; use of maintenance; testing of safety lamps; lamp house and organization.

Heat and humidity :- Sources of heat in mines; geothermal gradient; effects of heat and humidity; heat transfer in bord and pillar and longwall workings; methods of calculation of heat flow and temperature rise; heat load due to various machines; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure.

Mechanical ventilation :- Mechanical ventilators; characteristics and selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; thermodynamic network analysis and computer application; estimation of pressure requirement; ventilation survey; recent development in mine ventilation, ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of coal dust; properties of stone dust; sampling and analysis of coal dust.

Mine fires:- Cause of mine fires, spontaneous combustion, mechanism and susceptibility indices (crossing and ignition point temperature); wet oxidation

potential; factors affecting spontaneous combustion; detection and prevention; dealing with mine fires; sealing off fire-areas; build-up of extinctive atmosphere; pressure balancing; fire fighting organization; gas ratios and their limitations; modified gas ratios; reopening of sealed off fire areas; fires in quarries over developed pillars; coal stack and waste dump fires.

Mine explosions :- Inflammability of fire damp and coal dust; fire damp and coal dust explosions; cause and prevention; stone dust barrier; water barrier and other methods.

Explosion in quarries over developed pillars.

Water gas explosion.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements; monsoon preparations, water danger plan.

Recovery of mine after explosion, fires and inundation and investigation rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system; emergency organization.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

(d) Mining Machinery and Electricity

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment, non destructive testing.

Underground machinery :- Coal drills; jumbo drills; roof bolters; quad bolters; UDM; shearers; ploughs; AFC; road headers; ding headers; continuous miners; shuttle cars; SDLs; LHDs.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors (belt, chain, cable belt, high angle, shiftable and pipe conveyor); aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track super elevation; track fitting and safety appliances; self acting inclines; coal handling plants; rail wagon loading; plants; use of diesel equipments in underground coal mines, free steered vehicles.

Pumps :- Types, Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface miners and their maintenance aspects.

Generation, transmission and utilization of power, steam, compressed air; safety aspects.

Preventive, periodical and total maintenance systems in mines.

Mine electrical engineering :- Generation, Transmission and distribution of electrical power in mines; radial and ring main distribution; substation arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures and intrinsic safety; use of high voltage operational equipment in mines.

(e) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; Gyro theodolite; principle and determination of Gyro north; determination of true bearing by equal altitude method; tachometry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north. Astronomical triangle; conversion of time system and precise determination of azimuth by astronomical methods.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts and roadways traversing along steep working with or without auxiliary telescopes.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail curves, surface and underground.

Dip, and strike problems; outcrop problems; borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

[No. Board/Coal/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Coal)

New Delhi, the 04th May, 2009

G.S.R. 67. – In pursuance of the provisions of Regulation 13(4) of the Coal Mines Regulations, 1957, the bye-laws for the conduct of examination and grant of Surveyors Certificates of Competency so far as they relate to Syllabus for Mine Surveyors Certificate Examination, (Appendix – I) being substituted by the following :-

APPENDIX – I
SYLLABUS FOR EXAMINATION FOR MINE
SURVEYORS CERTIFICATES OF COMPETENCY
(Under Metalliferous Mines Regulations, 1961)
FIRST PAPER

Linear measurement :- Instruments for measuring distance ranging, chain surveying; errors in chaining and plotting; optical square.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Plan Table Surveying; methods contouring using plane table and micro-optic alidade.

Miners' dials and other compass instruments; dialing; loose and fast needle surveying.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment.

Levelling :- Levelling instrument types of leveling; booking and reduction methods; temporary and permanent adjustment of levels; geometrical, trigonometric and physical leveling; characteristics and uses of contours; methods of contouring; traverse; co-ordinates and leveling problems.

Tachometry:- Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Use, care, testing, and adjustments of instruments.

SECOND PAPER

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north, astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates, vertical projections; mine models.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry and remote sensing in mining.

Correlation :- Method of correlation surface and underground including Gyro-Laser combination.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

Surveying of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts and roadways; traversing along steep working with or without auxiliary telescopes.

Area and volume calculation; different methods and their limitations; earth work and building estimation; laying out of rail curves on surface and underground; measurement of depths of incline roadways and shafts; determination of azimuth latitude and longitude.

Borehole surveying and calculations; dip, strike, outcrop and fault problems.

Types of plans their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Geological map reading.

Application of computers in mine surveying and preparation of mine plan;. 3D laser profiling of surfaces and bench walls.

[No.Board/Metal/939/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Coal)

New Delhi, the 04th May, 2009

G.S.R. 68. – In pursuance of the provisions of Regulation 13(4) of the Coal Mines Regulations, 1957, the bye-laws for the conduct of examination and grant of Overman Certificates of Competency so far as they relate to Syllabus for Overman Certificate Examination, (Appendix – I) is being substituted by the following :-

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINE OVERMAN'S CERTIFICATES OF COMPETENCY (Under Coal Mines Regulations, 1957)

(a) General Safety and Legislation

Duties and responsibilities of workmen, competent persons and officials (excluding managers, assistant managers); discipline amongst workers and control of staff.

Provisions of the Coal Mines Regulations, 1957, relating to mine working; explosives and shortfiring; haulage; ventilation; precautions against danger from fire, dust, gas and water and of other provisions and Rules, the enforcement of and compliance with which is the responsibility of overmen.

Writing of reports required to be made by overman under the regulations.

Dangerous occurrences in mines and dealing with the same; accidents, their causes and preventions; accident reports; not disturbing the place of accident.

Mine rescue; physiological effect of mine gases; rescue equipment and First Aid.

Sanitation and health; miners' diseases, their symptoms and preventions.

(b) Methods of Working.

Nature of occurrence of coal seams; geological disturbances and their effects on working conditions; dangers and precautionary measures while approaching geological disturbances areas. The purpose and utility of boreholes in mines; sinking; safety devices; temporary and permanent supports in sinking and working shafts; examination of shafts and outlets.

Opencast methods of mining; mechanized and manual methods; deep hole drilling and blasting; shovel and dumpers; dragline; bucket wheel excavators; surface miner; benching; maintenance of haul roads; precautions; while extracting developed pillars by opencast method and other safety precautions; methods of reclamation; dump management; high wall mining.

General principles of board and pillar and longwall method; multi-section workings; method of depillaring under different conditions; mechanized pillar extraction; precautions to be taken while working near/beneath waterlogged areas; roof convergence and convergence measuring devices etc., stone drifting.

Elements of roof control :- Rock Mass Rating (RMR) of roof strata; mechanism of rock bolting; support of roadways; face supports and their types, setting, testing and withdrawal; systematic support rules; packing and stowing; protection of surface structures; working beneath statutorily restricted areas and surface structures.

Safe handling and use of explosives; in coal and stone in gassy and non-gassy mines; simultaneous short firing; blasting in fire areas in opencast mines; safety precautions.

Inspection of workings; inspection and maintenance of haulage and travelling roadways; man riding system and return airways; gates and fences.

Reading of statutory plans.

(c) Ventilation and Precautions against Explosives: Fires and Inundation

Natural and mechanical ventilation ; ventilation of headings and sinking shafts; siting of auxiliary and booster fans; distribution, measurement and control of air in mines; estimation of air quantity requirements; methods of coursing of air; anemometer; hygrometer; maintenance of ventilation appliances.

Pollution of air; irruption/occurrence of gases in mines; properties of gases; detection and measurement of firedamp and noxious gases; sampling of air; determination of environmental condition; standards of ventilation.

Design and construction of flame and electric safety lamps; their use, examination and maintenance.

Suppression and treatment of coal dust; suitability of stone dust; sampling and analysis of mine dust.

Elementary knowledge of causes and prevention of firedamp and coal dust explosion, limits of inflammability of fire-damp.

Prevention, detection and control of spontaneous heating/fire; sealing off fire areas; fire stopping and their examination; precautions against outbreak of surface fires; fire fighting on surface and belowground.

Inspection of old workings.

Sources of danger from surface and underground water, precaution, to prevent inundation and irruption of water; precautionary measures while approaching abandoned and water logged areas, boring machines for exploratory work; water dams; water danger plan.

Recovery of mines after explosions fires and inundation; precautionary measures during re-opening and dewatering of mines.

(d) Elements of Mining Machinery.

Safety aspects and safe use of different kinds of machinery used in underground and opencast mines e.g. blast hole drills, rippers; scrappers; shovels; draglines; dumpers; road graders; dozers; wheel loaders; bucket wheel excavators; spreaders; surface continuous miners; brakes (including service and parking brakes); use of steam and internal combustion engines in mines.

Application of electricity in mines; safety precautions.

Winding equipments; ropes and guides; signaling and decking arrangements; safety devices; examination of winding equipments and shaft fittings.

Haulage and transport; types of haulage; rope haulage and locomotives; self-acting inclines; haulages; roads in underground and opencast working; rails and tracks; their maintenance and inspection; tubs; signaling; safety devices; codes of practices; traffic rules; unsafe practices; derailments.

Different types of pumps; principles and use of siphons; drainage and water lodgments.

Code of practice for transport, installation, use and shifting of underground and opencast machinery.

Belt conveyors and safety appliances.

[No.Board/Metal/940/2009]

M.M. SHARMA, Director General of Mines Safety &
Chairman, Board of Mining Examination (Coal)

Circulars – 2009

No. DGMS (Tech)/Circular No./ 01

Dhanbad, Dated – 16/01/2009

To,

Owner/Agent/Manager of All coal Mines and Mettalliferious mines.

Sub:- Surveyed off equipment in the open cast mine.

Investigation into the number of accidents have revealed that the accidents are increasing due to surveyed off equipments being used in opencast mines. Each company has a system of surveying off and condemning the equipment depending on the life either by number of working hours or number of years completed. Once the equipment attain the designed life, the equipment are surveyed off but the replacement has not been received. In this circumstances management has no other alternative but to use these surveyed off equipment to achieve production. During this course of time the equipment are not maintained properly and also do not get required spares causing dangerous occurrence or accidents.

In order to reduce/avert accidents and untoward incidents, the following steps are recommended to be taken before the surveyed off equipments are put into services.

1. (a) Committee consisting senior technical officer from company level, Original Equipment Manufacturer (OEM) and an independent agency shall make a through check and inspect the condition of equipment and advise the management for necessary maintenance/repairs to be carried out.
- (b) The management will be strictly implement the recommendation. The equipment shall not be put into service until the recommendation are fully complied.
- (c) The committee will re-inspect the equipment are recommend the period for further use of equipment.
- (d) An additional periodical maintenance program shall provided by the committee.
- (e) The additional periodical maintenance along with one recommended by OGM initially at one time of new installation shall be strictly followed by the mine official and a record of maintenance/inspection are recorded in a bound paged book and signed by the colliery Engineer & Manager.
2. The managements shall ensure all spares are made available for maintenance/repairs.
3. The stability of equipment shall be assessed by an independent agency in case of Excavator/Shovel and Dragline once in six months during the extended use. I am of the opinion that the above recommendation may help in reducing incidents/accidents due to extended use of surveyed off equipments. The recommendation may be strictly complied in the interest of safety.

No. DGMS (Tech)/Circular No./ 02

Dhanbad, Dated – 09/02/2009

To,

Owner/Agent/Manager of All coal Mines and Metalliferous mines.

Sub:- Structural Safety audit for Head gears used in Mines.

Head gear is a important structure located over the shaft that houses one or two sheaves, carrying winding ropes, flexible guides and other equipments. The head frames are constantly subject to static loads, dynamic loads and environmental effect. Foundations of reinforced concrete is buried in ground and is constantly subjected to reversible loads and environmental effects, which reduces the strength of concrete and alters the properties. Failure of foundation is most dangerous for headgear frames. Hence a time to time the structural audit for safety, stability, serviceability and durability must be done to assess the damage.

Regulation 73(1) of Coal Mines Regulations, 1957 & Regulation 80(1) of Metalliferous Mines Regulation 1961 requires that “every part of a winding installation, including headgear, shall be sound construction and adequate strength, and shall be maintained in safe working order. In case of any doubt as to the foregoing, it shall be referred to the Chief Inspector of decision.

Regulation 182 of the Coal Mines Regulation, 1957 & Reg. 172 of the Metalliferous Mines Regulations 1961 require that “all parts and working gear, whether fixed or moveable, including the anchoring and apparatus used as or forming part of the equipment of a mine, and all foundations in or to which any such appliances are anchored or fixed shall be of good construction, suitable material, adequate strength and free from visible defect and shall be properly maintained.

Head gear frame are generally not maintained for serviceability. Some of the members are removed for the convenience making structure unstable. Initial defects of fabrications of bolts, rivets are enlarged. Improper coating for protection of structure leads to corrosion of steel and reduction of properties due to environmental effects. Mishandling of structure leads also to deterioration of structure.

Durability and serviceability of head gear depends on constant watch on structure and audit for its stability. Material properties changed during service life need to be checked and identified.

Following important factors are to be carried out from time to time verified with the original.

Check to be carried out:-

1. Study the change in static and dynamic loads.
2. Evaluate change in configuration of head gear. Forces in members are to be checked and a diagram to be drawn to ensure resultant failing inside back leg.
3. Joints of members are to be checked (rivets, welds, bolts)
4. Strengths of material must be ascertained by taking samples.
5. Deflection and physical movement in all direction and vibration should be measured by applying 50%, 100%, 120% loads. Deformation of frame, buckling of each individual members in joint are need to be checked. Cracks/defects shall be carefully checked.
6. Plastic stage of sections used should be checked by observing change in colour and ductility of section.

7. Ultra sound pulse velocity (N.D.T.) should be done to assess the strength cracks or defects in concrete. Concrete core may also be taken to assess the compression strength of concrete by N.D.T. Cover meter test or hammer tests may be carried out to assess the damage.

Rehabilitation of Head gear

After full condition assessment and structural audit of the head gear frame for all points mentioned above scheme of rehabilitation and bringing back to original condition shall be prepared. Scheme of retrofitting and rehabilitation will vary from mine to mine. Broadly classified items rehabilitation are mentioned below :-

- 1) Retrofitting of members to maintain original stable configuration of structure.
- 2) Bringing back to original properties of materials and section by adding additional structure member.
- 3) Replacement of bolts, welds, rivets and correcting the perfect alignment of member.
- 4) For unstable head gear frame, deflection, physical movement is corrected.
- 5) Apply low diffusivity coating like epoxy to whole structure surface.
- 6) Grout, shotcrete, inject or jacket polymer concrete to strengthen the foundation of head gear frame and fill up the cracks in the concrete.

The structural audit of head gear shall be carried out once in five year. I am sure that in the interest of safety, all mining Companies shall take immediate action to implement the above recommendations.

No. DGMS (Tech)/Circular No./ 03 Dhanbad, Dated – 6th February, 2009

To,
Owner/Agent/Manager of Coal Mines.

Sub :- Qualitative and Quantitative assessment of Fire Fighting Equipment.

Sir,

It is well known fact that air, water and fire are primary sources of lives on the earth but at the same time if the natural equilibrium of any one is disturbed then it leads to disaster and irreparable damages. Fire hazards amongst all the three are very common in the industrial as well as domestic fields.

Fire in coal mines is one of the most common hazards that lead to disasters, accidents loss of valuable lives and damages to properties. Spontaneous heating and combustion in coal is one of the major sources of fires not only in belowground workings but also in opencast mines. Bench fire in coal mine is very common apart from dump fire.

Increased mechanization and use of large number of machines of higher capacities have posed another fire threats and the incidences of fires in such machinery and installations have increased. One of the major contributors to fire is the use of electricity at higher operating voltages. The fire fighting technologies and fire suppression system have advanced further which are more fast and effective to deal with fires either on surface or belowground including heavy earth moving machinery. A few of such technology is backpacked and handheld High Pressure Water Mist cum CAFs based fire fighting system which is applicable to quench not only oil fires but

even electrical fires upto 36 KV line. A live demonstration of this product was given in DGMS recently in the presence of Officials from Coal Mining Industry, Scientist from CIMFR, Indian School of Mines and other Fire Fighting Equipment manufactures as per EN3-7 Standard B233.135 liters of diesel and 25 Liters Petrol were ignited for 60 seconds to grow the fire and flames upto its maximum intensity and then the handheld High Pressure Water Mist cum CAFs based fire fighting system was operated and applied on the fire blazing upto 30 feet height. The fire was completely quenched within 12 second which appeared to be miraculous to everyone witnessing the demonstration. Similarly, the CAFs were also applied on live electrical wires/fire which was also quenched without any difficulty.

High Pressure Water Mist cum CAFs based fire fighting system is highly effective and fast in quenching and controlling fires of varying magnitudes. A survey was recently conducted in few coal mines and installations to identify the risk of fire areas and installation based on quantitative assessment of sources of fires and its magnitude of damage.

The survey revealed that the following places, machinery and installation should be provided with at least the required number of High Pressure Water Mist cum CAFs based Fire Fighting System or such other equivalent type or even better.

Sl. No.	Location	Installation/Equipment	Fire Extinguisher's Size	Requirement
1	Surface Installation	Electrical Sub-Station 33 KV	10 Liters	06
		Electrical Sub-station 11 KV	10 Liters	04
		Electrical Sub-station 550/440V	10 Liters	04
		Belt Conveyor Drive Head	10 Liters	02
		Tail-End Drum	10 Liters	01
		Transfer Point	10 Liters	01
		Belt Tensioning Point/Devices	10 Liters	01
		Belt Line where Gradient changes	10 Liters	01
		Haulage Engine Room	10 Liters	01
		Colliery Store	10 Liters	02
		Workshop	10 Liters 50 Liters	04 02
		Ventilation Fan	10 Liters	01
		Emergency Control Room	10 Liters	05
		Explosive Van	10 Liters	02
02	Opencast Mine	Dragline	50 Liters 10 Liters	01 06
		Electrical Shovel	10 Liters	04
		Electrical Drills	10 Liters	02
		Dumper	10 Liters	02

		Diesel Tankers	10 Liters	02
		Dozer	10 Liters	01
		Grader	10 Liters	01
03	Belowground	Electrical Sub-Station	10 Liters	02
		Haulage Room	10 Liters	01
		Belt Conveyor Drive Head	10 Liters	02
		Tail-End Drum	10 Liters	01
		Transfer Point	10 Liters	01
		Belt Tensioning Point/Devices	10 Liters	01
		Belt Line where Gradient changes	10 Liters	01
		Section Store	10 Liters	02
		Hydraulic Drill	10 Liters	01
		Pump House	10 Liters	01
		UG Tippler	10 Liters	01
		Load Haul Dumper (LHD)	10 Liters	01
		Side Discharge Loader	10 Liters	01
		Continuous Miner	10 Liters	02

The above estimate is based on the normal installations and machinery used in mines which may change due to extra large capacity machines installation.

It is, therefore recommended to implement the above scheme and regularly update the fire fighting plan maintained at the mine.

No. DGMS (Tech)/Circular No./ 04

Dhanbad, Dated – 16th February, 2009

To,

Owner/Agent/Manager of All Mines.

Sub :- Use of only Approved Types and Standards of Luminaries for Lighting in Mines.

Sir,

1.0 INTRODUCTION

Lighting is an essential environmental component for any working place, whether buildings, roads, offices, factories, stationery or mobile equipment, machines or any other installation and plants. It has a direct bearing on the efficiency of manpower and machine in addition to its effect on personal health. It is also well established that inadequacy of light and long exposure to inadequate lighting conditions lead to

numerous eye sight problems and ill effects on human body. It is also known that over exposure to light is equally dangerous to human body.

Various researches and studies have been carried out on this subject and different standards of lighting for specified objectives and operations have been prescribed by different countries and Standard Organizations.

Bare lamps causing glare are still in frequent evidence. In many cases the quantity of light generated is sufficient, but only a small percentage of the light reaches the work, by reason of failure to equip the lamps with suitable reflectors.

“The question of artificial lighting is of special importance at the present time when night work is general, and common in mines. Notwithstanding the important bearing which good eyesight must have upon output, the question is not today receiving adequate attention at the hands of those whose duty it is to obtain this output. Bad lighting affects output unfavorably, not only by making good and rapid work more difficult, but also by causing headaches and other effects of eye-strain.

Incidence of accidents due to poor lighting conditions and glare at the eyes of the driver operating vehicles and HEMMs has also increased in recent past.

Instance have come under the notice of this Directorate, of headaches and eye-strain resulting from (a) inadequate light, both artificial and natural; (b) artificial light, adequate in amount, but so placed as to throw a glare on the eyes of the workers; (c) employment of workers, whose eyesight should be aided by suitable glasses, to carry out fine work without first testing their eyesight.”

In view of the conditions prevailing at the mines and their effects on health and safety of the persons employed therein, it is imperative to re-examine the issue of lighting in the perspective of advancement made in Lighting and Photometry that need to be applied and implemented for better work environment and safety in mines.

1.1 BACKGROUND :-

Under *regulation 151 – General Lighting*, of the Coal Mines Regulations, 1957, the adequate arrangements for providing lighting at various places both on surface as well as belowground workings of a mine have been specified. Provisions to prevent glare or eyestrain, accidental damage and Lighting Fixture to be in compliance with the Indian Electricity Rules 1956 have been specified (Regulation 152).

A Technical Committee on mining standards was appointed by the Government of India which submitted its report on Standards of Lighting in Mines in 1963. Based on the recommendations of the Committee, a technical circular no. 14 of 1964 was issued from this Directorate in which the standards of lighting for underground work places, flood lighting in depillaring areas, individuals lights, importance of lighting and eye strain due to lighting were described in details.

The Standard of Lighting for Opencast Mines were also prescribed vide Government Notification No. GSR-804 dated 18.06.1975 for Opencast Coal Mines and vide GSR No. 829 dated 18.06.1975 for Metalliferous Opencast Mines.

Various other requirement of lighting in depillaring areas in coal mines vide Technical Circular No. 42 of 1961, Flood Lighting in depillaring areas in first degree gassy seam vide Technical Circular No.36 of 1969 have also been notified.

In the standards prescribed by the notifications mentioned above, the work place lighting requirements have been mentioned. The characteristics and parameters of the luminaries required to provide the desired level of illuminations need to be defined and specified. The lighting requirements of stationery and mobile equipment signal lighting, traffic lights and many other lighting parameters also need to be looked into.

2.0 Technology Advancement

The lighting technology has advanced manifold and many lighting systems including intelligent lighting system have been developed which are not only energy efficient but also has long life of its lamps and heat sink devices. The modern lighting systems works on low voltage low current ratings and gives output more than the existing and old light fixtures like high pressure sodium vapour lamp or gas discharge systems of lights.

Glaring on the eyes of the operators and eye strains are another area of concern which lead to accidents and failures resulting in loss of lives and equipment. In number of cases, the design of the lights and its fixtures were defective and in many other cases their uses were faulty.

In this context, it is essential to study and investigate the lighting parameters provided by the Luminaire and develop a standard based on such investigations.

The life of the lights not only depends on its design and output but also on the conditions and environment in which they are used. The Dust, water, water vapour, gas, heat, shock, noise and vibrations are the primary factors that need to be taken into considerations while designing lighting systems for specified use at specified places.

The Original Lights on-boards mobile machinery are designed for a particular working conditions but during use in mines, the conditions change from mine to mine and mineral to mineral due to variations in the conditions, methods and the requirements thereon. Thus the light provided by OEM fits in properly in one mining system whereas becomes unfit in another. The placement of light sources also plays an important role on the desired level of lighting at specified location.

A number of meetings and discussion have been held in this Directorate with the manufacturers and users of lighting systems in miners and have also seen during the course of inspections and enquires into accidents, that it is essential to focus our attention again on this subject and generate data from standardization of latest lighting systems and features which are required for mines and oilfields.

Under this varying scenario, it becomes inevitable to ensure that :-

- (i) The design of light source and its technical parameters.
- (ii) The spectral distribution of the light output with the type of reflector and diffuser in use,
- (iii) The working conditions and the environment in which they are to be used; are clearly specified by the manufactures and should fulfill the requirements of the users.

3.0 DEFINITIONS/TERMS OF PHOTOMETRY AND IMPORTANT FACTORS

Luminaries

The complete lighting assembly, less the support assembly. For purposes of determining total light output from a luminaries, lighting assemblies which include multiple unshielded or partially shielded lamps on a single pole or standard shall be considered as a single unit.

Lumen (unit)

The **lumen** (symbol: **lm**) is the **SI** unit of luminous flux, a measure of the perceived power of light. Luminous flux differs from radiant flux, the measure of the total power of light emitted, in that luminous flux is adjusted to reflect the varying sensitivity of the human eye to different wave lengths of light. The lumen is defined in relation to the candela by

$$1 \text{ lm} = \text{cd} \cdot \text{sr} = 1 \text{ lx} \cdot \text{m}^2$$

That is, a light source that uniformly radiates one candela in all directions radiates a total of 4π lumens. If the source were partially covered by an ideal absorbing hemisphere, that system would radiate half as much luminous flux – only 2π lumens. The luminous intensity would still be one candela in those directions that are not obscured.

Explanation

If a light source emits one candela of luminous intensity uniformly across a solid angle of one steradian, its total luminous flux emitted into that angle is one lumen. Alternatively, an isotropic one-candela light source emits a total luminous flux of exactly 4π lumens. The lumen can be thought of casually as a measure of the total “amount” of visible light in some defined beam or angle, or emitted from some source.

A standard 120 V, 100 watt incandescent light bulb emits 1500–1700 lumens, while a standard 230 V model emits 1200–1400 lm. A 23 watt compact fluorescent lamp emits about 1500 lm. The number of lumens produced per watt of power consumed is the wall-plug luminous efficacy of the source.

Difference between lumens and lux

The difference between the units lumen and lux is that the lux takes into account the area over which the luminous flux is spread. A flux of 1000 lumens, concentrated into an area of one square meter, lights up that square meter with an luminance of 1000 lux. The same 1000 lumens, spread out over ten square meters, produce a dimmer luminance of only 100 lux.

Achieving an luminance of 500 lux might be possible in a home kitchen with a single fluorescent light fixture with an output of 12000 lumens. To light a factor floor with dozens of times the area of the kitchen would require dozens of such fixtures. Thus, lighting a larger area to the same level of lux requires a greater number of lumens.

Luminance

It is the total amount of visible light illuminating (incident upon) a point on a surface from all directions above the surface. This “surface” can be a physical surface or an imaginary plane. Therefore luminance is equivalent to irradiance weighted with the response curve of the human eye.

Standard unit for luminance is Lux (lx), which is lumen per square meter (lm/m^2).

$$1 \text{ lx} = 10.764 \text{ fc}$$

Footcandle : fc

Horizontal luminance

The measure of brightness from a light source, usually measured in footcandles or lumens, which is taken through a light meter's sensor at a horizontal position on a horizontal surface.

Vertical luminance

The measure of brightness from a light source, usually measured in footcandles or lumens, which is taken through a light meter's sensor at a vertical position on a vertical surface.

Uniformity Ratio

It describes the uniformity of light levels across an area. This may be expressed as a ratio of average to minimum or it may be expressed as a ratio of maximum to minimum level of illumination for a given area.

Example :- U. ratio max. to min. = 4:1 for the given area, the lowest level of illumination (1) should be no less than $\frac{1}{4}$ or "4 times less" than the maximum (4) level of illumination.

The maximum brightness contrast of juxtaposed surfaces in the normal visual field should be preferably not greater than 20 to 1; that is to say, the darkest part of the working space observed should have brightness preferably not less than one-twentieth of that of the brightest part. If strictly local lighting is used without adequate general illumination of the workplace, the figure for brightness contrast will greatly exceed the standard given above and cause severe eye-strain and increases accident hazard. When the local lighting is used there must be employed in addition a moderate intensity of overhead lighting uniformly distributed.

Standard of Distribution

Lamps should be so installed in regard to height, spacing, reflectors or other accessories, as to secure a good distribution of light on the work area, avoiding objectionable shadows and sharp contrast of intensity. The illumination on the working plane should be as uniform as possible. The variation range of illumination, that is to say the ratio of the maximum illumination to the minimum illumination, is a measure of the distribution of light and should preferably be less than 3 to 1 and not greater than 4 to 1, as relating to the machinery or work benches as the case may be. As relating to machinery and adjoining passageways the range may, of course, be much wider but should preferably not exceed 20 to 1.

Direct Illumination

Illumination resulting from light emitted directly from the lamp, off of the reflector or reflector diffuser, or through the refractor or diffuser lens, of a luminaries.

Flood or Spotlight

Any light fixture or lamp that incorporates a reflector or a refractor with a diffusing glass envelop to concentrate the light output into a directed beam in a particular direction.

Lighting Fixture

The assembly that houses the lamp or lamps and can include all or some of the following parts.

- A housing, a mounting bracket or pole socket, a lamp holder, a ballast, a reflector or mirror, and/or a refractor or lens.

Full Cut off Light Fixture

A luminaire light distribution where no light is emitted above the horizontal, and where the intensity at 80 degrees from nadir is no greater than 100 candela per 1000 lamp lumens.

Fully Shielded Light Fixture

A lighting fixture constructed in such a manner, that all light emitted by the fixture, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the luminaire, is projected below the horizontal as determined by photometric test or certified by the manufacturer. Any structural part of the light fixture providing this shielding must be permanently affixed.

Height of Luminaire

The height of a luminaire shall be vertical distance from the ground directly below the centerline of the luminaire to the lowest direct-light-emitting part of the luminaire.

Glare

The sensation produced by a bright source within the visual field that is sufficiently brighter than the level to which the eyes are adapted to cause annoyance, discomfort, or less in visual performance and visibility.

Glare is often the result of excessive contrast between bright and dark areas in the field of view. For example, glare can be associated with directly viewing the filament of an sunshield or badly sunshield light. Light shining into the eyes of pedestrians and drivers can obscure night vision for up an hour after exposure. Caused by high contrast between light and dark areas, glare can also made it difficult for the human eye to adjust to the differences in brightness. Glare is particularly an issue in road safety, as bright and/or badly shielded lights around roads may partially blind drivers or pedestrians unexpectedly, and contribute to accidents.

Glare can also result in reduced contrast, due to light scattering in the eye by excessive brightness, or to reflection of light from dark areas in the field of vision, with luminance, similar to the background luminance. This kind of glare is a particular instance of disability glare, called **veiling glare**.

Glare can be categorized into different types.

- **Blinding glare** describes effects such as that caused by staring into the Sun. It is completely blinding and leaves temporary or permanent vision deficiencies.
- **Disability glare** describes effects such as being blinded by oncoming car lights, or light scattering in fog or in the eye, reducing contrast, as well as reflections from print and other dark areas that render them bright, with significant reduction in sight capabilities.
- **Discomfort glare** does not typically cause a dangerous situation in itself, though it is annoying and irritating at best. It can potentially cause fatigue if experienced over extended period.

Light clutter

Light clutter refers to excessive groupings of lights. Groupings of lights may generate confusion, distract from obstacles (including those that then may be intended to illuminate), and potentially cause accidents. Clutter is particularly noticeable on roads where the street lights are badly designed, or where brightly lit advertising surrounds the roadways. Depending on the motives of the persons or organizations who installed the lights, their placement and design may even be intended to distract drivers, and can contribute to accidents. Clutter may also present a hazard in the aviation environment if aviation safety lighting must compete for pilot attention with non-relevant lighting. For instance, runway lighting may be confused with an array of suburban commercial lighting and aircraft collision avoidance lights may be confused with ground lights.

Light Pollution

Any adverse effect of man-made light.

Light Trespass

Light falling where it is not wanted or needed, typically across property boundaries.

4.0 FACTORS AFFECTING STANDARDS OF ILLUMINATION

Light level standards are affected by light quantity and quality desired, fixture efficiency and other applicable factors.

Quantity of light or the light output and light levels is measured in lumens, lux and foot-candles. Initial Lumens/Foot-candles reflect the amount of light produced by a lamp when it is installed. Supply voltage variations, lamp's interaction with the ballast and dirt build up (Luminaire Dirt Depreciation) reduce the produced amount of light. Lessening of light output over time, while continuing to consume the same energy amounts (**Lamps Lumen Depreciation**) also reduces the light levels of the lamp and wastes energy.

Maintained Lumens/Foot-candles show the light level after light loss factors are taken into account over a period of time. Mean Lumens show the average light output over the lamp's lifetime. When addressing lighting standards a provision for the light quantity depreciation over time due to multiple factors should be made.

Quality of light depends on the brightness, distribution and light color.

Photometric brightness (Luminance) is the amount of light leaving the lamp or reflecting from a surface. It is measured in foot lamberts, candles/sq. ft. and candelas/square meter (metric).

Brightness can produce levels of glare if not contained properly.

Every fixture has a **Visual Comfort Probability (VCP)** rating that reflects its levels of visual comfort.

Glare can severely interface with visual comfort. High brightness ratios produce high contrast and can also create a visual fatigue during “transient adaptation”, which is the adaptation process of the eye when brightness changes.

Light color depends on the visible light spectrum and the wavelengths composition of the lamp light (Spectral power distribution), the color of the light the lamp produces (Color temperature measured in Kelvin), the way the light source makes the color appear to human eyes and how well subtle variations in color shades are revealed (Color rendering - **Color Rendering Index** from 0-100). The higher the **CRI** is, the better the color rendition appears. An inappropriate color rendition can deceive the eye and supply it with wrong information.

Lamp examples :-

Metal Halide Lamps are High Intensity Discharge Lamps (HID) and have high efficiency and good color rendition. These lamps are used in stadiums, warehouses and industrial settings.

High Pressure Sodium Lamps (HPS) are the most efficient of the HID family. Their color rendition, however, is not as good as the rendition of Metal Halide Lamps. HPS lamps are often used for street illumination.

Fixture efficiency is affected by two factors. The first factor is the amount of power (watts W) required for the fixture to work at any given time and the amount of light leaving the fixture (Electrical Efficiency). The second is how much light will be produced by the fixture and how much of it will be task efficient (Fixture Efficiency). An inefficient fixture can use the same amount of energy as an efficient one while producing less light.

5.0 Other Criteria Affecting Standards Illumination

Activity level in the area can change the requirement of light quantity and quality depending on the function that takes place.

Visual acuity is the ability to detect a different aspect of detail. Areas that require high detail differentiation may require high visual acuity. Excessive brightness or insufficient light can hinder visual acuity.

High Light Levels and vision.

At high light levels absolute sensitivity decreases, contrast threshold increases, the eyes switch to photonic (cone vision) vision.

Object recognition depends on the ability of the eye to discriminate differences in illumination within the object and against its environment, not on how bright the scene is.

6.0 Effects of Lighting on Human Health and Psychology.

Medical research on the effect of excessive light on the human body suggests that a variety of adverse health effects may be caused by light pollution or excessive light exposure, and some lighting design textbooks use human health as an explicit criterion for proper lighting. Health effects of over-illumination or **improper spectral composition** of light may include: increased headache incidence, worker fatigue, medically defined stress, decrease in sexual function and increase in anxiety. Common levels of fluorescent lighting in offices are sufficient to elevate blood pressure by about eight points. There is some evidence that lengthy daily exposure to moderately high lighting leads to diminished sexual performance.

Specifically within the USA, there is evidence that levels of light in most office environments leads to increased stress as well as increased worker errors.

The case against light pollution is strengthened by a range of studies on health effects, suggesting that excess light may induce loss in visual acuity, hypertension, headaches and increased incidence of carcinoma.

Where objective measurement is desired, light levels can be quantified by field measurement or mathematical modeling, with results typically displayed as ***an isophote map or light contour map.***

It is, therefore, recommended that Manger of every mien should prepare, update and maintain Lighting Plan :-

- (i) *Indicating the location of the places, and the type of illuminating devices, fixtures, lamps, supports, reflectors, and other devices.*
- (ii) *Description of the illuminating devices, fixtures, lamps, supports, reflectors, and other devices and the description may include, but is not limited to, catalog cuts by manufactures and drawings (including sections where required).*
- (iii) *Indicating photometric data, such as that furnished by manufactures or similar showing the angle of cut off or light emissions.*
- (iv) *Showing the required and exiting level of luminance at various places.*

The Mine Management shall additionally have certified reports of tests of illumination conducted by recognized testing laboratory.

7.0 General Requirements of Artificial Lighting.

The requirements for good illumination in mines, mills and other work places may be summarized as follows.

- i) Sufficient illumination should be provided for each workman irrespective of his position on the working space.
- ii) The lamps should be properly selected and so installed as to avoid or minimize strain on the eyes of the workmen. The type and size of lamp should be adapted to the particular location and height and class of work in question.
- iii) The lamps should be operated from sources of supply which will insure continuity of service and steadiness of light.
- iv) Adequate illumination should be provided from overhead lamps so that sharp shadows may be prevented as much as possible, and in such manner that individual lamps close to the work may be unnecessary except in special cases.
- v) In addition to the illumination provided by overhead lamps, individual lamps should be placed close to the work if they are absolutely necessary and in such cases the lamps should be provided with suitable opaque reflectors. These requirements may now be met by means of the new types of electric, LEDs and gas lamps. However the type of lamp should be decided based on the nature of work, work environment and the extent of ambient illumination.

It is, therefore proposed that all Lighting Systems and Components in mines both on surface and belowground including oil and gas mines/fields should be of a type and standard approved in writing from the Directorate.

A notification No.N-12019/2/2009/S&T(HQ)/16 dated 13th January 2009 in this regard has been forwarded to be published in the Gazette of India and the subject matter thereof is reproduced below for information and taking necessary actions to comply with the requirement.

“In exercise of the power conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation of 181 of the Coal Mines Regulation, 1957 and sub-regulation (1) of Regulation of 73 of the Oil Mines Regulation, 1984, I hereby declare 1st March, 2009, as the date from which all types of lights, lighting Fixtures and systems including lights on board mobile machinery, in HEMMs, Machinery and Plants, Indicators or Signal lights to be used in mines both on surface and belowground including oil and gas mines/fields will be of such type, standard and make as approved by me by a general or special order in writing.”

You are being informed in advance to take necessary steps in this regard and requested to ensure that it is implemented and complied with.

No. DGMS (Tech)/Circular No./ 05

Dhanbad, Dated – 18/02/2009

To,

Owner/Agent/Manager

Sub:- Corrections and modifications in the DGMS Technical Circular No. 9 of 2008 and Circular No. 1 of 2009

Sir,

Kindly refer to the DGMS (Technical) Circular No. 9 of 2008 and No. 1 of 2009 which were issued in connection with the modification in the conditions of permission granted under regulation 98 (1&3) of the Coal Mines Regulations 1957 and regulations 106 (2b) of the Metalliferous Mines Regulations 1961 as well as the condition for use of surveyed off equipment in Opencast mines respectively.

During the scrutiny of those circulars in this Directorate while recording, it was found that there were certain typographical errors and mistakes which have been rectified and corrected.

The corrected Circulars have now been issued with the same Circulars Numbers, therefore the Circulars issued earlier (Circular No. 9 of 2008 issued on 02.12.2008 and Circular No. 1 of 2009 issued on 16.01.2009) may kindly be replaced with these issued on 18th February 2009.

Inconvenience caused is deeply regretted.

No. DGMS (Tech)/Circular No./ 06 of 2009

Dhanbad, Dated – 12/03/2009

To,

Owner/Agent/Manager of all coal Mines.

Sub:- Use of Local Methane Detector (LMD) in underground Coal Mines.

Firedamp or Methane is the most important of the mine gases and has caused more loss of life in mines than any other gas. Methane or firedamp are synonymous to each other. Firedamp is a mixture of inflammable gases emitted from strata and besides methane, which is the principal constituent of mixture, contains higher hydrocarbons, carbon dioxide, nitrogen and water vapour. Methane mixed with air in certain proportions forms explosive mixtures. The approximate lower and upper limits of flammability of methane air mixtures are 5 and 14.8% of CH₄. Firedamp explosions have been responsible for deaths of many miners throughout the history of mining. Statistical figure indicated that during the period 1901 to 2007 there had been 37 cases of explosion (major accidents/disaster) resulting in death of 1258 persons. Lots of emphasis were given since then in detection and measurement of CH₄ concentration in mine atmosphere. Methane emission at a face is affected by factors such as type of work going on at the face and machinery used, the time of observation in relation to the cycle of work at face, the rate of coal output and face advance, barometric pressure change, variation in air velocity., method of mining and roof control and geological factors. Sudden emission of methane may occur as instantaneous coal and gas outburst, sudden emission from roof or floor strata, as gas

blower from the coal seam or adjacent strata. Thus, every mine having potential hazard on methane emission should have methane monitoring system installed and maintained.

In this connection Regulation 145(1)(e) of Coal Mines Regulation 1957 says that –

- (i) If the determination of inflammable gas in any ventilating district shows the percentage of inflammable gas to exceed 1.25 percent, the supply of electric energy shall be cut-off immediately from all cables and apparatus working in the district.
- (ii) Again, Rule 126(4)(d) of Indian Electricity Rules, 1956 says that in any coal seam of second or third degree gassiness or in the danger zone of oil mines :-

The supplied energy shall be disconnected from all apparatus (including portable & transportable apparatus) working in the vicinity of a place where inflammable gas has been detected by the lowered flame of a flame safety lamp kept and maintained in a continuous state of illumination. The apparatus shall be interlocked with controlling switch in such a manner as to disconnect power supply automatically in the event inflammable gas exceeds 1.25% at the place. Further, if an approved apparatus for automatic detection of % of inflammable gas or vapour in addition to Flame Safety Lamp is provided in any working district or place such apparatus shall be interlocked with portable or transportable equipment.

Thus looking into the all above aspects and considering high production and mechanization, it is suggested to install a **LMD (Local Methane Detector)** which can automatically and continuously detect % inflammable gas at all mines having II/III degree gassy seams at following places :-

- (i) **District/Faces having continuous mining machine.**
- (ii) **Return side of district/Longwall faces**
- (iii) **Return airway having Electrical motors.**
- (iv) **Main return airway.**

Though the power supply in a district has to be discontinued whenever the % of inflammable gas reaches 1.25, the power to the ventilating fans (auxiliary/booster) shall be so arranged that they run continuously.

It is expected that al owner, agent and manger shall implement this circular with right spirit.

सष्ट्र की सेवा में

A century committed to the service of the nation

No. DGMS (Tech)/Circular No./ 07

Dhanbad, Dated – 12/03/2009

To,
Owner/Agent/Manager of all Mines.

Sub:- Safe gaps between cage and landing levels in winding shaft

An accident occurred in one of the coal mines when a work person was entering in to a cage at inset landing, he fell down in the shaft. The investigation revealed that the gap between the cage and the collar of the shaft at the inset landing was abnormally large which resulted in the accident.

Although the gap between the cage and the landing level is governed by

- (a) Type of guide
- (b) Gap between the guide and convincible shoe/roller.
- (c) Place of landing such as at pit top, pit bottom or inter level insets.
- (d) Velocity/speed of the cage.

Hence, it is recommended that in case of shaft equipped with :-

(A) Rail/ Rigid guides.

- (i) Rail guides with shoes as connivance in cage the gap between the cage at all landing levels shall be as close as possible and not more than 50 mm.
- (ii) Rail guide with roller as connivance in cage/skip the gap between the cage at all landing levels shall be as close as possible and not more than 65 mm.

(B) Guide Rope :-

The gap between and both at top and bottom landing shall not be more than 65mm. At inter level inset for shaft less than 100 meters in depth the gap shall be not more than 75 mm and in the shaft more than 100 meters in depth the gap shall not more than 90 mm. Further a locking device between the cage and levels gate shall also be provided for safe movement of persons.

Further it is essential that swing/flap decking devices may be provided where larger gaps are warranted and it shall overlap into the cage by at least 75mm.

In the light of above, the managements shall ensure the recommendations are strictly complied in the interest of safety.

No. DGMS (Tech)/Circular No./ 08

Dhanbad, Dated – 01/05/2009

To,

The Owner/Agent/Manager of all Coal, Mettalliferious mines and Oil Mines.

Sub:- System Study and Safety Audit for the purpose of eliminating the Risk of Accidents & Dangerous Occurrences.

You all are aware that the incidence of accidents and dangerous occurrences are taking place in every type of mines whether small or big, organized or un-organized. Ultimately, it leads to human sufferings and loss of properties. The Directorate General of Mines Safety since its inception is trying its best to see that such occurrences do not occur and the valuable lives and properties are saved.

Whenever there occurs an accident, disaster or any dangerous occurrence, an investigation is made both at the mine management as well as DGMS level. Causes of such occurrence are found out and remedial measures suggested to prevent recurrence of such accident or disaster. However, it has been observed that such preventive measures are not properly implemented nor a recheck done in other mines to see that such situation and conditions which lead to such accidents or disaster do not exist.

When a mine becomes very large, this system to produce the required quantity of mineral also becomes complex and dynamic. In case of such mines, it becomes necessary to study the systems in details with all its components and parameters to find out the defects or flaws. A single person or group of persons may not be well equipped to know the defects in the system, therefore it becomes necessary to engage such number of competent persons or experts on various subjects who can really find out the faults and suggest remedial measures. In such cases, it becomes a job of experts comprising of multi disciplines and subjects.

With this objectives in view, it becomes necessary to carry out Risk assessment and Safety management studies and prepare a Safety Management Plan to ensure that the risk to injuries and loss of time and properties are eliminated and kept in control. A Technical Circular No. 13 of 2002 giving details and guidelines of such studies have already been circulated in the past but the progress made on this issue in mineral and not encouraging.

Safety Audit is an integrated component of Risk Assessment and Safety Management, which is required to be undertaken every year and on occurrence of every accident or dangerous occurrence. However, it is also required that the Team which conducts such System Study and Safety Audit should comprise of eminent persons from various fields of operations and are kept updated about the latest tools and technique prevailing in the industry not only in India but world over. It has been observed many a times that a single person retired from the Industry conducts the safety audit and prepares the report entirely based on his experience and exposure without bringing in any new facts or instrument to deal with certain difficult situation and thus such studies do not yield any tangible results.

Therefore, it is recommended that :-

- i) DGMS recognized Service Providers may be engaged in System Study and Safety Audit work to be undertaken at any mine.
- ii) Such Third Party System Study and Safety Audit (SYS-SA) should be conducted at least once in every year, after every major accident or disaster or dangerous occurrence, before implementation of any new technology or use of any new system or machinery in the mine.
- iii) Such Study may be subject-wise as well as an Integrated Report of the mine incorporating all subjects such as mining, mechanical, electrical, personal, occupational Health & Hygiene, and any other subject applicable to the mine and the system prevailing or to be used therein.
- iv) The Study Report should be discussed in a Tripartite Forum at Mine Level, Area Level and also at Company Level to know the high risk areas and implement the preventive measure plans so that the efforts are directed to yield desired results in timely and sustained manner.
- v) One of the Inspective Officers from every discipline from DGMS should also be involved in such System Study and Safety Audit program to contribute and arrive at certain valuable decision.
- vi) Annual System Study and Safety Audit Report of every mine after finalization in the Company should be submitted to DGMS for information and suggestion.
- vii) The Action Taken Report on the System Study and Safety Audit Report should also be prepared and submitted to the Company as well as to DGMS including the Trade Unions having major or prominent representation in the mine.

Risk Reduction Program (RRP) is an ongoing process to achieve **Zero Harm Status of Safety** in any mine and it is expected that all the persons, organizations, unions, agencies involved directly or indirectly in mining and allied business would cooperate and help achieve this goal of the DGMS and all mining Companies.

No. DGMS (Tech)/Circular No./ 09

Dhanbad, Dated – 02/June/2009

To,

Owner/Agent/Manager of all Oil Mines and all the manufactures of flexible cables.

Sub:- Use of flexible cables in drilling rigs and in other similar equipments in Oil Mines Reg.

- 1.0 Flexible cables are in use with drilling rigs and in other similar equipments in oil mines.
- 2.0 The electrical equipments used in a drillings machine are high capacity DC motors, 3 phase AC motors, their control gears, light fittings and instrumentations.
- 3.0 Flexible cables used with circuits exceeding low voltage shall be provided with flexible metallic screening or pliable armouring.

- 4.0 Such flexible metallic screening if used as a means of protections from mechanical injury it shall not be used by itself to form an earth conductor, but it may be used for that purpose in conjunction with an earthing core.
- 5.0 Though the metallic screening shall not be used by itself to form an earth conductor the same shall have conductivity at all parts and at all joints at least equal at 50 percent of the conductivity of the largest conductor.
- 6.0 IS: 14494-1998 “Elastomer insulated flexible cables for use in mines-specifications” an IS 9968 Part – I & II, “Specifications for elastomer insulated cables” are the relevant Indian Standards available on elastomer insulated cables.
- 7.0 IS: 14494-1998 is mainly for flexible cables used in belowground and open cast mines. This standard does not cover flexible cables used in oil mines. Though IS: 9968 (Part – I) does not speak about metallic screening for cables at voltages above low voltages, however, to afford protection against mechanical injury, it imperative that flexible cables for use in oil mines must have metallic screening also.
- 8.0 Hence it becomes mandatory that
- (a) The flexible cables used to connect 3 phase electrical equipments shall be EPR (Ethylene Propylene Rubber [IE-2]) insulated and HOFR (heat resisting, oil resisting & flame retardant) Elastomeric CSP (Chloro-sulphonated Polyethylene) sheathed, either individually or collectively copper screened, 4 core copper conductor cables with fourth core having 50% conductivity of the largest conductor and the combined screen having 50% conductivity of the largest conductor.
 - (b) The flexible cables used to connect light fittings shall be EPR insulated, and HOFR elastomeric, CSP sheathed unscreened 3 core copper conductor cables.
 - (c) The flexible cables used with alternators & DC motors shall be single core EVA (Ethyl Vinyl Acetate Rubber) insulated and sheathed, copper conductor cables, and
 - (d) The flexible cables used for control connections shall be EPR insulated, and HOFR elastomeric, CSP sheathed, copper screened flexible copper conductor cables having cores upto 20 and.
Shall generally conform to IS : 9968 (Part – I)
- 9.0 Termination of flexible cables with electrical equipments installed in hazardous area shall be through appropriate size of double compression glands and with electrical equipments installed in non-hazardous areas shall be through a readily detachable plug and socket assembly.

No. DGMS (Tech)/Circular No./ 10

Dhanbad, Dated – 13/July/2009

To,

Owner/Agent/Manager of All Mines & The Manufactures.

Sub:- Standards Composition and properties required for Resin Capsules to be used as grouting material for Roof Bolting in Mines.

1.0 BACKGROUND

As soon as the roof in coal seam is exposed, the immediate roof starts dilating and getting detached from the overlying layers of roof strata causing it to fail if not supported properly. Roof Bolts are therefore being used as common support in underground mines all over the world along with the cement or resin grout to reinforce the strata and provide adequate support in the excavation.

It is highly desired that the roof bolts once installed should immediately start taking load of the roof strata and prevent dilation so as to eliminate changes of roof fall. Resin Grout is a very effective material which sets very fast and prevents roof dilation. Although rapid set cement capsules are also being used as grout in roof bolting, but its setting time and time to provide reinforcement in the strata is too long to arrest the roof dilation. During impending loading on the roof bolts due to stressing of the strata also cement grout provides less resistance than the resin grout because resin has higher strengths than the cement grout.

It is, therefore necessary to have a minimum standard required for resin grout to provide desired result and fulfill the objectives to provide support in the mines.

The matter was discussed in this Directorate with the scientists from Central Institute of Mining and Fuel Research (CIMFR), Manufacturers and the Users. The following Standard and Parameters have been fixed as the minimum requirements for the Resin Capsules to be used in Mines after getting approval from this Directorate.

2.0 STANDARD PARAMETERS & CHEMICAL COMPOSITION

(a) Physical Condition :-

Physical Condition of the resin capsule is an essential property for quality evaluation. The product performance depends upon the condition of the cartridges and their packaging shape & size and stiffness. The resin capsule shall have following properties:

Sl. No.	Parameters	Acceptable Limits
1	Physical Condition • Crimping – Proper Crimping at ends to prevent leakage • Hardening of the product – No hardening • Shape & Size – To be in shape and specified size	Pass Pass Pass
2.	Straightness : The cartridges should be straight enough and not loose and too flexible to be difficult to push inside the hole	Pass
3	Fragileness Test of the double chamber Poly-tube	Pass

(b) Get Time and Setting Time :

The performance and workability of the resin capsule depend on the gel time and setting time. Gel time plays an important role in getting Physico-mechanical, properties of the resin matrix. The Gel time is defined as the period during which a resin can be mixed with no appreciable change in viscosity, i.e, before it begins to turn from fluid to Gel. Similarly, setting time is the period, in addition to gel time that is required for the resin to turn from Gel to Solid and attain enough strength.

1.	Gel Time • Fast Set • Medium Set • Slow Set	(In Seconds) 20±5 45±5 95±5
2.	Setting Time • Fast Set • Medium Set • Slow Set	(In Seconds) 10±2 12±2 20±2

Note :- Resin Capsules having different Gel and Setting Times may be manufactured and supplied for different applications as required by the User, but the capsule should have valid approval and the gel & setting times especially superscripted on the capsule.

(c) Viscosity :-

Resin matrix should be of suitable viscosity and flow which is necessary for proper mixing and grouping of the bolts. Viscosity of the resin matrix should not be too less to flow out of the hole and should not be too high to difficult to insert the MS steel bolt.

1	Viscosity (in cps)	40,000 (mins) and 60,000 (max)

(d) Acid Value :-

Acid value of the resin matrix is the presence of free acid available in the system. The availability of more quantity of free acid in the resin system will enhance the rusting characteristics of the MS Bolt. This may lead to release of MS bolt from the resin grouting material. Therefore it is necessary to keep the acid level in the resin matrix below the critical level which should not cause any damage to the MS Bolt.

1	Acid value (in mg of KOH/g)	8±2

(e) Reaction Temperatures :-

When catalyst (Hardener) is mixed with resin matrix, polymerization of the resin gets started. The reaction is exothermic and heat is generated in the resin system. The reaction temperature should not rise too high to get burning of the material. It is also observed that above 60°C, physico-mechanical properties of the product get affected and brittleness in the casted resin is developed which reduces the strength.

In India variation of ambient temperature is very high. Therefore product should be thermally stable when stored in low and high temperature for better shelf life and workability in the underground mines.

1	Reaction Temperature (°C)	Not More than 60° C
2	Thermal Stability • At 50° C for one hour • At 45° C for one hour	No physical & Chemical Change No physical & Chemical Change

(f) Water Resistance

Casted resin should not absorb water when immersed in water. Absorption of water develops micro-cracks in the resin that reduces the bonding properties and other physico-mechanical properties in the resin system.

1	Water absorption (7 days water immersion)	0.01 % (max)

2.1 Physico-Mechanical Properties

The Physico-Mechanical Properties of the resin capsule shall conform to the following parameters and values :

1.	Compressive Strength 30 minutes 24 hrs	30.0 MPa (Min.) 80.0 MPa (Min.)
2.	Bond Strength Test 30 minutes 24 hrs	10.0 Tonnes 20.0 Tonnes
3.	Shot Encapsulation Test (Tonne) 30 minutes 24 hrs	12.0 Tonnes 20.0 Tonnes
4	System Stiffness	20 KN/mm – System stiffness between 50 to 150 KN
5	Creep Test - Fast set at 5 KN for 25 minutes - Slow set at 20 KN for 25 minutes	(%) 0.12 (Max) 0.12 (Max)
6	Shear Test 30 minutes 24 hrs	7.50 Tonnes 15.0 Tonnes
7	Elastic Modulus Test 24 Hrs	11.0 GPa
8	Shrinkage test At 30±2°C & 65 % humidity 24 hrs 7 days	0.01 1% (Max.) 0.01 1% (Max.)

2.2 Other Properties :

1	Flammability Test Reaction of resin system is exothermic and methane with coal dust is likely to be present in underground mines. If reaction temperature reaches above 120°C by any reason, resin matrix should not catch fire. Product should be of very low flammability. The flame should cease within 10 second	Non-Flammable

	after removal of the product from burner after 30 second. NOTE :- The test will be applicable within three month of issuing of this guidelines.	
2	Toxicity Product should not affect skin, eyes and other organs of human being during application of the product.	Non-Toxic in Nature
3	Self Life	Six Month (Minimum) or to be specified by the user.

2.3 Facilities Required for Quality Control at Manufacturing Unit

Sr. No.	Name of Equipment	Quantity (Nos.)	Capacity
1.	Viscometer	One	10,00,000 cps.
2.	Gel Time Measuring Apparatus	One	-
3.	Humidifier	One	Humidity 90% Temp. 5 to 50 ⁰ C
4.	Anchorage Testing Machine	One	50 Tonnes
5.	Universal Testing Machine	One	50 Tonnes
6.	pH meter	One	0-14
7.	Stop Watch	Two	-
8.	Hot Air Oven	One	Ambient to 250 ⁰ C
9.	Magnetic Stirrer	One	100 ⁰ C
10.	Bunsen Burner	One	-
11.	Moulds	Different sizes	-
12.	Glassware	As per requirement	-
13.	Chemicals	As per requirement	-

3.0 SAMPLING & TESTING

In order to check the composition and required parameters during manufacture, it shall be required that the random sampling shall be collected at least 1 sample containing adequate number/quantity of resin capsules for every 10,000 pieces of resin capsule in a batch and shall be subjected to the required set of tests as prescribed at para-2.0 above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons out the test and shall be countersigned by the quality control officer posted at the manufacturing unit (s).

3.1 The user shall carry out Physical examination tests as far as possible but shall conduct Short Encapsulation Pull Test (SEPT) for every batch of Resin capsules and keep the records in a bound paged book kept for the purpose.

In case the resin capsules fail to pass the required tests at the user end, that lot of the manufacture shall not be used and intimation thereof shall be sent to this Directorate and also to the manufacture.

Manufactures and the Users including the Test Houses, who are engaged for testing such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

No. DGMS (Tech)/Circular No./ 11

Dhanbad, Dated – 17th July 2009

To,

The Owner/Agent/Manager of All Mines & The Manufactures.

Sub:- Standards Composition and Properties of Roof Bolts to be used in Mines.

Roof Bolts are now widely being used in coal mines as well as non-coal mines to provide support in the mine workings. The steel used for the roof bolts are normally from thermo mechanically treated (TMT) rebar manufactured by various steel manufacturing companies. During the testing of some of the samples of roof bolts manufactured by some companies, it has been found that the roof bolt itself had failed and broken at 8 to 10 Tonnes Tensile Load against the requirement of at least 16 Tonnes. In some cases, the failure was brittle and sudden which indicate that the quality of steel from which the roof bolts are made, is not of the required strength and properties. The Nuts, Threads and bearing plates had also failed at very low loads. If such types of roof bolts are used in the mines, it will not provide the desired resistance and support in the strata and would lead to premature fall of roof and sides leading to accidents and fatalities.

In view of the above, the matter was discussed in detail in this Directorate and it was decided to evolve a minimum standard that is required for the roof bolt and its accessories to comply with, so that the desired support resistance is provided by the roof bolts in the mine workings.

A meeting was convened with the Scientists from Central Institute of Mining and Fuel Research (CIMFR), and the Officers of DGMS. The issues related to Standard and Parameters that is required for the roof bolts were discussed in detail and the following Standard and Parameters have been fixed as the minimum requirements for the Roof Bolts and its accessories to be used in Mines after getting approval from this Directorate:-

1.0 Physical Properties :-

Roof Bolts

(a) Shape & Size :-

The Roof bolt shall be of MS Steel or TMT Rebar having circular cross-section with ribs on circumferential region. The Roof bolt shall be as per the drawing and dimensions given by the manufacturer :-

(b) Length :-

Length of the Roof Bolt shall not be more than the designed length $\pm 5\text{mm}$.

(c) Diameter :-

Diameter of the Roof Bolt shall not be more than the designed diameter $\pm 0.05\text{ mm}$.

(d) Straightness :-

The Roof Bolt shall be straight without any joint, welding, deviation or deflection. However if the deflection or deviation cannot be avoided due to practical reason, it shall not be more than $\pm 0.01\%$ per meter length of the bolt.

(e) Rib :-

The Rib of the Roof Bolt shall be as per the design of the rib with an objective to maximize the surface area without reducing the core diameter of the roof bolt and having maximum grip with the grout. However the height of the rib shall be kept within 2.5 to 5% of the core diameter of the roof bolt.

2.0 Physico-mechanical Properties :-**(a) Steel for the Roof Bolt :-**

The Roof Bolt shall be of thermo-mechanically treated (TMT) rebar manufactured from MS Grade Fe-500 or above for use with cement grout and FE-650 or above for use with resin. The Tensile Strength of Fe-500 Grade or equivalent Steel shall not be less than $500 \pm 10\text{ MPa}$ and that of Fe-650 Grade or equivalent Steel shall not be less than $650 \pm 10\text{ MPa}$ respectively.

(b) Yield Strength of Steel :-

The Yield Strength of the Steel shall not be less than 10 to 20% of the Ultimate Tensile Strength (UTS).

(c) Shear Strength of Steel :-

Shear Strength of the Steel shall not be less than $50 \pm 5\%$ of the Ultimate Tensile Strength (UTS).

(d) Elongation :-

The elongation of the roof bolt under its designed load shall be within 12 to 18% of the length of the bolt.

3.0 Chemical Composition :-

Chemical Composition of the steel for manufacturing of the roof bolts varies according to the requirement of strength characteristics and specific applications given by the roof bolts manufacturer and the end user. However certain chemical constituents of the steel which influence the required properties of steel are prescribed below:-

Sl. No.	Constituent	Percentage by Weight
1	Carbon (c)	0.3 (Max)
2	Sulfur (S)	0.06 (Max)
3	Phosphorous (P)	0.06 (Max)
4	Manganese	0.055 (Max)

Thread on the Roof Bolts :-

- (a) The **thread** on the roof bolt shall be cold rolled and no cut thread shall be used. The minimum length of the thread shall be 150 ± 5 mm and the tolerance of 8g
- (b) The **Nut** shall be of hexagonal shape of thickness not less than 30 mm and shall conform to IS 4218.
- (c) **Pull Test :-** Thread and the Nut on the roof bolt shall be subjected to pull test which should not slip at the yield strength/load of the roof bolt.

Bearing Plate

- (a) The Bearing Plate of the roof bolt shall be Dome Washer Plate of dimension $150 \times 150 \times 8$ (minimum) mm with compatible central hole of required size and angled side to accommodate the conical seat and nut.
- (b) The minimum load at which the Domed Washer Plate will become flat should be at least 14 Tonnes.

Conical Seat

- (a) Conical Seat shall be of forged steel of required dimension
- (b) The Conical Seat shall not deform at 30 Tonnes of load.

4.0 Tensile Test of the Roof Bolt Assembly

- (a) The Roof Bolt Assembly shall be subjected to Tensile Test and should not fail up to 16 Tonnes load, in case for use with Cement Grout; and
- (b) The Roof Bolt Assembly shall be subjected to Tensile Test and should not fail up to 20 Tonnes load, in case for use with Resin Grout.

Subject to the condition that System Stiffness of the Roof Bolt assembly shall be within 20 KN/mm- System stiffness between 50 to 150 KN.

5.0 Other Properties & Parameters

(a) Weather ability :-

The Roof Bolts and its components or parts shall be subjected to **Accelerated Weathering Test** in mine water condition for 20 days. No deterioration should occur on the Assembly.

(b) Accelerated Weathering Test shall also be conducted in acidic water condition for 20 days during which no deterioration should occur on the Assembly.

(c) Corrosion Resistance Test :-

The Roof Bolt Assembly shall also be subjected to Field Exposure and Corrosion Resistivity Test per IS-555: 1970 to test the resistance to corrosion of the steel of the roof bolt and its parts. The Roof Bolt should pass the required test.

6.0 SAMPLING & TESTING

In order to check the composition and required parameters during manufacture, it shall be required that the random sampling shall be collected at least 1 sample containing adequate number/quantity of roof bolts and its accessories for every 10,000 pieces of the product in a batch and shall be subjected to required set of tests as prescribed in the previous paragraphs above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and shall be countersigned by the quality control officer posted at the manufacturing unit (s).

6.1 The user shall carry out Physical examination tests as far as possible but shall conduct Tensile Test of the Assembly for every batch of Roof Bolts & its Accessories received at their end before use and keep the records in a bound paged book kept for the purpose.

In case the Roof Bolts or any of its accessories fail to pass the required tests at the user end, that lot of the manufacture shall not be used and intimation thereof shall be sent to this Directorate and also to the manufacture.

Manufactures and the Users including the Test Houses, who are engaged for testing of such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

No. DGMS (Tech)/Circular No./ 11 Dhanbad, Dated – 20th October, 2009

To,
Owner/Agent/Manager of all opencast Mines.

Sub:- Provisions of Rear Vision System in Equipments

Several accidents have occurred in opencast mines while reversing of equipment especially in dumpers/tippers. The manufactures provide only audio visual alarm and

rear view mirrors in the equipments. Although the Audio Alarm gives warning to the work persons, the drivers/operators does not have a clear view of the rear side of equipment. It is a practice in mines that the operator takes the assistance of a spotter while reversing. The spotters are exposed to danger of being crushed by equipment. The audio visual alarm warning at times may not provide sufficient time for the spotter and others to escape from the site and incidents/accidents takes place.

To avoid above kind of situations, it is strongly recommended that REAR VISION SYSTEM may be installed in the equipment especially in dumper/tippers. The system shall be provided with a monitor which can be installed inside the cabin of the operator and an automatic switch on the reverse gear actuates ultra low light camera with sufficient number of infra-red LEDS installed at rear of the vehicle which provide picture in nearly pitch dark and poor weather conditions and a clear and sharp picture is displayed on the monitor. The camera shall be housed in a fully water proof case which is shock and vibration resistance and suitable for high pressure washing. The two components shall be connected by a suitable detachable cable with water proof joints.

It may be noted that the above provisions is in addition to audio visual alarm and rear view mirrors which is already provided with the equipments/

It is recommended that in the interest of safety, necessary action shall be taken to provide Rear Vision System in equipments so as to eliminate the chances of accidents while reversing.

No. DGMS (Tech)/Circular No./ 13 Dhanbad, Dated – 17.11. 2009

To,

Owner/Agent/Manager of Underground Coal Mines.

Sub:- Telemonitoring System and their features for use in Underground Coal Mines.

Telemonitoring System for continuous monitoring of inflammable/toxic gases, air velocity, etc., are not new to the underground coal mines of the country. Such systems have been in use in some of the highly mechanized underground coal mines with history of high gassiness and proneness to spontaneous heating. This scenario is however slowly changing and more and more such systems are now being introduced in all such mines as an effective means to detecting inflammable/noxious gases and spontaneous heating in nascent stages, thereby enabling suitable mitigating measures to ward of likely disasters.

However, recent inspections of a large number of such installations by the officers of this Directorate revealed the dismal state of affairs as regards their installation and maintenance. Invariably, the system were found to be either faulty of non-working, thereby defeating the very purpose of their installation in difficult working situations. It was also revealed that there was no reliable mechanism to ensure the health of such installed systems on a long-term basis. The gravity of the situation was intense because of the working of such faulty system. In mines with a potential to give

misleading information on gas concentrations, etc. The consequences of such misleading information in potentially grave situation in difficult mining conditions do not need any elaboration.

As such, the matter was thoroughly deliberated upon in a tripartite technical workshop held on 9th of October, 2009 in this Directorate at Dhanbad, attended by the representatives of the management, manufacturers and this Directorate for resolving various connected issues, and the following collective decisions were arrived at.

1.0 The basic components of a Telemonitoring system :- A telemonitoring system for use in underground mines shall consist of the following as essential basic components.

- Various sensors.
- A display unit.
- Surface monitoring system for display, storage and retrieval of readings and also a warning system.
- Power supply system.
- Electrical power tripping arrangements.
- Connected data transmission cables.

2.0 Underground display unit of the telemonitoring system :- Proper display arrangements shall be provided at surface and also in the underground installation at the out-stations and with sensors. The display shall be clearly visible from a reasonable distance. The display system shall also be provided with a colour changing/blinking arrangements for indicating any recording of an environmental parameter above the pre-set value.

3.0 Various parameters of the sensors as records (a) minimum operating life of sensors, (b) working limits of temperature & relative humidity, (c) calibration including the maximum permissible deviation when tested with standard gases, frequency of calibration, availability of standard gases and various records to be maintained thereof :-

a) The minimum operating life of the sensors shall be as follows.

<u>Sensors Type</u>	<u>Operating Life</u>
CH ⁴ (Infrared)	5 years.
CH ⁴ (Catalytic)	2 years.
CH ⁴ (Elecro-chemical)	2 years.
CO	2 years
O ²	1 year

b)	Workings limits of temperature	-	Not more than 50
C	Workings limits of Relative Humidity	-	Upto 100%

c) Calibration

- (i) The deviation of the measured gas concentration shall not be more than 3% for all sensor types when tested with standard gases.
 - (ii) The maximum interval of calibration of sensors shall not exceed three months, alternating between the OEM and the users. However, The OEM shall examine the complete telemonitoring system in totally at least once every six months.
 - (iii) Adequate samples of standard gases shall be always made available at the concerned mine.
 - (iv) Proper records of calibrations done, duly signed by the designated officer and the Manager for the purpose, shall be maintained at the mine.
- 4.0 Use of the approved system in the mines :- Any sale/purchase of the continuous telemonitoring system shall be in conformity with the approved system in respect of all the basic components as mentioned above.
- 5.0 The minimum required power back up with the telemonitoring system:- The minimum required power backup in the event of disruption of the main electrical power supply shall be for a period of four hours.
- 6.0 Alarm system in the telemonitoring system :- The minimum intensity of the audio part of the audio-visual alarm provided with the telemonitoring system shall be 90 dB(A). In the underground workings, at least one audio alarm shall be provided with every out-station of the telemonitoring system.
- 7.0 Electrical interlocking of the telemonitoring system :- The tripping circuit of the telemonitoring system shall be electrically interlocked with the power supply system of the connected workings so as to cut off power supply when the concentration of inflammable gases measured exceeds a preset value.
- 8.0 Recording of telemonitoring events on surface :- Every telemonitoring installation shall be provided with an arrangements for recording and retrieving data on a continuous basis.
- 9.0 Maintenance of the telemonitoring system :- Every telemonitoring system shall be associated with a comprehensive Annual Maintenance Contract (AMC) with the OEM to cover both for spares and services. The period of AMC shall be not less than 5 years. The maximum response time for attending to any maintenance related problems shall not be more than 24 hours.

It is therefore, requested that the above mutually agreed recommendations are implemented strictly in respect of all telemonitoring system installed in underground coal mines. For ensuring efficient working of such systems on a long-term basic, the ISO shall have suitable time bound action plans and shall rigorously follow-up with the same.

No. DGMS (Tech)/Circular No./ 14

Dhanbad, Dated – 17.11. 2009

To,

All Owner/Agent/Manager of Underground Coal Mines.

Sub:- Use and care of Local Methane Detectors in Underground Coal Mines.

Of recent, Local Methane Detectors (LMD) are being installed in underground coal mines for monitoring the make of inflammable gases and for imitating suitable mitigating measures well in advance before the concentration assumed dangerous proportions. In this connection, a DGMS (Tech) Circular No. 6 of 2009 was issued to the industry covering a few aspect of the installation and operation of the LMDs in the mines.

However, recent inspection of such installation by the officers of this Directorate revealed that such installation are not in a position to deliver the purpose for which they were installed, on account of several reason. It was also revealed that the aforementioned DGMS (Tech) Circular No. 6 of 2009 was also not being followed in the right spirit.

This matter was viewed on a serious note and a technical workshop was organized in this Directorate at Dhanbad on the 8th of September, 2009 for extensive deliberations on the above subject. As a result of the deliberations, the following recommendations were arrived at.

- 1.0 Various components which make an LMD :- An LMD shall include the following as essential basic components.
 - A CH⁴ sensor unit
 - An FLP housing for the electrical circuits and a display unit for the detected and measured CH⁴ concentration. The FLP housing may be integrated with the sensor unit. The FLP housing shall be of an approved type. The FLP housing shall accommodate various arrangements for battery backup and coupling the LMD with the power supply system of the ventilating district.
 - An audio-visual warning alarm unit.
- 2.0 The defined parameters of the life of the sensor used in the LMDs and their operating limits in terms of temperature and relative humidity :- The minimum life of a sensor used in the LMDs shall be at least three years. The sensor shall operate satisfactorily at a temperature upto 50⁰ C and a relative humidity of upto 100%.
- 3.0 Place of installation of the LMD :- The LMD shall be installed in the main district ventilation return airway of the district, as close as practically possible to a well supported roof as may facilitate clear observation of the display unit.
- 4.0 The type of electrical interlinking necessary with the LMD :- Every LMD shall have a provision of a suitable outlet for coupling with the electrical supply system of the ventilating district by way of approved cables, connectors

and other electrical accessories. The tripping circuit of the LMD shall be electrically interlocked with the power supply system of the connected workings so as to cut off power supply when the concentration of the measured inflammables gases exceeds a preset value.

- 5.0 The minimum required power back up with the LMD :- The minimum required power backup in the event of disruption of the main electrical power supply shall be for a period of 60 minutes, to be provided by a battery preferably of a rechargeable type and with a minimum life of 12 months from the date of dispatch of the battery. Wherever there is no battery backup, the same shall be incorporated within a period of six months.
- 6.0 The levels of Audio-visual alarm to be provided in terms of intensity :- The audio level of the audio-visual alarm shall be at least 85 dB (A). The visual alarm shall be consisting of a cluster of LEDs or other suitable arrangements as may be distinctly visible from at least two opposite directions.
- 7.0 The frequency of calibration of sensors and other components :- The maximum interval of calibration of the sensors shall not exceed three months, alternating between the OEM and the user. All calibrations shall be done by the OEM.
- 8.0 The type of back-up service required for proper up keep of the system viz-a-viz reliability :- The OEM examine the LMD in totally at least once every six months.

It is therefore, requested that the above recommendations are implemented in true spirit in respect of all installations of LMD in underground coal mines. Also, you are requested to utilize the mechanism of the Internal Safety organizations (ISO) of your respective companies to have a time bound action plan to ensure that installed LMDs are always maintained functional and in reliable conditions.

Ref:Law(HQ)/Legal-Circular/09/01

Dated, the 20th April, 2009

**To,
All the Technical Officers,
DGMS,**

Sub:- Production of Gazette Notifications such as Appointment as the Inspector of Mines/ Electrical Inspector and General authorization issued under Sec. 75 of the Mines Act-1952, whichever is applicable.

It has come to the notice of the undersigned that whenever Technical officers of this Directorate attend court for adducing evidences, in most of the cases it has been noticed that they do not carry either certified copies of the Gazette Notifications pertaining to their appointment as the Inspector and general authorizations issued

under Sec. 75 of the Mines Act 1952 or original Gazettes for inspection of the courts. The non-submission/filing of the gazette notifications goes against Prosecutions (us) and accused are benefited.

It is therefore, advised to ensure that whenever any Technical officer of this Directorate being I.O./Complainant or companion Inspector (s) witness of the case attend court for adducing evidence, they must carry either the certified copies of the aforesaid notifications for its filing or original Gazettes for inspection of the Courts to prove their stand beyond any reasonable shadow of doubts.

It is further advised that the copies of the Gazette may also be enclosed along with the compliant petition at the time of its filing as well as entire contents of the Gazette as notified in the Gazette of India pertaining to (a) the appointment of Inspector of Mines/Electrical Inspector must be reproduced in toto in item No. 5.0 under heading particulars and nature of offence of compliant petition in the following manner :-

“On receiving information about the occurrence of fatal accident of Colliery of M/s On Sri DDMS/Director of Mines Safety also an Inspector of Mines under Section-5(1) of the Mines Act, 1952, or Electrical Inspector under Sec. of the Electricity Act, 2003 (whichever is applicable) as notified in the Gazette of India, which is reproduced herein under (Insert the entire contents of notifications) made an inspection and enquiry on to find out the cause and circumstances leading to the said accident and

(b) Under Item No. VIII, which will say “The compliant is authorized by the Chief Inspector of Mines under Sec. 75 of the Mines Act, 1952 to Institute prosecution on his behalf vide Gazette notification No.Law/G-22/07/736, dated 29th August, 2007 published in the Gazette of India, Part III, Sec. 1, dated 15th September, 2007, which reads – I

.....

 as declared under Sub-Section (3) of Section 6 of the said Act

Sd/
 Chief Inspector of
 Mines
 And Director
 General of
 Mines Safety.

It may please be ensured that the above guidelines, whichever is applicable, in the particular case, are complied strictly while filling and attending the case in courts.

DIRECTOR GENERAL OF MINES SAFETY

No. DGMS (Tech)/Circular No./ 02

Dhanbad, Dated – 14/08/2009

To,

Owner/Agent/Manager of all Metalliferous mines.

Sub:- Amendment in Bye-Laws in relation to syllabus for Manager's, Surveyor's, Foreman Certificate of Competency Examination under Metalliferous Mines Regulation, 1961.

The Bye-Laws for the conduct of examinations under Metalliferous Mines Regulation, 1961 for grant of Manager Surveyor's, Foreman Certificate of Competency as far as they relate to syllabus for examination have been amended and published under Notification Nos. G.S.R. 60 (Board/Metal/944/2009), G.S.R. 61 (Board/Metal/945/2009), G.S.R. 62 (Board/Metal/946/2009), G.S.R. 63 (Board/Metal/941/2009), G.S.R. 64 (Board/Metal/942/2009), and G.S.R. 62 (Board/Metal/943/2009) all dated 04.05.2009 in the Gazette of India, Part II – Section 3- Sub-section (i) dated 10.05.2009 – 16.05.2009.

Subject-wise revised syllabus for different certificates of competency examinations are given in Annexure enclosed.

Henceforth Manager's, Surveyor's, Foreman Certificate of Competency Examination shall be conducted in accordance with the amended provisions of the bye-laws. You are requested to bring this to the notice of all concerned.

The amended Bye-Laws are available at DGMS official website www.dgms.gov.in

APPENDIX – I
SYLLABUS FOR EXAMINATION FOR FIRST CLASS MANAGER'S
CERTIFICATE OF COMPETENCY
(Under Metalliferous Mines Regulations, 1961)

(a) Winning and Working

Geology :- Characteristics and classification of mineral deposits; geological structures; folds, faults, fractures, fissures etc. methods of exploration and delineation of the ore bodies; boring through disturbed strata; bore hole survey; sampling; estimation of cut-off grade and ore reserve; losses of mineral in mining; net smelter return (NSR) to mill and mine; mine valuation; quality control, interpretation of geological maps.

Opening of mineral deposits; Legal requirement about outlets; siting; vertical and inclined shaft; adits; declines; shaft sinking and deepening; methods of sinking; mechanized sinking; in ordinary and water logged grounds, in running sand etc.; freezing, cementation and other special methods; shaft supports, temporary and permanent, tubings etc., recent developments.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of developments and stopping and factors affecting the same; statutory provisions.

Primary and secondary Development; Choice of level interval and back/block length; main haulage drifts and tunnels; high speed drifting; excavation and equipping of grizzly (conventional and mechanized), ore/waste bin, main ore-pass system, underground crushing, loading and hoisting stations, underground service chambers, sump and other subsidiary excavations.

Cross-cut and drifts; raises and winzes; ground breaking; mucking; ventilation and support; extension of track and other services; modern drilling and loading equipment; Alimark and Jora-lift raising, long-hole and vertical crater retreat (VCR) raising; Raise boring systems; mechanized winzing.

Stopping :- Classification, selection of stopping methods and applicability; stope layouts, stope preparation and production operation ground breaking, mucking, ventilation, supports, haulage and dumping; stopping of narrow and wide ore bodies; mining of parallel veins; open, supported, filled and caving methods; combined systems and special methods; underhand, overhand, breast, long-hole and raise, resuing, room & pillar, sublevel, large diameter blast hole (DTH), cascade, shrinkage, vertical crater retreat, horizontal cut and fill, square set, top slicing, sub-level caving, block caving methods, combined open room, shrinkage and cut-fill and subsequent filling systems; hydraulic, thermal, hydro chemical, bio chemical and nuclear device mining system; design and construction of draw points; mechanics of draw and draw control procedure; recovery and dilution; problems of deep mining and the remedial measure; design and layout of stopes in rock burst prone mines, mining sequence and rationale.

Opencast Mining: Opening of deposits and preparation for excavation; box cut, types; selection of site; formation of production benches; ripping; types of rippers; concept of rippability and cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and problems of blasting side casting; environment friendly non-blasting techniques; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; applicability of electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; side cast diagram; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; types; methods of work; push pull operation etc., bucket wheel excavator; operational methods (lateral block, half block and full block etc.,) productivity calculation; continuous surface miner; operational methods (wide/full base methods, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; mode of operation etc., OITDS (operator independent truck dispatch system); in-pit crushing and strip-mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; stress, strain, uniaxial and tri-axial strength, Poisson's Ratio, Young's Modulus, convergence, elasticity, litho static and hydrostatic pressure; rock mass classification, strength of pillars (crown/rib/sill/post) and shaft pillar; protection of surface structures; design and stability of structures in rock; design of support and reinforcement for underground excavations support resistance, yielding and non-yielding supports, dynamic and static loading, measuring instruments, consolidated and unconsolidated fills, rock bolts, cable bolts, latest developments in mine supports, economics of support design, cost benefit analysis subsidence; caving of rock mass;

problems of deep mining; rock burst; monitoring of rock mass performance; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Use and safe handling of explosives; blasting techniques and their relative efficiency; total cost concept.

Application of numerical modeling in mine design application of computers in mine design and operational controls.

(b) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; flame safety lamp; monitoring of different gases; inflammability of fire damp; fire damp explosions.

Flame safety lamps and their design; use and maintenance; testing of safety lamps; lamp house and organization.

Heat and humidity :- Sources of heat in mines; geothermal gradient; heat flow in deep mines; effects of heat and humidity; psychometrics; computation of thermodynamic properties of mine air; basic modes of heat transfer in mines; methods of calculation of heat flow and temperature rise in mine airways; heat and moisture transfer in stopes; Computation of heat load due to various machines in development working and stopes e.g. drills, road headers/tunnel bores, LHDs, low profile dumpers locomotives, lump breakers, crushers, belt conveyors underground sub-stations, etc.; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure; thermodynamic principles and other short-cut methods.

Mechanical ventilation :- Theory of different fans; characteristics and suitability of fan; selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; ventilation of heading and sinking shafts; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; Hardy Cross methods of iterative analysis and application of linear theory; thermodynamic network analysis and computer application; application of numerical modeling; estimation of pressure requirement; ventilation survey; ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of mine dust.

Mine fires:- Types; causes; detection; prevention and control of mine fires; spontaneous heating; dealing with mine fires; sealing off fire-areas, build-up of extinctive atmosphere; fire fighting organization; reopening of sealed off fire areas.

Firedamp and sulphide dust explosion :- Cause and prevention; stone dust barrier; water barrier and other methods.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements water danger plan.

Recovery of mine after explosion, fires and inundation and investigation after the same; rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Recent development in mine ventilation; use of numerical modeling in ventilation planning.

Risk Assessment and analysis with reference to mine environment, management of environmental risks.

(c) Mining Machinery

Strength of materials; applied mechanics; fluid mechanics.

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment.

Underground machinery :- Pneumatic and hydraulic drilling hammers, jumbo drills, Roof bolters, quadro bolters, road headers, raise climbers; tunnel, raise and shaft borers, LHDs, LPDTs, booster compressors, DTH and ITH drilling machines.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); scraper winches, aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; ore handling plants; use of diesel equipments in underground mines.

Pumps :- Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Mine electrical engineering :- Transmission and distribution of electrical power in mines; radial and ring main distribution; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power economics; industrial tariffs; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures; use of high voltage operational equipment in mines.

Generation, transmission and utilization of power, steam, electricity and compressed air; air compressor and auxiliary equipment; air turbines and air engines; efficiency of power, electricity and steam systems; safety aspects.

Automation in mines :- Armchair mining (tele-operations of mining equipments)

Maintenance Systems :- Monitoring and reporting tribology – corrosion, planned maintenance, Preventive, periodical and total maintenance systems in mines. Condition based monitoring and related maintenance system.

(d) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Dials; loose and fast needle surveying; plan table surveying and micro-optic alidade.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; tacheometry.

Lavelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels; problems solving.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development and stone surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts, tunnels, raises and winzes; traversing along steep working with or without auxiliary telescopes; 3D laser profiling of stope surfaces and bench walls.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry in mining.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves, surface and underground.

Dip, strike, fault and outcrop problems, borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

(e) Mine Management : Legislation : Environmental Management and General Safety.

Mine Management :-

Introduction :- Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management :- Selection; training and development of human resources for mining enterprises; leadership; study of traditional leader behavior; autocratic; democratic and Laissez-Faire behaviors.

Production Management :- Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity; concepts and measurements; application of Ergonomics in mine operation.

Financial Management :- Capital budgeting; techniques for mining project; project evaluation; payback period and IRR; methods of cost analysis and cost control; breakeven charts; working capital management.

Mining Environment:- EIA (Environment Impact Assessment), EMP (Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management; mine closure plan; R&R (rehabilitation and re-settlement).

Economic Impact of Mining Economics of mining effect on community – before, during and after mining.

Materials Management for mining sector.

Behavioural Sciences for Management :- Conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth; Individual motivation; two way personal communication.

Industrial Accident :- Study of human factors of industrial accidents; their causes and remedies.

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Metalliferous Mine Regulation, 1961, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Duty of care; occupational hazards of mining; causes and prevention; accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; safety management system; contribution of human elements in mine safety, workers participation in safety management; ISO and safety

audit; safety conferences; tripartite and bipartite committees; role of information technology in safety management.

Risk Management :- Theory and application, baseline, continuous and issue based risk assessment, how they are applied to technical areas, risk management techniques, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management, due diligence, application of risk assessment and risk management with reference to due diligence.

Disaster management :- Emergency services, equipments and procedures, emergency control rooms, rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response, investigations and reports; assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

APPENDIX – II

SYLLABUS FOR EXAMINATION FOR SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY (Under Metalliferous Mines Regulations, 1961)

(a) Winning and Working

Geology :- Characteristics and classification of mineral deposits; exploration and delineation of the ore bodies; boring through disturbed strata; bore hole survey; structural geology; interpretation of geological maps.

Opening of mineral deposits; vertical and inclined shaft; adits; declines; shaft sinking and deepening; methods of sinking; mechanized sinking; in ordinary and water logged grounds, other special methods; shaft supports, temporary and permanent.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of developments and stopping and factors affecting the same; statutory provisions.

Primary and secondary Development; Level interval; block length; main haulage drifts high speed drifting; excavation and equipping of grizzly (conventional and mechanized), ore/waste bin, main ore-pass system, underground crushing, loading and hoisting stations, underground service chambers, sump etc.

Cross-cut and drifts; raises and winzes; ground breaking; mucking; ventilation and support; extension of track and other services; modern drilling and loading equipment; Alimak and Jora-lift raising, long-hole and vertical crater retreat (VCR) raising; Raise boring systems; mechanized winzing.

Stopping :- Classification, selection of stopping methods and applicability; stope layouts, stope preparation; production; operation ground breaking, mucking, ventilation, supports, haulage and dumping; stopping of narrow and wide ore bodies; mining of parallel veins; underhand, overhand, breast, long-hole and raise, resuing, room & pillar, sublevel, large diameter blast hole (DTH), cascade, shrinkage, vertical crater retreat, horizontal cut and fill, square set, top slicing, sub-level caving, block caving methods, combined open room, shrinkage and cut-fill and subsequent filling systems; design and construction of draw points; mechanics of draw and draw control procedure; recovery and dilution; problems of deep mining and the remedial measure; design and layout of stopes in rock burst prone mines.

Opencast Mining: Opening of deposits; preparation for excavation; box cut, types; site selection; formation of benches; rippability; types of rippers; cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and related problems; non-blasting techniques.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers bucket wheel excavator; (lateral block, half block and full block method etc.,) productivity calculation; continuous surface miner; (wide/full base, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; in-pit crushing and strip-mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; strength of pillars (crown/rib/sill/post) and shaft pillar; protection of surface structures; design and stability of structures in rock; design of support and reinforcement for underground excavations support resistance, yielding and non-yielding supports, dynamic and static loading, consolidated and unconsolidated fills, rock bolts, cable bolts, subsidence; caving of rock mass; problems of deep mining; rock burst; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Use and safe handling of explosives; blasting techniques and their relative efficiency; total cost concept.

(b) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; flame safety lamp; monitoring of different gases; inflammability of fire damp.

Flame safety lamps; design; use and maintenance; testing of safety lamps; lamp house and organization.

Heat and humidity :- Sources of heat in mines; geothermal gradient; effects of heat and humidity; heat transfer in mines airways and stopes; methods of calculation of heat flow and temperature rise; heat load due to various machines; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Mechanical ventilation :- Mechanical ventilators; characteristics and selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift,

diffuser and evasee; booster and auxiliary fans; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; thermodynamic network analysis and computer application; estimation of pressure requirement; ventilation survey; ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of mine dust.

Mine fires:- Types; causes; detection; prevention and control of mine fires; spontaneous heating; dealing with mine fires; sealing off fire-areas, build-up of extinctive atmosphere; fire fighting organization; reopening of sealed off fire areas.

Firedamp and sulphide dust explosion :- Cause and prevention; stone dust barrier; water barrier and other methods.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged workings; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements water danger plan.

Recovery of mine after explosion, fires and inundation and investigation after the same; rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Recent development in mine ventilation.

(c) Mining Machinery

Strength of materials; applied mechanics; fluid mechanics.

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment.

Underground machinery :- Pneumatic and hydraulic drilling hammers, jumbo drills, Roof bolters, quadro bolters, road headers, raise climbers; tunnel, raise and shaft borers, LHDs, LPDTs, booster compressors, DTH and ITH drilling machines.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track super elevation; track fitting and safety appliances; self acting inclines; ore handling plants; rail wagon loading plants; use of diesel equipments in underground mines.

Pumps :- Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Mine electrical engineering :- Transmission and distribution of electrical power in mines; radial and ring main distribution; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures; use of high voltage operational equipment in mines.

Generation, transmission and utilization of power, steam, electricity and compressed air in mines; safety aspects.

Automation in mines :- Armchair mining (tele-operations of mining equipments)

Preventive, periodical and total maintenance systems in mines.

(d) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment. Gyro theodolite principle and determination of Gyro north; determination of true bearing by equal altitude method; tachometry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development and stone surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts, tunnels, raises and winzes; traversing along steep working with or without auxiliary telescopes.

Theory of errors and adjustments: Causes and classification of errors; indices of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformatric of coordinates.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves, surface and underground.

Dip, strike, fault and outcrop problems, borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

(e) Mine Management : Legislation : Environmental Management and General Safety.

Mine Management :-

Introduction :- Principles of scientific management; management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management :- Selection; training and development of human resources.

Production Management :- Production planning; scheduling and control; short term and long term planning; productivity; concepts and measurements.

Environmental Management:- Mine environment monitoring and control; EMP (Environment Management Plan), mine closure plan; R&R (rehabilitation and re-settlement).

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Metalliferous Mine Regulation, 1961, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Causes and prevention of accidents and their classification; frequency rate and severity rates; cause-wise analysis, investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; risk assessment and risk management; cost of accident; safety management system; human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees.

Disaster management :- rescue and recovery; mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

APPENDIX – I
SYLLABUS FOR EXAMINATION FOR MINE
SURVEYORS CERTIFICATES OF COMPETENCY
(Under Metalliferous Mines Regulations, 1961)
FIRST PAPER

Linear measurement :- Instruments for measuring distance and ranging, chain surveying; errors in chaining and plotting; optical square.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Plan Table Surveying; methods contouring using plane table and micro-optic alidade.

Miners' dials and other compass instruments; dialing; loose and fast needle surveying.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment.

Levelling :- Levelling instrument types of leveling; booking and reduction methods; temporary and permanent adjustment of levels; geometrical, trigonometric and physical leveling; characteristics and uses of contours; methods of contouring; traverse; co-ordinates and leveling problems.

Tachometry:- Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Use, care, testing, and adjustments of instruments.

SECOND PAPER

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates, vertical projections; mine models.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Astronomy :- Astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry in mining.

Correlation :- Method of correlation surface and underground including Gyro-Laser combination.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

Control of direction and gradient in inclined shafts, shifts, tunnels, raises and winzes; surveying of flat, moderately and steeply inclined, and vertical ore bodies.

Area and volume calculation; different methods and their limitations; earth work and building estimation; laying out of rail curves on surface and underground; measurement of depths of incline roadways and shafts; determination of azimuth latitude and longitude.

Borehole surveying and calculations; dip, strike, outcrop and fault problems.

Development sampling :- Channel and block averaging; stope sampling; averaging of stope-face boundaries; valuation of block roof tonnages; milling widths; observe plans.

Types of plans their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Geological map reading.

Application of computers in mine surveying and preparation of plans. 3D laser profiling of bench walls in opencast mine.

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINE FORMAN'S (UNRESTRICTED) CERTIFICATES OF COMPETENCY (Under Metalliferous Mines Regulations, 1961)

(a) General Safety and Legislation

Duties and responsibilities of workmen, competent persons and officials (excluding managers, assistant managers); discipline amongst workers and control of staff.

Provisions of the Metalliferous Mines Regulations, 1961, relating to mine working; explosives and blasting; haulage; ventilation; precautions against danger from fire, dust, gas and water and of other provisions and Rules, the enforcement of and compliance with which is the responsibility of mine foremen.

Writing of reports required to be made by mine foreman under the regulations.

Dangerous occurrences in mines and dealing with the same; accidents, their causes and preventions; accident reports; not disturbing the place of accident.

Mine rescue; physiological effect of mine gases; rescue equipment and First Aid.

Sanitation and health; miners' diseases, their symptoms and preventions.

(b) Methods of Working.

Nature of occurrence of mineral deposits; geological disturbances and their effects on working conditions; dangers and precautionary measures while approaching geological disturbances areas.

The purposes and utility of boreholes in mines; shaft sinking; safety devices; temporary and permanent supports in sinking and working shafts; estimation of shafts and outlets.

Opencast methods of mining; mechanized and manual methods; deep hole drilling and blasting; shovel and dumpers; dragline; bucket wheel excavators; surface continuous miner; benching; maintenance of haul roads; other safety precautions; methods of reclamation; dump management.

General principles of primary and secondary development; stopping methods; manual and mechanized stone drifting.

Elements of roof control; mechanism of rock bolting; support of roadways; face supports and their types, setting, testing and withdrawal; systematic timbering rules; packing and stowing; protection of surface structures; working beneath statutorily restricted areas and surface structures.

Safe handling and use of explosives; deep hole drilling and blasting; safety precautions.

Inspection of workings; inspection and maintenance of haulage and travelling roadways; man riding system and return airways; gates and fences.

Reading of statutory plans.

(c) Ventilation and Precautions against Explosives: Fires and Inundation

Natural and mechanical ventilation ; ventilation of headings and sinking shafts; siting of auxiliary and booster fans; distribution, measurement and control of air in mines; estimation of air quantity requirements; methods of coursing of air; anemometer; hygrometer; maintenance of ventilation appliances.

Pollution of air; irruption/occurrence of gases in mines; properties of gases; detection and measurement of firedamp and noxious gases; sampling of air; determination of environmental condition; standards of ventilation.

Design and construction of flame and electric safety lamps; their use, examination and maintenance.

Suppression and treatment, sampling and analysis of mine dust.

Elementary knowledge of causes and prevention of firedamp and sulphide dust explosion, limits of inflammability of fire-damp.

Fires and spontaneous heating; prevention, detection and control of mine fire; sealing off fire areas; fire stopping and their examination; precautions against outbreak of surface fires; fire fighting on surface and belowground.

Inspection of old workings.

Sources of danger from surface and belowground water, precaution, to prevent inundation and irruption of water; precautionary measures while approaching abandoned and water logged areas, boring machines for exploratory work; water dams; water danger plan.

Recovery of mines after explosions fires and inundation; precautionary measures during re-opening and dewatering of mines.

(d) Elements of Mining Machinery.

Safety aspects and safe use of different kinds of machinery used in underground and opencast mines including blast hole drills, rippers; scrappers; shovels; draglines; dumpers; road graders; dozers; wheel loaders; bucket wheel excavators; spreaders; surface continuous miners; brakes (including service and parking brakes); generation and use of compressed air; use of steam and internal combustion engines in mines.

Application of electricity in mines; safety precautions.

Winding equipments; ropes and guides; signaling and decking arrangements; safety devices; examination of winding equipments and shaft fittings.

Haulage and transport; types of haulage; rope haulage and locomotives; self-acting inclines; haulages; roads in underground and opencast working; rails and tracks; their maintenance and inspection; tubs; signaling; safety devices; codes of practices; traffic rules; unsafe practices; derailments.

Different types of pumps; principles and use of siphons; drainage and water lodgments.

Code of practice for transport, installation, use and shifting of underground and opencast machinery.

Belt conveyors and safety appliances.

No. DGMS (Tech)/Circular No./ 03

hanbad, Dated – 14/08/2009

To,

Owner/Agent/Manager of all Coal Mines.

Sub:- Amendment in Bye-Laws in relation to subject & syllabus for Manager's, Surveyor's, Overman Certificate of Competency Examination under Coal Mines Regulation, 1957.

The Bye-Laws for the conduct of examinations under Coal Mines Regulation, 1957 for grant of Manager Surveyor's, Overman Certificate of Competency as far as they relate to syllabus for examination have been amended and published under Notification Nos. G.S.R. 66 (Board/Coal/2009), G.S.R. 67 (Board/Coal/939/2009), and G.S.R. 68 (Board/Coal/940/2009) all dated 04.05.2009 in the Gazette of India, No. 17, Part II – Section 3- Sub-section (i) dated 10.05.2009 – 16.05.2009.

The main features of the amendment are as follows :-

A. The subjects for managers competency examination under the Coal Mines Regulation 1957 :-

Certificate of Competency	Bye Law No.	Existing Provisions	Substituted Provisions
Managers Certificate of Competency	5	Subjects and syllabus for Examinations (a) Winning and Workings. (b) Mine Management (c) Mine Ventilation, Explosions, Fires and Inundation (d) Mine Surveying (e) Mining Machinery	Subjects and syllabus for Examinations (a) Mine Management (b) Winning and Workings. (c) Mine Ventilation, Explosions, Fires and Inundation (d) Mining Machinery and Electricity. (e) Mine Surveying

B. Subject wise revised syllabus for different certificates of competency examinations are given in Annexure enclosed.

Henceforth, Manager's, Surveyor's, Overman Certificate of Competency Examination shall be conducted in accordance with the amended provisions of the bye-laws. You are requested to bring this to the notice of all concerned.

The amended Bye-laws are available at DGMS official website. www.dgms.gov.in

APPENDIX-I

SYLLABUS FOR THE EXAMINATION FOR FIRST CLASS MANAGER'S CERTIFICATE OF COMPETENCY (Under Coal Mines Regulations, 1957)

- (a) **Mine Management : Legislation and General Safety.**
Mine Management :-

Introduction :- Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management and Organizational behavior Selection; training and development of human resources for mining enterprises; leadership; study of traditional leader behaviour; autocratic; democratic and Laissez-Faire behaviors; conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth individual motivation; two way personal communication.

Production Management :- Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity; concepts and measurements; application of Ergonomics in mine operation.

Financial Management :- Capital budgeting; techniques for mining project; project evaluation; payback period and IRR; methods of cost analysis and cost control; breakeven charts; working capital management; ERP (Enterprise Resources Planning).

Mining Environment:- EIA (Environment Impact Assessment), EMP (Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management; mine closure plan; R&R (rehabilitation and re-settlement).

Economic Impact of Mining Economics of mining effect on community – before, during and after mining corporate social responsibility (CSR).

Materials Management for mining sector; ABC analysis, Inventory Management.

Industrial Accident :- Study of human factors of industrial accidents; their causes and remedies.

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Coal Mine Regulation, 1957, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast metalliferous mines.

General Safety in Mines

Safety in Mines :- Duty of care; occupational hazards of mining; causes and prevention; accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; safety management system; contribution of human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees; role of information technology in safety management.

Risk Management :- Theory and application, baseline, continuous and issue based risk assessment, risk management techniques and application, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management, due diligence, application of risk assessment and risk management with reference to due diligence.

Disaster management :- Emergency services, equipments and procedures, emergency control rooms, rescue and recovery; procedure and responsibilities, safety

of persons engaged in emergency response, investigations and reports; assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

(b) Winning and Working

Geology :- Nature and occurrence of coal seams; description of Indian coalfields; application of geology to mining; geological structures; folds, faults, fractures, fissures etc. boring through disturbed strata; bore hole survey; indicated and proved coal reserves; interpretation of geological maps.

Opening of coal seams: Legal requirement about outlets; siting; vertical shaft; inclines shaft; inclines; shafts sinking and deepening; drift drivage; mechanized sinking; in ordinary and water logged grounds, in running sand etc.; freezing, cementation and other special methods; shaft supports, temporary and permanent, tubings etc., recent developments.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of mining coal seams and factors affecting the same; statutory provisions.

Board and Pillar method :- Schemes of development; design of bord and pillar working; statutory provisions selection of equipment for development mechanized loaders, continuous miners etc., preparatory arrangement for depillaring; statutory provision for depillaring; designing the system of pillar extraction with caving and stowing; mechanization in depillaring operation; types of loading machines; continuous miners etc.; roof management; local fall and main fall; indications of roof weighting; air blasts and precautions against the same; precautions against fire and inundation during depillaring; multi-section and contiguous working; liquidation of developed pillars.

Longwall mining :- Method of driving gate roads; single and multiple heading gate roads; longwall face layout advancing and retreating faces; orientation of longwall face; support system for longwall gate roads; powered support; face transfer, operation of shearer and plough; roof management and hard roof management; periodic and main fall; design of high productive longwall panel; mini/short wall mining; communication and telemonitoring.

Thick seam mining :- Board and pillar and longwall methods in multi-section; multi-slice methods; inclined slicing; horizontal slicing and cross slicing in ascending and descending orders; under winning methods; sublevel caving; integral caving; blasting gallery and descending shield methods; hydraulic mining; special methods of thick seam mining.

Other special methods of mining :- Wide stall method; methods of mining thin seams; underground coal gasification, coal bed methane/ coal mine methane etc.

Opencast Mining: Opening of deposits and preparation for excavation; box cut, types; selection of site; formation of production benches; ripping; types of rippers; concept of rippability and cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and problems of blasting side casting; environment friendly non-blasting techniques; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; applicability of electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; side cast diagram; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrapers; types; methods of work; push pull operation etc., bucket wheel excavator; operational methods (lateral block, half block and full block etc.) productivity calculation; continuous surface miner; operational methods (wide/full base methods, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; mode of operation etc., OITDS (operator independent truck dispatch system); in-pit crushing and strip-mining; opencast mining over developed coal seams; high-wall mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; stress, strain compressive and tensile, shear strength uniaxial and tri-axial strength, Poisson's Ratio, Young's Modulus, convergence, elasticity, lithostatic and hydrostatic pressure; rock mass classification, strength of stooks; shaft pillar; protection of surface structures; design and stability of structures in rock; design of support and reinforcement for underground excavations support resistance, yielding and non-yielding supports, dynamic and static loading, measuring instruments, consolidated and unconsolidated fills, rock bolts, cable bolts, latest developments in mine supports, economics of support design, subsidence; caving of rock mass; bumps; monitoring of rock mass performance; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Development of safe explosives; permitted explosives; composition and testing of safe explosives Milli-second detonators; alternatives of explosives. Use and safe handling of explosives in coal and stone drivages in gassy and non-gassy mines, blasting techniques and their relative efficiency, total cost concept.

Application of numerical modeling in mine design application of computers in mine design and operational controls.

(c) *Mine Ventilation, Explosives, Fires and Inundation*

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; methane content; methane drainage; flame safety lamp; methanometers and multi-gas detectors; gas chromatograph; methane layering; monitoring of different gases; telemonitoring; coal bed methane/coal mine methane.

Heat and humidity :- Sources of heat in mines; geothermal gradient; heat flow in deep mines; effects of heat and humidity; psychometrics; computation of thermodynamic properties of mine air; basic modes of heat transfer in mines; methods of calculation of heat flow and temperature rise in mine airways; heat and moisture transfer in bord and pillar and longwall workings; Computation of heat load due to various machines e.g. belt conveyor, power pack stage loader, lump breaker, armoured flexible conveyor, shearer etc. in longwall gate roads and face and road

header, continuous miner and underground sub-stations etc. in the mine; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure; thermodynamic principles and other short-cut methods.

Mechanical ventilation :- Theory of different fans; characteristics and suitability of fan; selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; ventilation of heading and sinking shafts; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; Hardy Cross methods of iterative analysis and application of linear theory; thermodynamic network analysis and computer application; application of numerical modeling; estimation of pressure requirement; ventilation survey; recent development in mine ventilation, ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of mine dust; properties of stone dust; sampling and analysis of coal dust.

Mine fires:- Cause of mine fires, spontaneous combustion, mechanism and susceptibility indices detection and prevention of spontaneous heating and mine fires; dealing with mine fires; sealing off fire-areas; build-up of extinctive atmosphere; pressure balancing; fire fighting organization; gas ratios and their limitations; modified gas ratios; reopening of sealed off fire areas; fires in quarries over developed pillars; coal stack and waste dump fires.

Mine explosions :- Fire damp and coal dust explosions; cause and prevention; stone dust barrier; water barrier and other methods.

Explosion in quarries over developed pillars. Water gas explosion.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements; monsoon preparations, water danger plan.

Recovery of mine after explosion, fires and inundation rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

Risk Assessment and analysis with reference to mine environment, management of environmental risks.

(d) Mining Machinery and Electricity

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment, non destructive testing.

Underground machinery :- Coal drills; jumbo drills; roof bolters; quad bolters; UDM; shearers; ploughs; AFC; road headers; ding headers; continuous miners; shuttle cars; SDLs; LHDs.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors, systems (belt conveyor, chain conveyor, cable belt conveyor, high angle conveyor, shiftable belt conveyor, pipe conveyor); aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track design and layout; super elevation; track fitting and safety appliances; self acting inclines; coal handling plants; rail wagon loading; plants; use of diesel equipments in underground coal mines, free steered vehicles.

Pumps :- Types, Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface continuous miners and their maintenance aspects.

Generation, transmission and utilization of power, steam, compressed air; air compressor and auxiliary equipment; air turbines and air engines; efficiency of power, electricity and steam systems; safety aspects.

Maintenance Systems :- Monitoring and reporting tribology – corrosion, planned maintenance, Preventive, periodical and total maintenance systems in mines. Condition based monitoring and related maintenance system.

Mine electrical engineering :- Generation, Transmission and distribution of electrical power in mines; radial and ring main distribution; power economics; industrial tariffs; power factor improvement; sub-station arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures and intrinsic safety; use of high voltage operational equipment in mines.

(e) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Dials; loose and fast needle surveying; plan table surveying and micro-optic alidade.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; tacheometry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels; problems solving.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north. Astronomical triangle; conversion of time system and precise determination of azimuth by astronomical methods.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development and stone surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts and roadways traversing along steep working with or without auxiliary telescopes; 3D laser profiling of bench walls.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry and remote sensing in mining.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail curves and haul road curves, surface and underground.

Dip, and strike problems; outcrop problems; borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

APPENDIX – II

SYLLABUS FOR THE EXAMINATION FOR SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY (Under Coal Mines Regulation, 19570

(a) **Mine Management : Legislation : and General Safety.**

Mine Management :-

Introduction :- Principle of scientific management; management functions; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management:- Selection; training and development of human resources for mining enterprises;

Production Management :- Production planning, scheduling and control; short term and long term planning; productivity; and its measurements.

Environmental Management :- Mine Environment monitoring and control; EMP (Environment Management Plan); mine closure plan; R&R (rehabilitation and resettlement).

Mine Legislation :-

Health and Safety Laws :- The Mines Act, 1952; Mines Rules 1955, Coal Mine Regulation, 1957, Mines Rescue Rules, 1985, provisions of Indian Electricity Rules, 1956 applicable to mines; Vocational Training Rules, 1966, other rules and legislation applicable to coal mines.

General Safety in Mines

Safety in Mines :- Causes and prevention of accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, investigation into accidents and accident report; in-depth study into various causes of accidents measures for improving safety in mines; risk assessment and risk management; cost of accident; safety management system; human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees.

Disaster management :- rescue and recovery; mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance work.

Notified and occupational diseases; silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting :- General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines.

Safety related issues in mineral beneficiation and transport.

(b) Winning and Working

Geology :- Nature and occurrence of coal seams; description of Indian coalfields; geological features of coalfields; methods of boring; boring through disturbed strata; bore hole survey; interpretation of geological maps.

Opening of coal seams: shafts sinking and drift drivage; methods of sinking; mechanized sinking; in ordinary and water logged grounds, and other special methods; shaft supports, temporary and permanent; mechanized stone drifting etc.

Developments and layout of mines including surface and underground arrangements; layout and development of shaft-top and pit-bottom and haulage arrangements.

Underground Mining Methods; Choice of methods of mining coal seams and factors (depth, seam thickness, inclination etc.) affecting the same; statutory provisions.

Board and Pillar method :- design of bord and pillar working; statutory provisions mechanized loaders, continuous miners etc., depillaring and applicable

statutory provision pillar extraction with caving and stowing; mechanization in depillaring; local fall and main fall; indications of roof weighting; air blasts and precautions against the same; precautions against fire and inundation; multi-section and contiguous working.

Longwall mining :- Method of driving single and multiple heading gate roads; orientation of longwall face; advancing and retreating faces; support system for longwall gate roads; powered support; face transfer, operation of shearer and plough; periodic and main fall; mini/short wall mining; communication and telemonitoring.

Thick seam mining :- Board and pillar and longwall methods in multi-section; multi-slice methods; inclined slicing; horizontal slicing and cross slicing in ascending and descending orders; under winning methods; sublevel caving; integral caving; blasting gallery and descending shield methods; hydraulic mining; special methods of thick seam mining.

Other special methods of mining :- Wide stall method; methods of mining thin seams; underground coal gasification, coal bed methane/ coal mine methane etc.

Opencast Mining: Opening of deposits and preparation for excavation; box cut, types; site selection; formation of benches; rippability; types of rippers; cycle of operation; drilling; blast hole drills; performance parameters; requirement of number of drills; blasting; blast design; factors influencing blast design; deep hold blasting; calculation of charge per hole; ground vibration; secondary blasting and related problems; surface miners; safety aspects.

Discontinuous/cyclic methods of excavation and transport; shovel dumper operation; electric shovel and hydraulic excavators; cycle time and productivity calculation; estimation of equipment fleet; dragline operation; side casting; calculation of reach; cycle time; productivity calculation; bucket capacity requirement; scrappers; bucket wheel excavator; (lateral block, half block and full block etc.,) productivity calculation; continuous surface miner; (wide/full base, wide/full bench, block mining, stepped cut, empty travel back, turn back and continuous mining methods); conveyors; shiftable and high angle conveyors; in-pit crushing and strip-mining; opencast mining over developed coal seams; high-wall mining; safety aspect.

Application of concepts of Rock Mechanics for designing the methods of mining and strata control; Theories of ground movement and strata control; strength of stooks; shaft pillar; protection of surface structures; design and stability of structures in rock; rock mass rating; design of support and reinforcement for underground excavation consolidated and unconsolidated fills, rock bolts, cable bolts, subsidence, caving of rock mass; bumps monitoring of rock mass performance; mechanics of rock fragmentation; slope stability and dump stability; dump management; roof management.

Use and safe handling of explosives; blasting techniques and their relative efficiency, total cost concept.

(c) Mine Ventilation, Explosives, Fires and Inundation

Composition of mine atmosphere; Mine gases; generation, properties and effects; sampling and analysis of mine air; occurrence, properties, characteristics, detection and measurement of firedamp; methane drainage; flame safety lamp; methanometers and multi-gas detectors; gas chromatograph; methane layering; monitoring of different gases; telemonitoring; coal bed methane/coal mine methane.

Flame safety lamps and their design; use of maintenance; testing of safety lamps; lamp house and organization.

Heat and humidity :- Sources of heat in mines; geothermal gradient; effects of heat and humidity; heat transfer in bord and pillar and longwall workings; methods of calculation of heat flow and temperature rise; heat load due to various machines; air cooling and conditioning.

Air flow in mines:- Laws of air flow; resistance of airways; resistance and splitting problems; equivalent orifice; flow control devices; permissible air velocities.

Natural ventilation :- Seasonal variations; calculation of natural ventilation pressure.

Mechanical ventilation :- Mechanical ventilators; characteristics and selection, testing and output control; fans in series and parallel; reversal of air flow; fan drift, diffuser and evasee; booster and auxiliary fans; standards of ventilation; ventilation calculation.

Ventilation planning :- Ventilation layout; determination of size of shafts and airways; estimation of air quantity requirements; ventilation network analysis; thermodynamic network analysis and computer application; estimation of pressure requirement; ventilation survey; recent development in mine ventilation, ventilation plans.

Airborne dust :- Generation, dispersion, measurement and control; suppression and treatment of coal dust; properties of stone dust; sampling and analysis of coal dust.

Mine fires:- Cause of mine fires, spontaneous combustion, mechanism and susceptibility indices (crossing and ignition point temperature); wet oxidation potential; factors affecting spontaneous combustion; detection and prevention; dealing with mine fires; sealing off fire-areas; build-up of extinctive atmosphere; pressure balancing; fire fighting organization; gas ratios and their limitations; modified gas ratios; reopening of sealed off fire areas; fires in quarries over developed pillars; coal stack and waste dump fires.

Mine explosions :- Inflammability of fire damp and coal dust; fire damp and coal dust explosions; cause and prevention; stone dust barrier; water barrier and other methods.

Explosion in quarries over developed pillars.

Water gas explosion.

Inundation :- Causes and prevention; precautions and techniques of approaching old water logged working; safety boring apparatus; pattern of hole; design and construction of water dams; water lodgements; monsoon preparations, water danger plan.

Recovery of mine after explosion, fires and inundation and investigation rescue and recovery in mines; rescue apparatus; organization of rescue work; emergency preparedness and response system; emergency organization.

Illumination :- Cap lamps, layout and organization of lamp rooms; standards of illumination; photometry and illumination survey.

(d) Mining Machinery and Electricity

Theory of Machines :- Machine design, different types of gears and drives, bearing, collars and joints, brakes and friction clutches, governors.

Heat engines, general outline of working principles of steam generators and auxiliary equipment, condensing plant, reciprocating steam engines, turbines, internal combustion engines, conduct of gas, oil and steam engine trial; mechanical efficiency of engines, measurement of indicated and brake horsepower.

Machine tools and workshop processes:-

Wire ropes :- Construction details, applications, mechanical properties, breaking load, factor of safety bending factor, capacity factor, snap length, critical depth inspection; examination and discarding criteria; rope capping and splicing.

Mine winders :- Types and applications components; shaft fitting; drums and sheaves; ropes and guides; drives and control systems; automatic contrivances; brakes; cage; skip; counter weight and suspension arrangement; duty cycle diagram; winder capacity and motor power calculations; equivalent mass of winder installation; safety devices; Installation; examination and testing of winding equipment, non destructive testing.

Underground machinery :- Coal drills; jumbo drills; roof bolters; quad bolters; UDM; shearers; ploughs; AFC; road headers; ding headers; continuous miners; shuttle cars; SDLs; LHDs.

Material handling equipment in mines; Types, construction and operation; safety devices; maintenance and calculations for rope haulages; locomotives (tractive effort, draw bar pull, ideal gradient), conveyors (belt, chain, cable belt, high angle, shiftable and pipe conveyor); aerial rope-ways, man riding systems; in-pit crushers, feeder breaker etc., mine cars, track super elevation; track fitting and safety appliances; self acting inclines; coal handling plants; rail wagon loading; plants; use of diesel equipments in underground coal mines, free steered vehicles.

Pumps :- Types, Characteristics, motor power, capacity and calculations, laying of water mains, dealing with acid water; slurry, drainage; lodgements, storage, designs and layout of dams, sumps, pumping problems.

Opencast machinery :- Constructions, function and operation of blast hole drills, rippers, scrapers, shovels; draglines, dumpers, road graders, dozers, wheel loaders; bucket wheel excavators; spreaders; surface miners and their maintenance aspects.

Generation, transmission and utilization of power, steam, compressed air; safety aspects.

Preventive, periodical and total maintenance systems in mines.

Mine electrical engineering :- Generation, Transmission and distribution of electrical power in mines; radial and ring main distribution; substation arrangements; short transmission lines; cables; switch gears and protective devices; protective relays; circuit breakers; gate-end box; drill panel; field switch; transwitch; symmetrical fault and circuit breaker rating; mine signaling; power factor improvement; electrical drives and semiconductor controllers; selection of motors and starters; semiconductor devices; principles of operation of thyristor controlled variable speed electrical drives; electrical breaking; earthing; flameproof enclosures and intrinsic safety; use of high voltage operational equipment in mines.

(e) Mine Surveying

Linear measurement :- Instruments for measuring distance and ranging, units of measurement in surveying.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment; Gyro

theodolite; principle and determination of Gyro north; determination of true bearing by equal altitude method; tachymetry.

Levelling :- Levelling instruments; types of leveling; characteristics and uses of contours; methods of contouring; booking and reduction methods; shaft depth measurement; temporary and permanent adjustment of levels.

Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north. Astronomical triangle; conversion of time system and precise determination of azimuth by astronomical methods.

Correlation :- Methods of correlation surface and underground including Gyro-Laser combination.

Development surveys :- Surveys of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts and roadways traversing along steep working with or without auxiliary telescopes.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight; propagation and adjustment of errors; adjustment of triangulation figures.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates.

Area and volume calculation :- Different methods and their limitations; earth work and building estimation; laying out of rail curves, surface and underground.

Dip, and strike problems; outcrop problems; borehole surveying and calculations.

Types of plans and their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Application of computers in mine surveying and preparation of plans.

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINE SURVEYORS CERTIFICATES OF COMPETENCY (Under Coal Mines Regulations, 1957)

FIRST PAPER

Linear measurement :- Instruments for measuring distance ranging, chain surveying; errors in chaining and plotting; optical square.

EDM :- Principles of measurements; types; correction and selection of instrument.

Angular measurement :- Prismatic compass; bearing of lines; local attraction; magnetic declination.

Plan Table Surveying; methods contouring using plane table and micro-optic alidade.

Miners' dials and other compass instruments; dialing; loose and fast needle surveying.

Theodolite :- Modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing; traverse calculation; computation of coordinates; adjustment of traverse; temporary and permanent adjustment.

Levelling :- Levelling instrument types of leveling; booking and reduction methods; temporary and permanent adjustment of levels; geometrical, trigonometric and physical leveling; characteristics and uses of contours; methods of contouring; traverse; co-ordinates and leveling problems.

Tachometry:- Controlled surveys :- Triangulation; trilateration; application of GPS and Total Station in mine surveying.

Use, care, testing, and adjustments of instruments.

SECOND PAPER

Field astronomy :- Astronomical terms; determination of true bearing by equal altitude method; Gyro theodolite; principle and determination of Gyro north, astronomical triangle; conversion of time systems and precise determination of azimuth by astronomical methods.

National grid : Map projection Cassini Lambert's polyconic and universal transfers Mercator; transformation of coordinates, vertical projections; mine models.

Geodesy :- Geod, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Photogrammetry :- Introduction; scale of a vertical photograph; photographs versus maps; application of photogrammetry and remote sensing in mining.

Correlation :- Method of correlation surface and underground including Gyro-Laser combination.

Theory of errors and adjustments: Causes and classification of errors; inclines of precision; laws of weight propagation and adjustment of errors; adjustment of triangulation figures.

Surveying of flat, moderately and steeply inclined and vertical workings; control of direction and gradient in drifts and roadways; traversing along steep working with or without auxiliary telescopes.

Area and volume calculation; different methods and their limitations; earth work and building estimation; laying out of rail curves on surface and underground; measurement of depths of incline roadways and shafts; determination of azimuth latitude and longitude.

Borehole surveying and calculations; dip, strike, outcrop and fault problems.

Types of plans their preparation, care, storage and preservation; legislation concerning mine plans and sections; duties and responsibilities of surveyors.

Geological map reading.

Application of computers in mine surveying and preparation of mine plan;. 3D laser profiling of surfaces and bench walls.

APPENDIX – I

SYLLABUS FOR EXAMINATION FOR MINE OVERMAN'S CERTIFICATES OF COMPETENCY (Under Coal Mines Regulations, 1957)

(a) General Safety and Legislation

Duties and responsibilities of workmen, competent persons and officials (excluding managers, assistant managers); discipline amongst workers and control of staff.

Provisions of the Coal Mines Regulations, 1957, relating to mine working; explosives and shortfiring; haulage; ventilation; precautions against danger from fire, dust, gas and water and of other provisions and Rules, the enforcement of and compliance with which is the responsibility of overmen.

Writing of reports required to be made by overman under the regulations.

Dangerous occurrences in mines and dealing with the same; accidents, their causes and preventions; accident reports; not disturbing the place of accident.

Mine rescue; physiological effect of mine gases; rescue equipment and First Aid.

Sanitation and health; miners' diseases, their symptoms and preventions.

(b) Methods of Working.

Nature of occurrence of coal seams; geological disturbances and their effects on working conditions; dangers and precautionary measures while approaching geological disturbances areas.

The purpose and utility of boreholes in mines; sinking; safety devices; temporary and permanent supports in sinking and working shafts; examination of shafts and outlets.

Opencast methods of mining; mechanized and manual methods; deep hole drilling and blasting; shovel and dumpers; dragline; bucket wheel excavators; surface miner; benching; maintenance of haul roads; precautions; while extracting developed pillars by opencast method and other safety precautions; methods of reclamation; dump management; high wall mining.

General principles of board and pillar and longwall method; multi-section workings; method of depillaring under different conditions; mechanized pillar extraction; precautions to be taken while working near/beneath waterlogged areas; roof convergence and convergence measuring devices etc., stone drifting.

Elements of roof control :- Rock Mass Rating (RMR) of roof strata; mechanism of rock bolting; support of roadways; face supports and their types, setting, testing and withdrawal; systematic support rules; packing and stowing; protection of surface structures; working beneath statutorily restricted areas and surface structures.

Safe handling and use of explosives; in coal and stone in gassy and non-gassy mines; simultaneous short firing; blasting in fire areas in opencast mines; safety precautions.

Inspection of workings; inspection and maintenance of haulage and travelling roadways; man riding system and return airways; gates and fences.

Reading of statutory plans.

(c) Ventilation and Precautions against Explosives: Fires and Inundation

Natural and mechanical ventilation ; ventilation of headings and sinking shafts; siting of auxiliary and booster fans; distribution, measurement and control of air in mines; estimation of air quantity requirements; methods of coursing of air; anemometer; hygrometer; maintenance of ventilation appliances.

Pollution of air; irruption/occurrence of gases in mines; properties of gases; detection and measurement of firedamp and noxious gases; sampling of air; determination of environmental condition; standards of ventilation.

Design and construction of flame and electric safety lamps; their use, examination and maintenance.

Suppression and treatment of coal dust; suitability of stone dust; sampling and analysis of mine dust.

Elementary knowledge of causes and prevention of firedamp and coal dust explosion, limits of inflammability of fire-damp.

Prevention, detection and control of spontaneous heating/fire; sealing off fire areas; fire stopping and their examination; precautions against outbreak of surface fires; fire fighting on surface and belowground.

Inspection of old workings.

Sources of danger from surface and underground water, precaution, to prevent inundation and irruption of water; precautionary measures while approaching abandoned and water logged areas, boring machines for exploratory work; water dams; water danger plan.

Recovery of mines after explosions fires and inundation; precautionary measures during re-opening and dewatering of mines.

(d) Elements of Mining Machinery.

Safety aspects and safe use of different kinds of machinery used in underground and opencast mines e.g. blast hole drills, rippers; scrappers; shovels; draglines; dumpers; road graders; dozers; wheel loaders; bucket wheel excavators; spreaders; surface continuous miners; brakes (including service and parking brakes); use of steam and internal combustion engines in mines.

Application of electricity in mines; safety precautions.

Winding equipments; ropes and guides; signaling and decking arrangements; safety devices; examination of winding equipments and shaft fittings.

Haulage and transport; types of haulage; rope haulage and locomotives; self-acting inclines; haulages; roads in underground and opencast working; rails and tracks; their maintenance and inspection; tubs; signaling; safety devices; codes of practices; traffic rules; unsafe practices; derailments.

Different types of pumps; principles and use of siphons; drainage and water lodgments.

Code of practice for transport, installation, use and shifting of underground and opencast machinery.

Belt conveyors and safety appliances.

No. DGMS (Approval/Circular No./ 01

Dhanbad, Dated – 18/02/2009

To,

Owner/Agent/Manager of All Coal and Metal Mines.

Sub:- Approval of Dust Suppression/Prevention System in Drilling machines used in mines.

In continuation to DGMS (Approval)/Circular No.5 dated 25.11.2008, regarding approval of Dust Suppression/Prevention System in Drilling machines used in mines a Notification No. 16(38)79-Genl/6095 Dated 25.11.2008 published in the Gazette of India Part – II Section 3 (i) on 13.12.2008 vide GSR 215 is reproduced below for strict compliance.

“In exercise of the powers conferred on me under Regulation 123(6)(b)(ii) of Coal Mines Regulation, 1957 and Regulation 124(6)(b)(ii) of Metalliferous Mines Regulation 1961, I, M.M. Sharma, Chief Inspector of Mines also designated as Director General of Mines Safety hereby declare 31st December 2008 as date from

which following item will not be used in Coal Mines and Metalliferous Mines unless the same has been approved by me by a general or special order in writing.

1. Dust Suppression/Prevention device in drilling and boring equipment.

No. DGMS/S&T/Tech.Cir. (Approval No./ 02 Dhanbad, Dated – 18th June 2009

To,

All the Owner/Agent/Manager & Manufacturer

Sub:- Standard Composition and Properties required for Cement Capsules to be used as grouting material in Roof Bolting in Mines.

1.0 BACKGROUND

In early years in mining, timber was the primary material being used as supports of the underground excavations in belowground mines. In those days, good quality treated timbers were available in sample and was also being imported from Burma (Now Myanmar). Increased exploitation of forest resources and rampant deforestation resulted in scarcity of timbers even for house hold uses. Steel then came into market as substitute and is invariably used in the industry including domestic uses. Cement is equally important material to be used along with the steel in industries and infrastructure fields.

Roof Bolts are now being used as common support in underground mines all over the world along with the cement or resin grout to reinforce the strata and provide adequate support in the excavation. Since past ten to fifteen years, cement grouted roof bolts have almost replaced the timber supports in coal mines in India.

It is highly desired that the roof bolts once installed should immediately start taking load of the roof strata and prevent dilation so as to eliminate chances of roof fall. Quick Setting Cement Grout was the only option to provide required support resistance. Various composition were tried by adding quick setting chemicals and other re-agents in the cement composition. It was then possible to gain pull out load of about 3 Tonnes within 30 minutes and 5 Tonnes within 2 hours of installation. The Resin Grouts were also available for use in mines but it was cost prohibitive and uneconomical for Indian conditions during nineties. With the advancement of technologies and faster rates of extraction, resin capsule is now being invariably used and are now economically viable in case of mass production.

However, the use of cement capsules would continue for medium and small scale productions. A number of technical circulars have been issued from this Directorate regarding load requirements, installation, testing and use of roof bolts from time to time.

Technical Circular No.6 of 1996, Circular No. 3 and 6 of 1993 are highly elaborative and exclusive on the subject. In spite of the best effort put in both from the mine operators as well as from this Directorate, the results are not upto the expected level.

2.0 NECESSITY

It would be pertinent to mention here the trends of fatal accidents in coal mines especially due to fall of roof and sides. The accidents data analyzed for the past fifteen to twenty years during which the full column grouted roof bolts along with cement capsules were being used, have revealed that :-

- (i) 38 to 40% of the fatal in coal mines are caused due to fall of roof and sides;
- (ii) 57 to 60% of the total below ground accidents are caused due to fall of roof and sides; and
- (iii) 58 to 60% of the roof fall accidents occur within 10 m of the face i.e. within the Freshly Exposed Roof Area.

A number of accidents due to fall of roof have occurred within 2 to 4 hours of exposure of the roof where cement grouted roof bolts were used that failed and fell along with the failing roof of thickness varying from 0.25 to 1.2m. In many cases during the course of inspection and enquiry, it has been found that the roof bolts which were expected to take 3 Tonnes of anchorage load after 30 minutes of installation were pulled out within 1.6 to 2.4 Tonnes. The roof Bolts which were expected to take 5 Tonnes of load after 2 hours of installation were pulled down in less than 3 Tonnes.

The above observations necessitated in-depth studies on this subject and to have a better system to check and monitor the quality of grout as well as the roof bolts being used in the mines. With this objective in view, it was decided in this Directorate to bring the support materials and the Steel supports under the purview of approval and testing before being used in the mines. A notification vides G.S.R. 160, dated 14th August, 2008 and DGMS Technical Circular No. (S&T)3/703 dated 14th August, 2008 were issued in this regard.

3.0 APPROVAL & TESTING

The applicants were granted approval for field Trials and Testing based on their Tests and Performance Reports submitted along with their applications. During the period of such approval, samples were collected from the Manufactures Units and tested at the Central Institute of Mining and Fuel Research (CIMFR), Dhanbad. On receipt of the Test Reports from CIMFR, it was observed that many of the Cement Capsules manufactured by various manufactures could not pass the bare minimum requirements and had failed. The detailed information on the Tests Data of few samples is tabulated below:-

Test Data No. 1**(a) Physico- Mechanical Properties**

Sl. No	Parameters	Acceptable Limit	Result	Conclusion
1	Average Soaking Time	3.0 Minutes (Maximum)	2.55 Minutes	Passed
2	Initial Setting Time	3.0 Minutes (Maximum)	3.30 Minutes	Failed
3	Final Setting Time	15.0 Minutes (Maximum)	6.00 Minutes	Passed
4	Compressive Strength gained after 30 Minutes 2 Hrs 24 Hrs 7 Days 21 Days 28 Days	Minimum Compressive Strength in MPa 4.5 9.0 16.0 16.0 16.0 16.0	3.00 4.90 4.65 4.60	Failed
5	Anchorage Strength after 30 Minutes 2 Hrs 24 Hrs	Minimum in Tonnes 3.0 5.0 8.0	3.2 3.5	Failed

(b) Chemical Properties

Sl. No	Parameters	Acceptable Limit	Result	Conclusion
1	Thicksotropic/Viscosity	Minimum – 35,000 Cps & Maximum – 50,000 Cps	4300 cps	Passed
2	Chloride Free Test	No Chloride	Chloride Present	Failed
3	Shrinkage Test @ 27 ± 20 ⁰ C & 65% Humidity 24 Hrs 7 Days 35 Days	Maximum 0.01% Maximum 0.01% Maximum 0.01%	0.015%	Failed
4	Chemical Constituents - Loss on Ignition - Calcium Oxide (CaO) - Magnesium Oxide (MgO) - Ferrous Oxide (Fe₂O₃) - Alumina (Al₂O₃) - Silicon Dia Oxide (SiO₂)	Maximum – 2% Maximum – 35% Maximum – 2% Maximum – 5% 10 to 25% Maximum 20%	4.0 23.32 1.41 2.00 3.40 24.00	Failed

Test Data No. 2**(a) Physico- Mechanical Properties**

Sl. No	Parameters	Acceptable Limit	Result	Conclusion
1	Average Soaking Time	3.0 Minutes (Maximum)	2.34Minutes	Passed
2	Initial Setting Time	3.0 Minutes (Maximum)	3.35 Minutes	Failed
3	Final Setting Time	15.0 Minutes (Maximum)	5.10 Minutes	Passed
4	Compressive Strength gained after 30 Minutes 2 Hrs 24 Hrs 7 Days 21 Days 28 Days	Minimum Compressive Strength in MPa 4.5 9.0 16.0 16.0 16.0 16.0	4.69 4.08 5.80 7.45	Failed
5	Anchorage Strength after 30 Minutes 2 Hrs 28 Hrs	Minimum in Tonnes 3.0 5.0 8.0	2.8 3.5	Failed

(b) Chemical Properties

Sl. No	Parameters	Acceptable Limit	Result	Conclusion
1	Thicksotropic/Viscosity	Minimum – 35,000 cps & Maximum – 50,000 cps	39000 cps	Passed
2	Chloride Free Test	No Chloride	Chloride Present	Failed
3	Shrinkage Test @ 27 ± 20^0 C & 65% Humidity 24 Hrs 7 Days 35 Days	- Maximum 0.01% - Maximum 0.01% - Maximum 0.01%	No Shrinkage	Failed
4	Chemical Constituents - Loss on Ignition - Calcium Oxide (CaO) - Magnesium Oxide (MgO) - Ferrous Oxide (Fe₂O₃) - Alumina (Al₂O₃) - Silicon Dia Oxide (SiO₂)	- Maximum – 2% - Maximum – 35% - Maximum – 2% - Maximum – 5% 10 to 25% - Maximum 20%	7.0 23.77 5.19 2.46 2.34 32.00	Failed

Note :- It was also observed that the compressive strength had reduced by 25% when the casted cement blocks were immersed in water before subjecting compressive strength testing. Thus the above composition was found unsuitable for wet or watery strata conditions.

On examination of the above information, it was found that the bare minimum anchorage load of 3 and 5 Tonnes required after 30 minutes and 2 hours could not be achieved. Even the required compressive strength of 16 MPa could not be achieved after 24 hours and also after 7 days. In addition, the composition had failed in other tests. Therefore the approvals granted to such manufactured were withdrawn.

4.0 STANDARD PARAMETERS & CHEMICAL COMPOITION

Based on the above observations, it was decided in this Directorate to have detailed discussions on this matter with the scientist from CIMFR who are dealing with this subject and also from the Expert on Strata Control and Rock Mechanics from Indian School of Mines University. After detailed deliberation on various issues and parameters required for the Cement Capsule, it was decided that the following parameters shall be essentially required for the Cement Capsules to be used in mines as a Grouting materials.

Sr. No.	Parameters	Acceptable Limits
1	Average of soaking time (Minutes)	3.0 (max)
2	Initial setting time (Minutes)	3.0 (max)
3	Final setting time (Minutes)	15.0 (max)
4	Compressive Strength Gain after- • 30 Minutes • 2 Hrs • 24 Hrs • 7 Days • 21 Days • 28 Days	Minimum in MPa 4.5 9.0 16.0 16.0 16.0 16.0
5	Anchorage Strength after • 30 Minutes • 2 Hrs • 28 Hrs	(Minimum in Tonnes) 3.0 but test will be conducted till complete failure 5.0 but test will be conducted till complete failure 12.0 but test will be conducted till complete failure

(b) Chemical Properties of Cement Capsules

Sr. No.	Chemical Test	Acceptable Limits
1	Chloride Free Chloride free cement capsule composition is essential	NIL

	because, presence of chloride will exchange the rusting rate of MS steel bolt grout with cement capsules. This may lead to release the MS steel bolt from the grouting material.	
2	Viscosity/Thyrotrophic Nature of Wetted Cement Capsules Proper Viscosity and flow of wetted cement capsule is necessary for proper grouting of the bolts. Viscosity of wetted cement capsule should not be too less to flow out of the hole and should not be too high to difficult to insert the MS steel bolt. The optimum viscosity of cement capsules will be in the range of 35,000 to 50,000 cps.	35,000 to 50,000 cps.
3	Shrinkage Test (IS:4031 (Part 10) 1988 Shrinkage of the grouted cement capsules should not be more than 0.01% at $27 \pm 2^{\circ}$ C and 65% humidity upto 35 days. If shrinkage is allowed than bolt with grouted material will release the surface of the hole and will fall out from the hole.	Less than 0.01%
4	Calcium Oxide Calcium Oxide exchange the cementing properties of the grouting material and present in the quick set cement and other cements used in the manufacturing of the cement capsules. The optimum quantity of CaO is essential for getting the proper setting time as well as strength in the grouting material. Optimum quantity of CaO is 35%. Below the optimum it will affect the setting time and strength of the grouting material and above the optimum percentage brittle nature will develop in the grouting material. Cracks develops in the grouted material will release the bolt and become unsafe to mine environment.	30 to 35%
5.	Alumina Alumina plays an important and crucial role in the initial setting, final setting and getting proper strength in the cement capsules. The quantity of alumina in the cement capsule is depends upon the quantity of high alumina cement added in the composition. Generally high alumina cement contain 35-45% alumina content and for manufacturing cement capsule of good quality about 30% high alumina cement should be added in the composition. Therefore, percentage of alumina percentage should not be less than 10% to get proper setting time as well as strength and shelf life of the grouting material. It was observed that above 25% alumina content in the cement capsules, the brittle nature of the grouted material is increased and cracks were developed in the material due to exothermic reaction.	10 to 15%

6.	Iron Oxide Proper quantity of iron oxide in the cement capsules is required for getting proper performance and it should be not more than 5%. Above the optimum percentage iron oxide will enhance the brittle nature of the grouting material.	5% (Max.)
7.	Magnesium Oxide Optimum quantity of magnesium will give the better result but increase in percentage will decrease the setting time but increase the brittle nature of the material which may lead to decrease in the strength of the material. MgO content.	2% (Max.)
8.	Loss on Ignition Organic and other combustible material should not be more than 2% of the total mass. It is observed that water reducers, plasticizers and organic grouting material will enhance the physico- mechanical properties of the grouting material but above 2% it will give adverse effect on the grouting materials.	2% (Max.)
9.	Silica Content Silica plays an important role in the cement capsules and will provide encapsulation properties as well as enhance the strength and other physico- mechanical properties of the grouted material. With high alumina strength silica gives proper binding and compressive strength to the MS bolt. Proper quantity of silica is required for getting good quality of cement capsule composition and it should not be more than 20% of the total mass. The silica should be clay free.	15 to 20%
10.	Plaster of Paris It was observed that present manufactures are using plaster of Paris in place of high alumina cement. Due to POP physico- mechanical properties is below the acceptable limits and giving very poor results. Therefore, it is advised to instruct the cement capsule manufactures not to add POP and manufacture POP free cement capsules.	NIL

4.1 TEST FACILITIES AT MANUFACTURER'S UNIT

In order to ensure and maintain the quality of cement capsule manufactured at the manufacturing units, it shall be required to have the following apparatus & testing facilities:

Sr. No.	Name of Apparatus/Equipment	Quantity (Nos)	Capacity
1.	Viscometer	One	10,00,000 cps.
2.	Humidifier	One	Humidity 90% Temp. 5-50 °C
3.	Anchorage Testing Machine	One	50 Tonnes
4.	Universal Compressive testing	One	50 Tonnes

	machine		
5.	Vicat Apparatus	One	As per IS:5513:1996
6.	Muffle Furnace	One	1000 ⁰ C
7.	pH meter	One	0-14
8	Flow Table	One (With different cones)	As per requirement
9.	Stop Watch	Two	
10	Hot Air Oven	One	Ambient – 250 ⁰ C
11	Heater	Three	500 ⁰ C
12	Magnetic Stirrer	One	100 ⁰ C
13	Glassware	As per requirement	-
14	Chemicals	As per requirement	-

4.2 TEST FACILITIES AT USER'S END

Similarly, the user shall also have the responsibility to ensure that the required quality of the cement capsules is provided in the mine for use. Thus the cement capsules shall also be tested before being allowed to be used in mines and for this purpose, at least the following apparatus/equipment shall be maintained at the user's end:

Sl. No.	Name of Apparatus/Equipment	Quantity (Nos)	Capacity
1.	Viscometer	One	10,00,000 cps.
2	Anchorage Testing Machine	One	50 Tonnes
3	Universal Compressive testing machine	One	50 Tonnes
4	pH meter	One	0-14

5.0 SAMPLING & TESTING

In order to check the composition and required parameters during manufacture, it shall be required that the random sampling shall be collected at least 1 sample containing adequate number/quantity of cement capsules for every 10,000 pieces of cement capsule in a batch and shall be subjected to the required set of tests as prescribed at para-4.0 above and the data shall be kept recorded in a bound paged book kept for the purposes which shall be signed by the persons carrying out the test and shall also be counter-signed by the quality control officer posted at the manufacturing unit (s).

5.1 The user shall also carry out similar sampling and testing as per the apparatus/instrument kept there at their end before using, for every batch of cement capsules and keep the records in a bound paged book kept for the purpose.

In case the cement capsules fall to pass the required tests at the user end, that lot of the manufactures shall not be used and intimation thereof shall be sent to this Directorate and also to the manufacturer.

Manufacturers and the Users including the Test Houses, who are engaged for testing such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

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DGMS

NOTIFICATIONS & CIRCULARS

Notifications – 2010

Dated 22nd February, 2010

S.O.431(E).- In exercise of the powers conferred by Sub-Section (8) of Section 24 of the Code of Criminal Procedure, 1973(2 of 1974), the Central Government hereby appoints the following Officers in the Directorate General of Mines Safety/Ministry of Labour and Employment, as Special Public Prosecutors for the conduct of cases instituted under the Mines Act, 1952(35 of 1952), in trial courts, appeals, revisions and other matters arising out of these cases in revisional or Appellate Courts, established by Law in any State or Union Territory to which the provisions of the aforesaid section apply :-

- (1) Shri Jai Prakash Jha, Law Officer Grade-II
- (2) Smt. Ritu Shukla, Law Officer Grade – II

[F.No.S-29026/03/2007-ISH.II]
S.K.SRIVASTAVA. Additional Secretary.

Dated 13th May, 2010

S.O. 1088(E) - In exercise of the powers conferred by sub-section (I) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Satish Puri, Deputy Director General of Mines Safety, in the Directorate General of Mines Safety Organisation to be the Chief Inspector of Mines for all the territories to which the said Act extends with immediate effect from 11-5-2010 till the assumption of duties by Shri S.J.Sibal as per the extant Rules.

[F.No.Z-16025/41/2009-ISH.II]
S.K.DEV VERMAN, Joint Secretary.

Dated 12th August, 2010

S.O. 1989(E). - In exercise of the powers conferred by sub-regulations (I), (2) and (3) of Regulation 11 of the Coal Mines Regulations, 1957 and in suppression of the notification of the Government of India in the Ministry of Labour and Employment number S.O. 1366(E), dated 6-8-2007, the Central Government hereby re-constitutes the Board of Mining Examinations (Coal) and appoints the following persons as members of the Board for a period of three years or till their successor is appointed, which ever is later, namely :-

1. Chief Inspector of Mines, since Designated as Director General of Mines Safety)	Chairman ex-officio
2. Prof. Durga Charan Panigrahi, Professor and Head, Department of Mining Engineering, Indian School of Mines, Dhanbad (Jharkhand) – 826 004	Member
3. Shri Jammalamadaka V. Duttatreylu, Director (Operations) Singareni Collieries Company Ltd., Khamma.	Member
4. Shri Vinay Kumar Singh Chairman-cum-Managing Director M/s.Northern coalfields Ltd., P.O.Singrauli Colliery, Dist. Singrauli-486889 (MP)	Member
5. Shri Nagendra Kumar	Member

- Director (Technical),
M/s.Eastern Coalfields Ltd.,
C.M.D's Office, Sanctoria, P.O.Dishergarh – 713333
Dist- Burdwan, (West Bengal).
6. Shri Pradip Kumar Roy Chowdhury Member
Director (Technical) Operations,
M/s.South Eastern Coalfields Ltd.,
Seepat Road, Bilaspur (Chhattisgarh)Pin- 495006.

[F.No.S-66012/01/2007-ISH.II]
A.C. PANDEY, Joint Secretary.

Dated 7th October, 2010

S.O. 2453(E)- Shri Satish Puri, Deputy Director General of Mines Safety (Mining), Directorate General of Mines Safety (Headquarters), Dhanbad on his appointment as Director General of Mines Safety in the Directorate General of Mines Safety, Dhanbad has taken over the charge of the post with effect from the forenoon of 1st October, 2010.

2. Therefore, in exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints Shri Satish Puri, Director General, Directorate General of Mines Safety, Dhanbad to be the Chief Inspector of Mines for all the territories to which the said Act extends.

[No.A-32012/07/2009-ISH.II]
A.C. PANDEY, Joint Secretary.

Dated 19th November, 2010

S.O.2990 – In pursuance of sub-rule (4) of Rule 10 of the Official Language (Use for official purposes of the Unions) Rules, 1976 (as amended 1987), the Central government hereby notifies following offices under the administrative control of the Ministry of Labour & Employment, at least 80% staff where of have acquired working knowledge of Hindi:

1.	Office of Director of Mines Safety, Goa Region, Fatima Bhawan, 2 nd Floor Barnando Kosta Road, Margaon, Goa – 403601
2.	Office of Director of Mines Safety, Guwahati Region, Camp Office, Digboi, Tinsukhia (Assam) – 786171.

[File No.E.11017/1/2006-RBN]
K.M. Gupta, Economic Adviser.

Dated 13th December, 2010

S.O. 3168 – I, Satish Puri, Chief Inspector of Mines and also designated as Director General of Mines Safety, under the powers conferred on me under sub section 3 of Section 6 of the Mines Act, 1952, in partial modification of S.O.No.3177 dated 6-11-2009 (S-29022/1/2009-Genl/3423), published in Part-II, Section 3, Sub-section (ii) of the Gazette of India dated 15/11/2009, hereby declare inclusion of Singrauli District of the State of Madhya Pradesh in the area of jurisdiction of Varanasi Region, with respect to which Inspectors appointed under Sub-section I of Section 5 of Mines Act, 1952 shall exercise their respective powers, which had erroneously been left due to typographical error, in the above referred notification.

[No.S-29022/1/2009-Genl/3008]
SATISH PURI, Chief Inspector of Mines &
Director General of Mines Safety.

Circulars – 2010

No.DGMS/Circular/General/ No.01

Dhanbad 22.10.2010

To
The Owners, Agents and Managers of all coal Mines.

Sub: Approval of the Indian School of Mines, Dhanbad and Central Mine Planning And Design Institute, Ranchi as approved test houses for conducting of test on cement /resin capsules.

This is to bring to your notice that recently, approval of the test houses of the Indian School of Mines, Dhanbad and Central Mine Planning and Design Institute, Ranchi were accorded vide following details.

No.	Name of the test house/Institute	Approval accorded for testing of	Validity period
1.	Indian School of Mines, Dhanbad	Cement Capsules.	One year from 30/9/2010
2.	Central Mine Planning and Design Institute, Ranchi	Cement and Resin Capsules	One year from 30/9/2010.

It is therefore, requested that all efforts may be taken in giving wide publicity and encouraging existing and any prospective manufacturer of cement and resin capsules to conducting tests for cement/resin capsules either at the Central Institute of Mining and Fuel Research, Dhanbad or in any of the above two test houses as the case may be. It may also be noted that the standard parameters for testing of cement and resin capsules have already been notified vide DGMS Technical Circular (Approval) No. of 4 dated 15/6/2010 and DGMS/S&T/Tech.Cir(Approval) No.3 of 22/9/2010 respectively.

No.DGMS/(Approval) AVA/ 01

Dhanbad 25.05.2010.

To
All Owners, Agents and Managers
Of all Opencast Mines

Sub: Audio Visual alarm for surface transport Machinery & other Heavy earth Moving Machinery.

Several accidents have occurred in open cast mines while reversing of equipment especially in dumpers/tippers. In most of the equipments the manufacturers provide audio visual alarm and rear view mirrors for assistance during reversal. Although the Audio Visual Alarm gives warning to the work persons, it is a practice in mines that the operator takes the assistance of a spotter while reversing. The spotters are exposed to danger of being run over by transport machinery. The audio-visual alarm warning at times fail due to defective manufacturing and poor maintenance.

Hence, to have a better quality of products in mines, the Audio Visual Alarm was included in the list of approved type and make and was notified in the Gazette of India vide GSR No.144 dated 22nd July, 2008.

In the view of experience gathered over a period of time, it has been decided to approve the design, specification and test procedures of the Audio Visual Alarm by this circular and shall be treated as a general order. Existing type of Audio Visual Alarms not in conformity with the design, specification and test procedures and not specially approved separately should be replaced as early as possible but not later than 31.12.2010.

The manufacturer and Workmanship

The manufacturer shall be reliable, having adequate facility for proper manufacturing and test facilities of the audio-visual alarms. Every part of the unit shall have good workmanship and good finish and shall be free from any defect. The manufacturer shall be fully responsible for the quality of the Audio-Visual Alarms and conformity with prescribed specifications.

Design

The Audio-Visual Alarm shall be provided at the rear of the vehicle which can be actuated by a pressure switch when the reverse gear is used by the operator. The unit shall be housed in a fully water proof case which is shock and vibration resistant and suitable for high pressure washing. The two components shall be connected by a suitable detachable cable with water proof joints. Corrugated PVC tubes shall be used as a wire protective element. A suitable relay shall be provided to protect the pressure switch from heavy current flow and also to prevent contact point from overloading by backup lamp and alarm current. Two fail safe synchronized speakers should be provided in the Audio Visual Alarm. Mechanical lock shall be provided to prevent unauthorized tampering.

Specification

The sound of the Audio Visual Alarm should be more than the surrounding noise level so that it can be heard distinctly. 110 dB sound level is suitable for Audio Visual Alarms. However the sound level shall be within ± 5 dB of the value for which the equipment is designed when measured at a distance of 1.2 meters from the unit and the light intensity shall be not less than 300 lux when measured at a distance of 300mm from the unit. Red bright LED of suitable quantity must be used in the Audio Visual Alarm and shall start blinking when the vehicle is reversed.

Self adjusting back up alarm may be preferred where the sound level is automatically maintained at 5dB higher level than the surrounding noise level.

Testing

The sample of Audio Visual Alarm shall be drawn by the manufacturer as specified in IS:13109(part-I) 1991 & shall conform to IS: 13947 (part-I) of 1993 for the following protection against dust and water.

Degree of protection	Test condition as per IS 13947 (part-I) see sub clause
1. Protection against dust and shall prevent ingress of dust	C7.5&C7.6
2. Protection against dropping water	C8.1
3. Protection against spraying water	C8.3
4. Protection against splashing water	C8.4

The Audio Visual Alarm shall also confirm to IS 13109 (part-I) of 1991 for the following environmental requirements:

TEST

Test Condition

1. Vibration test	As per table 1 of IS 13109 (part-I) of 1991.
2. Shock test	
3. Bump test	
4. Drop and Topple test	
5. Cold test	
6. Dry Heat test	
7. Damp Heat (cyclic) test	

The following endurance test of Audio Visual Alarm shall also be carried out in accordance with SAEJ 994.

TEST

Test Condition

(e) Endurance test at high temperature	As per Para 7.1
(f) Endurance test at room temperature	As per Para 7.2

Electrical Wires shall conform to the performance requirement of DIN 72551-FLRY-B or SAEJ1128, Type SXL

Pressure Switch shall withstand the operating temperature range of – 40 deg. F to +250 deg. F and shall be tested for a proof pressure of 500PSI.

Light intensity at a distance 300mm should recorded and mentioned in the test report.

Functional Test Requirements : Unless otherwise specified data measurement will be taken during a minimum test period of 1 min operation at ambient temperature of 25 deg.C ± 11 deg.C and supply voltage of 14V DC ± 0.2 VDC for a nominal 12V alarm and 28V DC ± 0.2 VDC for 24V alarm and the performance of functional test should be recorded in the test report. Sound level shall be checked before and after the above test and shall be within ± 5 dBA of the value for which the equipment is designed.

Testing shall be carried out in Government labs, Institutes under CSIR,BIS approved test house and DGMS approved test houses.

Marking:

Each audio visual alarm shall be legibly marked on the body of the Audio Visual Alarm mentioning the serial number, batch number, date of manufacture. Copies of test reports for every lot shall be supplied.

Inspection and maintenance :

The user industry shall also be responsible to ensure correct quality and conformity to the prescribed specification and also take proper care while Audio Visual Alarms are in use.

At least two percent of the Audio Visual Alarms from the lot when supplied to the mine shall be randomly drawn and tested as mentioned above in a laboratory mutually agreed between manufacturer and the user industry. If the Audio Visual Alarms fail to conform to the specifications, the whole lot of Audio Visual Alarms shall be rejected.

A competent person shall check and inspect the Audio Visual Alarms daily. Once in a week, at least ten percent of the Audio Visual Alarms working in machinery shall be measured for the sound level and intensity of light and the readings shall be recorded in a bound paged book signed by a competent person and counter signed by the engineer of the mine.

No.DGMS/S&T/Tech.Cir.(Approval) No.02

Dated 3.6.2010

To:

The Owner, Agent, Manager of All Mines & The Manufacturers.

Sub: Standard Components and Properties of Rigid Steel Props, Chocks & Cogs to be used in Mines.

Steel Supports such as rigid steel cogs, chocks and props are being widely used in the mines. In making of such steel supports, various types of circular or square section hollow steel tubes, angles, frames etc. are being used. In order to ensure the desired strength, stability and durability of such supports, a committee was constituted comprising of mine

management, trade union, CIMFR and officials from DGMS to look into this issue to depth. On the basis of such study conducted by the committee, a technical circular vide DGMS (Tech).S&T/Cir/No.1 dated 5th January 2007 was issued from this Directorate. The Circular prescribes the minimum test standard for such supports before using in mines.

After due technical considerations and to check the quality of support being used in the mines, the steel supports including roof bolts were brought under the purview of approval vide Gazette Notification No.GSR 160 dated 14th August, 2008 and a circular in this regard was also issue vide this Directorate's issue No.DGMS(Tech)(S&T)/Circular No. 3/703 dated 14/08/2008.

The Cogs, Chocks and Steel Props manufactured by various companies have also been approved from this Directorate. The Data collected during the testing of such supports have been analyzed. Several meetings and discussions were held with scientists from Central Institute of Mining & Fuel Research (CIMFR) and Professors from Indian School of Mines, Dhanbad.

During the period of testing, approval and field trails of such supports, various suggestions, recommendations and advices were received from the scientists from Research & Development Centre for Iron & Steel (RDCIS), Ranchi & CIMFR, Dhanbad , CMPDII, Ranchi, ISM, Dhanbad and CIL, Kolkata. The feedbacks received from such organisations have been considered and the standard and parameters of the steel chocks, cogs and Props to be used in mines are prescribed as under:-

1.0 Physical Properties :

Materials

Manufacturer shall specify the steel grades and characteristics from which the steel support has been made/manufactured.

- (a) The tensile strength of the steel grade used shall be at least 1.08 times the measured yield stress.
- (b) Elongation prior to fracture A of the steel grade used shall not be less than 10%.
- (c) The manufacturer of the support shall specify the design, calculations, Yield Strength and Ultimate Tensile Strength along with elongation at Yield and the factor of safety of the supports. The Steel support shall be as per the drawing and dimensions given by the manufacturer.

Dimension

Dimension of the support shall be as per the design and the tolerances specified in the IS:1852 – 1985 or any other Standard as applicable.

2.0 Chemical Composition :

Chemical composition of the steel for manufacturing of the steel supports varies according to the requirement of strength characteristics and specific applications given by user. However certain chemical constituents of the steel which influence the required properties of steel are prescribed below :

SL No.	Constituent	Percentage by weight
1.	Carbon (c)	0.25 (Max)
2.	Sulfur (S)	0.05 (Max)
3.	Phosphorous (P)	0.05 (Max)
4.	Manganese	1.7 (Max)
5.	Other Alloying/micro alloying elements	0.50 (Max)

In this regard, reference may be made of IS 2062: 2006 for considerations and testing.

3.0 Physico-mechanical Properties:

- 3.1 At least two prototype samples shall be tested for type test at a National Test House or Laboratory.
- 3.2 At least 0.5% of the production shall be subjected to routine test or production test.
- 3.3 Axial Load test :

The Steel Prop, Cog or Chock shall be set vertically in a testing machine and the designed load is applied. The load-yield characteristics shall be obtained.

3.4 Eccentric Load Test :

The test shall be conducted on the Square Steel Prop, Cog/Chock by putting the support with an eccentricity of about 54 mm at the upper end.

3.5 Overload Test :

An overload test shall be conducted by subjecting the Steel Prop, Cog/Chock to a load equal to 1.20 time the designed load. The test shall be conducted for a least five loading cycle.

Minimum performance requirements:

- There shall be no visible deformation, distortion or failure of any part of the support.
- The minimum load bearing capacity of Steel prop shall be 20 Tonnes and for Cog/Chock 30 Tonnes.

However, the support can be manufactured and used of higher capacities as per the requirements of the user.

4.0 Welding and Weld Tests

All the parts and components of the supports structure if joined together by welding shall be welded with following the specified code of welding prescribed under various BIS. The welding stresses shall also be calculated and tested as prescribed under various BIS.

5.0 Other Properties & Parameters

(a) Weatherability :

The support and its components or parts shall be subjected to Accelerated Weathering Test in mine water condition for 20 days . No deterioration should occur on the Assembly.

- (b) Accelerated Weathering Test shall also be conducted in acidic water condition for 20 days during which no deterioration should occur on the Assembly.

[Note: The AWT under mine water condition generally is at pH > 4 and that under acidic water condition is considered at pH-2 (5% HCL aqueous solution) during testing. The test limit is that the loss of weight shall not be more than 5%]

(c) Corrosion Resistance Test :

The Support shall also be subjected to Field Exposure and Corrosion Resistivity Test as per IS-5555: 1970 to test the resistance to corrosion of the steel support and its parts.

6. Marking:

Steel Prop, Cog or Chock shall be marked with the manufacturers name and /or registered trade mark, serial number, size and the designed load of the Square Steel Cog Stool/Chock.

- 7.0 In case the support or any of its part fail to pass the required tests at the user's that batch or lot of the manufacture shall not be used in the mine and intimation there shall be sent to the manufacturer. A record in this regard shall be maintained at the mine/company.
- 7.1 The Chief Inspector of Mines or an Inspector of Mines May inspect, check and examine the manufacturing facilities at any time and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of the manufacturer.
- 7.2 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the supports at any time in the mine or the area of the mines and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of manufacturer or user.

8.0 General Requirement

All the Owner, Agent and Manager including the manufactures and suppliers shall be required to comply with this standard and any deviation or defects found in the product supplied or used in the mine, shall be brought to the notice of this Directorate.

Manufacturers and the Users including the Test Houses, who are engaged for testing of such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

The Standard, Parameters and Testing of Steel props, cogs and chocks as mentioned above, in this circular shall be considered as approved by the Chief Inspector of Mines by a general order as provided under regulation 181(3) of the Coal Mines Regulations, 1957. This is being issued in continuation of the gazette notification No.GSR 160 dated 14th August, 2008.

No.DGMS/S&T/Tech.Cir.(Approval) No.03

Dhanbad 3.6, 2010.

To

The Owner, Agent, Manager of All Mines & the Manufacturers

Sub: Standard Components and Properties of Steel Roof Bolts to be used In Mines.

Steel Roof Bolts with Nuts, Dome Washer, Bearing Plates and W-Straps are being widely used in the mines. In making of such steel supports, various types of steel rods. TMT bars are generally used. In order to ensure the desired strength and durability of such supports, A study was carried out during the year 2008 and the steel supports including roof bolts were brought under the purview of approval vide Gazette Notification No.GSR 169 dated 14th August, 2008 and a circular in this regard was also issued vide this Directorate's issue No.DGMS(Tech)(S&T)/Circular No.3/703 dated 14/08/2008.

The Roof Bolts, Nuts, Bearing Plates & W-straps manufactured by various companies have also been approved from this Directorate. The Data collected during the testing of such supports were analyzed. After detailed discussions and meetings held with scientists from Central Institute of Mining & Fuel Research (CIMFR) and Professors from Indian School of Mines, Dhanbad, A Technical Circular No.DGMS/S&T/Tech.Cir(Approval) No.11 dated 17th July 2009 was issued on the standard components and properties of roof bolts to be used in mines. Based on the standards and parameters specified in the circular, testing of the steel roof bolts are being conducted at the test house and on the basis of such test reports approvals are being granted.

During the period of testing approval and field trials of such roof bolts and bearing plates including w-straps, various suggestions, recommendations and advices were received from the scientists from Research & Development Centre for Iron & Steel (RDCIS), Ranchi & from such organizations have since been considered and the standard and parameters of the roof bolts and its assembly to be used in mines are prescribed as under:

1.0 Physical Properties:

(a) Shape & Size:

The Roof bolt shall be MS Steel or TMT Rebar having circular cross-section with ribs on the circumferential region. The manufacturer of the roof bolt shall specify the design, circulations, Yield Strength and Ultimate Tensile Strength along with elongation at Yield and the factor of safety of the roof bolt manufactured by them. The roof bolt shall be as per the drawing and dimensions given by the manufacturer.

(b) Length:

Length of the roof bolt shall not be more the designed length ± 5 mm.

(c) Diameter:

Length of the Roof Bolt shall not be more the designed length $\pm 4\%$ by mass as specified under IS 1786-2008 or as per the standard given in BS 7861 (Part-1) 2008.

(d) Straightness:

The roof bolt shall be straight without any joint, welding, deviation or deflection. However, if the deflection or deviation cannot avoided due to practical reasons, it shall not be more than $\pm 0.1\%$ per meter length of the bolt.

(e) Rib:

The Rib of the roof bolt shall be as per the design of the rib with an objective to maximize the surface area without reducing the core diameter of the roof bolt and having maximum grip with the grout. However, the height of the rib shall be kept within the standard prescribed in IS 1786 – 2008 or BS 7861 (Part 1) 1996 or latest revision thereof.

2.0 Physic-mechanical properties:

Steel for the Roof Bolt:

The roof bolt shall be of thermo-mechanically treated (TMT) rebar manufactured from MS Grade Fe-500, Fe-600 or above. The Yield Stress, Tensile Strength and % elongation steel Grade shall be maintained as per the IS 1786 and IS 13920.

However, the minimum load bearing capacity (Anchorage Load) of the roof bolt shall be 160 kN.

3.0 Chemical Composition:

Chemical composition of the steel for manufacturing of the roof bolts varies according to the requirement of strength characteristics and specific applications given by the roof bolt manufacturer and the end user. However, certain chemical constituents of the steel which influence the required properties of steel and prescribed below:

SL No.	Constituent	Percentage by weight
1.	Carbon (c)	0.25 (Max)
2.	Sulfur (S)	0.05 (Max)
3.	Phosphorous (P)	0.05 (Max)
4.	Manganese	1.5 (Max)
5.	Other Alloying/micro alloying elements	0.50 (Max)

In this regard, reference may be made of IS 1786: 2008 for considerations and testing.

Thread on the Roof Bolt:

- (a) The thread on the roof bolt shall be M20 cold rolled thread conforming to IS 4218 (part-2&3) and no cut thread shall be used. The Minimum length of the thread shall be $150 + 5\text{mm}$ and the tolerance class designation of 8g. The thread shall conform to tolerance class of 7H.

As a routine test, one thread in every 50 produced shall be checked using a go/no-go gauge.

- (b) Non-threaded end

The non threaded end of the rock bolt shall be formed by cropping or sawing and shall be free from burrs and edges which protrude beyond the profile of the rock bolt.

As a routine, one rock bolt in every 200 produced shall be checked for straightness.

- (c) The Nut shall be of hexagonal shape of thickness not less than 30mm conforming to IS 1363 (Part-3) and the thread shall conform to tolerance class of 7H.
- (d) Pull Test : Thread and the Nut on the roof bolt shall be subjected to pull test which should not slip at the yield strength/load of the roof bolt.

Bearing Plate

- (a) The Bearing Plate of the roof bolt shall be Dome Washer Plate of dimension $150 \times 150 \times 8$ (minimum) mm with compatible central hole of required size and angled side to accommodate the conical seat and nut.
- (b) The minimum load at which the Domed Washer Plate will become flat should be at least 14 Tonnes.

Conical Seat

- (a) Conical Seat shall be of forged steel of required dimension.
- (b) The conical Seat not deform at 1:20 times the Yield stress of the roof bolt.

The roof bolt, thread, nut, conical seat, domes washer plate as well as domed bearing plate shall be subjected to tensile test and type as specified in BS 7861 (Part-I) 1996 or revised edition.

4.0 Tensile Test of the Roof Bolt Assembly

- (a) The Roof Bolt Assembly shall be subjected to Tensile Test and should not fail up to 16 Tonnes load.

Subject to the condition that system stiffness of the Roof Bolt Assembly shall be within 20 KN/mm-System stiffness between 50 to 150 KN.

5.0 Other Properties & Parameters

- (a) Weatherability :

The Roof Bolts and its components or parts shall be subjected to Accelerated Weathering Test in mine water condition for 20 days. No deterioration should occur on the Assembly.

- (b) Accelerated Weathering Test shall also be conducted in acidic water condition for 20 days during which no deterioration should occur on the Assembly.

[Note: The AWT under mine water condition generally is at $\text{pH} > 4$ and that under acidic water condition is considered at $\text{pH} = 2$ (5% HCL aqueous solution) during testing. The test limit is that the loss of weight shall not be more than 5%]

(c) Corrosion Resistance Test :

The Roof Bolt Assembly shall also be subjected to Field Exposure and Corrosion Resistivity Test as per IS- 5555: 1970 to test the resistance to corrosion of the steel of the roof bolt and its parts. The Roof Bolt should pass the required test.

6.0 SAMPLING & TESTING

In order to check the composition and required parameters during manufacture, it shall be required that the random sampling be done @ of 2 roof bolts per 1000 pieces of roof bolts and its accessories manufactured in a batch which shall be subjected to the required set of tests as prescribed in the previous paragraphs above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and shall be countersigned by the quality control officer posted at the manufacturing unit(s).

6.1 The user shall carry out Physical examination tests as far as possible but shall conduct Tensile Test of the Assembly for every batch of Roof Bolts & its Accessories received at their end before use and keep the records in a bound paged book kept for the purpose.

In case the Roof Bolts or any of its accessories fail to pass the required tests at the user's end, that batch or lot of the manufacture shall not be used in the mine and intimation thereof shall be sent to the manufacturer. A record in this regard shall be maintained at the mine/company.

6.2 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the manufacturing facilities at any time and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of the manufacturer.

6.3 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the roof bolts and its accessories at any time in the mine or the area of the mines and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of manufacturer or user.

7.0 General Requirement

All the Owner, Agent and Manager including the manufacturers and suppliers shall be required to comply with this standard and any deviation or defects found in the product supplied or used in the mine, shall be brought to the notice of this Directorate.

Manufacturers and the Users including the Test Houses, who are engaged for testing of such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

The Standard, Parameters and Testing of Steel Roof Bolt assembly as mentioned above, in this circular shall be considered as approved by the Chief Inspector of Mines by a general order as provided under regulation 181(3) of the Coal Mines Regulations, 1957. This is being issued in continuation of the gazette notification No.GSR 160 dated 14th August, 2008.

No.DGMS/Tech.Cir(Approval) No. 05

Dhanbad 27.12.2010.

To

a) All Owners, Agents and Managers

b) All Manufacturers.

c) ISM-Dhanbad, CIMFR-Dhanbad & CMPDIL- Ranchi.

Sub: Revised Standard for Testing and Use of Cement Capsule as Group Material for Roof Bolding in Mines.

1.0 BACKGROUND:

1.1 Post notification of DGMS Technical (Approval) Circular No.04 of 15th June, 2010 on "Standard, Composition and Properties required for Cement Capsule to be used as grouting material for Roof Bolting in mines". Some representations were made for reviewing the parameters on chemical composition and properties of cement capsules. Accordingly, a technical workshop was arranged at DGMS, Dhanbad on 18th November, 2010. The objective of the workshop was to review and simplify the standard by clearly defining the minimum required parameters on physico-mechanical and chemical properties and also the minimum responsibilities of the test houses, manufacturers and the users. The workshop was attended by representatives of manufacturers, users, scientific institutions like ISM-Dhanbad, CIMFR-Dhanbad and CMPDIL-Ranchi and the prevailing standards were reviewed point by point in details.

1.2 After careful consideration of the views of all stake holders and other expert opinions based on the experience and technical inputs, the new revised standards for testing and use of Cement Capsules as grouting material for Roof Bolting in mines along with guidelines/procedures for the test houses which meet the requirements of DGMS(Technical) Circular No.5 of 1994, manufacturers and the users have been formulated which are as follows.

2.0 (A) PHYSICO-MECHANICAL PROPERTIES:

(i) Soaking Time in Water:

The soaking Time of the Cement capsule in water shall conform to the standard given below.

Parameter	Standard
Soaking Time	Maximum of 3 mintes

(ii) Initial Setting Time:

The initial setting time of the cement capsule shall conform to the standard given below.

Parameter	Standard
Initial setting Time including Soaking Time	Minimum – 5 Minutes. Maximum – 10 Minutes.

(iii) Final Setting Time:

The final setting time of the cement capsule shall conform to the standard given below.

Parameter	Standard
Final Setting Time including Soaking & Initial Setting Time	Maximum of 15 Minutes.

(iv) Compressive Strength:

The measured minimum compressive strength gain of the cement capsule after completion of moulding for various time durations shall be as given below.

Parameter	Standard (MPa)
• 30 minutes	≥ 3.0
• hours	≥ 7.0
• 24 hours	≥ 12.0
• 7 days	≥ 12.0
• 21 days	≥ 12.0
• 28 days	≥ 12.0

(v) Anchorage Strength :

The measured minimum Anchorage Strength gain of the cement capsule after completion of grouting for stipulated time durations shall be as given below.

Parameter	Standard (MPa)
➤ 30 minutes	≥ 3.0
➤ 2 hours	≥ 5.0
➤ 24 hours	≥ 10.0
➤ 28 days	≥ 12.0

(B) CHEMICAL PROPERTIES:**(i) Chloride:**

Parameter	Standard
Chloride	Maximum of 0.1%

(ii) Shrinkage:

Parameter	Standard
Shrinkage	No shrinkage.

(iii) Expansion:

Parameter	Standard
Expansion If measured by ' Autoclave method' Or If measured by ' LeChatelier's method	Maximum of 0.8% Or Maximum of 10mm

(iv) Major Chemical constituent:**Sulphuric Anhydrite**

Parameter	Standard
Sulphuric Anhydrite	Maximum of 15%

- 2.1 It is therefore, essential that for any make of cement capsule to be used in mines as grouting material, it shall satisfactorily meet all the stipulated parameters as above during testing in accordance with Annexure 1,2 and 3 to this Circular.

3.0 IMPORTANT REQUIREMENTS OF THE TEST HOUSES MEETING THE REQUIREMENTS OF DGMS (TECHNICAL) CIRCULAR NO.5 OF 1994:

- 3.1 For assessing the above standard properties of cement capsules and for sake of ensuring uniformity amongst the test houses, tests as per the procedure shown in Annexure-I shall be performed by the approved test houses.

4.0 IMPORTANT REQUIREMENTS OF THE MANUFACTURERS OF CEMENT CAPSULES:

- 4.1 The basic consideration for approval for any cement capsule manufactured by a firm is the report of successful laboratory test of representative samples. It is therefore, mandatory that after that after approval, the manufacturers always maintain the quality of the cement capsule satisfying all the above properties. For this sake, the manufacturers shall ensure the requirements as stipulated in Annexure-2 to this Circular.

5.0 IMPORTANT REQUIREMENTS OF THE MINING COMPANIES USING CEMENT CAPSULES :

- 5.1 In order to ensure that the samples of cement capsules always comply with the standards as stipulated vide para 2.0 of this Circular, it is very essential that suitable mechanisms are evolved by the mining companies at mine/ area levels as per convenience to constantly monitor the quality of cement capsules in respect the stipulations on compressive strength and anchorage strength. Some of the important arrangements which shall be always maintained at the mine/area level by the mining companies are as stipulated in Annexure – 3 to this Circular.

- 6.0 Manufacturers, users and the Test Houses engaged for testing cement capsules are therefore, requested to ensure the above mentioned Standard and Parameters before supplying and using in mines.

- 7.0 This circular supersedes DGMS Technical Circular (Approval) No.4 of 15/6/2010 and all earlier circulars on the subject issued from time to time and will come into force with immediate effect.

- 8.0 Since Resin capsules are technically superior and considered world-wide to be better to cement capsules in an overall techno-economic perspective, it has been decided to gradually shift over to resin capsules from the current system of cement capsules.

ANNEXURE-I**IMPORTANT REQUIREMENTS OF THE TEST HOUSES WHICH MEET THE REQUIREMENTS OF DGMS (TECHNICAL) CIRCULAR NO.5 OF 1994****1.0 GENERAL REQUIREMENTS:**

- 1.1 Every laboratory engaged in testing of samples of cement capsules shall develop suitable protocol in respect of the receipt of un-tampered samples. The details of the protocol as above shall be notified to every firm/manufacturer seeking test of cement capsules.
- 1.2 Atleast, 110 Kg of cement capsules shall be received for the purpose of conducting various tests out of which, one half shall be preserved in the test house as a reference sample for a period of six months from the date of receipt or the expiry date as recommended by the manufacturer, whichever is earlier.
- 1.3 A minimum of three tests shall be performed at the test house for assessment of each of the standard parameter.

2.0 STANDARD PROCEDURES TO BE ADOPTED BY APPROVED TEST HOUSES FOR LABORATORY TESTING OF CEMENT CAPSULES:**2.1 METHOD OF TEST FOR SOAKING TIME, INITIAL SETTING TIME & FINAL SETTING TIME OF CEMENT CAPSULE****a) TEST PROCEDURE:**

For measurement of soaking time, cement capsule in perforated polythene is immersed in the water in a tub and a stop watch is started. When bubbles stop coming out of capsules completely, it can be assumed that soaking of the cement capsules in water is complete and the stop watch is stopped. The time elapsed in between is the soaking time.

For initial & final setting time "Vicat" instrument as stipulated in IS : 4031-Part-5-1988 is used. The procedure for measurement of 'Initial' and 'Final' setting time is as per the stipulations of IS : 4031-Part 5- 1988.

b) INSTRUMENTS REQUIRED FOR TESTING:

Instruments as required by IS : 4031-Part-5-1988 shall be provided and maintained at the test house.

2.2 METHOD OF TEST FOR COMPRESSIVE STRENGTH OF CEMENT CAPSULE**a) PREPARATION OF TEST SPECIMEN:**

Prepare a cubical test specimen of size 70.6 mm x 70.6 mm x 70.6 mm from the sample of cement capsules collected. For making the cube, portable water shall be used to the same extent as used for preparing specimens for testing of initial and final setting time as stipulated vide para 2.1 of this Annexure. As the cement capsule is already grout with and pre-mixed by the manufacturer in required amounts, no additional sand shall be added for preparing the cube as above. Also curing of the cubes so moulded need not be done. Further, during the making of the cubes, flow tables may be used instead of a vibrator as required under IS 4031 (part 6).

(b) TEST PROCEDURE:

The test procedure shall be as per the stipulations of IS 4031 (Part 6): 1988. Tests shall be carried out in temperature controlled environment at 27 ± 2 deg. C for measuring the

compressive strength of the cube as per the laid down standards after 30 minutes, 2 hours, 24 hours, 7 days, 21 days and 28 days of preparation of the test specimen/mould.

(c) INSTRUMENTS REQUIRED FOR TESTING:

Instruments as required IS 4031 (Parts 6): 1988 by or as prescribed above shall be provided and maintained at the test house.

2.3 METHOD OF ANCHORAGE STRENGTH TEST FOR CEMENT CAPSULE :

(a) PREPARATION :

This test requires a 1500 mm long steel pipe of 38 mm inner diameter- with roughed inside surface and of adequate wall thickness, and a 22mm diameter roof bolt of appropriate length to accommodate a normal hydraulic pull out jack, with suitable threading on one end for a length of atleast 150mm. The test specimen shall be prepared by placing adequate number of soaked cement capsules in the tube to ensure full column grouting and inserting the roof bolt. The specimen shall be left to be cured for the required duration of the test.

(b) PROCEDURE :

Attach a pull out jack/anchorage testing machine to the threaded end of the roof bolt. Apply load to the pull out jack/anchorage strength slowly and steadily as long as the applied load is sustained or the corresponding anchorage strength stipulation of the circular is sustained, whichever is early, as indicated by the reading in the pull out jack/anchorage testing machine.

(c) OBSERVATION :

The specimen under test can be considered as having passed the test if the applied load upto the corresponding stipulations of the test duration as laid down in this circular, is sustained. However, some test specimens may be tested to failure as per the discretion of the test house.

- i. Anchorage testing Machine : 25 Tonnes capacity
- ii. Steel pipe : 1.5m length, 38mm (ID)/Adequate wall thickness with roughed inside surface.
- iii. Roof bolts (TMT Ribbed Bar): 1.6 to 1.8m length, 22mm dia with one end threaded and the other end pointed.

2.4 METHOD OF TEST FOR PRESENCE OF CHLORIDE IN CEMENT CAPSULE:

The methodology of assessment for the presence of 'chloride' in cement capsule samples shall be in accordance with the stipulations of IS 10500: 1991.

2.5 METHOD OF TEST FOR SHRINKAGE AND EXPANSION OF CEMENT CAPSULE:

a) PREPARATION OF TEST SPECIMEN:

Samples shall be prepared as per the stipulations of IS 4031 (Part 10 and Part 3) excepting that no sand need be added to the cement grout mixture. Also, water shall be mixed with the cement grout mixture in the same proportions as used for making specimens to test the initial and final setting time as stipulated vide para 2.1 of this Annexure.

b) PROCEDURE:

The methodology/procedure for testing for shrinkage/expansion of cement grout mixture of cement capsules shall be in accordance with IS 4031 (Part 10) for shrinkage and IS 4031 (Part 3) for expansion. The test houses/manufacturers may choose any one method among

the two methods as prescribed in the IS: 4031 (Part-3) for expansion test, but it should be mentioned in the test report.

c) INSTRUMENTS REQUIRED FOR TESTING :

As per IS 4031 (Part-10 and Part-3).

2.6 METHOD OF TEST FOR MAJOR CHEMICAL CONSTITUENTS OF CEMENT CAPSULES:

The methodology/procedure of assessment major chemical constituents of cement capsule samples shall be in accordance with the stipulations of IS 4032: 1985.

3.0 If any test house has entered into collaboration or transferred the technology/patent/knowledgebase/know-how for manufacturing cement capsule to any firm/manufacturer or has provided assistance to upgrade/renovate/rectificate the quality of cement capsule of any firm/manufacturer, the test report for cement capsule from such test house will not be considered. The test house shall clearly indicate in writing in this regard in the test report.

ANNEXURE - 2

IMPORTANT REQUIREMENTS OF THE MANUFACTURERS OF CEMENT CAPSULES FOR USE IN MINES

1.0 For sake of ensuring the basic quality of the cement capsules being produced, the manufacturers shall possess the following minimum equipments/ facilities.

SL.	Name of Apparatus/Equipment	Quantity (Nos.)	Capacity
1.	Humidifier	One	Humidity 90% Temp.5-50 deg.C
2.	Anchorage Testing Machine	One	25 Tonnes
3.	Compressive Testing Machine	One	25/50 Tonnes
4.	Vicat Apparatus	One	As per IS:5513:1996
5.	Furnance	One	1000 deg.C
6.	Flow Table	One	As per requirement
7.	Stop Watch.	Two	-
8.	Hot Air Oven	One	Ambient – 250 deg.C
9.	Heater	One	500 deg.C
10.	Glassware	As per requirement	-
11.	Chemicals	As per requirement	-
12.	Other instruments/equipments/arrangements	As required by relevant IS.	-

2.0 In order to check the required parameters during manufacturing, it shall be required that the random sampling be collected. Atleast one lot of sample containing adequate number/quantity of cement capsules for every 10,000 pieces of cement capsules manufactured, shall be subjected to all required set of tests as prescribed (standard) above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and countersigned by the quality control officer posted at the manufacturing unit(s). Such records shall be maintained for the purpose of verification for a period of atleast three years from the date of manufacturing.

3.0 The manufacturing firm shall prepare an elaborate usage and storage manual in respect of the batches of cement capsules manufactured for use in mines. With every consignment of cement capsules dispatched to a user, usage and storage manuals shall also be furnished.

5.0 All details on the Loss on Ignition (LOI) values of the individual batch of cement capsules manufactured and dispatched to users shall be recorded in a bound paged book kept for the purpose and shall be signed by the persons carrying out the test and countersigned by the quality control officer posted at the manufacturing unit(s). Such records shall be maintained for the purpose of verification for a period of atleast three years from the date of manufacturing.

6.0 The manufacturing firm shall ensure that every consignment of cement capsules dispatched is suitably protected against exposure to extreme weather which could alter the properties of the cement capsules.

6.0 In case of any particular batch of cement capsules failing to meet the standards on “Compressive Strength test” or the “anchorage strength test” performed at the user end during joint testing, the manufacturer shall take all steps to immediately intimate all other users to withdraw that particular batch which failed, from use and also confirm in writing to this Directorate within 24 hours of being intimated by the user.

ANNEXURE - 3

IMPORTANT REQUIREMENTS OF THE MINING COMPANIES USING CEMENT CAPSULES

1.0 The mining companies using cement capsules for roof bolting purposes shall ensure the following.

a) Proper arrangements are provided and maintained for storage of the cement capsules received in consultation with the respective manufacturers.

b) Every consignment of cement capsules received is suitably protected against exposure to extreme weather which could alter the properties of the cement capsules.

c) Adequate number of effective protective wears and gears are made available in every user mine for handling cement capsules.

2.0 Every mine/area shall carry out tests for ‘Compressive Strength’ for 30 minutes, 2 hours and 24 hours as per the procedure vide Annexure – I and /or anchorage strength assessment for 30 minutes, 2 hours and 24 hours after setting of test roof bolts in the underground workings for every batch/consignment of cement capsules received at the mine/ area and the results of the tests shall be properly recorded in a bound paged book kept for the purpose and also signed by the manager. The above tests shall be completed within maximum 72 hours of the receipt of the each consignment at the Area Level.

3.0 Where, the cement capsules received from a manufacturer do not meet stipulated standards in respect of either or both the above tests, a repeat of both tests shall be conducted in the presence of the representative of the manufacturer and the results of the joint test report of the batch of cement capsules shall be properly recorded in a bound paged book kept for the purpose and also signed by the manager and the representative of the manufacturer.

4.0 If any Batch/consignment is proved failed in joint testing, it shall be ensured that the particular failed batch of the cement capsules supplied shall be withdrawn from use in all mines of the company and intimation thereof shall be sent to this Directorate. A representative sample of the size as required for carrying out a complete laboratory test of the cement capsules of the batch/consignment which had failed during joint witnessing of tests by representatives of the mine and the manufacturer shall be immediately sent for testing in one or two approved test house(s) subject to para 3.0 of Annexure-I. A copy of the report of the test shall be furnished to this Directorate immediately on receipt from the test house.

No.DGMS/Tech.Cir.(Approval) No.06

Dhanbad 27.12.2010.

From
The Director General of Mines Safety
Dhanbad.

To
The Owners, Agents and Managers of all Mines.

Subject: Approval of Safety Belt/Full Body Harness for use in mines.

Sir,

The issue of according specific approval for the safety belt/full body harness to be used in mines was recently examined by this Directorate.

After careful considerations on the matter, this is to inform that for using safety belts/full body harness in mines, the standards as stipulated vide Indian Standard No.IS:3521:1999 shall be considered as approved by the Chief Inspector of Mines by a general order as provided under Regulation 181(3) of the Coal Mines Regulations, 1957 and Regulation 73(1) of the Oil Mines Regulations, 1984.

This circular is being issued in continuation of the earlier issued DGMS (Approval) Circular No.6 of 11/5/2007.

No.DGMS/Tech.Cir.(Approval) No.07

Dhanbad 27/12/ 2010.

From
The Director General of Mines Safety
Dhanbad.

To
The Owners, Agents and Managers of all Mines.

Sub: Approval of all types of lights, lighting fixtures and system including lights On board mobile machinery in HEMMs, Machinery and Plants, indicators or signal lights to be used in mines both on surface and belowground including oil and gas mines/fields.

Sir,

The issue of according specific approval for all types of lights, lighting fixtures and system including lights on board mobile machinery in HEMMs, Machinery and plants, indicators or signal lights to be used in mines both on surface and belowground including oil and gas mines/fields, in accordance with Gazette Notification No.31 dated New Delhi, January 25th 2009, published in Part –II, Section 3, sub-section (i) vide GSR 9, was recently examined by this Directorate.

After careful considerations on the matter, it has been decided to supersede the above referred Gazette Notification by the following.

“In exercise of the power conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation of 181 of the Coal Mines Regulation 1957, as well as sub-regulation (2) of Regulation 75 of the Oil Mines Regulations 1984, and in supersession of the earlier Gazette Notification No.31 dated New Delhi, January 25th, 2009, published in Part-II, Section 3, sub-section (i) vide GSR 9, I hereby require that all types of lightings, lighting fixtures and system, indicators or signal lights to be used in mines belowground and oil and gas mines/fields will be of such type, standard and make as approved by me by a General or special order in writing.”

It is therefore, requested that all actions arising out of the new Gazette Notification as mentioned above be taken by all the Coal and Oil/Gas Mining Companies for strict implementation.

No.DGMS/Technical/Circular (Approval) No.08

Dhanbad 27/12/ 2010.

To

The Owner, Agent, Manager and Manufacturer.

Sub: Approval of Safety Belt/Full Body Harness for use in mines.

This is to inform that for using safety belts/full body harness in mines, the standards as stipulated vide Indian Standard No.IS:3521:1999 shall be considered as approved by the Chief Inspector of Mines by a general order as provided under Regulation 181(3) of the Coal Mines Regulations, 1957 and Regulation 73(1) of the Oil Mines Regulations, 1984. This is being issued in supersession of the earlier issued DGMS (Approval) Circular No.6 of 11/5/2007.

No.DGMS/S&T/Tech.Circular No.01

Dhanbad 21.1.2010.

To

The All Owner, Agents, Managers of Mines.

Sub: Respirable Dust Measurements and Control to Prevent Pneumoconiosis in Mines.

Dear Sir,

It is to bring to the notice of all concerned that an integrated effort is being made by the Government of India to significantly reduce the prevalence of Pneumoconiosis/Silicosis by 2015 and to totally eliminate Pneumoconiosis/Silicosis at Workplaces by 2030 in line with the international Labour Organization (ILO) and the World Health Organizations' (WHO) Global Programme for the Elimination of Silicosis.

Pneumoconiosis

Excessive or long-term exposure to harmful respirable dusts may result in a respiratory disease called pneumoconiosis. Pneumoconiosis is a general name for a number of dust-related lung diseases including.

- Silicosis – Silicosis is a form of pneumoconiosis, a disease of the lungs due to breathing of dust containing silica particles. Silica dust can cause fibrous or scar tissue formations in the lungs which reduce the lung's ability to work, extract oxygen from the air. There is no cure for this disease, thus, prevention is the only answer.
- Coal worker's pneumoconiosis (CWP) – Coal Worker's Pneumoconiosis (CWP) also called Black Lung Disease is a form of Pneumoconiosis in which respirable coal dust particles accumulate in the lungs and darken the tissue. This disease is progressive.
- Asbestosis – Asbestosis is a form of pneumoconiosis caused by asbestos fibers. This disease is also irreversible.

1.1. Symptoms

There are several stages of pneumoconiosis/silicosis. Early stages may go completely unnoticed. Continued exposure may result in the exposed person noticing a shortness of breath upon exercising, possible fever and occasionally bluish skin at the ear lobes or lips. Pneumoconiosis or Silicosis makes a person more susceptible to infectious diseases of the lungs. Progression of the disease leads to fatigue, extreme shortness of breath, loss of appetite, pain in the chest cavity which all may lead eventually to death. Acute pneumoconiosis or silicosis may develop after short periods of exposure. Chronic silicosis usually occurs after 10 or more year of exposure to lower levels of quartz.

1.2 Defining the Dust

A number of materials hazardous to health are present at the work place in the form of aerosols i.e suspensions of solid or liquid particles in air. Dust is generally understood to be an aerosol of solid particles of size 0.1 μm and above. Most of the dusts contain particles of wide range of sizes. Behaviour, deposition and its effect after entry into the human respiratory system depend on the nature and size of the particle.

Dust consists of solid particles carried by air currents. Coal or Rock dust originates at impact points (including drilling, blasting, loading, unloading, crushing and grinding), from previous accumulations or from weathering. A wide range of particle sizes can be produced during a dust generating process. Larger particles settle more quickly than smaller particles and the smallest particles can remain suspended in the air indefinitely. Dust is typically measured in micrometers (commonly known as microns). Coal or Rock dust can range in size from over 100 μm to less than 2 μm . As a comparison, red blood cells are typical 8 μm and human hair ranges from 50-75 μm in size.

For the purposes of occupational hygiene, it is important to consider the concentrations of dust present in different size fractions.

- (a) Inhalable Dust – It is the fraction of airborne dust that enters the nose and mouth during breathing, and is therefore available for deposition in the respiratory tract.
- (b) Respirable Dust – It is the fraction of inhalable dust that penetrates into the gas exchange region of the lung. It is mostly in the size fraction of 0.1 to 10 μm .

2.0 Exposure Limits

In order to ensure that the work place is safe for the workers to work continuously for a period of eight hours in a shift, many studies and investigations have been carried out world over and the maximum exposure limits (MELs) have been prescribed. In USA, MEL is prescribed as 2 mg/m^3 for eight hours time weighted average provided the concentration of silica in the respirable dust remains less than 5%. In case the % of Silica content in the respirable dust exceeds 5, the MEL is calculated to be 10 divided by the % of Silica content in the respirable dust. In India, the MEL is prescribed as 3 mg/m^3 for eight hours time weighted average provided the concentration of silica in the respirable dust remains less than 5%. In case the % of Silica content in the respirable dust exceeds 5, the MEL is calculated to be 15 divided by the % of Silica content in the respirable dust. It is, therefore essential to determine the concentration of silica in the respirable dust in order to define the threshold limit (MEL) of the concentration of respirable dust at any work place. Regulation 123 of the Coal Mines Regulations, 1957 as well as regulation 124 of the Metalliferous Mines Regulations, 1961 clearly specify provisions therefore.

In many countries, the maximum exposure limits (MEL) for crystalline silica in respirable airborne dusts has been prescribed to be 0.3 mg/m^3 for eight hours time weighted average (TWA). However, in most of the cases, it is reasonably practicable to control exposure to 0.1 mg/m^3 (8 hours TWA) or less by engineering or process control.

It is advised that the mine management should ensure that the workers are not exposed to respirable crystalline silica dust concentrations above this level. If exposure can not be controlled to 0.1 mg/m^3 (8-hours TWA) or below, by elimination, engineering or process control, then the exposure must be controlled by provision and use of suitable respiratory protective equipment as provided under sub regulation (4) of regulation 123 of the Coal Mines Regulations, 1957 and that of the Metalliferous Mines Regulations, 1961.

3.0 Sampling and Analysis of Respirable Dust Concentrations

In order to ensure that the work place is safe and free from the risk of respirable dust, it is essential to measure and analyze the concentration of respirable dust at the work places. Specific provisions have been made in this regard under sub-regulation (3) and (4) of regulation 123 of the Coal Mines Regulations, 1957 and the Metalliferous Mines Regulations

1961. Provisions for static monitoring and portal to portal personal monitoring have also been made under these regulations.

However, it has been found that the determination of respirable concentration of dust requires weighing of the filters and analysis of the silica content therein, which takes time, during this intervening period, the persons are exposed to higher dust concentration levels in cases where the concentration exceeds the threshold level, before any corrective measures and controls are put in place. Advances in instrumentation for dust measurements have been made and Real Time Dust Monitors are now available which indicates the actual dust concentration level on the site of measurements directly but the Silica concentration level is to be determined in the laboratory only.

There are mainly two standard analytical methods for determination of crystalline silica content in the dust that are Infra Red Spectrophotometry and X-Ray Diffraction methods. Standard Methods and Instruments are available for this purpose. Central Institute of Mining and Fuel Research (CIMFR), Dhanbad and M/s. Startech Labs Private Limited, 2nd Floor, SMR Chamber, H.No.1-58/7, Opposite St. Ann's Junior College, Madaniguda, Serilingampally, Hyderabad – 500 050, A.P. have been approved for this purpose. It is however advised that each mining company having large numbers of mines should have properly equipped and approved laboratory to assess the dust concentration and free silica in the dust so that the delay, in obtaining the results and follow up actions thereon, is avoided. Detailed Guidelines on the issue of determination of dust concentration at work places in mines have already been provided in the DGMS Circular No.1 of 2004. Companies owning more number of mines having established such facilities may also extend the services to smaller companies and mines especially in unorganized mining sector.

3.1 Sample Survey of Dust Control Measures in Mines

The Science and Technology Wing of DGMS have recently conducted airborne dust survey in some of the mines of Coal Companies as well as Non-Coal Companies during the years 2004 to 2009. During the Survey, the following observations were made:

- (i) The Time weighted Average Concentration 30m out by of the return airway in a Longwall Panel was found to be 31.40mg/m³. TWA concentrations of dust for Face Crew, Shearer Operator and Helpers measured by Personal Dust Sampler were 5.64, 9.54 and 7.02 mg/m³ respectively.
- (ii) SDL & Drill Operators at the Face in depillaring districts of underground coal mine were subjected to higher level of dust concentrations when measured by Personal Dust Sampler.
- (iii) In most of the Opencast Coal Mines, dry drilling was being done and the water spraying arrangements were either non functional or ineffective, which resulted into exposure of Drilling Crew, Shovel & Dozer Operators to the level of dust beyond permissible limits.
- (iv) System was not established to measure and control the dust exposure to persons within permissible limits.

In view of the observations made above, it is recommended that –

- (b) The concentrations of dust and crystalline silica content therein should be determined for the strata encountered during drilling in Overburden Benches and also for every coal seam in the mine.
- (c) Wherever there is change in the strata condition, the same measurements should be done at such places also.
- (d) In underground workings, the concentration of respirable dust should also be determined while drilling in the floor as well as into the roof up to a level/depth which are required to be used for roof bolting, cable bolting or for any other purpose.
- (e) Dust Measurements should invariably be done while using new drill bits/picks and while rejecting the bits/picks so as to know the dust generation profile of the drill machines/Continuous Miner or any other cutting Machine.

4.0 Occupation Health Survey and Monitoring

In spite of the all the best efforts and system put in place in the mine, it has been found that the persons working at places prone to generate airborne dust are exposed to respirable dust beyond permissible limits. Such persons or Group of persons are more likely to get affected with the diseases caused due to airborne dust i.e. silicosis and pneumoconiosis. The cases of such affected persons are detected only at the time of medical examinations which are conducted an interval of five years or on complaints of ailments reported in the hospitals.

In view of the potential danger of dust prone disease existing at the work places/processes in the mine, it is recommended that –

- (a) The Medical Examination of Identified persons or Group of Persons working at places or operations/processes prone to generate airborne dust should be conducted once in every year and the Results of such medical examinations should be correlated with the dust exposure profiles of that place(s) and or process(s).
- (b) During the conduct of Medical Examination of such select persons or group of persons, an Officer of Occupational Health Wing from this Directorate should also be called as an external member.
- (c) In case of any person found suspected for contracting disease due to airborne dust, the case may be reported to this Directorate immediately in the prescribed format (Form V).
- (d) Apart from the above, an independent team of Medical Experts on Pneumoconiosis and Silicosis may be formed by selecting doctors from outside the companies and such team should be entrusted with the work of medical examinations at least once in every year for the above purpose independently.
- (e) The Reports of medical examinations of such independent team should be submitted to this Directorate at the end of every year.
- (f) In case, a person is found to be affected with Pneumoconiosis or silicosis, the details regarding his work profile, degree of disability, medical history and expenses, compensation and the status of health and rehabilitation measures taken by the company etc. should be sent to this Directorate immediately in the prescribed Form –VA.
- (g) Suitable Training Module for imparting training to Medical Officers engaged in conducting medical examinations for identification of Silicosis/Pneumoconiosis as per the ILO Classification of Chest Radiograph shall be prepared and conducted once in every year so that the Medical Officers are adequately trained and equipped to identify the cases of Silicosis/ Pneumoconiosis without any doubts or ambiguity.

It is, therefore requested to all concerned that a concerted and integrated efforts in line with the above recommendations be made at all levels to ensure that the incidence of diseases due to respirable dust is eliminated from the mining industry.

It is further requested that the expertise and the facilities for dust monitoring and medical surveillance existing in the organized sector should also be extended to unorganized sector mines so that the menace of silicosis and pneumoconiosis is eliminated and the miners are protected from this industrial disease.

Form – V A**INFORMATION IN RESPECT OF REPORTED CASES OF SILICOSIS/ PNEUMOCONIOSIS**

SL No.	Name of Employee	Designation	Name of Mine	Length of Service on the date of detection	Date of detection	Percentage of disability	Expenses incurred on medical treatment of silicosis / pneumoconiosis
1	2	3	4	5	6	7	8

Compensation paid in Rupees	Compensation due in Rupees	Present Health Status	Rehabilitation Measures Taken	Remarks
1	2	3	4	5

Name & Signature of Medical Officer
 Name & Signature of Agent
 Who detected the case.

Name & Signature of Manager

Name & Signature of Agent.

To
The All Owners, Agents, Managers of Mines.

Sub: Design, Control and Monitoring of Pit and Dump Slopes in Opencast Mines.

Sir,

1.0 INTRODUCTION:

In India, fast increase in output of various minerals can be largely attributed to rapid increase in opencast mining activities and intensified mechanization. This has resulted in the opencast mines going deeper day by day with the maximum stripping ratio being planned currently looking upto 1:15, at a depth of about 500 m. As a direct consequence, the amount of waste mining and dumping will also be commensurately very high thereby increasing the risks of highwall, slope and dump failures tremendously. With more and more stringent environmental damage control regimes and non-availability of alternative lands for afforestation purposes, the risks assume very complex proportions with the deep excavations and growing dumpyards altering the complex stress concentration levels. Under such situations with most production areas concentrated close to the excavation floor, there is a constant danger to the men and machinery deployed thereat with a potential to cause catastrophic loss of life and property.

An analysis of the accidents in opencast mines revealed that slope failure and dump failures have started assuming an upwards trend in the recent times. A few of the recent fatal accidents/dangerous occurrences in opencast mines involving slope and dump failures were as follows.

- a) In Kawadi Opencast coal mine of M/s. Western Coalfields Limited on 24/06/2000 in which ten persons including the blasting overman and sirdar were trapped and killed due to slope failure of 31m high over burden bench.
- b) In Tollem Iron Ore Mine M/s. Kunda R.Gharse in Goa on 09/12/2006 in which six persons were trapped and killed under the debris due to slope failure of 30 to 46m high Dump and benches in the mine.
- c) In Jayant Opencast Project of M/s. Northern Coalfields Limited on 17/12/2008 in which a portion of the dragline dump measuring 135m (length) x 70m (height along the side of the slope) x 6 to 19m (height across the slope) failed suddenly and trapped five persons to death and buried a shovel at its bottom.
- d) In Sasti Opencast Coal Mine of M/s. Western Coalfields Limited on 04/06/2009 wherein a dragline overburden dump of 73m height failed and slid down the pit resulting in deaths of two persons and burial of two excavators.
- e) In Hamsa Minerals and Export Granite mine on 25/2/2010 where a mass of Granite stone measuring about 30m long x 35-45m height x 10m thickness slid along a known inclined joint plane and fell from height varying between 10 to 55m on 18 persons working at the pit floor them burying and inflicting fatal injuries to 14 persons with serious bodily injuries to another.
- f) In a private soapstone mine, a portion of the almost vertical 17m high bench side with several undercuts slid suddenly, trapping and fatally injuring 3 persons working at the bottom. This was immediately followed by a subsequent failure from the same area measuring about 8m long x 7m high x 1.5m to 2.0m thick which trapped another five persons who were engaged in the rescue operations.
- g) In another coal mine, a total volume of around 1,30,000 m³ of waste material slid from a height of 10m to 12m to the bench floor, without involving any casualty.
- h) A deep seated circular failure of an overburden dump about 62m high, made on the foundation of 10-15m thick soil, caused severe upheaval to an adjacent arterial road and damage to a 400 KV overhead line in a coal mine. The road got totally blocked and power supply got disrupted.

The analysis also converged on one common but a major factor causing the accidents that of the lack of scientific design and monitoring of the pit and the dump slopes in mines.

There are several ways to reduce the chances of surface ground control failures as given below.

- (a) Safe geotechnical designs,
- (b) Secondary supports or fall catchments arrangements and
- (c) Monitoring devices for advance warning of impending failures.

Safe geotechnical design is with a single focused objective that of ensuring adequate stability against any failure while working, involving the complete study of local geologic formations/structures, rock mass properties, hydrologic conditions and the rainfall pattern about the openpit. While a flatter slope always means better stability, it also involves permanent locking up of huge quantities of mineral reserves. On the contrary, steeper slope greatly increases the potential of failures. Therefore, a scientific balance has to be constantly established between the two situations catering to the expected life of the benches.

While it is very important to have good geotechnical designs of dumps and slopes, effective monitoring and examination of slopes for failure warning signs is the most important means of protecting exposed mine workers. Even, very carefully designed slopes may experience failure from unknown geologic structures, unexpected weathers or seismic shock etc. The problem of such failures are getting compounded manifold due to non-availability of land for dumps leading to increased height of the existing dumps, poor drainage systems, proximity to inhabited areas, non-separation of top-soil during excavation, etc.

2.0 Monitoring of side and slopes in Opencast Workings :

Conventional monitoring methods depend on regular surveying of the sides and slopes of the benches and dumps using the most modern survey instruments and associated software. Additional instruments can be used as part of a comprehensive system to register subsurface rock mass displacement, groundwater parameters, and blast vibration levels. Aside from visual inspection, these methods provide displacement information only for a single site, or at best, at discrete number of sites. If the monitored sites are too widely separated or if displacement occurs between sites, early indications of an impending slope failure might go unnoticed. In addition, these monitoring tools are difficult to install at many quarries and surface coal mines where steep highwalls and lack of benches limit access to areas above the working floor which is very common in dragline dumping in coal mining. With the constantly shifting mining front and the need for regular monitoring increasing steadily, relocating monitoring devices is not only costly and time consuming, but can also be dangerous on unstable slopes. Point –by-point monitoring of every potential failure block in a mine or dump slope is not practical. In some countries, scanning laser rangefinders have been used wherein ground displacements were detected by comparing successive scans but processing requirements and scan rates have so far made repeat pass intervals too great for effective and timely slope monitoring. In addition, the range and accuracy of these systems are impaired by differences in the reflectivity of the rock, the angle of the rock face, weather, and other factors.

However, radar technology – used widely in a variety of fields for several decades, has found its utility of recent in monitoring ground movements in mining applications. This technology sports distinct advantages over conventional methods in its ability to cover large areas on the surface for true two-dimensional monitoring day and night in almost any weather, and atmospheric dust and/or haze have little effect. Radar's active transmit/receive mode of operation also provides an advantage over passive optical methods that depend on solar or other illumination/reflection etc. The present day advanced computing techniques have provided the low-cost processing power needed for complex ground movement computations. Further, the widespread adoption of modern wireless communication devices has resulted in practical integrated circuits for microwave frequencies that can be used in task-specific radar applications.

Slope Stability Radar (SSR), developed on the above radar technology, is now being widely used in several countries to provide real time monitoring and advance warning signals before any slope or dump failure in opencast mines. The SSR system can detect and alert movements of a wall with sub-millimeter precision, with continuity and broad area coverage. This monitoring occurs without the need for mounted reflectors or equipment on the wall or slope and the radar waves adequately penetrate through rain, dust and smoke, 24 hours a day. The SSR system produces data for interpretation usually within minutes. The radar is moved around the mine in a repeatable manner to compare movements at each site over an extended time and determine problematic areas. Cyclic monitoring off the focus area in this manner is often used to identify new places where impending signs of developing failure patches are observed. The latest instruments have the radar technology suitably integrated with a real time visual imaging system for continuously scanning the problem area to identify the potential areas of failure and visualize any impending ground movement/failure, by comparing the repeated measurements against the first scan. Such systems can also have suitable audio-visual warning systems incorporated for activation at any pre-set value being breached due to ground movements. Alternatively, Synthetic Aperture Radars (SAR), a type of ground-mapping radar that was originally designed to be used from aircraft and satellites, may be used to generate high quality digital elevation maps and to detect disturbances of earth's surface.

All these point to the fact that, strong, reliable and person independent monitoring systems need to be introduced at Indian Opencast mines on an urgent basis.

3.0 Application of Slope Stability Radar in Monitoring of Slope & Dumps in Opencast Mines:

The SSR have been successfully used in some countries with highly variably geotechnical conditions including massive hard rock, intensely fractured, foliated rocks, weathered rock, coal strata and waste dumps of variable characteristics. Several case studies of the SSR providing improved operational risk management by characterizing the slope instability, and providing sufficient warning time prior to failure, have been reported all over the world during last five to eight years.

3.1 Experiences in Coal Mines

- (i) The Mount Owen Coal Mine of M/s. Xstrata Coal in Hunter Valley, Australia is one of the deepest opencast coal mines in Australia with depths in excess of 270m and has extreme and unusual geological conditions. SSR installed in the mine indicated warning of huge failure (20million m³) four hours before its occurrence in January 2005 and saved valuable life and properties.
- (ii) In Drayton and Leigh Creek Mine in Australia where SSRs were deployed, the advance warnings of impending failure of the slope were given 3 hours prior to the occurrences and resulted into safety of persons and the machinery.

3.2 Experiences in Metalliferous Mines

- (i) Mount Polley Copper Mine of M/s. Imperial Metals Corporation in British Columbia, Kimberly Diamond mine of M/s. De Beers and Sandsloot Open Pit Platinum Mine of M/s. Anglo Platinum in South Africa and many other mines have reported successful deployment of SSR and its timely detection and warning system that has saved many precious lives and property.
- (ii) Rampura and Aghucha Zinc Mine of M/s. Hindustan Zinc Limited in Rajasthan, India is the only mine in India where SSR is being used to monitor its opencast workings to give pre-warn against any such slope failures.

4.0 Conclusion and Recommendation:

In view of the scenario explained above, it is essential to take following steps immediately:

- (i) Design mine and the pit as well as dump slope scientifically taking into consideration of geotechnical parameters of rock and the dumps including hydro geologic and weather conditions to ensure stable pit and Dump slope profile not only during mining but also thereafter; and
- (ii) Deploy Slope Stability Radar (SSR) with integrated visual imaging system or any similar such technology giving a real time monitoring of displacements of strata or dumps well in advance of any failure and providing mine management sufficient time to safety withdraw men and machinery from such prone areas. Such systems would not only increase safety but also the productivity and efficiency of opencast operations.

In view of the seriousness of the implications of ground movements in open pit excavations, all mining companies having open pit excavations are urged to immediately initiate a time bound concrete action plan on the above matters.

No.DGMS/S&T/Tech.Cir.(Approval) No.03

Dated 22.9.2010

To:

The Owner, Agent, Manager of All Mines & The Manufacturers.

Subject: Revised Standards for testing and use of Resin Capsules as grouting material for Roof Bolting in Mines.

1.0 BACKGROUND:

- 1.1 On 2nd September, 2010, the existing DGMS Technical (Approval) Circular No.10 of 13/7/2009 on Standard Composition and Properties required for resin capsules to be used as grouting material for roof bolting purposes, was reviewed at DGMS, Dhanbad in the presence of representatives from the manufacturers, users like M/s.BCCL, M/s.ECL, M/s.CCL, M/s.SCCL, M/s.SECL, M/s.WCL, M/s.MCL & M/s.IISCo and research institutions like ISM, CIMFR, M/s.CMPDIL-Ranchi. During the meeting, the prevailing standard was reviewed point by point in details.
- 1.2 After careful consideration of the views from the gathering and other expert opinions, a set of revised standards for testing and use of Resin Capsules as grouting material for Roof Bolting in Mines along with guidelines/procedures for the test houses meeting the requirements of DGMS (Technical) Circular No.5 of 1994, manufacturers and the users have been formulated which are as follows.

2.0 STANDARD PARAMETERS:

2.1 Gel Time and Setting Time :

The measured Gel Time and Setting Time of the resin capsule shall conform to the standards as given below.

(f) Gel Time & Setting Time :	
a) For FAST SET type	23 Seconds (minimum) to 54 seconds (maximum)
b) For SLOW SET type	134 Seconds (minimum) to 202 seconds (maximum)

2.2 Reaction Temperature & Thermal Stability:

The reaction temperature and the thermal stability of the resin capsule shall be as given below.

Reaction Temperature (Deg.C)	Not more than 80.
Thermal Stability ▪ At 5 deg.C for one hour ▪ At 45 deg.C for one hour	The sample shall satisfy the gel time and setting time criteria as stipulated vide clause 2.1.

2.3 Physico-Mechanical Properties :

The Physico-mechanical properties of the resin capsule after setting conform to the following parameters and values.

1.	Compressive Strength: (Applicable for slow-set type of resin only) ▪ 30 minutes. ▪ 24 hours.	▪ 30.0 MPa(min) ▪ 80.0 MPa(min)
2.	Bond Strength Test: ▪ 30 minutes. ▪ 24 hours.	▪ 10.0 Tonnes ▪ 15.0 Tonnes
3.	Shear Test : The measured strength as per procedure defined in Annexure-1.	The sample shall record a minimum of 19 MPa.
	Shrinkage test : (Applicable for slow-set type of resin only) ▪ 24 hrs. ▪ 7 days.	▪ 0.01%(max) ▪ 0.01%(max)

2.4 Other Properties:

1.	Flammability Test :	The product should be of very low flammability.

2.5 it is therefore, essential that for any make of resin capsule to be used in mines as grouting material, it shall satisfactorily meet all the stipulated parameters as above.

3.0 IMPORTANT REQUIREMENTS OF THE TEST HOUSES MEETING THE REQUIREMENT OF DGMS (TECHNICAL) CIRCULAR NO.5 OF 1994.

3.1 For assessing the above standard properties of resin capsules and for sake of ensuring uniformity amongst the test houses, tests as per the procedure shown in **Annexure-1** shall be performed by the approved test houses.

4.0 IMPORTANT REQUIREMENT OF THE MANUFACTURERS OF RESIN CAPSULES:

4.1 The basic consideration for approval for any resin capsule manufactured by a firm is the report of successful laboratory test of representative samples. It is therefore, mandatory that after approval, the manufacturers always maintain the quality of the resin capsule satisfying all the above properties. For this sake, the manufacturers shall ensure the requirements as stipulated in Annexure -2 to this Circular.

5.0 IMPORTANT REQUIREMENTS OF THE MINING COMPANIES USING RESIN CAPSULES:

- 5.1 In Order to ensure that the samples of resin capsules always comply with the standards as stipulated vide para 2.0 of this Circular, it is very essential that suitable mechanisms are evolved by the mining companies at mine/area levels as per convenience to constantly monitor the quality. Some of the important arrangements which shall be always maintained at the mine/area level by the mining companies are as stipulated in Annexure -3 to this Circular.
- 6.0 Manufacturers , users and the Test houses engaged for testing resin capsules are therefore, requested to ensure the above mentioned standard and parameters before supplying and using in mines.
- 7.0 This circular supersedes all earlier circulars on the subject issued from time to time and will come into force with immediate effect in so however that for facilitating satisfactory development of facilities/arrangements as per Annexure 1,2 and 3 by test houses meeting the requirements of DGMS(Technical) Circular No.5 of 1994, manufacturers and users respectively, a period of six months as reckoned from the date of issue of this Circular is permitted.

ANNEXURE-1

IMPORTANT REQUIREMENT OF THE TEST HOUSES MEETING THE REQUIREMENT OF DGMS (TECHNICAL) CIRCULAR NO.5 OF 1994.

1.0 GENERAL REQUIREMENT:

- 1.1 Every laboratory engaged in testing of samples of resin capsules shall develop suitable protocol in respect of the receipt of untampered samples. The details of the protocol as above shall be notified to every manufacturing firm seeking test of resin capsules.
- 1.2 Atleast, 100 numbers of 24mm dia x 600 mm or equivalent sized resin capsules shall be received from the manufacturers for the purpose of testing.

1.0 STANDARD PROCEDURES TO BE ADOPTED BY APPROVED TEST HOUSES FOR LABORATORY TESTING OF RESIN CAPSULES :

2.1 METHOD OF TEST FOR GEL TIME & SETTING TIME OF RESIN CAPSULE

(a) DEFINITION

Period during which a resin matrix and proportionate catalyst can be mixed evenly before it begins to turn from fluid to solid state. Set time is the time taken from the gel state to the hardened state.

(b) PREPARATION OF TEST SPECIMEN

Weight at least 25 grams of Resin matrix into a plastic mug and note the mass of resin matrix taken and cover the resin matrix with a small piece of a film. Onto the film in the cup, weigh out, to the accuracy of the quantity of the catalyst proportionately as available in the resin capsules, ensuring that the two substances do not mix any way. Condition the cup and its contents in the conditioner until the temperature of the contents is stable at 27+ 2 deg.C. Retaining the cup in the conditioner and using the Spatula, Scrape the whole quantity of catalyst from the film into the resin matrix.

(c) PROCEDURE

Immediately start the stop watch and begin mixing the resin matrix and catalyst together and continue mixing till the mixture turns from fluid to beginning of hardening state and finally

hardens. Take a pin and try to insert at regular intervals of 2 seconds, when the pin starts hitting the surface, note the time. This is the total of gel and set time.

(d) INSTRUMENTS REQUIRED FOR TESTING

- (a) Stop Watch
- (b) Plastic cup
- (c) Electronic weighing scale
- (d) Metal Allpin.

2.2.A METHOD OF TEST FOR MAXIMUM REACTION TEMPERATURE OF RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

100 grams resin matrix and proportionate quantity of Catalyst in proportion as stipulated by the manufacturer are mixed thoroughly and put into a glass beaker of 5 cm diameter.

(b) PROCEDURE

The main knob of the mercury thermometer/thermo-couple is coated with any mould oil and is inserted into the resin mix up to maximum 25mm and the maximum temperature shown in the thermometer is recorded for 3 tests and the mean value shall be recorded as final result.

(c) INSTRUMENTS REQUIRED FOR TESTING

- (A) Beaker of 5 cm dia : 200 ml. capacity
- (B) Mercury thermometer/ : 150 degree C max.
Thermo-couple

2.2.B METHOD OF TEST FOR THERMAL STABILITY OF RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

Keep 3 nos. of Resin capsules at 5 degree C for one hour. Remove the samples and condition till they achieve a temperature of 27+/-2 degree C. Keep the same samples 3 nos. of Resin Capsules at 45 degree C for another one hour and then again condition all the Resin Capsules till 27+/-2 degree C.

(b) PROCEDURE

Measure the Gel time and Set time of all the specimens by the procedure as prescribed in 2.1 as above.

(c) OBSERVATION

The Gel time and set time of all the specimens shall be within specified limit as prescribed in the standards.

(d) INSTRUMENTS REQUIRED FOR TESTING

- (A) Refrigerator - 1 no.
- (B) Oven - 1 no.
- (C) Stop Watch
- (D) Plastic Cup

- (E) Electronic weighing scale
- (F) Plastic film
- (G) Metal Allpin.

2.3.(1) METHOD OF TEST FOR COMPRESSIVE STRENGTH OF SLOW SET RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

Prepare a test specimen from the same batch of Resin each measuring 50mm x 50mm x 50mm. Prepare the test specimens, including the conditioning, proportioning and mixing of Resin matrix & Catalyst and conditioning and filling of the moulds, but casting and curing the specimens at 27 degree +/-2 degree C.

(b) PROCEDURE

Carry out all the tests at 27 degree +/-2 degree C after 30 minutes and 24 hours after preparation of the test specimens. The test duration shall be counted from the preparation of the test moulds.

Measure the width and thickness of each specimen at its centre to the nearest 0.1mm and calculate the cross – sectional area.

Wipe clean the bearing surface of the testing machine and any auxiliary platens. Remove any loose grit or other material from the surfaces of the cube that are to be in contact with the compression platens. Place the test cube in the machine in such a manner that the load is applied to sides of the test cubes as cast, i.e. not to the top and the bottom. Place the cube on the lower machine platen and carefully centre. Do not use any packing at any of the interfaces between the test specimen, auxiliary platens, spacing blocks and machine platens.

(c) OBSERVATION

The compressive strength of each cube is calculated to the nearest of 0.1 MPa by maximum load (N)/original cross sectional area (mn²).

30 minutes duration compressive strength of 8 specimens is taken and the minimum and maximum reading are discarded and the mean value of the middle 6 readings is to be taken as result. Similar procedure is applied for 24 hours duration compressive strength testing.

(d) INSTRUMENTS REQUIRED FOR TESTING

(A) Compressive Strength Machine	: 50 Tonnes capacity
(B) Cube Moulds (50mm)	: As per IS : 10086:1982
(C) Poking Rod	: As per IS: 10086:1982
(D) Gauging Trowel	:100-150 mm length & Weighing 210+/-10 grams.

2.3(2) METHOD OF TESTING OF BOND STRENGTH OF RESIN CAPSULE

(a) PREPARATION

A pipe of 25mm inner diameter and 37.5mm outer diameter and 300mm length with 27 x 3 internal metric threads and a 22mm diameter roof bolt bar of appropriate length to accommodation a normal hydraulic jack, with suitable threading on one end for a length of atleast 150mm are taken. The test specimen shall be prepared by placing resin matrix and catalyst mixture into the threaded tube, inserting the roof bolt bar and

rotating the bar in accordance with the instructions of the manufacturer. The specimen shall be cured for the required duration of the test.

(b) PROCEDURE

Assemble the grouted pipe section as shown in the figure- A and attach the dial indicator to the rear end of the grouted roof bolt bar to indicate movement at the end of the bar.

(c) OBSERVATION

Take the maximum bond load reading till the displacement up to 5mm and the mean value is calculated from three tests.

(d) APPRATUS

- (A) A section of pipe of 25mm ID & 37.5 mm OD, of a total length of 600mm of which, 300mm length shall be with 27 x 3 internal metric threads.
- (B) Roof bolt bar of appropriate length to accommodate a normal hydraulic jack, including 150mm threading with nut.
- (C) Anchor machine 25MT capacities with full assembly (jack with central hole, pump and pressure gauge and hose pipe).
- (D) Dial indicator for measuring displacement of 0.02 mm least count with suitable fixing attachments.
- (E) Steel collar for supporting hydraulic jack and pipe section.

2.3(3) METHOD OF TEST FOR SHEAR STRENGTH OF SET RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

Separately weigh out approximately 10 grams of Resin matrix and the recommended quantity of Catalyst there for , as stipulated by the manufacturer. Cool in a refrigerator. Place a metal washer on the film. Mix together the cooled Resin matrix and catalyst and mould a test specimen I the washer, using a knife blade to ensure that no air bubbles are entrapped I the specimen. Prepare at least 6 specimens. Before testing, condition the specimens for 3 hours at 50 degree C.

(b) PROCEDURE

Allow the specimens to cool in air to a temperature of 27+/-2 degree C, then measure the thickness of a specimen (in the washer), to the nearest 0.01 mm at several points. Position the specimen symmetrically in the punching tool assembly and screw the die home against the test specimen in the bolster, using only sufficient force to ensure that there is no clearance between the test piece and the adjacent surfaces of the die and the bolster.

Position the punching tool assembly on the loading device and using the punch, so apply a steadily increasing force to the test specimen that the test specimen fractures within 15 seconds to 45 seconds. Repeat the test on the remaining 5 test specimens.

(c) INSTRUMENTS REQUIRED FOR TESTING

- (A) Refrigerator : 4.0 degree C+/-1.0 degree C
- (B) Metal Washers : 3.0 mm+/-0.1 mm thickness,
25.0mm+/-0.2mm OD &
21.6mm+/-0.5mm ID
- (C) A Punching Tool assembly : Punch dia. 12.575mm to 12.591mm
& Die of diameter 12.707mm
To 12.723mm

(D) Compressive Strength Machine: 2000 N $\pm$ 20 N to the punch at Uniform rate.

(E) Film (LDPE) : Compatible with Resin matrix & Catalyst

2.3(4) METHOD OF TEST FOR SHRINKAGE TEST OF SLOW SET RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

The moulds shall be thinly covered with mineral oil. After this operation, the stainless steel or non-corroding metal reference insets with knurl heads shall be set to obtain a effective gauze length of 250mm, care being taken to keep them clean and free of oil.

Clean appliances shall be used for mixing of Resin matrix and Catalyst in a proportion as stipulated by the manufacturer, at 27 $\pm$ 2 degree C.

Immediately following the completion of mixing, the test specimen shall be moulded in the two layers, each layer being compacted with jerks and vibration through Flow Table. After the top layer has been compacted, the Resin mix shall be labeled of flush with the top of the mould and the surface smoothen with a few strokes of the trowel. During the operation of mixing and moulding rubber hand gloves shall be used.

(b) PROCEDURE

After filling the moulds, place them immediately in Humidifier at 27 $\pm$ 2 degree C and 50 $\pm$ 5% relative humidity for 24 $\pm$ 2 Hours. Then remove the specimen from the moulds. Measure the length at 27 $\pm$ 2 degree C using the length comparator. Place the moulds back into the Humidifier at 27 $\pm$ 2 degree C and 50 $\pm$ 5% relative humidity. Remove the specimens from the Humidifier and measure the length at 27 $\pm$ 2 degree C using the length comparator.

After the specimens are measured at the age of 24 hours and 7 days, calculate the average difference in length of 3 specimens to the nearest 0.01% of the effective gauze length and report this difference as shrinkage.

(c) INSTRUMENTS REQUIRED FOR TESTING

(A) Beam Mould	: 25x25x282mm Internal Length IS:10086:1982
(B) Control Cabinet	: 90% Humidity max and 50 degree C max.
(C) Length comparator	: As per IS : 9559:1980
(D) Gauzing Trowel	: 100 to 150mm Length and mass 210 $\pm$ 10g
(E) Flow Table	: IS:5512:1969

2.4 METHOD OF TEST FOR FLAMMABILITY OF CASTED RESIN CAPSULE

(a) OUTLINE OF THE METHOD

The casted sheet of Resin Capsule is subjected to a flame for specified time from Bunsen Burner and its Flammability evaluated.

(b) PREPARATION OF SPECIMEN

Resin matrix and Catalyst are mixed thoroughly and casted sheet is prepared. From this caste sheet four specimens shall be cut not less than 150mm long, 12.0 $\pm$ 0.5 mm wide, and 3.0 $\pm$ 0.15mm thick and a line shall be drawn, across the specimen at 75mm from the end to be ignited, at right angles to the longitudinal axis.

(c) PROCEDURE

Test the specimen in a draught – free atmosphere (see Figure – 'B'). Clamp the specimen in a rigid support at one end so that its longitudinal axis is horizontal and its transverse axis is at 45 deg. To the horizontal and the line on the specimen at 75mm is clearly visible. Clamp a piece of clear wire gauze (seven mesh per linear cm) 12mm square in a horizontal position 6mm below the specimen with 6mm of the unsupported end of the specimen projecting beyond the edge of the gauze. Place a Bunsen centrally under the free end of the specimen so that the top of the burner is 50mm vertically below the longitudinal axis of the specimen. The temperature of the flame shall be such that a piece of the 0.70mm diameter copper wire held 5cm above the top of the burner melts within 6 seconds. Remove the flame after 30 seconds and record the time taken until the specimen ceases to flame or glow. In the event of the specimen extinguishing within 10 seconds of the removal of the flame, apply again the flame for a further 30 seconds.

(d) ASSESSMENT (VERY LOW FLAMMABILITY)

At least 3 or 4 specimens shall cease to flame or glow within 10 seconds of the removal of the flame and again within 10 seconds after the second removal of the flame.

(e) INSTRUMENTS REQUIRED FOR TESTING

- (A) Draught free box
- (B) Bunsen Burner
- (C) Stop Watch
- (D) Die Mould for Resin cast sheet
- (E) Screw gauze

ANNEXURE -2

**IMPORTANT REQUIREMENTS OF THE MANUFACTURERS OF RESIN CAPSULES
FOR USE IN MINES**

- 1.0 For sake of ensuring the basic quality of the resin capsules being produced, the manufacturers shall possess the following minimum equipments/facilities.

No.	Name of Equipment	Quantity (Nos.)	Capacity
1.	Gel & Setting Time Measuring apparatus	One	---
2.	Humidifier	One	Humidity 90% Temp. 5 to 50 deg.C.
3.	Anchorage Testing Machine	One	30 Tonnes
4.	Universal Testing Machine	One	50 Tonnes
5.	Stop Watch	Two	---
6.	Flammability test set up	One	---
7.	Moulds	Different sizes	---
8.	Glassware	As per reg.	---
9.	Draught free box	1	As per drawing
10.	Bunsen burner	1	
11.	Die mould for resin cast sheet.	1	
12.	Screw gauge	1	As per IS:10086:1982
13.	Poking rod	10	100 to 150mm long & weighting 210 ± 10g.
14.	Gauging trowel	02	4 deg.C ± 1 deg.C
15.	Refrigerator	1	Punch dia of 12.575 mm to

			12.591 mm & die dia of 12.707 mm to 12.723 mm.
16.	Punching tool assembly	2	Compatible with resin matrix and catalyst.
17.	Film (LDPE)	One 5m long roll	25mm x 25mm x 282mm Internal length
18.	Beam mould	2	As per IS:9459:1980
19.	Length comparator	1	As per IS:5512:1969
20.	Flow table	1	Upto 150 deg.C
21.	Mercury Thermometer/ Thermo-couple	1	

- 2.0 In order to check the required parameters during manufacturing, it shall be required that the random sampling be collected. Atleast one lot of sample containing adequate number/quantity of resin capsules for every 10,000 pieces of resin capsules manufactured, shall be subjected to all required set of tests as prescribed (standard) above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and countersigned by the quality control officer posted at the manufacturing unit(s). Such records shall be maintained for the purpose of verification for a period of atleast three years from the date of manufacturing.
- 3.0 The manufacturing firm shall prepare an elaborate usage and storage manual in respect of the batches of resin capsules manufactured for use in mines. With every consignment of resin capsules dispatched to a user, adequate number of usage and storage manuals shall also be furnished.
- 4.0 Resin Capsules having different Gel and Setting Times may be manufactured and supplied for different applications as required by the User, but the capsule should have valid approval and the gel & setting times shall be clearly superscripted on the capsule.
- 5.0 The manufacturing firm shall ensure that every consignment of resin capsules dispatched is suitably protected against exposure to extreme weather which could alter the properties of the resin capsules.
- 6.0 In case of any particular batch of resin capsules failing to meet the standards on “Short Encapsulation Pull Test (SEPT)” performed at the user end, the manufacturer shall take all steps to immediately intimate all other users to withdraw that particular batch which failed, from use and also confirm in writing to this Directorate within 24 hours of being intimated by the user.

ANNEXURE -3

IMPORTANT REQUIREMENT OF THE MINING COMPANIES USING RESIN CAPSULES

- 1.0 The mining companies using resin capsules for roof bolting purposes shall ensure the following .
- Proper arrangements are provided and maintained for storage of the resin capsules received in consultation with the respective manufacturers.
 - Adequate number of effective protective wears and gears are made available in every user mine for handling resin capsules.
- 2.0 Regular tests shall be carried out for assessment of get time and setting time in respect of the oldest batch stored in the mine, at a frequency not exceeding once a month.
- 3.0 Every mine shall carry out “ Short Encapsulation Pull Test (SEPT)” in a minimum of three horizons in the roof as may be determined by the Manager, in the presence of the representatives of the manufacturer. For this test, care shall be exercised in

ensuring that the RMR value of the rock horizon involved in the test is atleast 40. Only those batch of capsules which satisfy the following minimum performance levels of SEPT as per the table given below shall be used underground for supporting purposes by roof bolts.

Short Encapsulation Pull Test After 30 Minutes. 8 hours or 24 hours	10.0 Tonnes (for 20mm dia roof bolt) 12.0 Tonnes (for 22mm dia roof bolt) 15.0 or 20.0 Tonnes respectively.
Net displacement measured during the SEPT (mm)	Not more than 15.

- 4.0 Such tests shall be conducted for every batch of Resin capsules received at the mine and the results of the tests shall be properly recorded in a bound paged book kept for the purpose and also signed by the manager.
- 5.0 In case of any particular batch of resin capsules failing to pass the "Short Encapsulation Pull Test (SEPT)" as above, that particular batch of the resin capsules supplied shall be withdrawn from use in all mines of the company and intimation thereof shall be sent to this Directorate. A representative sample of the size as required for carrying out a complete re-test of the resin capsules of the batch which had failed, shall be immediately sent for testing. A copy of the report of the test shall be furnished to this Directorate immediately on receipt.

No.DGMS/(Tech.Cir.) No.04

Dhanbad 28/09/ 2010.

To
The Owners, Agent and Manager
Of all Coal & Manufacturers Mines

Sub: Usage of portable hydraulic banding machine for recapping of Wedge type rope cappel.

The wedge type cappel is one of the cage suspension gear components more commonly used in Mines. It is characterized by a pair of wedges, interlocked to ensure complementary movement and grooved to suit the particular rope diameter. A clearance between each half wedge allows progressive movement to retain the grip on the rope as the load increases. A number of bands, driven over the uniformly diverging exterior surfaces of the cappel limbs provide the initial compressive force to ensure that the wedges grip the rope. The limbs internal surfaces and the wedge backs are machined to provide a matching taper diverging from the cappel mouth. A safety block is white metallised on to the end of the rope protruding beyond the bottom of the wedges.

The operation of this type of cappel depends upon the friction (i) between the rope and the wedges, and (ii) between the wedges and cappel limbs.

The frictional forces developed at these surfaces of contact depend upon (i) the tightness of the bands on the limbs, (ii) the resistance of the rope to compression, and (iii) the angle of taper of the wedges.

For many years traditional method of banding and disbanding a wedge type cappel has been carried out by experienced strikers using sledge hammers. Numbers of skilled strikers are required to facilitate tightening of bands. Some times the sides of bands adjacent to the wedges shall never be struck. Burrs can also be caused during sledging of bands which may foul the wedges and retard their movement. Many a time bands get deformed and damaged due to sledge hammering. Experience have shown when the bands are driven on using the

specified weight of hammers, the friction between wedges and cappel will vary and under extreme conditions the rope may tend to pull through the wedges.

M/s.Becker (from United Kingdom) the originator of Wedge type of cappel had developed portable hydraulic banding machine for assembly/ disbanding operation instead of striking by hammers. The advantage of portable hydraulic banding machine is that sledge hammering on bands is avoided and ensures consistent pressure on every band for tightening. Further burring, deformation and damages to bands due to sledge hammering are avoided and hence longer life of the Cappel and rope. Accident due to flying off sledge hammer or slippage of drifts is also avoided. Banding & disbanding is much swifter compared & to sledge hammering operation. The same machine can be used for various sizes of ropes.

A schematic drawing of the hydraulic banding machine is being enclosed which may be altered or improvised as needed.

In view of the above, in interest of the safety the Portable hydraulic banding machines shall be used for safe banding and disbanding operations and discontinue sledge hammering to avoid damages to the cappel and rope.

It is requested to ensure that the above recommendation is strictly implemented.

No.DGMS/(Tech.Cir.) No.05

Dhanbad 13/10/ 2010.

To
The Owners, Agent and Manager
Of all Coal & Manufacturers Mines

Subject : Safety features to be incorporated in Tippers/Trucks.

The most common mode of transport of coal/ ore and materials in opencast mines whether big or small size is trucks or tippers and their use is on increase. Unfortunately, the incidence of accidents due to such vehicle is alarmingly high in opencast mines.

The Analyses of accidents revealed that majority of them have occurred due to :-

- Collision either due to Head on or head to tail
- Failure of brakes.
- Over speeding or rash driving by operators
- While reversing
- Fire
- Driving of the vehicle while body still raised.
- Short circuit due to problems in Auto-electrical system

A model code of practice was circulated vide circular No.11 of 1973 and was required to be enforced by the management. Mine managements have since been further reminded by various circulars.

The matter has since been again examined in this Directorate. It has been decided to ensure that in every mine where tipping trucks are being engaged either in opencast workings or on surface operations, the following safety features shall be incorporated so that the risk of accidents are minimized. These features are applicable to all types/model/capacity of truck/ tippers

Safety features required in tippers/ trucks

1. Cabin Guard Extension :

Canopy shall cover the operator's cabin fully.

2. Exhaust/Retard Brake :

Device to control the speed of truck while operating down the gradient. Refer DGMS (Tech) Circular 02 of 2004.

3. Propeller shaft guard :

Propeller shaft guard as specified in DGMS (Tech) Circular 10 of 1999.

4. Tail gate protection:
Protection of operator against collision either by head on or head to tail
5. Limiting speed device :
Enable mine management to decide the maximum speed of vehicle to be operated in mine. The device may be Electronic or mechanical type speed governors.
6. Audio-visual alarm while reversing :
The audio-visual alarm provided should confirm to DGMS(Tech) Circular No.01 of 2010.
7. Provision of two brakes :
One of brakes shall be fail safe. For details refer DGMS circular 09 of 1999.
8. Body lifting position locking arrangement:
A hooter along with an indication is provided to indicate the body is still in lifted position.
9. Fire suppression System
Refer DGMS circular 10 of 2004. The fire suppression system shall be a factory Fitment and of approved type from Directorate.
10. Blind spot mirror
Operator can have view in blind spot area.
11. Fire resistant hoses at hot zone:
To decrease chance of fire
12. Electric Wires and sleeves are to be of fire resistant quality :
To decrease chance of fire
13. Turbo Charge Guard and exhaust tube coated with heat insulated paint :
To decrease chance of fire.
14. Battery Cut off Switch:
To decrease chance of fire
15. Retro reflective reflectors on all sides :
For visibility of truck during night
16. Seat belt reminder
To alert operator for using the seat belt
17. Proximity warning device
To alert operator when approaching after vehicles/ obstruction.
18. Rear Vision System
To assist operator during reversing. Refer DG Circular No.12 of 2009.
19. Auto dipping System
To reduce glaring on eyes of operator during night operation
20. Load Indicator and Recorder
Enables management to detect and prevent over loading

The management shall ensure that the safety features listed above are provided in trucks/ tippers and shall be a part of notice inviting tender for new procurement and action shall be taken to provide the safety features in existing trucks within a specified time frame but not later than one year from the date of issue of this circular. The same features shall be included in contractor's agreement also while out-sourcing so that the trucks/ tippers are provided with required safety features before putting in to operation in the mines.

In the interest of safety all the Owners, Agent and Managers of the mine in which such transport vehicles are being used are requested to comply with the aforesaid safety requirement so that the accidents due to this cause are minimized and eliminated.

No.DGMS/(Tech.Cir.) No.06

Dhanbad 11/11/ 2010.

To
The Owners, Agent and Manager
Of all Opencast Mines

Subject : Provision of a separate road for light Motor Vehicle in the premises of Mechanized Opencast Mines.

Consequent to quantum jump in opencast mining operations in the country, the number of accidents involving persons travelling by light Motor Vehicles (LMV) in opencast mines, has shown an alarming upward trend. The main cause of such accidents was revealed as due to being hit by transportation machinery like dumpers/heavy –duty tippers, etc. because of a variety of attending factors like non provision of a dedicated roadway for the movement of LMVs in the mine workings, confusion between the operators of the LMVs and the dumpers, etc.

To mitigate such accidents in opencast mines, a DGMS (Technical) Circular No.6 of 2008 was already issued requiring the provision and maintenance of a separate roadway for movement of all such LMVs in the mine workings and which will not cross the haul road at any place in the mine premises.

In this connection, some representations were received from the operating mining companies and after careful examination and consideration of the same, it is once again emphasized that the following recommendations shall be strictly implemented in all opencast mines.

- a) A separate roadway shall be provided and maintained for the movement of all LMVs which shall not cross the haul roads of dumpers anywhere in the mine to the extent practically possible.
- b) Where such crossing of roadways of LMVs and dumpers cannot be avoided for reasons which are to be vetted by the Internal Safety Organization (ISO) of the mining company and approved by the Regional Inspector in writing, the following safety measures shall be strictly ensured.
 - c) All such crossings shall be planned in close consultations with the ISO of the mining company.
 - ii) Attempts shall be made to locate such crossings in such a manner that the portion of the involved haul-road falls only on a level ground.
 - iii) All such crossings shall be clearly visible to the operators of both LMVs and dumpers for a distance of atleast three times the braking distance of the largest dumper plying.
 - iv) The HEMM plying on the Haul roads shall have the Right Way over the LMVs.
 - v) All such crossings shall be suitable manned in all working shifts and shall also be provided with proper barricading arrangements and audio-visual warning systems on both sides of the roadway catering to LMVs as approved/vetted by the ISO of the mining company.
 - vi) The approach to such crossings shall be provided with suitable speed barriers as approved/vetted by the ISO of the mining company, in the

- carriageway for LMVs at a distance of not more than 30m from the crossing.
- vii) The ISO of the mining company shall review the arrangements from time to time as the mine workings advance and may also stipulate any other conditions as may deem fit depending on the prevailing local conditions.

It is therefore, requested that all out efforts are taken as mentioned above with the active involvement of the Internal Safety Organization, to eliminate accidents involving LMVs in opencast mines.

This circular supersedes the earlier issued DGMS (Technical) Circular No.6 of 2008 on the subject.

No.DGMS/(Tech.Cir.) No.07

Dhanbad 27/12/ 2010.

To
All Owners, Agents and Managers
Of all Coal Mines

Sub: Assessment of the requirement of Fire Fighting Equipments.

Sir,

It is a well know fact that fire in mines and the machinery deployed is one of the most common hazards therefore, calling for utmost caution in mitigating the same at the nascent stage itself. This problem has assumed very complex dimensions in the recent past owing to a variety of changes in mining technology and the equipment deployed.

It is therefore, imperative that every mine has a clear safety management plan for dealing with fire hazards, evolved through risk assessment process. The scope of formulation of such plans shall also include the assessment of quality and quantity of fire fighting equipments to be made available at different places in the mine for effective tackling of a wide range of fires like oil fires, electrical fires, fires due to burning of flammable materials, etc. Such plans also need to be periodically reviewed and updated, commensurate to the level of mechanization involved and the newer technology deployed in the mine.

In view of the above, the mining companies through their respective Internal Safety Organization should take a lead-role evolving such safety management plan for dealing with fire hazards in mines, in consultations with the concerned Regional Inspector of mines.

This circular supersedes the previously issued DGMS (Technical) Circular No.2 dated 06/02/2009.

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NOTIFICATIONS & CIRCULARS

Notifications – 2011

Dated 24th January, 2011

G.S.R.85 – In exercise of the powers conferred on the Chief Inspector of Mines also designated as Director General of Mines Safety under sub-regulation (3) of Regulation of 181 of the Coal Mines Regulation 1957, as well as sub-regulation (2) of Regulation 75 of the Oil Mines Regulations 1984, and in supersession of the earlier Gazette Notification No.31 dated New Delhi, January 25th, 2009, published in Part II, Section 3, Sub-section (i) vide GSR 9, I hereby require that all types of lightings, lighting fixtures and system, indicators or signal lights to be used in mines below ground and oil and gas mines/fields will be of such type, standard and make as approved by me by a general or special order in writing.

[F.No.S&T(HQ)/179]

SATISH PURI, Director General of Mines Safety

Dated 29th March, 2011

S.O. 867,-- In exercise of the powers conferred by sub-section (1) of section 162 of the Electricity Act, 2003(36 of 2003) read with Qualification, power and function of Chief Electrical Inspector and Electrical Inspectors Rules, 2006 notified on 17-8-2006, the Central Government hereby appoints following Officers of Electrical Cadre of Directorate General of Mines Safety, Dhanbad as Electrical Inspector Subject to the qualification and condition mentioned in above

S.N	Name of the Officer/Shri	Designation in DGMS	To be appointed as
1	Dharmendra Kumar	Dy. Director General of Mines Safety (Elect.)	Chief Electrical Inspector
2	B.K.Panigrahi	Director of Mines Safety(Elect)	Electrical Inspector
3	B.K.Lama	Director of Mines Safety(Elect)	Electrical Inspector
4	K.M.Ghosh	Director of Mines Safety(Elect)	Electrical Inspector
5	M.K.Das	Director of Mines Safety(Elect)	Electrical Inspector
6	Mukesh Srivastava	Director of Mines Safety(Elect)	Electrical Inspector
7	U.N.Pandey	Director of Mines Safety(Elect)	Electrical Inspector
8	S.K.Thakur	Director of Mines Safety(Elect)	Electrical Inspector
9	G.L.Kanta Rao	Director of Mines Safety(Elect)	Electrical Inspector
10	B.S.Nim	Director of Mines Safety(Elect)	Electrical Inspector
11	Radhey Shyam	Dy. Director of Mines Safety (Elect)	Electrical Inspector
12	K.S.Yadav	Dy. Director of Mines Safety (Elect)	Electrical Inspector
13	M.K.Malviya	Dy. Director of Mines Safety (Elect)	Electrical Inspector
14	Madhukar Sahay	Dy. Director of Mines Safety (Elect)	Electrical Inspector
15	Ajay Singh	Dy. Director of Mines Safety (Elect)	Electrical Inspector
16	T.Srinivas	Dy. Director of Mines Safety (Elect)	Electrical Inspector

The above mentioned official shall exercise the powers and perform function in respect of electrical works, electrical institutions and electrical rolling stock in operation within the area of Directorate General of Mines Safety, as per the procedure provided in Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations, 2010.

The person appointed as Electrical Inspector shall undergo such training as the Central Government may consider it necessary for the purpose and such training shall be completed to the satisfaction of the Government.

[F.No.42/3/2010-R&R]
ASHOK LAVASA, Addl.Secy.

Dated 7th April, 2011

No.A-32012/08/2009-ISH-II – The President is pleased to appoint the following officers to the post of Deputy Director General of Mines Safety (Mining) in the pre-revised pay scale of Rs. 18,400-500-22,400/- in the Directorate General of Mines Safety, Dhanbad with effect from the dates shown against their names and until further orders :-

SL.No.	Name of the Officer	Date of appointment in the Grade of Deputy Director General of Mines Safety (Mining)
1.	Shri B.P.Ahuja	30.03.2011 (F/N)
2.	Shri Anup Biswas	25.03.2011 (A/N)
3.	Shri Akhilesh Kumar	25.03.2011 (A/N)

SUBHASH CHAND, Under Secy.

Dated 7th April, 2011

S.O. 1082 – In exercise of the powers conferred by Sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints the following officers as Inspector of Mines, Subordinate to the Chief Inspector of Mines, Until further orders :

1. Shri Vir Pratap	6. Shri Muralidhar Bidari
2. Shri Supriya Chakraborty	7. Shri Saifullah Ansari
3. Shri S.Chandramouli	8. Shri Vinodanand Kalundia
4. Shri T.R.Kanan	9. Shri Manish Chandra Jaiswal
5. Shri Niraj Kumar	10. Shri Murli Dhar Mishra

[No.S-29025/01/2008-ISH-II]
SUBHASH CHAND, Under Secy.

Dated 13th September, 2011

S.O.2741, -- In pursuance of Sub-Rule (4) of Rule 10 of the Official Language (Use for official purposes of the Union) Rules, 1976 (as amended 1987) the Central Government hereby notifies following offices under the administrative control of the Ministry of Labour and Employment, at least 80% Staff whereof have acquired working knowledge of Hindi :-

1. Office of Director, Mines Safety, Varanasi
2. Office of Director, Mines Safety, Ahmedabad Region, Ahmedabad.
3. Office of Director, Mines Safety, Surat Region, Surat.
4. Office of Director, Mines Safety, Gwalior Region, Gwalior.
5. Office of Director, Mines Safety, Raigarh Region, Raigarh.
6. Sub-Regional Office, Employees State Insurance Corporation, Okhla.

[No.E-11017/1/2006-RBN]
CHANDRA PRAKASH, Jt.Secy.

Dated 27th September, 2011

S.O. 2933, -- In exercise of the powers conferred by sub-section (1) of Section 5 of the Mines Act, 1952 (35 of 1952), the Central Government hereby appoints the following officers as Inspector of Mines, subordinate to the Chief Inspector of Mines, until further orders :-

1. Shri Ajay Singh, Deputy Director of Mines Safety (Electrical).
2. Shri Thammisetty Srinivas, Deputy Director of Mines Safety (Electrical).
3. Shri Parmanand Kumar Singh, Deputy Director of Mines Safety (Mechanical)

[F.No.S-29025/1/2008-ISH-II]
VANDANA SHARMA, Director

Circulars – 2011

No.DGMS(LEGIS) CIRCULAR No .01 Dhanbad, dated 18/07/2011

To

The Owners, Agents and Managers of all Mines.

Sub: Notification of diseases as reportable under Section 25 of the Mines Act, 1952.

The Government of India, Ministry of Labour and Employment have notified certain diseases as diseases connected with mining operations vide Notification No. S.O. 399(E), published in Extraordinary, Part II, Section 3, Sub-section (ii) of the Gazette of India dated 21st February, 2011.

The notification is reproduced below for your information.

Ministry of Labour and Employment

NOTIFICATION

New Delhi, the 21st Feb.2011

S.O.399(E) – In exercise of the powers conferred by sub-section (1) of Section 25 of the Mines Act, 1952 (35 of 1952), the Central Government hereby notifies each of the following disease as diseases connected with the mining operations:-

1. Noise induced hearing loss.
2. Contact Dermatitis caused by direct contact with chemicals.
3. Pathological manifestations due to radium or radioactive substances.

[F.No.Z-16025/165/2010-ISH-II]

A.C.Pandey, Jt.Secy.

DGMS(Tech.)(S&T) Circular No.01 Dhanbad, dated 21/01/2011.

To

The Owners, Agents and Managers of all mines.

Sub: Guidelines on Occupational Health Survey (Medical Examination) of person Working at places or operations/processes prone to generate airborne dust.

Secretary General, National Human Rights Commission, New Delhi, vide his D.O.Letter No.11/3/2005-PRP&P dated 10th January, 2011 (Copy enclosed) expressed deep concern about the health hazards posed by silicosis and advised the Directorate to take suitable action on the recommendations made by the Expert Group and stakeholders on Preventative, Remedial, Rehabilitative and Compensation aspects relating to Silicosis. In view of NHRC recommendations and in continuation of DGMS (Tech.)(S&T) Circular No.01 of 2010, accordingly the guidelines framed on Occupational Health Survey (Medical Examination) of person working at places or operations/processes prone to generate airborne dust are as follows:-

- (A) The Medical Examination of Identified persons or Group of persons working at places or operations/ processes prone to generate airborne dust should be conducted once in every six months. It is advised that the health assessment for workers exposed to silica dust should include the following :-
 - i) A history should be taken covering
 - a. the worker's occupational exposure to dust containing silica;
 - b. any past or present medical diagnosis of respiratory disease; and
 - c. the worker's smoking history.
 - ii) A clinical examination should be carried out on the respiratory tract system. A spirogram (Pulmonary Function Test) should be carried out including

determinations of forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV1).

- (B) Sputum examination for Tuberculosis once in every year.
- (C) A Single posterior-anterior chest X-ray should be done every 5 years on workers without signs of silicosis or other pneumoconiosis and every 3 years on workers who do have X-ray changes. All chest radiographs should be classified according to International Labour Office (ILO) Classification of Radiographs of the Pneumoconiosis, 2000.
- (D) Initial medical examination should be conducted for all mining workers whether permanent, temporary or contractual, before they are engaged in any mining job. This include a single posterior-anterior chest X-ray and A spirogram (Pulmonary Function Test) should be carried out including determinations of forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV1).
- (E) In any person employed in a mines contacts any notifiable diseases, the case shall be reported to this Directorate immediately in the prescribed format Form-V (Regulation 10 MMR, 1961/CMR, 1957.
- (F) In case, a person is found to be affected with pneumoconiosis or silicosis, the details regarding his work profile, degree of disability, medical history and expenses compensation and the status of health and rehabilitation measures taken by the company etc. should be sent to this Directorate immediately in enclosed format.

It is, therefore requested to all concerned that an integrated efforts in line with the above guidelines be made at all levels to ensure that the incidence of diseases due to respirable dust is detected in the mining industry.

No.DGMS(TECH)(S&T) Circular No. 02 Dhanbad, dated 4/3/2011

To

The Owner, Agent and Manager of all mines.

Sub: Safety Management System – Provision for auditing and review.

Sir,

The Ninth & Tenth Conference on Safety in Mines recommended adopting Risk Management as a tool for development of appropriate health & Safety management systems in Indian mines. It was further suggested that the risk assessment exercise should follow an appropriate process.

The Science & Technology division of this Directorate conducted several workshops on 'Risk Management' in Indian mines with the assistance of experts from Australian International Mines Safety Training Co. Pvt. Ltd., under an Indo-Australian Aid Project. Drawing inputs from inferences drawn from the workshops and synthesizing the same with International recommended practices, a document on "Safety Management System – A guideline for implementation " was prepared and circulated as DGMS (Tech)(S&T) Circular No.13 of 2002, a copy of which is enclosed.

You are requested to undertake the a formal risk assessment process with the help of above guidelines. It should be followed by preparation of 'Risk Management Plans' and implementation thereof, aimed at reducing the likely hood and impact of mishaps of all kinds in Indian Mines.

No.DGMS(TECH)(S&T) Circular No.03 Dhanbad, dated 30/3/2011

To

The Owner, Agent and Manager of all mines.

Sub: Guidelines regarding implementation of recommendation of Ninth Conference on Safety in Mines held on 2nd and 3rd Feb. 2000.

In the Ninth Conference on Safety in Mines, following points were recommended in regards to the Occupational Health Surveillance in Mining Industry.

All the Chest Radiograph of Initial and periodical Medical Examination shall be classified for detection, diagnosis and documentation of Pneumoconiosis in accordance with ILO Classification for Pneumoconiosis.
(Point No 8.4 of Cir.Tech.2000)

The PME Medical Officer in every PME Centre shall be trained in Occupational Health and use of ILO Classification for Pneumoconiosis.
(Point No 8.5 of Cir.Tech. 2000)

These points were also taken for review during the deliberations of recommendations of Tenth Safety Conference.

In this connection this is being further clarified that both the above mentioned points were meant to be implemented in all categories of Mines both under Public or Private Sectors like the other pointes recommended in the same conference in regards to Occupational Health Surveillance.

Therefore it is being requested to all concerned to take necessary steps to implement the above mentioned points in all categories of Mines as per the recommendations of the Conference.

No.DGMS(TECH) Circular No.04

Dhanbad, dated 08/04/2011

To

The Owner, Agent and Manager of all mines.

Sub: Training for operators in Heavy Earth Moving Machinery using Simulator.

Investigation into the accident of heavy earth moving machinery revealed that the numbers of accidents are occurring due to operator's negligence, harsh driving and lack of knowledge of equipments. Accidents in transportation machinery in opencast mine continue to remain high and rising every year.

Effective training has a huge impact on operating skills and helps in reducing accidents. All safety conferences on mine has deliberated in detail and insisted on providing training to operators for better productivity and to reduce accidents.

Simulator is a state-of the art indoor mining equipment that imparts basic and advanced skills required to operate the heavy earth mining equipment like Dumpers, Shovels/Excavators, Dozers of various capacities and operating either on wheels or tracks in challenging environment. The simulator has different training lessons for new, experienced and out-of-touch operators, supervisors and trainers. Simulators trains recruits into skilled operators, reduces downtime of equipment, reduces maintenance cost, optimally utilizes the capacity and increases safety thus reduce accidents.

The simulator uses 3D computer generated imagery and simulates realistic motion feel visuals and sounds. The training progresses from equipment familiarization to advanced levels of training and testing under complex driving scenarios. The simulator also has features for interactive fault-finding and rectification. They have the same set of controls, ergonomics and transmission systems. In the mining simulators the operator/ driver operates the system and get familiarized in using the parts such steering, brakes, lights, horns, indicator etc and has a feeling of operating the main equipment. The operator can be evaluated and further training may be given if necessary.

Training should follow carefully prepared and devised programmes. The instructor should explain and demonstrate each stage, and should allow operator to practice in turn. It is essential that practice is closely and constantly monitored. Each operator will be required to pass a practical skills test and theory and on successful completion of the training on equipment, the operator shall be issued certificate to operate the machine on which he

has been trained. The management shall ensure to appoint such operators' possessing certificate.

It is recommended that all mining companies have opencast working and use heavy earth moving equipment shall install simulator training for operators. In respect of small mechanized mine the matter may be taken up by the group vocational training centers create common facility in infrastructure for simulator training.

It is recommended that in the interest of safety, all mining companies' shall initiate necessary action to provide Simulator training for operators in heavy earth mining equipment.

No.DGMS(TECH)(S&T) Circular No.05 Dhanbad, dated 08/04/2011

To

The Owner, Agent and Manager of all mines.

Sub: Inclusion of additional Formats of Medical Examination along with Existing Form 'O' for the purpose of Initial and Periodical Medical Examination of persons working in Mines.

It had been observed since the 10th Conference on Safety in Mines held on 26th and 27th November, 2007 that the existing Form 'O' stipulated in Mines Rule 1955 was not adequate enough to record all the Clinical findings of physical examination and Laboratory investigations of initial and Periodical Medical Examination of the Mines employees, as per the recommendations of 10th Conference on Safety in Mines. It had also been felt that the existing Form 'O' did not have the required provision for recording findings of some of the clinical investigative procedures of Medical Examination already existing in statue.

Keeping these in mind two sheets of new formats have been designed to record all the Clinical Findings of the existing Statues as well as all the recommendations of the 10th Conference on Safety in Mines.

Therefore all concerns are being requested to use these two Formats enclosed here with, in continuation with the existing Form 'O' , for recording the findings of initial and Periodical Medical Examinations of Mines employees so that the entire Medical Examination Report can be as comprehensive as required by the Statue.

**Report off Medical Examination Under Mines Rule 29B
(To be used in continuation with Form 'O')**

Certificate No.

Name :

Identification Marks :

Result of Lung Function Test (Spirometry)

Parameters	Predicted Value	Performed Value	% of Predicted
Forced Vital Capacity (FEV)			
Forced Vital Capacity 1 FEV1			
FEV1/FVC			
Peak Expiratory Flow			

Spirometry Report enclosed

Signature of the Examination Authority

Report off Medical Examination as per the recommendations of
National Safety Conferences in Mines
(To be used in continuation with Form O)

Certificate No.

Name :

Identification Marks:

1. Cardiological Assessment

Auscultation	S1	
	S2	
	Additional Sound	
Electrocardiograph (12 leads) findings :		Normal/Abnormal

Enclosed ECG

2. Neurological Assessment

Findings	Normal/Abnormal
Superficial Reflexes	
Deep Reflexes	
Peripheral Circulation	
Vibrational Syndromes	

3. ILO Classification of Chest Radiograph :

Profusion of Pneumoconiotic opacities	Grades	Types
Present/Absent		

Enclosed Chest Radiograph

4. Audiometry Findings :

Conduction Type	Left Ear	Right Ear
Ear Conduction	Normal/Abnormal	Normal/Abnormal
Bone Conduction	Normal/Abnormal	Normal/Abnormal

Enclosed Audiometry Report.

5. Pathological/Microbiological Investigations:

S.No.	Tests	Findings
1	Blood-Tc, Dc, Hb, ESR, Platelets	WNL/Abnormal
2	Blood Sugar- Fasting & PP	WNL/Abnormal
3	Lipid profile	WNL/Abnormal
4	Blood Urea, Creatinine	WNL/Abnormal
5	Urine Routine	WNL/Abnormal
6	Stool Routine	WNL/Abnormal

Enclosed Investigation Reports.

6. Special Tests for Mn exposure

Behavioral Disturbances		Present/Not Present
	Speech Defect	Present/Not Present
Neurological Disturbances	Tremor	Present/Not Present
	Adiadocokinesia	Present/Not Present
	EEEmotional Changes	Present/Not Present

7. Any other Special Test Required :

Signature of the Examination Authority

No. DGMS(TECH)(SOMA)Circular No.06 Dhanbad, dated 08/04/ 2011

To

The Owners, Agents and Managers
of all Coal and Non-Coal underground mines.

Sub: Provision of Pit Bottom Buffer in Man-winding shafts.

Number of cases of hard landing of cage at pit bottom have been observed to be on the increase.

To prevent injuries to persons due to hard landing of cage/conveyance, DGMS (Tech) Circular No.1 of 1990 has recommended for providing suitable pit bottom buffers in the shafts used for man-winding.

Subsequently DGMS (Tech) Circular No.1 of 1993 has also recommended that in the first phase, pit bottom buffers should be provided in all new winding installations where winding depth is 200 m or more and the same should be provided in shafts where there is history of frequent over-winding irrespective of depth.

Recently, two accidents occurred in which cage hard landed at pit bottom of man-winding shaft injuring two work-persons travelling in the cage. If suitable pit bottom buffers would have been provided and maintained, this accident could have been averted.

After issue of the two above mentioned Technical Circulars, considerable time has passed and action to provide suitable pit bottom buffers (as pointed in above circulars) in all mines where shafts are being used for man-winding, has been observed to be slow. This has resulted in increase in accidents due to hard landing of cage at pit bottom.

Now I am of the opinion that the management of the mines should initiate action for providing pit bottom buffers in the interest of safety to work persons, in all man-winding shafts within time frame but not latter than one year from the date of issue of this circular.

No.DGMS(Technical Circular No.07 Dhanbad, dated 14/11/2011

To

The Owners, Agents and Managers of all mines.

Sub: Provision of Slack Rope and Automatic Rope Slip Protections for Winder.

Recently there was an accident of due to breakage of coupling between the man-riding car of a haulage system. The enquiry revealed that the brake lever was operated inadvertently by one of the person alighting from the car and the brakes applied. Unknowingly the train guard signaled for lowering the car and the hauler operator lowered the Man riding haulage. The rope in the hauler drum uncoiled to about 15meters. As the cars did not move the train guard observed that car brakes are on, operated the hydraulic pump and released the brakes. As a result, the anchor car and man riding car ran down with speed till the slackness of the rope was over and due to sudden jerk & shock load broke the coupling between cars. Both cars traveled down with speed and due to tripping of governors and applying of brakes the cars stopped.

This accident emphasis the need of providing additional safety features such as slack rope and rope slip protection in winders.

Slack Rope Protection

The slack rope may occur due many reasons:

- Cage stuck up in shaft.
- Derailment of man riding cars.
- Application of brakes in man riding cars.
- Negligence of operator.

There are a variety of ways in which slack rope between the winder haulage drum and the conveyance may be detected such as

- Measurement of motor current.
- Rise in tail rope loop on friction winders.
- Trip wires across the rope operating for a drum winder.

- Rope monitoring
- Load cells under head sheaves or friction winder drums.

The above mentioned detection methods are all protection systems which directly measures the tension in the hoisting ropes and if this drops below a preset threshold value initiates an emergency stop which trips winders.

(a) Automatic Rope Slip Protection

In Koepe system of winding the rope slips on the winding drum as there is no positive locking. The movement of the rope is caused by friction in the groove of the drum. In ideal condition there should not be any slippage between the winding drum and the winding rope. Small slippage is manually adjusted at the end of travel however many times the rope may have excessive movement with respect to the drum. On the other hand the drum may rotate without making the rope to move both these situations are unwarranted and unsafe and may cause problems which can be sometimes dangerous hence the need arises to detect occurrence of such relative movement between rope and the drum and immediately stop the engine.

Both the above systems should also generate warning signals to draw attention of the engine operator to take necessary corrective action.

The above safety features shall be provided in all existing winders both drum (including man riding system) and friction winders within a specified time frame but not later than six months from the date of issue of this circular. The same features shall be included in new procurement of winders before putting in to operation in the mines.

In the interest of safety, the above requirements shall be implemented strictly to reduce the chances of accidents in winders working in mines.

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NOTIFICATIONS & CIRCULARS

Notifications – 2012

New Delhi, the 2nd May, 2012.

No. A-31014/01/2011-ISH.II – The President is pleased to appoint Shri Vir Pratap to the post of Deputy Director of Mines Safety (Mining) in the office of Directorate General of Mines Safety, Dhanbad with effect from 31.10.2010 in a substantive capacity.

S. K. SINGH, Under Secy.

Circulars – 2012

No.DGMS(Tech.)Cir.No. 01

Dhanbad the 3rd January, 2012

To

The Owner, Agent and Manager of All Mines

Subject: Occupational Safety and health (OSH) issues of Contractual Employees in mines – Improvements needed.

1.0 Background

Increased demands of infrastructure and industrial growth in the country have necessitated quantum jump in production of minerals, coal, oil and natural gas during the past two decades . Multi-national companies joining in mining sector has changed not only the organizational structure of the companies but also the nature of employment which is drifting from Company's Owned employment to Contractual Employment through outsourcing of whole or part of the mining operations such as loading and transportation, enrichment and beneficiation to safety and security.

2.0 Employment and Accident Scenario

An exercise on fatality to contractual employees in coal mines during the past decade was conducted in this Directorate which revealed that :-

- (a) Although overall employment in coal mines has reduced from 4,48,264 in the year 2000 to 3,73,950 in 2010 i.e. 16.58% reduction but the contractual employment has increased from 10,123 in 2000 to 29,449 in the year 2010 i.e. almost 3 times increase. The percentage of increase in contractual employment is about 4 times during the period.
- (b) Overall fatality rate in coal mines varies from 0.21 to 0.31 per thousand persons during the last decade. The fatality rate within company's owned employees varies from 0.21 to 0.30 whereas within the contractual employees it varies from 0.52 to 1.14 per thousand persons which is 2.47 to 5.42 times the fatality rate of company's owned employees.

This is a matter of concern for every one of us.

(c) The reasons of more fatality amongst contractual employees were also analyzed which revealed that:-

- Long hours of work leading to tiredness and fatigue;
- Lack of work knowledge and ignorance to apprehended hazards and dangers associated with work, working places and environment;
- Deployment of unskilled contractual employees in place of skilled employee's jobs without supervision;
- Exposure of contractual employees on jobs with higher levels of risks and under hazardous conditions;
- Non-provision of personal protective equipment (PPEs) and also not using such PPEs wherever provided

3.0 Preventive measures

In the light of the above, the following measures are required to be taken to reduce the trends of fatality of contractual employees in the mines and activities incidental to or connected therewith:

- (i) Contractual Employees should be selected on the basis of their educational, professional and job-need based qualifications, which should be recorded in their Job-Card and Employment Register;
- (ii) Initial Training and Skill Development Programme should be framed based on the Skills required which should be imparted for specified period under constant supervision and monitoring by specialists;
- (iii) After completion of Initial Training and Skill development exercise, such employees should be put on-job training under skilled employees with supervision of competent person;
- (iv) Normal or regular jobs to contractual employees should be given only after undergoing above stages of training and practices;
- (v) Extended hours of work, exposure to risky and hazardous places and operations and deployment on skilled jobs should not be allowed for contractual employees unless otherwise experienced for such jobs for a period of at least Five years; and
- (vi) Initial and Periodical Medical Examinations including occupational safety and health surveillance of all contractual employees shall be conducted by an expert agency once in at least three years or at lesser interval.

It is further requested to develop suitable scheme on each issue mentioned above with an objective to computerize the database and use for further analysis. All the Formats, databases and analysis tools developed in this regard should be sent to this Directorate for development of standard tools and system on this subject so that it can be circulated for wider application through DGMS website i.e. www.dgmsindia.in

Director General of Mines Safety

No.DGMS Technical Circular/02

Dhanbad, dated 10.01.2012

To

The Owners, Agents and Managers
Coal and Metalliferous Mines

Subject: Precautions while charging Nitrogen gas in Accumulator cylinder of machinery.

Inquiry into a fatal accident occurred in a mechanized open cast mine revealed that while engine of a 240 tone capacity dumper was started in a workshop after charging one of the two accumulator in hydraulic circuit with oxygen instead of nitrogen, an explosion took place in the charged accumulator cylinder with in two minutes causing bursting of the cylinder into pieces along with huge flare created by ignited hydraulic fluid which inflicted fatal injury to the engineer and burn injuries to three workers who are at a distance of about 18m.

Once the oxygen was charged in to the accumulator cylinders and engine was started the hydraulic oil entered the accumulator cylinder from bottom at about 3500 psi. The highly pressurized oil rapidly compressed the oxygen filled in the bladder there by increasing its temperature beyond the flash point of hydraulic oil and melting point of polymer of the bladder. The instantaneous combustion of hydraulic oil led to explosion in the cylinder and ultimately bursting the same.

In order to prevent such type of accident in future the following safety measures shall therefore be followed:

1. Accumulator cylinders or suspension cylinder or any other applicable gas filled device used in Hydraulic circuit of mining equipment shall be charged only with gas as per recommendation of the OEM.
2. The content of the gas & its purity as recommended by the OEM shall be checked with suitable equipment before putting it to use.
3. Separate & distinct gas charging valve assembly shall be deployed on Oxygen & Nitrogen gas cylinders as per IS: 3224: 2002 there by eliminating the risk of inadvertent charging of the gas in the cylinder.
4. All cylinders shall be distinctly marked as specified in BIS specification to avoid any confusion.
5. Ensure the valve assembly is in good working condition and only use recommended tools for opening and closing. The valve protection rings must be provided to protect the valve assembly from damage while in storage or being handled.
6. Each type of gas shall be kept separately in workshop stores in a cool, dry & well ventilated place away from combustible materials and electrical connections.
7. The cylinders shall be stored in upright position & immobilized by chains or other clamping devices to prevent them from falling.
8. Handling and transportation of Nitrogen cylinders must be done in a safe manner e.g. use of wheeled trolleys.
9. In case of a leakage Nitrogen cylinder (which cannot be rectified by simple valve tightening) ensure the cylinder is moved to an open isolated location away from inflammable material/electrical connections and attach a tag to the cylinder indicating it is unserviceable and allow the cylinder to remain there till the gas is fully discharged. Contact the gas supply agency for proper disposal.
10. Use first in first out (FIFO) method to rotate cylinder stocks.
11. Only authorized personnel shall handle cylinders.
12. Personnel must wear personal protective equipment when handling gases.

13. Awareness amongst the workers regarding the dangers of using Oxygen in accumulator cylinders shall be developed & suitable warnings should be displayed at charging points stations.
14. Records of receipts and issues of gas cylinders and checking of purity etc. shall be maintained and counter signed by Engineer and Manager of the mine.
15. Adequate number of fire extinguishing equipment must be readily available near to the place of cylinder storage & usage.
16. Gas supply agencies should provide test certificate indicating purity of the supplied gas.

In the interest of safety, the above recommendations shall be implemented strictly to reduce the chances of accidents while charging Nitrogen in gas filled device used in machinery working in mines.

Director General of Mines Safety

No .DGMS (Tech.)(S&T)Cir.No.03 of 2012

Dhanbad, dated 01.02.2012

To

The Owners, Agents and Manager of All Mines

Subject: Periodic Examination of Mining employees above the age of Sixty years.

It is being observed in recent time that many Mining Organisations are engaging persons with sixty years of age or more in non statutory capacities of Mining operations. Their Periodic Medical Examinations are also being conducted once in every three to five years along with other non statutory employees, who are aged below sixty years, as per the existing provisions of Mines Rule 29B of 1955. But as the persons above the age of sixty years are much more vulnerable to both occupational and non-occupational Health Hazards, in comparison to their counterparts below the age of Sixty, Medical examinations once in three years are not providing them adequate Health surveillance for timely diagnosis of their illnesses. As a result, a large number of Non statutory employees, above the age of sixty years, from both open cast and underground Mines, suffer serious Medical problems while on duty and in some cases succumbing to them also.

Keeping the entire scenario in mind, it is being requested to all concerned to conduct Periodic Medical Examination of all the employees above the age of Sixty both statutory and non-statutory capacities, at least once in every year in order to provide these senior citizens an adequate and effective Health Surveillance mechanism for early diagnosis of their illnesses and thus protecting them and their fellow colleagues life while on duty.

(Satish Puri)
Director General of Mines Safety

No. DGMS Technical Circular/04

Dhanbad, dated 06.03.2012

To

The Owners, Agents and Managers
Coal and Metalliferous Mines.

Subject: Accidents due to Dumpers due to failure of braking and steering
systems in mines.

Accidents and dangerous occurrences during the recent years due to transport machinery have increased especially by dumpers. Analysis of such accidents reveals that poor maintenance and lack of inspection especially for braking and steering system of machinery.

In a recent accident at a mine, it has been observed that while a loaded dumper was climbing upon a ramp/haul road against a gradient of 1 in 10, engine stalled midway and rolled back to a distance of about 60 m, inflicting fatal injuries to a mining Sirdar instantly.

In another mine while a dumper was traveling along a haul road collided with another dumper traveling on the same haul road causing fatal injury to both the operators.

One enquiry, it was found that in both the cases either the breaking system or the steering of the dumper was weak and was not tested for a long period.

The DG's technical circulars and also the permission issued under Regulation 98 of Coal Mines Regulation, 1957 and Regulation 106 of Metalliferous Mines Regulation, 1961 stipulates that at the commencement of every shift the operator or competent person appointed in writing by the manager will test every vehicle paying special attention to the brakes, steering, horn and other warning devices and if he finds any defect, he shall report the matter to the competent person and get the defects remedied before operating the vehicle. Further a record of such tests shall be maintained in a bound paged book and shall be signed by persons carrying out the test and countersigned by engineer and manager. Surprise inspection needs to be done by the engineer/superior officers to ensure that the braking system of the dumper is kept in working order.

The brakes are to be tested as per standards as per ISO 3450 or SAE J 11152 – 1980 which requires an adequate brake testing area to operate the vehicle at specific speed and then apply break to note the stopping distance. For parking brake test, the loaded vehicle has to be parked in a gradient for ten minutes to assess the efficiency. These procedures are so elaborate, it is difficult to carry out test every shift.

It may be noted that the Engineers will test and inspect braking system as per standard and records are maintained.

Discussions were held with manufacturers of dumpers and a simple method of testing the brakes and steering has been evolved which is reproduced below.

Test procedures – Service Brake:

- (ii) Fasten the seat belt
- (iii) Move the machine to dry level surface.
- (iv) Check the area around the machine.
- (v) Make sure that machine is clear from obstacles.
- (vi) Start the engine and build air pressure up to out of point.
- (vii) Apply the service brake while keeping all other brakes off and move the transmission selector lever to first range forward.
- (viii) Accelerate the engine RPM to 1400 and maintain it for few seconds.

Desired result: Machine should not move.

Test procedures – Retard brake

- (ii) Fasten the seat belt.
- (iii) Move the machine to dry level surface.
- (iv) Check the area around the machine.
- (v) Make sure that machine is clear from obstacles.
- (vi) Start the engine and build air pressure up to cut of point.
- (vii) Apply the retard brake while keeping all other brakes off and move transmission selector lever to first range forward.
- (viii) Accelerate the engine RPM to 1300 and maintain it for few seconds.

Desired result: Machine should not move.

Test procedures – Dump and parking brake

- (ii) Fasten the seat belt.
- (iii) Move the machine to dry level surface.
- (iv) Check the area around the machine.
- (v) Make sure that machine is clear from obstacles.
- (vi) Start the engine and build air pressure up to cut of point
- (vii) Apply parking brake while keeping all other brakes off and move the transmission selector lever to first range forward.
- (viii) Accelerate the engine RPM to 1200 and maintain it for few seconds.

Desired result: Machine should not move. Parking brake is considered to be in good working condition and can be expected to hold a loaded dumper on gradient of 15%.

Test procedures – Steering

1. Fasten the seat belt.
2. Move the machine to dry level surface place.
3. Check the area around the machine and ensure machine is clear from obstacles.
4. Start the engine and build air pressure up to cut off point.
5. Remove all brakes and keep gear in neutral.
6. Rotate the steering wheel and bring the tyres to an extreme end position.
7. Remove the hands from steering wheel.
8. Accelerate the engine RPM to 1000.
9. Rotate the steering wheel and bring the tyres to other an extreme end position.

Desired result:

When the hand is removed from the steering wheel either the steering or the tyres shall not move on its own. If any movement is observed it shall be concluded that the steering system needs checking and necessary repairs shall be carried out before putting the dumper into service.

In the interest of safety it is desired that shift and daily testing of braking and steering system of dumpers from the competent person/operators are carried out as above and records maintained to reduce the chances of accidents.

Director General of Mines Safety

No. DGMS Technical Circular No.05

Dhanbad, dated 14.03.2012

To

The Owners, Agents and Managers of all mines,

Subject: Grounding regime to be adopted for power supply and distribution systems for mines belowground and oilfields.

A national workshop on choice and standardization of electric power supply system in mines was held in Dhanbad on 11 and 12 May, 1990 wherein representatives from Mining Industries, National Laboratories, Statutory Authorities and Academic Institutions deliberated upon adoption of suitable grounding regime for power supply and distribution system both on surface and belowground feeding power to electrical equipment in mines and oilfields, recommended adoption of restricted grounding regime as this was considered to be the safest system for power supply system in mines and oilfields. The recommendations further elaborated as under :

- (a) With increase in degree of mechanization in underground coal mines, it has been felt necessary to limit the earth leakage current at not more than 750 milliampere.
- (b) Compared to solidly earthed neutral system the insulated and restricted neutral power supply system for mines have distinct advantages in reducing the hazards from the electrical sources.
- (c) Restricted neutral system can be conveniently adopted in mines. This is also in accordance with 1.5 Code of practice.
- (d) Solidly earthed neutral system of supply in coal mines is to be discontinued accordingly.

In view of the foregoing, the provisions of the then Rule 116(1) of the Indian Electricity Rules, 1956 [since redesignated as Regulation 100(1) of Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulation 2010] was amended as under:

"In the interest of safety, appropriate equipment shall be suitably placed in the mines for automatically disconnecting supply to any part of the system, where a fault, including an earth fault, occurs and fault current shall not be more than 750 milliampere in installations of voltage exceeding 250 V and upto 1100 V and upto 11 KV in open case mines and the magnitude of the earth fault current shall be limited to these specified values by employing suitable designed, restricted neutral system of power supply.

The original amendment to the Provisions of Indian Electricity Rule, 1956 was notified in March, 2000 effective from April 2000 [GSR 112:22nd March 2000 (w.e.f. 15.04.2000)]. Subsequently, a technical circular No.9 of 2001 (dated 20.09.2001) was issued by the Directorate requesting compliance within a year.

It has been observed that even after more than a decade, the compliance, at best, is sporadic and partial, jeopardizing safety in use of electricity in mines and oilfields.

It is, therefore, requested that mine management should take suitable action to convert the underground and oilfields power supply system from solidity grounded system to **restricted neutral system** within two (02) years.

Director General of Mines Safety

Encl: Copy of "Form for reporting electrical accidents".

No.DGMS (Tech.)/ Circular No.06 of 2012

Dhanbad, dated 14.03.2012

To

The Owners, Agents and Managers of all mines,

Subject: Lightning Protection System (LPS) in mines.

As well all are aware that lightening is a natural hazard with very high risk potential to inflict severe damage and destruction to life and property during the course of its discharge. The

mechanism through which lightning stroke completes its path to the ground causing accidents and damages is, therefore, needs to be reexamined. There have been a number of accidents/disasters due to lightning in mines and oil fields.

- 1.0 After review of global development on the issue of protection against lightning and the standards specified in IEC, it is observed that the key to safety against lightning lies in providing:-

- Electrical continuity with very low earth resistance; and
- Equipotential bonding in the plant and machinery including structures or group of structures.

In Oil or Gas mines including gathering storage and transportation lines, the following areas/places need special attention and protection;

- i. Transportation lines and storage tanks;
- ii. Structures in hazardous areas; and
- iii. Structures in non-hazardous area.

- 2.0 The details of protection required to be provided in the areas mentioned above are described below :-

- (i) Storage tanks :-

- a) Protection against Lightning for the structures used for the storage of liquids that can produce flammable vapours or used to store flammable gases, should be as mentioned in Annexure-D of IEC 62305-3 (point D.5.5.2).
- b) Soil covered tanks and pipelines do not require the installation of Air-termination devices.
- c) Isolated tanks or containers should be earthed according to Clause 5 of IEC 62305-3 depending on the greatest horizontal dimension (diameter or length)

Up to 20 m: one
Over 20 m: twice

- d) For tanks in tank farms (for example refineries and tank stores), the earthing of every tank at one point only is sufficient, independent of the maximum horizontal dimension. The tanks in tank farms shall be connected to each other. Pipelines, which are connected so that they are electrically- conductive according to clause 5.3.5 of IEC 62305-3 may also be used as connections.

(ii) Structures in hazardous area :

The LPS for the structures located in hazardous area of Coal/Oil/Gas mines should be in accordance with IEC 62305-3.

(iii) Structures in non-hazardous area :

The LPS for the structures located in non-hazardous area of Coal/ Oil/Gas mines should be in accordance with IEC 62305-3.

The circular is not exhaustive. Standard design, construction, extension, alteration or modifications in respect of lightning protection, earth termination system etc. for structures in hazardous and non-hazardous areas should be made in accordance with the standard and procedure mentioned in IEC 623053.

- 3.0 A standard checks and maintenance procedure should be framed and implemented for each machinery and installation in identified areas.

- 4.0 The data generated during installation, checks and maintenance/repairs or replacement shall be recorded in a prescribed format duly authenticated by competent person and engineer in-charge.

It is anticipated that a systematic approach with planned preventive maintenance would eliminate risk of lightning and reduce the incidence of accidents due to this cause.

Director General of Mines Safety

No.DGMS (Tech.)/ Circular No.07

Dhanbad,dated 14.03.2012

To

The Owners, Agents and Managers of all mines,

Subject: Intimation of accidents due to electricity in Mines.

The Indian Electricity Rules, 1956 has since been replaced by Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulation 2010.

Intimation of Electrical accidents has been not included in the Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulation, 2010, as it was already covered under "Indian Electricity Act 2003" under section 161 and Rule 3 of "The Intimation of accidents (Form and time of service of notice) Rules 2005".

It is therefore requested that the mine management shall intimate all electrical accidents to the concerned Electrical Inspector in the prescribed format (Form-A) provided in " The Intimation of accidents (Form and time of service of notice) Rules 2005" (Copy enclosed).

Director General of Mines Safety.

No.DGMS (Tech.)/ Circular No.08 of 2012

Dhanbad,dated 23.03.2012

To

The Owners, Agents and Managers of
All Coal mines,

Subject: Use and maintenance of Telemonitoring System.

The 10th Conference for Safety in Mines had recommended for providing effective monitoring system for the environmental parameters in respect of methane, carbon monoxide and other noxious gases. Facilities of continuous type monitoring was required to be installed within two years in all degree III gassy coal mines and in such other mines having active fire.

DGMS had issued Technical Circular (No.13 of 2009) intimating the guidelines regarding standard and upkeep of Tele-monitoring System at underground coal mines. Tele-monitoring being continuous monitoring system is an effective means for detecting dangers in nascent stages and thereby enabling suitable mitigating measures and averting losses due to disasters.

It has been observed that all degree-III and fiery mines have not implemented the directives fully. Even the few mines where the system is installed have a poor record as far as the standard, maintenance and operation are concerned. The system installed has been observed to be poorly maintained often inactive and is in a dismal state of affairs. Such situation was attributed to poor maintenance and lack of reliable mechanism of after sales service to the installation on a long term basis. Prevailing situation of non application of the directives and also of such defective systems in mines is contrary to the larger interest of safety, and that of sustainability.

Past experience on the issue also corroborates this, wherein it was felt that if Tele-monitoring system would have been installed and maintained at those mines, perhaps accidents/disasters could have been averted, and much of life and property could have been saved.

It is very much felt necessary to install reliable and efficiently working Tele-monitoring System at underground coal mines for continuous monitoring and early detection for noxious gasses which would enhance the possibility of early preventive action. Recent advances have been made on the Tele-monitoring subject, wherein many other parameters identified for pre warning have been added and wherein hand held instruments can also be effectively connected to the main Tele-monitoring system. As such all out efforts should be made to install reliable and effective Tele-monitoring systems in the larger interest of mines, and it should be ensured that the system is in continuous working order.

It is therefore, required that in the larger interest of safety and sustainability and in compliance to the recommendation of 10th Conference on Safety in Mines, regarding facilities of continuous monitoring, Strict directive be issued and implemented for ensuring reliable and efficiently working Tele-monitoring system at the underground coal mines.

Director General of Mines Safety

No. DGMS (Exam) Circular/01

Dhanbad, dated 12.01.2012

To

The Owners, Agents and Managers
Coal Mines

Subject: Certificate of training in surveying work in Coal Mines.

Of late, number of cases have been noticed where candidates for the Surveyor's Certificate of Competency Examination have submitted experience certificates in surveying work of very small belowground coal mines. There were very little or no infrastructures, survey instruments available in such mines to provide quality training. It has also been noticed that large numbers, even upto 77 candidates were deputed at a time to take training in such mine under one surveyor.

In order to improve the quality of training in surveying work, the Board of Mining Examination has decided that henceforth the training certificates issued by the mines having at least one. Theodolite of 20" least count and one auto level along with the supporting materials shall only be considered for grant of Surveyor's Certificate of Competency by the Board. The Board of Mining Examination has also decided that not more than five trainees shall be allowed for such training under one surveyor at one time.

Manager's are requested to ensure compliance of the above while engaging candidates to take training in surveying work in the mine and issue experience certificates.

Director General of Mines Safety

No. DGMS(Genl)/SOMA/Circular/01 of 2012

Dhanbad, dated 07.03.2012

To

The Owners/Agents/Managers
Of all Metalliferous Mines

Subject: Appointment of Engineers to hold general charge of machinery,
their installation, maintenance and safe working—regarding.

Often doubts are being raised on the above subject. This is to clarify that in pursuance of sub-regulation (1) of regulation 36 of the Metalliferous Mines Regulations, 1961, Government of India vide Notification No.S-66025/4/81/MI(ii) dated 8th November, 1982 have approved the Bachelor Degree in Mining Machinery awarded by the Indian School of Mines, Dhanbad as equivalent to the Degree in Mechanical Engineering for the purpose of holding general charge of machinery, their installation, maintenance and safe working, at the mines.

All concerned are being informed to initiate suitable action as desired for appointment of engineer under sub-regulation (1) of regulation 36 of Metalliferous Mines Regulations, 1961.

Director-General of Mines Safety

No.DGMS(Genl)/SOMA/Circular/02 of 2012

Dhanbad, dated 07.03.2012

To

The Owners/Agents/Managers
Of all Coal Mines

Subject: Appointment of Engineers to hold general charge of machinery,
their installation, maintenance and safe working—regarding.

Often doubts are being raised on the above subject. This is to clarify that in pursuance of sub-regulation (1) of regulation 33 of the Coal Mines Regulations, 1957, Government of India vide Notification No.S-66025/4/81/MI(i) dated 8th November, 1982 have approved the Bachelor Degree in Mining Machinery awarded by the Indian School of Mines, Dhanbad as equivalent to the Degree in Mechanical Engineering for the purpose of holding general charge of machinery, their installation, maintenance and safe working, at the mines.

All concerned are being informed to initiate suitable action as desired for appointment of engineer under sub-regulation (1) of regulation 33 of Coal Mines Regulations, 1957.

Director-General of Mines Safety

No.DGMS (Approval)AVA/01

Dhanbad, dated 29.02.2012

To

The Owners, Agents and Managers
Coal and Metalliferous Mines

Subject: Audio visual Alarm for surface transport Machinery & other Heavy
Earth Moving Machinery.

Vide Circular No.DGMS(Approval)/AVA/01 dated 25/05/2010, the standards for audio-visual alarms for surface transport Machinery & other Heavy earth Moving Machinery to be used in mines was circulated. However several queries are being raised on the status of approval of above item granted prior to 25.05.2010.

This is to inform that for using audio-visual alarms in the mine, the standards as stipulated vide Circular No.DGMS(Approval)/AVA/01 dated 25.05.2010 have not changed and the audio-visual alarms complying with the specified standard shall be considered as approved by the Chief Inspector of Mines by a general order as provided in the Gazette Notification No.Gazette of India vide GSR no.144 dated 22nd July, 2008.

The user industry are required to ensure that standard set Vide Circular No.DGMS(Approval)/AVA/01 dated 25.05.2010 are met by suppliers and strict quality control is maintained as per the standard specified.

It is also necessary that inspection and maintenance of audio-visual alarms as specified in Circular No.DGMS(Approval)AVA/01 dated 25.05.2010 are also strictly complied with.

Director General of Mines Safety

Encl: Copy of "Form for reporting electrical accidents".

DGMS

FORM FOR REPORTING ELECTRICAL ACCIDENTS

1. Date and time of accident :
2. Place of accident:
(Village/Town, Tehsil/Thana, District and State)
3. System and voltage of supply [Whether Extra High Voltage(EHV)/High Voltage (HV)/Low Voltage (LV) Line, Sub-station/generation station/consumer's installations/service lines/other installations].
4. Designation of the officer-in-charge of the generating company/license in whole jurisdiction the accident occurred.
5. Name of owner/user of energy in whose premises the accident occurred.
6. Details of victim(s):

(a) Human

Sl.No.	Name	Father's Name	Sex of victim	Full postal address	Approximate age	Fatal /non-fatal
1	2	3	4	5	6	7

(b) Animal

Sl.No.	Description of animal(s)	Number(s)	Name(s) of owner(s)	Address(s) of owner(s)	Fatal/non-fatal
1	2	3	4	5	6

7. In case the victim(s) is/are employee(s) of supplier:-
 - (a) Designation of such person(s);
 - (b) Brief description of the job undertaken, if any;
 - (c) Whether such person/persons was/were allowed to work on the job
8. In case the victim(s) is/are employee(s) of a licensed contractor:-
 - (a) Did the victim(s) possess any electric workmen's permit(s), supervisors certificate of competency ?
If yes, give number and date of issue and the name of issuing authority;
 - (b) Name and designation of the person who assigned the duties of the victim(s).
9. In case of accident in the system of the generating company/licensee, was the permit to work (PTW) taken ?
10. (a) Describe fully the nature and extent of injuries, e.g. fatal/disablement(permanent or temporary or any portion of the body or burns or other injuries.
(c) In case of fatal accident was the post-mortem performed ?

The intimation of accidents (Form and Time of Service of Notice) Rules. 2005.

11. Detailed causes leading to the accident :
(To be given in a separate sheet annexed to this form).
12. Action taken regarding first aid, medical attendance etc. immediately after the occurrence of the accident (Give details).

13. Whether the District Magistrate and Police Station concerned have been informed of the accident (If so, give details).
14. Steps taken to preserve the evidence in connection with the accident to extent possible.
15. Name and designation(s) of the person(s) assisting, supervising the person(s) killed or injured.
16. What safety equipments were given to or used by the person(s) who met with this accident (e.g., rubber gloves, rubber mats, safety belts and ladders etc.)?
17. Whether isolating switches and other sectionalizing devices were employed to deaden the sections for working on the same. Whether working section was earthed at the site of work.
18. Whether the work on the live lines was undertaken by authorized person(s) ? If so, the name and the designation of such person(s) may be given.
19. Whether artificial resuscitation treatment was given to the person(s) who met with the electric accident. If yes, how long was it continued before its abandonment ?
20. Names and designations of persons present at, and witnessed, the accident.
21. Any other information /remarks.

Place.....

Signature.....

Time.....

Name.....

Date.....

Designation.....

Address of the
Person reporting.....

<><><><><><>

NOTIFICATIONS & CIRCULARS**Notifications – 2013****MINISTRY OF LABOUR AND EMPLOYMENT**
(DIRECTORATE-GENERAL OF MINES SAFETY)

Dhanbad, the 17th July, 2013

G.S.R.183.- In continuation of the earlier Gazette Notification No. 554 dated 16th June, 2007 in Part- II Section 3, Sub- section (i) vide G.S.R. 106 and as provided thereat, I hereby approve the design, specification and test procedures of pit bottom buffer to be installed at pit bottom of winder shaft in mines by DGMS (Approval) Circular No.1 of 20.06.2013 and it shall be treated as a general order in writing and shall be applicable from the date of publishing in Gazette Notification.

[No.16 (38)79- Say-/01]

RAHUL GUHA, Director General of Mine Safety

Dhanbad, the 18th July, 2013

G.S.R.184.- In continuation of the earlier Gazette Notification No. 35 dated New Delhi, August 24th August-30th, 2008 in part-II, Section 3, sub- section (i) vide G.S.R. 160 and as provided thereat, I hereby declare 17th July, 2013 as the date from which the use of Glass/ Fibre Reinforced Plastic/ Polymer (GRP/FRP) rockbolt assemblies and components as supports for other than roof strata in the working of below ground coal mines, will be considered as approved by me by this general order in writing subject to complying with the standards as stipulated in DGMS Circular (approval) No. 3 of 2013 dated 17th July, 2013.

[No.16 (38)79- Say//02]

RAHUL GUHA, Director General of Mine Safety

CIRCULARS-2013

No-DGMS Technical circular/01

Dhanbad, dated: 25.02.2013

To
The Mine Owner, Agent and Manager,
Coal and Metal Mines.

Sub: Accidents due to failures of coal/ore handling plants in mines.

There had been number of accidents due to collapse of coal/ore handling plants and their bunkers resulting in fatalities. It has been noticed that such incidences are on the rise. Two such cases were as follows,

- (1) In a mine while a gang of six persons, engages in repair work in a coal handling plant, were trying to open a jammed chute gate with a chain block which had become weak and unsafe due to failure of welding. The bunker collapsed burying four of them to death beneath the coal and broken steel, the fifth received bodily injuries where as the sixth escaped unhurt.
- (2) Recently in one of the mine while a chute operator was loading tippers by standing near the operating panel located below the bunker, the conical shape hopper of the bunker dislodged from the welded joints of the bunker and fell over the operator inflicting serious bodily injuries to which he succumbed instantaneously.

The enquiry into these fatal accidents revealed that :-

- 1) An old coal handling plant working in some other mine was shifted and re-installed,
- 2) The dismantling and installation works were carried out by contractors, who did not possess adequate facility and expertise,
- 3) The coal handling plant was not constructed on the basis of any drawing and not certified for its safe design and construction by any competent agency,
- 4) Quality of fillet weld was inferior to that normally designed for structures,
- 5) Improper welding had reduced the strength of joints,
- 6) The lesser width strips and non-uniform weld size without proper alignment between the connecting members reduced the strength of joints and structures,
- 7) Quality control and thorough inspections were inadequate,
- 8) The chute operator panel was provided below the bunker,

In order to avoid the repetition of such coal/ore handling plant failures, it is suggested that:

The management of the mines should conduct a risk assessment process to identify and hazard that could influence the safety and health of workers while installing and maintenance of coal/ore handling plants and other heavy structural works. All hazards must be quickly identified and controlled using a risk ranking process.

It should be noted that hazard identification and risk assessment should not be considered to be a on/off occurrence but should be done at regular intervals to ensure that the plants to cope with the identified hazards are pertained and up to date.

Further the following measures shall be under taken by the management:-

- 1) All coal/ore handling plants and other heavy structural works should be fabricated and installed on the basis of drawings certified by competent organization and each bunker should have adequate factor of safety,
- 2) The plants should be installed under proper supervision who have knowledge of norms of fabrication, welding and testing procedures,

- 3) After completion, its stability needs to be checked by an independent agency before it is commissioned. Completion certificate of the structure should be given jointly by Civil and Electrical and Mechanical departments of the company,
- 4) The bunker should not be allowed to accumulate load for a long time and should be emptied as early as possible,
- 5) The operating control panel of the chute shall be installed away from the structure and never located below the plant,
- 6) Only trucks/trippers having canopies covering the full cabin should be used for transportation of coal/ore,
- 7) In the event of jamming of gates, proper supports should be provided. This supports should be certified by the manager and engineer of the mine in writing to the subordinate officials before starting the repair work,
- 8) Competent agency should study the adequacy of design of Coal/ore handling plants already installed and if required further strengthening of structure shall be carried out.
- 9) The daily, weekly and monthly examination protocol of plants and structures shall be framed and implemented within 3 months of issue of this circular,
- 10) The annual inspection programme of CHP must be carried out as per DG(Tech) Circular 2 of 1999.

In the interest of safety, the above recommendations along with risk assessment shall be implemented strictly to reduce the chances of accidents in coal/ore handling plants working in mines.

Chief Inspector of Mines and HOD

No. DGMS Technical Circular/02

/Dhanbad, dated 25.04.2013

To
The Mine Owner, Agent and Manager,
Coal, Metalliferous Mines and Oil Mines.

Sub: Users of Manila Ropes in Mines.

Manila ropes and sisal ropes are items which are used in applications of lifting, climbing etc in Mines. It involves human life and any defect in manufacturing of such ropes may lead to serious consequences. Number of accidents/incidents due to failure of such ropes is being reported to this Directorate.

Attention is drawn to circular No.6 of 1996 recommending the use of manila rope conforming to IS 1084: 1993. It has been observed during inspection and enquiries that manila ropes not conforming to Indian standard are being used which may lead to accidents.

The manufacturing of manila and sisal rope involves hacking and spinning of fibers into yarn and further twisting of yarn into ropes. Manufactures have to install hard fiber processing plant comprising of goods spreader machine for hacking drawing machine for parallelization and evenness of sliver, spinning machine twisting of yarn etc.

We would reiterate that the manila ropes used in mines should conform to IS-1084 of latest revision and preferably procured from manufacturer having license from Bureau of Indian Standard to manufacture manila ropes.

I trust the mine managements will take appropriate action to comply with the above recommendation in the interest of safety of persons employed in the mine.

Chief Inspector of Mines

DGMS

No. DGMS Technical Circular/03**/Dhanbad, dated 23.05.2013**

To
The Owner, Agents & manager,
of all Coal Mines.

Sub: Accidents due to dumpers and tippers/trucks in Open Cast Coal Mines.

Analysis of fatal accident statistics in coal mines from 2006-2011 revealed the followings:-

- (i) Out of the total 487 fatal accidents, 135 accidents occurred in opencast coal mines;
- (ii) Out of the 135 accidents as mentioned above, 58 fatal accidents were due to dumpers, 59 due to tippers/trucks and 18 were caused by other vehicles;
- (iii) 42.96% of the accidents were caused by dumpers and 43.70% were caused by trucks/tippers, thereby, making them the largest cause group contributing to fatal accidents in opencast coal mines;
- (iv) Analysis also revealed that 12.07% of the accidents caused by dumpers was due to head on collision, 18.97% due to hit by dumpers, 24.14% due to run over while reversing and about 20.69% was due to toppling;
- (v) 5.08% of the accidents caused by trucks/tippers were due to head-on collision, 40.68% were due to runover while reversing, 16.95% were due to toppling down of trucks/tippers and 15.25% were due to hit by truck/tippers;
- (vi) Reversing of dumpers and trucks/tippers contributed to a large percentage of the accidents;

Investigation into such accidents further identified the root causes as:-

- (a) Lack of awareness
- (b) Lack of adequate training
- (c) Issues regarding maintenance of dumpers/tippers/trucks etc.
- (d) Design and maintenance of haul road etc.

In order to prevent such accidents and to increase awareness among all stakeholders, several circulars had been issued by the DGMS in the past. A list of such circulars is enclosed.

I once again reiterate the need for exercising utmost caution in operation of such machines in opencast coal mines of the country and remind all concerned that compliance to the recommendations made in the circulars will go a long way in preventing accidents caused by dumpers, tippers/trucks etc.

I would also like to draw your attention to the recommendations of the 7th and 8th Conferences(1988 & 1993) of "Safety in Mines" pertaining to the subject and urge all mine managements, supervisors, workers and contractors to implement the recommendations in right earnest.

All such accidents are preventable, and in order to achieve that, a thorough risk assessment, framing and implementation of an effective safety management plan need to be made at all mine level so that the risks from operation of dumpers, tippers/trucks and other wheeled – trackless transportation machinery are eliminated.

(Rahul Guha)
Director General of Mine Safety

Encl: As above.

Annexure**List of Circulars issued earlier**

1. Circular (Tech) 13 of 2002 on "Safety management System", which specify Risk Assessment, Risk Management Plan & its control.
2. Circular (Tech) 9 of 2003 on "Provision of proper audio visual alarm during reversing of vehicles", which specify the specifications of Audio Visual Alarm.
3. Circular (Tech) 2 of 2004 on "Accidents due to tippers in opencast mines", which specify about the fitment of exhaust brake.
4. Circular (Tech) 6 of 2008 on "Separate road for light motor vehicles in mine premises of mechanized opencast coal and non-coal mines".
5. Circular (Tech) 9 of 2008 on "Modified standard condition stipulated under regulation 98 of CMR, 1957 and regulation 106 MMR, 1961 for using HEMM in opencast mines".
6. Circular (Tech) 1 of 2009 on "Use of Surveyed off equipment in opencast Coal and Metalliferous Mines".
7. Circular (Tech) 12 of 2009 on "provision of rear vision system in equipment".
8. Circular (Tech) 5 of 2010 on "Safety features to be incorporated in Tippers/Trucks".
9. Circular (Tech) 4 of 2012 on "Accidents due to dumpers due to failure of braking and steering systems in mines".

No. DGMS Technical Circular/04/MAMID

/Dhanbad, dated 17.07.2013

To
The Owner, Agent and Manager of all Mines

Subject: "Safety is My Responsibility" campaign.

Mining is a hazardous profession where safety and health of persons working in mines is of utmost importance. Over the years, many rules, protocols, standards etc. have been established to ensure that the activities at work do not affect the safety and health of the miners adversely. The rapidly changing scenario of mining industry the world over and specifically in India has introduced newer hazards and safety concerns at workplace while the traditional hazards such as inundation, fire, dust, noise etc. in mines are yet to be fully controlled. These hazards pose new challenges for occupational safety and health professionals as well as mining technologists and will require comprehensive surveillance at workplaces and newer strategies for prevention of accidents in mines. The fact remains that despite efforts by government agencies, due importance is yet to be given by the mining industry to prevention of adverse effect on health of workers and the traditional approach towards safety has stopped yielding better results.

Our endeavour to bring down the hazards to prevent accidents and occupational diseases by all available means to an acceptable level of risk must continue. A concerted effort needs to be directed to reduce the risk so as to keep the work force not only safe but healthy and happy too.

Keeping this in view, The Ministry of Labour and Employment & DGMS launched a Nationwide initiative called "Safety is My Responsibility" campaign. As a first step, a card has been launched by Honorable Ministry of Labour & Employment Shri Sis Ram Ola in hindi and English in the inaugural session of 11th Conference on Safety in Mines held on 4th & 5th July, New Delhi. This card in due course of time will be carried by each mine worker of the country while at work. The card contains 10(Ten) very important questions reminding the employees to ask them before start of any work in mines. If the answers to such questions result in a "No", the workers will be urged to take up the issue with their senior supervisors at site for initiating corrective measures.

Hence everybody should give this concept a wide publicity and the mining companies need to replicate this card in local languages, so that in a short while, no miner in our country may start work without asking these 10 questions.

Content of the card is enclosed for your ready reference.

Yours faithfully,

Director General of Mines Safety

No. DGMS(Tech) Circular(MAMID)/05

Dhanbad, dated 17.07.2013

To,

The Owner, Agent and Manager of all Mines

Subject: Recommendations of 11th National Conference on Safety in Mines held on 4th & 5th July 2013 at New Delhi.

You are aware that the 11th National Conference on Safety in Mines held on 4th & 5th July, 2013 at New Delhi. Besides reviewing the status of implementation of the recommendations of 10th Conference on Safety in Mines, the Conference have deliberated upon and made valuable recommendations on the following subjects:

1. Small Scale Mining
2. Safety, Health and Welfare of Contractual Workers
3. Surface and Underground Transportation Machinery

The recommendations of the n" Conference as enclosed are hereby being brought to your attention for information and necessary action.

Director-General of Mines Safety

To

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For information and bringing it to the notice of the nominated Owner(s)/Agent and Managers of all Mines of the Company and Others.

Recommendations of 11th Conference on Safety in Mines held on 4th & 5th July, 2013 at New Delhi.

1.0 Review of status of implementation of recommendations of 10th Conference on Safety in Mines.

- 1.1(a) Necessary facilities for monitoring the environmental parameters in respect of Methane and Carbon Monoxide should be provided at mines. Facilities of continuous type monitoring should be installed within two years in all degree III gassy COAL and in such other mines having active underground fire.
- 1.1(b) Indigenous manufacturers should be encouraged to manufacture necessary equipments.
- 1.1(c) Time bound programme is to be made, which should be decided in a tripartite committee at company level.
- 1.2 In underground specified mines where long or arduous travel is involved, arrangement for transport of men should be made with a target of 20 % every year.
- 1.3 In respect of small-mechanised mines, which are operating in NON-COAL sector, it may not be feasible for a small organization to create a special department on Occupational Health Services. For such small mines, it is suggested that an Association of small mines operators creates common facilities and infrastructure for occupational health services. Creation of such facilities are specially needed for asbestos, manganese and mica mines.
- 1.4 Development of a portable instrument for detecting hidden slips in roof of COAL mines should be taken up on priority by R&D organizations. The instrument should be developed by S&T project which should be guided by a committee consisting of an officer from DGMS and others from COAL Industry and Research Organisations.
- 1.5(a) Before the valid gate pass is issued for entry of trucks and other vehicles not belonging to management into the mine, the mine engineer should check the road-worthiness of such vehicles.
- 1.5(b) In order to check entry of un-authorized vehicles in mine premises, each mine should establish property manned check gate(s) at the entrance(s) where record of entry and exist of each such vehicle should be maintained.
- 1.6(a) All persons engaged at any work within the mine premises through the contractors have received relevant training and other job-related briefings and that the drivers of vehicles belonging to contractors entering the mine premises have additionally been explained the salient provisions of "traffic rules".
- 1.6(b) Each mining company should draw up appropriate training schedules and modalities in this regard and implement the same.
- 1.6(c) In case of smaller mines, such arrangement may be made by association of mine operators.
- 1.7 Considering the risk of fire, all COAL mine companies shall rank its COAL mines on a uniform scale according to its risk from fire on scientific basis. Guidelines may be framed by DGMS and circulated to all mining companies

1.8 Contractor work vis-à-vis safety

1.8.1 Employer's responsibilities

- 1.8.1(a) Suitable clauses (in consistence with risk of the work allotted) shall be included in tender

- document (including NITs) stating how the risk arising to men and material from the mining operation/operations to be done by the contractors shall be managed.
- 1.8.1(b) Ensure that contractors are familiar with the relevant parts of the statutes, health and safety management system and are provided with copies of such documents prior to commencing work .
- 1.8.1(c) Ensure that contractor's arrangements for health and safety management are consistent with those for the mine owner. All the rules, regulations and bye-laws as applicable to the mine owner are also applicable to the contractor. Details of the contractor's workmen should be maintained in the owners Form-B register. Whereas as C, D & E registers for contractor men may be maintained independently by the owner and shall be kept in the mine office of the manager.
- 1.8.1(d) Ensure that contracts should preferably of longer period (3 years), so that there is adequate scope of management of safety by the contractor.
- 1.8.1(e) Ensure that contractors provide the machinery, operator and other staff with written safe work procedures for the work to be carried out, stating clearly the risk involved and how it is to be managed.
- 1.8.1(f) Monitor all activities of the contractors to ensure that contractors are complying with all the requirements of statute and the system related to safety. If found non-compliance of safety laws directing the contractors to take action to comply with the requirements and for non-compliance, the contractor may be suitably penalized. Clause to this affect may be a part of the agreement between the employer and the contractor.
- 1.8.1(g) Where a risk to health or safety of a person arises because of a non-compliance directing the contractor to cease work until the non compliance is corrected.
- 1.8.2 Contractor's responsibilities**
- 1.8.2 (a) Prepare written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with it/them.
- 1.8.2 (b) Provide copy of the SOP to the person designated by the mine owner who shall be supervising the contractor's work.
- 1.8.2 (c) Keep an up to date SOP and provide a copy of changes to a person designated by the mine owner
- 1.8.2 (d) Ensure that all work is carried out in accordance with the Statue and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner.
- 1.8.2 (e) For work of a specify scope/nature, develop and provide to the mine owner a site specific Code of Practice (COP).
- 1.8.2 (f) Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring the compliance all safety laws by the sub or sub-sub contractors.
- 1.8.2 (g) All persons deployed by the contractor for working in mine must undergo vocational training, initial medical examination, PME. They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of VT & IME.
- 1.8.2 (h) Every person deployed by the contractor in a mine must wear safety gadgets to be provided by the contractor. If contractor is unable to provide, owner, agent and manager of the mine shall provide the same.
- 1.8.2 (i) The contractor shall submit to DGMS returns indicating -Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment of work

persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons. The return shall be submitted quarterly (by 10th of April, July, October and January) for contracts of more than one year. However, for contracts of less one year, returns shall be submitted monthly.

1.8.3 Employees Responsibilities

- 1.8.3 (a) An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.
- 1.8.3 (b) An employee must, while at work, co-operate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

1.9 Safety issues in mines in un-organised sector

- 1.9.1 In case of stone quarried on hillocks, whole of the hillock should be given out as a single lease so that necessary development could be done from top-downwards after making approach road to reach to top of the hillock before starting extraction of stone. A condition to this effect may be incorporated before granting such leases.
- 1.9.2 In the lease document, reference should be made to the Mines Act and the Rules and Regulations made there under for compliance. The DGMS may prepare, in consultation with Ministry of Mines a model document for grant of leases by the state governments so that the conditions of leases are such that there is a uniformity and compliance with central laws.
- 1.9.3 A copy of the lease document should be sent to the DGMS and lessees explicitly asked to send notice of opening of mine to DGMS in accordance to the Provisions of the Mines Act.
- 1.9.4 The Conference has noted that there have been instances in some States where leases have been granted in close proximity of inhabited area and within 45 m. of Railway acquired land and land acquired for National and State highways, public works without consulting the appropriate statutory authority. The conference recommends that the States may grant mining leases in conformity of Central Laws.
- 1.9.5 DGMS should organize Orientation Programmes for officers of State Mines and Geology Departments to inform them about safety laws.

1.10 Occupational Health surveillance and Notified Diseases

- 1.10.1 Noise mapping should be made mandatory of various workplaces in the mine premises based on the various machines being used in concerned mines along with personal noise dosimetry of individual workmen exposed to noise level above 85 dbA.
- 1.10.2 Vibration studies of various mining machineries before their introduction in mining operation should be done as per ISO Standards.
- 1.10.3 Ergonomical assessment of all latest machines, before their introduction into mining operation as per ISO standards. Ergonomical assessment should include:
- * Assessment of work process.
 - * Assessment of working Aids/tools
 - * Assessment of working posture.
- 1.10.4 Portability tests of drinking water supplied to the mine employees, to be made mandatory once in a year irrespective of its source, preferably after Rainy seasons, the sample of water should be collected from the points of consumption.
- 1.10.5(a) In addition to measurement of blood pressure, detailed cardiovascular assessment of employees

should be done. This should include 12 leads electrocardiogram and complete lipid profile.

- 1.10.5(b) Detailed neurological examinations including testing of all major superficial and deep reflexes and assessment of peripheral circulation to diagnose vibrational syndromes.
- 1.10.5(c) In addition to routine urine, fasting and post-parandial blood sugar should be included for early diagnosis of diabetes mellitus.
- 1.10.5(d) Serum Urea Creatinine should be included for assessment of Renal function.
- 1.10.6 Special tests should be included in the PME for employees exposed to specific health hazard:
 - 1.10.6(a) For employees exposed to manganese, special emphasis should be given to behavioural and neurological disturbances such as speech defect, tremor, impairment of equilibrium, adiadochokinesia H2S and emotional changes.
 - 1.10.6(b) For persons exposed to lead, PME should include blood lead analysis and delta aminolevulinic acid in urine, at least once in a year.
 - 1.10.6(c) Employees engaged in food handling and preparation and handling of stemming material activities should undergo routine stool examination once in a every six months and sputum for AFB and chest radiograph once in a year.
 - 1.10.6(d) Employees engaged in driving/HEMM operation jobs should undergo eye refraction test at least once in a year.
 - 1.10.6(e) Employees exposed to ionizing radiation should undergo blood count at least once in a year.
- 1.10.7 All other types of Pneumoconiosis excluding Coal workers pneumoconiosis, silicosis and asbestosis. This include Siderosis & Berillyosis.
- 1.10.8 For smaller mines where PME facilities are not existing, medical examinations can be done through other competent agencies.

1.11 Mechanisation with view to phase out manual loading etc.

- 1.11.1 Keeping in view the objective of phasing out manual loading, all COAL companies shall identify appropriate technology suitable for the prevailing geo-mining conditions and introduce the same in such a manner so as to phase out manual loading operation completely within a period of five years in COAL seams with gradient of 1 in 5 or less, within a period of seven years where gradient steeper than 1 in 5.
- 1.11.2 While formulating the strategies for face mechanization in underground workings, it shall be ensured that back facilities like COAL evacuation, support system, ventilation arrangements etc are compatible with face mechanization.
- 1.11.3 The scheme of face mechanization shall be based on proper scientific investigation. The scheme shall also include arrangements for monitoring strata behaviour and environmental conditions.
- 1.11.4 Possibility of deployment of multi-skilled miners in the face shall be explored to reduce the exposure at hazardous areas without affecting employment.
- 1.11.5 Suitable training for efficient and safe operation of machinery shall be imparted to all concerned.
- 1.11.6 While planning for face mechanization, due considerations shall be given for long term sustainability of the technology.

1.12 Reduction from risk from roof and sides falls in coal mines.

- 1.12.1 In every Coal mining company, STRATA CONTROL CELL shall be established at corporate and area levels within a period of one year, to assist mine managers, for formulation of Systematic Support Rules, monitoring strata control measure in a scientific way to ensure efficacy of support system and for procurement/supply of quality supporting materials. Such cell shall be manned by adequate number of technical personnel headed by a senior official not below the rank of General Manager at Corporate level and Dy. General Manager at Area level.
- 1.12.2 Roof bolting shall be used as a primary means of support for freshly exposed roof in development as well as depillaring districts. For the roof category Poor, having value of RMR of 40 or less, or where there is excessive seepage of water from the roof strata, roof bolts exclusively with resin capsules shall be used to ensure adequate & immediate reinforcement of the strata.
- 1.12.3 To ensure proper drilling for roof bolting in all types of roof strata, suitable fit-for-use roof bolting machines shall be introduced in all mines within a period of one year. Such machines shall be capable of being operated from a distance or be provided with suitable canopy to protect the supporting personnel during drilling or bolting operations.
- 1.12.4 Risk assessment exercise shall be carried out in the mines for assessing for risk from the hazards of roof and sides falls and identifying the control mechanism with specific responsibility for implementation. This exercise shall be reviewed at regular intervals not exceeding a year.
- 1.12.5 Each company shall take steps to impart structured training to officers, supervisors and support personnel on roof bolting.

1.13 Below ground communication and tracking system

- 1.13.1 Mining companies in collaboration with research institutions/equipment manufacturers shall initiate and fund for, suitable research initiatives for establishment of appropriate communication system for below ground mines including to locate the trapped miners.
- 1.13.2 Mine management in collaboration with equipment manufacturers shall evolve a system of proximity warning device in HEMM and initiate measures for its implementation.

1.14 Safety Management system” Strategies for implementation and path forward.

- 1.14.1 Every mine should employ a sound risk analysis process, should conduct a risk assessment, and should develop a safety management plan to address the significant hazards identified by the analysis / assessment.
- 1.14.2 The managements of every mining company should adopt the process of safety management system and commit itself for proper formulation and implementation of the same in totality. Necessary resources should be allocated for implementation of the control measures identified by the risk assessment process.
- 1.14.3 Necessary training of all employees of Mining Companies should be organized with the help of experts, both national and international, for optimal adoption of safety management system.

1.15 Implementation of ILO convention No. 176 in Mines

- 1.15.1 The committee decided that a separate discussion be held by the Govt. of India in a tripartite forum to deliberate on the implications arising out of ILO Convention No. 176.

2.0 Small Scale Mining

- 2.1 The concerned authority in State Governments may grant prospecting lease/mining lease/ mining right after ascertaining technical feasibility of mineral extraction in pursuance with provisions of the mining law, so that the lessee can make medium to long-term plan for investment in infrastructure and work the mines in a safe and scientific manner. While conduct of mining operations, it should be ensured that the Central Laws, including the Mines Act are complied with.
- 2.2 The State Governments may explore the feasibility of demarcation of mining zones to avoid problems of growing habitation encroaching into the mining area, thereby creating unsafe and unhealthy conditions. However, the State Governments may take efforts to relocate the habitation already existing near mining zones.
- 2.3 The lease granting authority of State Governments may assign a unique identification number, which will serve as a common reference for all central and state authorities responsible for administration of central and state laws.
The details of lease may be displayed in a board of permanent nature in a prominent place in the lease hold are showing following:
- Name of lessee:
 - Lease number:
 - Period of lease:
 - Unique identification number:
- 2.4 The lease granting authority of State Governments may insert a clause in the lease document requiring the lessee to submit a notice of (i) commencement of any mining operation, and (ii) appointment of a manager, prescribed under the Mines Act, 1952 and Rules and Regulations framed there under.
- 2.5 The concerned authorities of State Governments may be requested to explore the possibility of introducing a course in Mining at Industrial Training Institutes in consultation with DGMS to augment the requirement of Mining Mates.
- 2.6 Orientation Programmes may be organized for officers of State Mine and Geology Departments on OSH Laws.
- 2.7 Organized mines of public and private sector may consider extending their facilities in Vocational Training, Occupational Health Surveillance and other Safety Awareness Programmes for workers engaged in small scale mining sector.
- 2.8 As a promotional initiative, social dialogue and deliberations at appropriate level may be initiated to facilitate formation of Cooperative Society/Mine Owners Association to tackle issues of resource and logistics management essential for safe and healthy mining.
- 2.9 The Conference appreciates the efforts made by Ministry of Labour & Employment and Directorate General of Mines Safety for encouraging and adopting innovative means to create awareness about OSH issues and improving compliance in small scale mining sector with public private interventions. It is recommended to continue with such initiatives vigorously and in enhanced manner.
- 2.10 The concerned authorities may explore possibilities of setting up of Mine Workers Welfare Boards for minerals like sandstone, marble and granite.

3.0 Safety, Health and Welfare of Contractual Workers.

- 3.1 The recommendations made in the 10th conference on Safety in Mines regarding safety, health and welfare of contractor's workers shall be complied within two years. Owner, Agent and Manager shall be responsible for ensuring compliance at their respective mines.
- 3.2 There shall be provisions for modifications in Notice Inviting Tenders (NITs) to fulfil the

requirement of statute/circulars issued by DGMS from time to time subsequent to the finalization of NITs also.

- 3.3 The contractor shall not employ or terminate his worker without the knowledge of the mine management.
- 3.4 Payment to contractor's workers including leave with wages shall be made through bank only.
- 3.5 In case of non-routine type of work in the mine a Work-Permit system, outlining the precautions to be adopted, SOPs, supervision, persons responsible for the job etc., shall be adopted.
- 3.6 Each company shall frame a safety, health and welfare policy for their contractor's workers keeping in view the requirement of Mines Act and Rules & Regulations made there-under. The details of the policy shall be included in the tender document which will be a binding clause for the contractor.
- 3.7 Each mining company shall extend all benefits including medical facilities and payment of wages, to contractor's workers receiving injury whilst on duty. Owner, Agent and Manager shall be responsible for ensuring compliance at their respective mines.
- 3.8 Medical facilities shall be extended to contractor workers.
- 3.9 Central Government should take steps against non-compliance of the recommendations of the National Safety Conferences.

4.0 Surface and Underground Transportation Machinery:

4.1 MACHINERY FOR SURFACE OR OPENCAST OPERATIONS.

- 4.1(a) Mine Planning & Design;
The provisions of requirements of HEMMs and their installations, operations, maintenance and training shall be included in the project at planning stage.
- 4.1(b) Safety Features in HEMMs
 - 4.1(b)(i) Audio-Visual Alarm;
 - The sound level of AVA should be at least 5 to 20% higher than the ambient noise level; and
 - The audio frequency and its amplitude band should be increasing and uniquely heard to keep persons alert in the blind zone during reversal.
 - AVA should be of IP 67 compliance.
 - 4.1(b)(ii) Anti-Skid and Tail-End Protection System;
The provision of tail end protection, bumper extension or any other device shall be provided in dumpers/tippers to prevent collision both head on and head to tail conditions.
 - 4.1(b)(iii) GPS-GSM Based Navigation System;
The GPM-GSM based vehicle navigation system shall be used in large mines in a phased manner.
- 4.1(c) Risk Control and Management;
Risk Assessment and Control of Risks should be conducted by the mine management quarterly and annually.
- 4.1(d) Skill Development and Training;
General Skill Development programme should be undertaken for training of operators and all other associated staffs using state of the art technique including simulation and 3D Virtual Reality system.

- 4.1(e) Protection against Fatigue.
- 4.1(e)(i) Long or Extended Hours of driving beyond 8 continuous hours with a rest interval of half an hour after four hours of continuous operation, shall not be permitted, for which biometric system of check-in & check-out system of attendance associated with suitable software shall be introduced in the mine.
- 4.1(e)(ii) Additional warning system for operator's fatigue should be provided in the machine.
- 4.1(e)(iii) Operator's Seat in the Vehicle/HEMMs should be ergonomically designed to have adequate comforts while driving continuously.
- 4.2 TRANSPORTATION MACHINERY IN UNDERGROUND:-
- 4.2(a) All steam winders should be replaced with electric winders in phased manner within a period of five years.
OR
Alternate access to the mine in the form of Inclines or Shafts may be considered and implemented within the same period.
- 4.2(b) Safety Features in Winding;
Detail survey of all winding installation completed 20 years shall be carried out by committee of experts and its recommendations shall be implemented.
- 4.2(c) Man-Riding System;
DGMS should initiate necessary steps to frame suitable standard for man riding system within a period of 18 months through an expert committee.
- 4.2(d) Use of Diesel Equipment belowground in Coal Mines;
An expert committee may be appointed to examine and frame standards and safety provisions for diesel equipment in belowground both coal and non-coal mines.

DGMS Circular (Technical) No. 6 of 2013

Dhanbad, dated 22.08.2013

To

All Owners/Agents/Managers of all Coal Mines.

Subject: Use of High Wall Mining Technology in Indian Coal Mines.

1.0 High wall mining technology is very new to the Indian coal mining scenario with only two mines presently operating. But, because of techno-economic viability, more mines are planning to introduce the same. Therefore, with a view to enhance overall standards of safety, productivity and efficiency by better understanding of the intricacies involved in the technology and evolving standardized approaches/processes/operations for mines, a technical workshop was organized on 2nd August, 2013 at DGMS(HQ), Dhanbad. The workshop was well attended by over 125 representatives from various coal companies, machinery manufacturers, private contractors, research organizations, educational institutions apart from officers of DGMS. 10 technical presentations were made on various related subjects by the participants.

2.0 Brain storming in technical sessions over a wide range of connected subjects during the workshop led to the formulation of the following recommendations.

2.1 Strategic Prior Planning for the technology at corporate levels:

- a) The suitability of any seam/section earmarked for exploitation by High wall Mining technology shall be studied. in depth by mining companies with the active engagement of DGMS, specially in respect of maximizing coal extraction/conservation while sustaining highest levels of operational safety.
- b) Mining companies shall ensure macro & micro geological mapping of the area proposed for exploitation along with a detailed study report on their influence on web/barrier pillar stability during exploitation.
- c) The most suitable and scientific exploitation of the area proposed by High wall Mining Technology shall be formulated by the mining companies with active engagement of the internal R&D cells, scientific organization sand DGMS.
- d) Mining companies shall ensure an effective and continuously available coal evacuation system from the area proposed for exploitation by High wall Mining Technology to ensure that operations at the producing front are not interrupted any time with attendant dangers of serious strata management issues.
- e) Mining companies shall ensure provision and availability of commensurate ancillary arrangements in the exploitation area.
- f) Mining companies shall ensure a properly functional Strata Management Cell at mine/Area level in accordance with Recommendations of the 10th Conference on Safety in Mines, with adequate staffing and infrastructure.
- g) Mining companies through their respective R&D cell & in consultation with DGMS and scientific organizations, shall formulate effective goaf inertization programmes for preventing danger of fire/explosion and for avoiding pre-mature stoppages of operations thereby during operation and also beyond, minimizing strata control problems and also enhancing panel life and general stability of the area.

2.2 Statutory Compliance Ensurance System:

Mining companies shall evaluate the statutory compliance aspects of the prospective OEMs before initiating actions for feasibility studies. Systems shall have to be so planned that the minimum required statutory stipulations are satisfactorily met with through-out the lifespan of the system.

2.3 Site Preparation:

Before deploying High wall Mining Technology in a mine, the mining companies shall ensure an effective site preparation by addressing all related key issues with long-term implications, in the chosen area.

2.4 Implementation of Dynamic Ground Monitoring and Management Systems:

R&D Cell and the Strata Management Cell of Mining Companies, along with the engaged Scientific Organizations

- a) shall develop expertise in adequate understanding of the likely strata stress re-distribution taking place in the High wall Mining workings due to very high speed mining operations, and also the ability to forecast problems well in advance to enable course correction, if required;

- b) shall, in consultations with DGMS, formulate both short-term and long-term strata monitoring strategies with optimized locations and the extent of penetration required for study purposes in three dimensional terms;
- c) shall ensure that suitable joint machinery is developed for the purpose of real-time analysis of the dynamic data generated in the High wall Mining workings;
- d) shall ensure that the monitoring regime has the necessary in-built dynamism to address the ultimate objective of instantaneous assessment on a developing situation for use by the front-line officials manning the mining operations at the work places.

2.5 Training & Education Scheme:

Mining Companies with the active engagement of the respective OEMs shall arrange for:

- a) adequate training/re-training/education/exposure of the key mining personnel at mine level to the essential requirements of the technology, including those engaged on ground monitoring,
- b) Commensurate skill up-gradation by engaging with scientific organizations/educational/ research institutions- both nationally and globally, and
- c) Schemes to inculcate work-site discipline amongst the onsite operating crew.

2.6 Formulation of SOPS, Codes of Practices, etc:

Mining Companies with the active engagement of the respective OEMs shall formulate effective SOPs, Codes of Practices customized to their respective needs based on Risk Assessment. Safety Management Plans formulated by Risk Assessment Processes shall be made integral to the production mechanism.

2.7 Use of latest Scientific and IT tools:

Mining Companies shall encourage use of advanced scientific tools, computing techniques, IT, etc., in various stages of planning and policy execution. Persons manning the strata control cells may be trained effectively on use of Numerical Modeling techniques for accurate planning, prediction and implementation.

2.8 Emergency Management System:

Mining Companies with the active engagement of the respective OEMs shall ensure adequate logistics in terms of both men and material for dealing with all exigencies connected to deployment of CM.

2.9 R&D Initiatives:

Mining Companies shall in consultations with DGMS, associate fruitfully in various Research & Development activities taking place both nationally and globally specially on building-up adequate understanding of complex stress redistribution scenario likely in multi-seam/section operations, simultaneous extraction, geologically challenging areas, etc., so as to design appropriate optimized extraction schemes. Viability of void filling technologies post-mining shall be explored to both enhancing recovery and ensuring better long-term ground stability.

2.10 Monitoring for long-term Ground Stability:

Mining Companies with active engagement of Scientific Organizations, M/s CMPDIL, educational institutions, etc., shall subject an extracted area by High wall Mining technology to be put under active surveillance for as long a period as the danger of instability is apprehended.

Owner, Agent and Manager of coal mines operating High wall Technology are requested to take appropriate actions to implement the above recommendations which will ultimately go a long way in sustaining highest standards of safety and productivity in mines.

(Rahul Guha)
Director General of Mines Safety.

DGMS Circular (Technical) No.07 of 2013

Dhanbad, dated 22.08.2013

To
All Owners/ Agents/ Managers of all Coal Mines.

Subject: Use of Continuous Miners in belowground workings of Indian Coal Mines.

1.0 On 1st and 2nd August, 2013, a two days' technical workshop was organized at DGMS(HQ), Dhanbad to deliberate upon issues related to standardization of various approaches/processes/operations vis-a-vis use of Continuous Miner technology in belowground coal mines for better understanding and enhancement of overall standards of safety, productivity and efficiency. The workshop was well attended by over 125 representatives from various coal companies, machinery manufacturers, private contractors, research organizations, educational institutions apart from officers of DGMS. 15 technical presentations were made by the participants during the workshop on various related subjects by various stake holders.

2.0 As a result of the deliberations on a wide range of connected subjects in the workshop, the following recommendations emerged.

2.1 Strategic Prior Planning for the technology at Corporate levels:

- a) The suitability of any seam/section earmarked for exploitation by Continuous Miner technology shall be studied in depth by mining companies with the active engagement of DGMS, specially in respect of maximizing coal extraction/conservation while sustaining highest levels of operating safety.
- b) Mining companies shall ensure macro & micro geological mapping of the area proposed for exploitation along with a detailed study report on their influence on pillar/part-pillar stability during exploitation/extraction.
- c) The most suitable and scientific exploitation of the area proposed for exploitation by Continuous Miner Technology shall be formulated by the mining companies with active engagement of the internal R&D cells, scientific organizations and DGMS.
- d) Mining companies shall ensure an effective and continuously available coal evacuation system from the area proposed for exploitation by Continuous Miner Technology to ensure that operations at the producing front are not interrupted any time with attendant dangers of serious strata management issues.

- e) Mining companies shall ensure provision and availability of commensurate ancillary arrangements like advanced and high speed supporting systems, etc., in the exploitation area.
- f) Mining companies shall ensure a properly functional Strata Management Cell at mine/Area level in accordance with Recommendations of the 10th Conference on Safety in Mines, with adequate staffing and infrastructure.
- g) Mining companies through their respective R&D cell & in consultation with DGMS and scientific organizations, shall formulate effective goaf inertization programmes for preventing danger of fire/explosion and for avoiding pre-mature stoppages of operations thereby, minimizing strata control problems and also enhancing panel life.

2.2 Statutory Compliance Ensurance System:

Mining companies shall evaluate the statutory compliance aspects of the prospective OEMs before initiating actions for feasibility studies. Systems shall have to be so planned that the minimum required statutory stipulations are satisfactorily met with through-out the lifespan of the system.

2.3 Implementation of Dynamic Strata Monitoring and Management Systems:

R&D Cell and the Strata Management Cell of Mining Companies, along with the engaged Scientific Organizations

- a) shall develop expertise in adequate understanding of the likely strata stress re-distribution taking place in the Continuous Miner workings due to very high speed mining operations, and also the ability to forecast problems well in advance to enable course correction, if required.
- b) shall, in consultations with DGMS, formulate both short-term and long-term strata monitoring strategies with optimized locations and the extent of penetration required for study purposes in three dimensional terms.
- c) shall ensure that suitable joint machinery is developed for the purpose of real-time analysis of the dynamic data generated in the CM workings.
- d) shall ensure that the engaged monitoring regime has the necessary in-built dynamism to address the ultimate objective of instantaneous assessment on a developing situation for use by the front-line officials manning the mining operations at the work places.

2.4 Training & Education Scheme:

Mining Companies with the active engagement of the respective OEMs shall arrange for

- a) adequate training/re-training/education/exposure of the key mining personnel at mine level to the essential requirements of the technology, including those engaged on strata monitoring,
- b) commensurate skill up-gradation of the scientific organizations/educational/research institutions and
- c) schemes to inculcate work-site discipline amongst the onsite operating crew.

2.5 Formulation of SOPs, Codes of Practices, etc:

Mining Companies with the active engagement of the respective OEMs shall formulate effective SOPs, Codes of Practices customized to their respective needs based on Risk Assessment. Safety Management Plans formulated by Risk Assessment processes shall be made integral to the production mechanism.

2.6 Use of latest Scientific and IT tools:

Mining Companies shall encourage use of advanced scientific tools, computing techniques, IT, etc., in various stages of planning and policy execution. Persons manning the strata control cells may be trained effectively on use of Numerical Modelling techniques for accurate planning, prediction and implementation.

2.7 Emergency Management System:

Mining Companies with the active engagement of the respective OEMs shall ensure adequate logistics in terms of both men and material for dealing with all exigencies connected to deployment of CM.

2.8 R&D Initiatives:

Mining Companies shall in consultations with DGMS, associate fruitfully in various Research & Development activities taking place both nationally and globally specially on developing adequate understanding of complex stress redistribution scenario likely in multi-seam/section operations, simultaneous extraction, geologically challenging areas, etc., so as to design appropriate optimized extraction schemes.

3.0 Owner, Agent and Manager of coal mines operating Continuous Miner technology in their belowground workings are requested to take appropriate actions to implement the above recommendations which will ultimately go a long way in sustaining highest standards of safety and productivity in mines.

(Rahul Guha)

Director General of Mines Safety.

No. DGMS Technical Circular/08

/Dhanbad, dated 23.09.2013

To
All Owners/Agents/Managers of all Coal Mines.

Subject: Design, control and monitoring of Pit and Dump Slopes in Opencast Mines.

Sir,

With ever increasing demand for minerals, the opencast mines are growing deeper and deeper. The increased speed of mining introduce additional risks to the standing slopes in opencast mines in terms of their stability. Compounding the problem is the lack of adequate dumping areas for the operating mines due to a variety of reasons forcing the mines to go for in-pit dumping. Various dangers associated therewith had been clearly brought out in DGMS Technical Circular No.2 of 2010 dated 06.07.2010.

In view of the above, the following measures are recommended for all operating opencast mines.

- (i) Design mine and the pit as well as dump slope scientifically taking into consideration geotechnical parameters for rock and the dumps including hydro geologic and weather conditions etc., to ensure stable Pit and Dump slope profile not only during mining but thereafter also and
- (ii) Deploy a suitable slope monitoring system in mines customized to the local needs as arrived at by a Risk Assessment Process, for ensuring timely withdrawal of men and machinery from any area in a mine likely to be affected by an impending slope failure.

This Circular supersedes all clarifications issued earlier by this office on the subject.

(Rahul Guha)
Director General of Mines Safety

No.DGMS(Approval)/Pit bottom buffer/01

/Dhanbad, dated 19.06.2013.

To,
All owner, Agent and Manager, □
Coal and Metalliferous Mines. □

Subject: Pit bottom buffer in Mn-winding shafts.

Several accidents have occurred due to hard landing of cage at pit bottoms of shaft injuring work persons travelling in the cage. DGMA Circular No.1 of 1990 and DGMS Circular No.1 of 1993 recommended that suitable pit bottom buffer is provided in all shafts used for man-winding in order to prevent injury to person due to hard landing of cage. The mine managements have taken steps to provide pit bottom buffer in man-winding shafts.

To standardize specification and the quality of products used in mines, the pit bottom buffer was included in the list of approved type and make and was notified in the gazette of India vide GSR no 106 dated 25th May 2007.

In the view of experience gathered over a period of time, it has been decided to **approve the design, specification and test procedures of the pit bottom buffer by this circular and the same shall be treated as a general order.** Existing type of pit bottom buffer not in conformity with the design, specification and test procedures and not specially approved separately should be replaced as early as possible but not later than 31.12.2013.

The Manufacturer and Workmanship:

The manufacturer shall be reliable, having adequate facility for proper manufacturing and test facilities of the pit bottom buffer. Every part of the unit shall have good workmanship and good finish and shall be free from any defect. The manufacturer shall be fully responsible for the quality of the pit bottom buffer and conformity with prescribed specifications.

Design

The pit bottom buffer installed at Pit Bottom of a shaft is to reduce the impact of landing of the descending cage at time of over winding or hard landing and to ensure safety of workmen in the cage. The pit bottom buffer shall actuate while cage is landing on it. The unit shall be capable to absorb shock and vibration due to hard landing of a cage. The design will be made considering the depth and dimensions of shaft, the total load inclusive of weight of the cage, suspension gear, rope and maximum number of men allowed in cage. The details shall be provided by the mine to design and manufacture pit bottom buffer. The calculations, drawings and other technical literature shall be provided by the manufacturer.

Specification

The parameters and salient features are as follows:

- a. Pit bottom buffer shall be designed for an impact speed of 2.50m/second or more taking into account the dead weight of cages, suspension gear and men. The impact energy should be so absorbed that an average retardation between 1 to 2.5 kgs(Max.) is produce

- b. In designing the stroke of buffers, it shall be ensured that the maximum deceleration is 2.5 g for 40 milli-second and the buffer comes to original position automatically even with full designed load in cage.
- c. The impact energy of the descending cage shall be absorbed by pit bottom buffer and it should be recoverable and reusable immediately after removal of impact load.
- d. Landing platforms made of structural steel of sufficient strength, topped with fire resistant rubber shall support the pit bottom buffer. These structure shall be grouted in the shaft.
- e. Suitable arrangement has to be provided so as to give protection against ingress of undesirable items.
- f. Protective finish should be provided to combat corrosion in parts.
- g. Only fire resistant hydraulic fluid shall be used in the system. The seals, valve or other parts shall be compatible to fire resistant hydraulic fluid.

Marking :

Each pit bottom buffer shall be legibly marked on the body mentioning the serial number, batch

Number, date of manufacture. The stamp used for marking shall be of minimum 5 mm size.

Testing:

Each of the pit bottom buffers shall be tested as appended below.

- 1) Proof Load Test: Three times of safe working load or design load.
- 2) Drop test: The design load to be dropped from height of slow banking distance of the shaft for which the buffer is designed and also ensure max deceleration is 2.5 g for 40 milli sec. The compressed distance of the buffer and duration taken for buffer to return to its original position with full load in cage shall be observed and reported.
- 3) Chemical composition/physical properties of materials used.
- 4) Ultrasonic test for all the load carrying members, springs, tie rods, pistons, cylinders etc.

Test Certificates:

- a. Ultrasonic test certificates for all the load carrying members, springs, tie rods.
- b. Chemical composition/physical properties of materials used.
- c. Proof load test report.
- d. Drop test report.

Copies of test reports as mentioned above conducted in a laboratory mutually agreed between manufacturer and the user industry shall be supplied for each pit bottom buffer.

Inspection and Maintenance:

The user industry shall also be responsible to ensure correct quality and conformity to the prescribed specification and also take proper care during the installation of pit bottom buffer and also while in use. When pit bottom buffer is supplied to the mine the mine shall ensure that the system has been adequately designed for the shaft and load parameters and tested as mentioned above.

A competent person shall check and inspect the pit bottom buffer daily. Once in a week all vital parts of the pit bottom buffer shall be inspected thoroughly. Once in three months the cage loaded with designed load shall be landed on the buffer at a speed of 1.5 meter per second and the compressed distance of the buffer and duration take for buffer to return to its original position shall be observed and recoded in a bound paged book signed by a competent person and counter signed by the engineer of the mine. Any defects observed shall be immediately rectified and till such time the speed of the winder shall be restricted to 1 meter per second.

Sd/-

(Rahul Guha)

Director General of Mines Safety

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No. DGMS(Approval) Circular No. 02

Dhanbad, dated 8th July, 2013

To

All Owners/Agents/Managers of Coal Mines and Oil & Gas Mines/Fields.

Subject: Fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression systems- in mines both on surface and belowground including oil- and gas mines/fields.

Sir,

- 1.0 Through a Gazette notification vide No. 35 dated New Delhi, August 24tr. - August 301i\ 2008 in Part - II, Section 3, sub-section (i) vide GSR 159, the subject matter of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression systems in mines both on surface and belowground including oil and gas mines/fields, was brought under the approval regime of this Directorate from 1st November, 2008. Since then, many approvals have been accorded by this Directorate to, various manufacturers of such fire fighting and fire suppression systems for being used in mines.
- 2.0 In order to simplify the matter of introduction and maintenance of proper fire fighting and suppression systems in mines, so as to enable the mining industry to design appropriate- Safety Management Plans, a Technical Workshop. on "Fire fighting Systems and Arrangements in Mines" was held on 17/8/2011 at DG(\1SP

hanbad, The workshop was well attended by representatives Of user mines, manufacturers and scientific organizations like CIMFR & ISF/! and many issues connected to the subject viz-a-viz fast changing mining technology in the country with import of latest mining machinery etc., were deliberated upon leading to better understanding."

3.0 In view of the technical workshop held and the experience gained till date on the subject, it is recommended that "all types of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs materials and chemicals to be used in fire fighting or suppression systems in mines both on surface and belowground including oil and gas mines/fields shall conform to the following minimum requirements";

- a) All types of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression systems shall have valid test certificate(s) from any Government or Government approved Laboratory in-compliance with relevant Indian Standards.
- b) All Materials used in the fire fighting/fire suppressant systems shall be non-toxic and in no manner harmful to human beings during handling and use.
- c) The high pressure storage vessels and hoses, if used with fire fighting and fire suppressant systems, shall conform to the requirements stipulated in the relevant Indian Standards.

3.1 As provided under Regulation 181(3) of the Coal Mines Regulations 1957, Regulation 73(1) of the Oil Mines Regulations, 1984 and the earlier published GSR 159 vide Gazette notification No. 35 dated New Delhi, August 24th - August 30th, 2008 in Part, II, Section 3, Sub-section (i), the requirements stipulated at para 3.0 on the above subject is considered as approved by the Chief Inspector of Mines by this general order for the purpose. A fresh Gazette notification in this regard vide GSR443 (E), in Part II, Section 3, sub-section (I) of Extraordinary Gazette Notification No. 315, dated New Delhi, Friday, June 28, 2013 has already been published for information and necessary compliance.

4.0 All Owners/Agents/Managers of Coal mines, oil and gas mines/fields are therefore, advised to ensure strict compliance with this circular in respect of all types of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression systems mines both on surface and belowground including oil and gas mines/fields. It may be noted that no specific approval will be required from this Directorate in this regard.

(Rahul Guha)
Director General of Mines Safety

No.DGMS Circular(Approval) No.3 of 2013

Dhanbad, dated 17/7/2013.

To

All the Owner/Agent/Manager of belowground coal mines.

Subject: Standards for the use of Glass/Fibre Reinforced Plastic/Polymer(GRP/FRP) rockbolt

assemblies and components as supports for other than roof strata, in the workings of belowground coal mines.

1.0 **BACKGROUND:**

1.1 GRP/FRP(Glass/Fibre Reinforced Plastic/Polymer) rockbolts are slowly gaining utility in

the belowground workings of coal mines where advanced mining technology/masss coal production technology are deployed like Continuous Miner-Shuttle Car Combination, etc. Such bolt are both cuttable by the cutting machine deployed thereby not interfering with the deployed machinery and are substantially effective in managing side thrusts in mines. These rockbolts also offer high degree of handling ease compared to steel rockbolts. Till quite recently, these bolts were imported. But, presently, with the growing volume of demand by the user mining companies, indigenous manufacturing has also picked up considerably.

1.2 Initially, in the year 2008, through a Gazette Notification vide GSR 160 dated 14/8/2008,

the use of roof bolts in mines was brought under the approval regime of this

Directorate. Accordingly, vide DGMS/S&T/Tech.Cir(Approval) No.11 dated 17/7/2009,

the standard components and properties of steel roof bolts to be used in mines, were

notified. Subsequently, vide DGMS/S&T/Tech.Cir(Approval) No.3, Dhanbad dated 3rd

June 2010, earlier notified standards on steel roof bolts were revised & were also again

notified but as a general order approved by the Chief Inspector of Mines in writing.

1.3 In view of above actions, the standards and components of all steel roof bolts were

rationalized leaving non steel roof bolts namely the GRP/FRP rock bolts, etc., still under

the specific approval of this Directorate. As GRP/FRP rock bolts are materially and functionally quite different from steel roof bolts, a need for formulation of suitable standards for the same was felt since then.

- 1.4 Accordingly, on 29th May, 2013, a technical workshop was held at DGMS(HQ), Dhanbad for formulating suitable standards for the use of GRP/FRP rockbolt assemblies and components as supports for other than roof strata, in the workings of belowground coal mines. The workshop was well attended with representation from many manufacturers, users, scientific institutions like CIMFR-Dhanbad., ISM-Dhanbad, CMPDIL-Ranchi B.I.S.
- 2.0 After careful consideration of the views of all stake holders and other expert opinions based on the experience and technical inputs the following new standards for using GRP/FRP rockbolt assembly as supports for other than roof strata in the workings of belowground coal mines have been formulated as enumerated below.
- 2.1 **GENERAL REQUIREMENTS:**
- 2.1.1 GRP/FRP Rockbolt assemblies and components **shall not be** used for supporting **roof strata** in the belowground workings of coal mines.
- 2.1.2 The complete assembly of GRP/FRP rockbolt assembly consisting of the GRP/FRP rockbolt, nut, conical seat and domed washer plate shall be manufactured by one single manufacturer having all necessary arrangements and facilities thereof.
- 2.1.3 Every GRP/FRP rockbolt and the nut/seat/conical domed washer supplied alongwith shall be suitably marked by the manufacturer.
- 2.2 **PHYSICO-MECHANICAL PROPERTIES – GRP/FRP ROCKBOLT BAR:**
- 2.2.1 The bar of the GRP/FRP rockbolt shall be of circular section and may have a rough or threaded surface.
- 2.2.2 The minimum equivalent diameter of the GRP/FRP rockbolt bar defined as the diameter of an equivalent circular bar calculated from the weight and density of a 150 mm long sample of actual bar, shall be not less than 21.5 mm. The minimum measurement across the minor axis shall be not less than 20mm.
- 2.2.3 Straightness shall be within 0.4% of the length of the GRP/FRP Rockbolt bar.
- 2.2.4 When tested in accordance with **Annexure G of BS-7861-1:2007, Part-1**, the minimum torsional strength of the GRP/FRP rockbolt bar shall be 100 Nm in both directions.
- 2.2.5 The minimum length of the thread of the GRP/FRP rockbolt bar shall be 150 mm. The thread shall be compatible with the nut.
- 2.2.6 The distal end the GRP/FRP rockbolt bar shall be machined and free from burrs or edges which protrude beyond the profile of the rockbolt.

- 2.2.7 The tolerance on the manufactured length of the GRP/FRP rockbolt bar shall be = 5 mm.

Rockbolts lengths shall be identified by colour coding on the proximal and as specified in **Table 1 of clause 4.1.2.3 of BS-7861-1:2007, Part-1**. Rockbolt lengths other than those listed in Table 1 shall be identified as such by colour(s) other than those listed in the above table.

2.2.8 **Type Tests:**

a) **Tensile Strength**

When tested in accordance with **Annexure H of BS-7861-1:2007, Part-1 and BSEN ISO 527-1**, the GRP/FRP rockbolt bar shall have a tensile strength of not less than 850 N/mm². When tested in accordance with **Annexure I of BS-7861-1:2007, Part-1**, the peak load shall be atleast 320kN.

b) **Flexural strength:**

When tested in accordance with **Annexure J of BS-7861-1:2007, Part-1**, the material shall have a flexural strength of not less than 750N/mm based on the maximum load recorded during the test.

2.3 **PHYSICO -MECHANICAL PROPERTIES - NUT, CONICAL SEAT & DOMED**

WASHER PLATE:

- 2.3.1 Form of the nut, conical seat and domed washer plate: The form of the nut, conical seat and domed washer plate shall be compatible with the other components of the rockbolt assembly.

- 2.3.2 Breakout facility for the nut: The nut shall have a breakout facility, unless it is intended for installation in the side with a hand held machine, in which case a breakout facility is optional.

2.3.3 Type tests:

a) Nut breakout test:

Where torque nuts are used, they shall enable breakout at predetermined torque setting in the range of 35Nm to a maximum of 80% of the maximum torsional strength of the GrP/FRP rockbolt bar, when tested in accordance with **Annexure C.2 of BS-7861-1:2007, Part-1**. The breakout shall function correctly without damaging the rockbolt bar.

b) Assembly load test:

When tested in accordance with Annexure K of BS-7861-1:2007, Part-1, the assembly shall fail under a tensile loading of not less than 50kN.

c) Alignment test:

When tested in accordance with Annexure E of BS-7861-1:2007, Part-1, the conical seat and domed washer plate shall allow a minimum misalignment between the rockbolt and the domed washer plate of:

- 18° when using a steel domed washer plate; and
- 10° when using a non-metallic plate

2.4 **SYSTEM TESTS FOR THE GRP/FRP ROCKBOLT ASSEMBLY:**

2.4.1 Tensile test of threads:

When tested in accordance with **Annexure O of BS-7861-1:2007, Part-1**, the treaded portion of the rockbolt, or the thread of the assembly nut, shall not fail at a load less than 60 kN and shall not fail in a sudden manner.

2.4.2 Shear test:

When tested in accordance with **Annexure P of BS-7861-1:2007, Part-1**, the shear strength of the rockbolt assembly shall be at least 260 N/mm².

2.4.3 Bond strength and system stiffness:

When tested in accordance with Annexure Q of BS-7861-1:2007, Part-1, the minimum system bond strength shall be 120 kN and the minimum system stiffness shall be 100 kN/mm measured between loads 40 kN and 80kN.

2.5 **MINIMUM REQUIRED OTHER PROPERTIES OF GRP/FRP ROCK BOLT ASSEMBLY & COMPONENTS:**

2.5.1 Electrical resistance:

The antisatic properties of the GRP/FRP rockbolt bar and of the nut, conical seat and domed washer plate shall be in accordance with BS EN 13462-1.

2.5.2 Fire resistance:

When the GRP/FRP rockbolt bar and the domed washer plate are tested in accordance with Annex F of BS-7861-1:2007, Part-1, the persistence of flame time of the GRP/FRP rockbolt bar shall be less than 10 seconds.

3.0 **Therefore, for nay GRP/FRP Rockbolt assemblies and components manufactured by a firm to be used as supports for other than roof strata in the workings of belowground coal mines, it shall be ensured**

that standards as stipulated vide para 2.0 of this circular are satisfactorily met with.

- 4.0 Additionally, the manufacturers, test houses and the users shall also ensure certain minimum requirements as enumerated below.

a) **TEST HOUSES:**

For assessing the above standard properties of GRP/FRP Rockbolt assemblies and components and for sake of ensuring uniformity amongst the test houses, requirements as contained in Annexure-1 shall be ensured by the approved test houses.

b) **MANUFACTURES:**

For ensuring that every batch of GRP/FRP Rockbolt assemblies and components produced by a manufacturer complies with the standards laid above, the manufactures shall ensure the requirements on minimum facilities in their respective manufacturing premises as stipulated in **Annexure-2** to this Circular.

c) **MINING COMPANIES:**

For ensuring strict compliance with the stipulated standards of GRP/FRP Rockbolt assemblies and components vide para 2.0 of this circular, user mining companies shall strict compliance with stipulations as per **Annexure-3** to this Circular.

5.0

- 6.0 As provided under Regulation 181(3) of the Coal Mines Regulations 1957 and the earlier published GSR 160 vide Gazette notification No. 35 dated New Delhi, August 24th August 30th, 2008 in Part-II, Section 3, sub-section (i), the standards for using GRP/FRP rockbolt assembly as supports for other than roof strata in the workings of belowground coal mines, as stipulated at para 2.0 along with Annexures 1, 2 and 3 of this circular, is considered as approved by the Chief Inspector of Mines by this general order in writing, from the date of issue of this Circular. It may be noted that no specific approval will be required from this Directorate in this regard.

- 6.0 **All Owner/Agents/managers of belowground Coal Mines are atherfore, advised to ensure strict compliance with this circular in respect of use of GRP/FRP rockbolt assembly as supports for other than roof strata in the workings of belowground coal mines.**

**Sd/-
(R. Guha)
Director General of Mines Safety**

Encl: Annexures 1,2 and 3.

ANNEXURE-1**IMPORTANT MINIMUM REQUIREMENTS OF THE TEST HOUSES****1.0 GENERAL REQUIREMENTS:**

- 1.1 Every laboratory engaged in testing of samples of GRP/FRP rockbolt assemblies and Components shall develop suitable protocol in respect of the receipt of untampered samples. The details of the protocol as above shall be notified to every firm/manufacturer seeking test of GRP/FRP assemblies and Components.
- 1.2 Adequate number of samples of GRP/FRP rockbolt assemblies and components as are required for performing various stipulated tests at para 2.0 of this Circular, shall be received. Atleast an equivalent number of samples of GRP/FRP rockbolt assemblies and Components shall be preserved in the test house as reference samples for a period of six months from the date of receipt or the expiry date as recommended by the manufacturer, whichever is earlier.
- 1.3 If any test house has entered into collaboration or transferred the technology/patent/knowledgebase/knowhow for manufacturing complete assembly of GRP/FRP rockbolts with nuts/comical seats/domed washers to any firm/manufacturer or has provided assistance to upgrade/renovate/rectificate the quality of GRP/FRP rockbolt assemblies and Components of any firm/manufacturer, the test report for GRP/FRP rockbolt assemblies and Components from such test house will not be considered. The test house shall clearly indicate in writing in this regard in the test report.

ANNEXURE-2**IMPORTANT MINIMUM REQUIREMENTS OF THE MANUFACTURERS OF GRP/FRP ROCKBOLT ASSEMBLIES AND COMPONENTS FOR USE AS SUPPORT FOR OTHER THAN ROOF STRATA, IN THE WORKINGS OF BELOWGROUND COAL MINES**

- 1.0 For sake of ensuring the basic quality of the GRP/FRP Rockbolt assemblies and components being produced, all minimum equipments and facility shall be made available at the manufacturer's premises for conduct of tests as stipulated in Annexure C.2, E, I, K, O and P of British Standard BS 7861-1:2007, Part-1.
- 2.0 In order to check the composition and required parameters during manufacture it shall be required that random sampling be done of complete GRP/FRP Rockbolt assemblies and components manufactured in each batch which shall be subjected to the following tests.

Test Paraqmeter	Test Reference	Sample Size(Nos)
Tensile Strength test on GRP/FRP bar	Annexure 1 of BS 7861-1-2007, Part-1.	3(Three)
Nut breakout test	Annexure C.2 of BS 7861-1:2007, Part-1	5(Five)
Assembly load test	Annexure K of BS 7861-1:2007, Part-1	5(Five)
Alignment test	Annexure E of BS 7861-1:2007, Part-1	3(Three)
Tensile test of threads	Annexure O of BS 7861-1:2007, Part-1	5(Five)
Shear test	Annexure P of BS 7861-1:2007, Part-1	3(Three)

The results of the above tests shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and shall be countersigned by the quality control officer posted at the manufacturing unit(s).

- 3.0 The manufacturing firm shall prepare an elaborate usage and storage manual in respect of the batches of complete GRP/FRP Rockbolt assemblies and components manufactured use as supports for other than roof strata, in the

workings of belowground coal mines. With every consignment dispatched to a user, adequate number of usage and storage manuals shall also be furnished.

- 4.0 The manufacturing firm shall ensure that every consignment of GRP/FRP Rockbolt assemblies and components dispatched is suitably protected against exposure to extreme weather which could alter the properties of the GRP/FRP Rockbolot assemblies and components.
- 5.0 In case of any particular batch of GRP/FRP Rockbolt assemblies and components failing to meet the standards on performed test at the user end during joint testing, the manufacturer shall take all steps to immediately intimate all other users to withdraw that particular batch which failed, from use.

ANNEXURE-3

IMPORTANT MINIMUM REQUIREMENTS OF THE MINING COMPANIES USING GRP/FRP ROCK BOLT ASSEMBLIES AND COMPONENTS FOR SUPPORTING SIDES OF BELOWGROUND WORKINGS OF COAL MINES.

- 1.0 Proper arrangements shall be provided and maintained for storage of the GRP/FRP Rockbolt assemblies and components received, in consultation with the respective manufactures.
- 1.1. Every consignment of GRP/FRP Rockbolt assemblies and components received shall be suitably protected against exposure to extreme weather which could alter the properties.
- 1.2 Adequate number of effective protective wears and gears shall be made available in every user mine for safe handling of GRP/FRP Rockbolt assemblies and components.
- 2.0 Every mine/area shall carry out the stipulated test on "tensile test of threads" as per para 2.4.1 of this Circular, for every batch/consignment of GRP/FRP Rockbolt assemblies and components received at the mine/area and the results of the tests shall be properly recorded in a bound paged book kept for the purpose and also signed by the manager. Efforts shall also be made for making necessary arrangements to conduct other stipulated tests in the standard.
- 3.0 Where, the GRP/FRP Rockbolt assemblies and components received from a manufacturer do not meet stipulated standards in respect of the above test, a repeat of the test shall be conducted in the presence of the representative of the manufacturer and the results of the joint test report of the batch of

GRP/FRP Rockbolt assemblies and components shall be properly recorded in a bound paged book kept for the purpose and also signed by the manager and the representative of the manufacturer.

- 4.0 If any Batch/consignment of GRP/FRP Rockbolt assemblies and components is proved failed in joint testing, it shall be ensured that the particular 'failed' batch of the GRP/FRP Rockbolt assemblies and components supplied shall be withdrawn from use in all mines of the company and intimation thereof shall be sent to this Directorate. A representative sample of the size as required for carrying out a complete laboratory test of the GRP/FRP assemblies and components of the batch which had failed during joint witnessing of tests by representatives of the mine and the manufacturer shall be immediately sent for testing in any approved test house(s). A copy of this report of the test shall be furnished to this Directorate immediately on receipt from the test house.
- 5.0 Additionally, every mining company shall have an elaborate and properly functional Quality Ensurance mechanism at Corporate/Area/Unit levels for ensuring use of quality GRP/FRP rockbolt assemblies and components in mines and also for addressing problems of defective supply of GRP/FRP rockbolt assemblies and components. This mechanism shall provide for
- a) Timely education of all manufacturers regarding dangers due to use of bad quality GRP/FRP rockbolt assemblies and components,
 - b) Ensuring submission of a batch test report by the manufacturer with every batch of supply of GRP/FRP rockbolt assemblies and components,
 - c) Regular joint sampling and testing along with manufacturer(s) at intervals as may be mutually agreed to, at NTH/DGMS approved laboratory for comprehensive testing of all stipulated parameters of the standard in force,
 - d) Submission of information regarding failed batches of supply of GRP/FRP rockbolt assemblies and components to this Directorate through the Nominated Owner along with a detailed enquiry report, and
 - e) Taking such other steps as may be required in this regard in the interest of safety of persons involved.

No .DGMS Circular (Approval) No.04 of 2013,
To,
The Owner/Agent/Manager of all belowground coal mines.

Dhanbad, dated 19.07.2013

Subject:- Revised Standards for testing and use of Resin Capsules as grouting material for Roof bolting purposes in the belowground workings of coal mines.

1.0 BACKGROUND:

1.1 On 28th May, 2013, a technical workshop was held at DGMS(HQ), Dhanbad for the purpose of reviewing the existing standards on use of resin capsules as grouting medium for supporting purposes in the belowground workings of mines, as notified vide DGMS/S&T/Tech.Cir.(Approval) No .03 dated 22/09/2010. The workshop was attended with representation from many manufacturers, users, Scientific institutions like ISM-Dhanbad, CMPDIL-Ranchi, B.I.S, etc.

1.2 After deliberating in depth and carefully considering views of all stakeholders and other expert opinions based on the experience and technical inputs, the following revised standards for using resin capsules as grouting medium for supporting purposes in the belowground working of mines, was involved,

2.0 (A) General:

Parameter	Standard
Gel Time & Setting time: - For FAST SET type - For Slow SET type	23 Seconds (Minimum) to 54 Seconds (Maximum) 134 Seconds (minimum) to 202 Seconds (maximum)
Reaction temperature(.c)	Not more than 80.
Thermal Stability - At 5° C for one hour - At 45° C for one hour	The sample shall meet the gel time and setting time stipulations as mentioned above.

(B) PHYSICO-MECHANICAL PROPERTIES:

Parameter	Standard
Compressive Strength(Applicable for slow-set type of resin only) 30 minutes, 24 hours.	30.0 MPa(min) 80.0 MPa(min)
Bond Strength Test: 30 minutes. 24 hours.	10.0 Tonnes 15.0 Tonnes
Shear Test: The measured strength as per procedure defined in Annexure-1.	The sample shall record a minimum of 19 MPa
Shrinkage test⊗Applicable for slow-set type of resin only) 24 hrs 7 days	0.01%(max) 0.01%(max)

(C) OTHER PROPERTIES:

Parameter	Standard
Flammability Test	The product should be of very low flammability.

3.0 Therefore, for any resin capsule manufactured by a firm to be used as grouting mediums in mine for supporting purposes, it shall be ensured that all stipulations vide para 2.0 of this circular are satisfactorily met with.

4.0 Additionally, the manufacturers, test houses and the users shall also ensure certain minimum requirements as enumerated below.

a) TEST HOUSES:

For assessing the above standard properties of resin capsules and for sake of ensuring uniformity amongst the test houses, tests as per the procedure shown in **Annexure-1** shall be performed by the approved test houses.

b) MANUFACTURERS:

For ensuring that every batch resin capsules produced by a manufacturer complies with the standards laid above, the manufacturers shall ensure the requirements on minimum facilities in their respective manufacturing premises as stipulated in **Annexure-2** to this Circular.

c) MINING COMPANIES:

For ensuring strict compliance with the stipulated standards of resin capsules Vide para 2.0 of this circular, use mining companies shall strict compliance with stipulations as per **Annexure-3** to this circular.

- 5.0** As provided under Regulation 181(3) of the Coal Mines Regulations 1957 and the earlier published GSR 160 vide Gazette notification No.35 date New Delhi August 24th August 30th 2008 in part –II, Section 3, sub-section(i), the standards for using resin capsules as grouting medium for supporting purposes in the workings of belowground coal mines, as stipulated at para 2.0 along with Annexure 1,2 and 3 to this circular, is considered as approved by the Chief Inspector of Mines by this general order in writing, from the date of issue of this circular. It may be noted that no specific approval will be required from this Directorate in this regard.
- 6.0** All Owners/Agents/Managers of belowground Coal mines are therefore, advised to ensure strict compliance with this circular in respect of using resin capsules as grouting medium for supporting purposes in the belowground workings.

Sd/-

(R.Guha)

Director General of Mines Safety

Encl: Annexure 1,2 and 3.

ANNEXURE-1**IMPORTANT REQUIREMENTS OF THE TEST HOUSE**

1.0 GENERAL REQUIREMENTS:-

- 1.1** Every laboratory engaged in testing of samples of resin capsules shall develop suitable protocol in respect of the receipt of unhampered samples. The details of the protocol as above shall be notified to every manufacturing firm seeking test of resin capsules.
- 1.2** At least, 100 numbers of 24 mm dia X 600 mm or equivalent sized resin capsules shall be received from the manufactures for the purpose of testing.

2.0**STA****STANDARD PROCEDURES TO BE ADOPTED BY APPROVED TEST HOUSES FOR LABORATORY TESTING OF RESIN CAPSULES:****2.1 METHOD OF TEST FOR GEL TIME & SETTING TIME OF RESIN CAPSULE****(a) DEFINITION**

Period during which a Resin matrix and proportionate catalyst can mixed evenly before it begins to turn from fluid to solid state. Set time is the taken from time from the gel state to the hardened state.

(b) PREPARATION OF TEST SPECIMEN

Weight at least 25 grams of Resin matrix into a plastic mug and note the mass of resin matrix taken and cover the resin matrix with a small piece of film. Onto the film in the cup, weight out, to the accuracy of the quantity of the catalyst proportionately as available in the resin capsules, ensuring that the two substances do not mix any way. Condition the cup and contents in the conditioner until the temperature of the contents is stable at 27±2°C. Retaining the cup in the conditioner and using the Spatula, scrape the whole quantity of catalyst from the film into the resin matrix.

(c) PROCEDURE

Immediately start the stop watch begin mixing the resin matrix and catalyst together and continue mixing till the mixture turns from fluid to beginning of hardening state and finally hardens. Take a pin and try to insert at regular intervals of 2 seconds, when the pin starts hitting the surface, note the time. This is the total of gel and time.

(d) INSTRUMENTS REQUIRED FOR TESTING

- (a) Stop Watch
- (b) Plastic Cup
- (c) Electronic Weighing Scale
- (d) Plastic Film
- (e) Metal Alpiners

2.2.A METHOD OF TEST FOR MAXIMUM REACTION TEMPERATURE OF RESIN CAPSULE**(a) PREPARATION OF TEST SPECIMEN**

100gram resin matrix and proportionate quantity of Catalyst in proportion as stipulated by the manufacturer are mixed thoroughly and put into a glass beaker of 5 cm diameter.

(b) PROCEDURE

The main know of the mercury thermometer/thermo-couple is coated with any mould oil and is inserted into the resin mix up to maximum 25 mm and the maximum temperature shown in the thermometer is recorded for 3 tests and the mean the value shall be recorded as final result.

(c) INSTRUMENTS REQUIRED FOR TESTING

- (A) Beaker of 5 cm dia : 200ml. capacity
- (B) Mercury thermometer/ Thermo-couple : 150 degree C max.

2.2.B METHOD OF TEST FOR THERMAL STABILITY OF RESIN CAPSULE**(a) PREPARATION OF TEST SPECIMEN**

Keep 3 nos of resin capsules at 5 degree C for one hour. Remove the samples and condition till they achieve a temperature of 27 ± 2 degree C. Keep the same samples 3 nos. of Resin Capsules at 45 degree C for another one hour and then again condition all the Resin Capsules till 27 ± 2 degree C.

(b) PROCEDURE

Measure the Gel time and set time of all the by the procedure as prescribed in 2.1 as above.

(c) OBSERVATION

The Gel time and set time of all the specimens shall be within specified limit as prescribed in the standards.

(d) INSTRUMENTS REQUIRED FOR TESTING

- (A) Refrigerator-1 No
- (B) Oven- 1 No
- (C) Stop Watch

- (D) Plastic Cup
- (E) Electronic Weighing Scale
- (F) Plastic film
- (G) Metal Allpin

2.3.(1) METHOD OF TEST FOR COMPRESSIVE STRENGTH OF SLOW SET RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

Prepare a test specimen from the same batch of Resin each measuring 50mmX 50mmX50mm. Prepare the test specimens, including the conditioning, proportioning and mixing of Resin matrix & Catalyst and conditioning and filling of the moulds, but casting and curing the specimens at 27 degree+/-degree C.

- (b) Carry out all the tests at 27 degree +/-2 degree C after 30 minutes and 24 hours after preparation of the test specimens. The test duration shall be counted from the preparation of the test moulds.

Measure the width and thickness of each specimen at its centre to the nearest 0.1mm and calculate the cross-sectional area.

Wipe clean the bearing surface of the testing machine and any auxiliary platens. Remove any loose grit or other material from the surfaces of the cube that are to be in contact with the compression platens. Place the test cube in the machine in such a manner that the load is applied to sides of the test cubes as cast, i.e not to the top and the top and the bottom. Place the cube on the lower machine platen and carefully centre. Do not use any packing at any of the interfaces between the test specimen, auxiliary platens, spacing blocks and machine platens.

Apply load (without shock)and increase it continuously at 45(N/mm²)minute.

(c) OBSERVATION

The compressive strength of each cube is calculated to the nearest of 0.1 MPa by maximum load(N)/original cross sectional area (mm²).

30 minutes duration compressive strength of 8 specimens is taken and the minimum and maximum reading are discarded and the mean value of the middle 6 readings is to be taken as result. Similar procedure is applied for 24 hours duration compressive strength testing.

(d) INSTRUMENTS REQUIRED FOR TESTING

- (a) Compressive Strength Machine :50 Tonnes Capacity
- (b) Cube Moulds (50mm):As per IS:10086:1982
- (c) Poking Rod: As per IS:10086:1982
- (d) Gauging Trowel: 100-150 mm lengthen & weighing 210+/-10 grams.

2.3(2) METHOD OF TESTING OF BOND STRENGTH OF RESIN CAPSULE

(a) PREPERATION

A pipe of 25 mm inner diameter and 37.5 mm outer diameter, 300 mm with 27X3 internal metric threads, and a 22 mm diameter roof bolt bar of appropriate lengths to accommodate a normal hydraulic jack, with suitable threading on one end for a length of at least 150 mm are taken. The test specimen shall be prepared by placing resin matrix and catalyst mixture into the threaded tube, inserting the roof bolt bar and rotating the bar in accordance with the instructions of the manufacture. The specimen shall be cured for the required duration of the test.

(b) PROCEDURE

Assemble the grouted pipe section as shown in figure-A and attract the dial indicator to the rear end the grouted roof bolt bar to indicate movement at the end of the bar.

(c) OBSERBATION

Take the maximum bond load reading till displaresin up to 5 mm and the mean value is calculated from three tests.

(d) APPARATUS

(A) A section of pipe of 25 mm ID & 37.5 mm OD, of a total length of 600 mm of which, 300 mm length shall be with 27X3 internal metric threads.

(B) Roof bolt bar of appropriate length to accommodate a normal hydraulic jack, including 150 mm threading with nut.

(c) Anchor machine 25 MT capacities with full assembly (jack with central hole, pump, and pressure gauge and hose pipe).

(d) Dial indicator for measuring displacement of 0.02 mm least count with suitable fixing attachments.

(e) Steel collar for supporting hydraulic jack and pipe section.

2.3(3) METHOD OF TEST FOR SHEAR STRENGTH OF SET RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

Separately weight out approximately 10 grams of Resin matrix and the recommended quantity of catalyst there for, as stipulated by the manufacture. Cool in a refrigerator. Place a metal washer on the film. Mix together the cooled Resin matrix and catalyst and mould a test specimen in the washer, using a knife blade to ensure that no air bubbles are entrapped in the specimen. Prepare at least 6 specimens. Before testing, condition the specimens for 3 hours at 50 degree C.

(b) PROCEDURE

Allow the specimens to cool in air to a temperature of 27 ± 2 degree C, then measure the thickness of a specimen (in the washer), to the nearest 0.01 mm at several points. Position the specimen symmetrically in the punching tool assembly and screw the die home against the test specimen in the bolster, using only sufficient force to ensure that there is no clearance between the test piece and the adjacent surfaces of the die and the bolster. Position the punching tool assembly on the loading device and, using the punch, so apply a steadily increasing force to the test specimen that the test specimen fractures within 15 seconds to 45 seconds. Repeat the test on the remaining 5 test on the remaining 5 test specimens.

(c) INSTRUMENTS REQUIRED FOR TESTING

(A) Refrigerator: $4.0 \text{ degree C} \pm 1.0 \text{ degree C}$

(B) Metal Washers : $3.00 \text{ mm} \pm 0.1 \text{ mm}$ thickness,
 $25.00 \text{ mm} \pm 0.2 \text{ mm}$ OD, &
 $21.6 \text{ mm} \pm 0.5 \text{ mm}$ ID

(C) A Punching Tool assembly : Punch dia 12.575 mm to 12.591 mm
 & Die of diameter 12.707mm to 12.723

(D) Compressive Strength Machine : 2000N $\pm$ 20 N to the punch at uniform rate.

(E) Film (LDPE): Compatible with Resin matrix & Catalyst

2.3(4) METHOD OF TEST FOR SHRINKAGE TEST OF SLOW SET RESIN CAPSULE

(a) PREPARATION OF TEST SPECIMEN

The moulds shall be thinly covered with mineral oil. After this operation, the stainless steel or non-corroding metal reference insets with knurl heads shall be set to obtain an effective gauge length of 250 mm, care being taken to keep them clean and free of oil.

Clean appliances shall be used for mixing of Resin matrix and Catalyst in a proportion as stipulated by the manufacturer, at 27 ± 2 degree C.

Immediately following the completion of mixing, the test specimen shall be moulded in the two layers, each layer being completed with jerks and vibration through Flow Table. After the top layer has been compacted, the Resin mix shall be leveled off flush with the top of the mould and the surface smoothen with a few strokes of the trowel. During the operation of mixing and moulding rubber hand gloves shall be used.

(b) PROCEDURE

After filling the moulds, place them immediately in Humidifier at 27 ± 2 degree C and $50 \pm 5\%$ relative humidity for 24 ± 2 Hours. Then remove the specimen from the moulds. Measure the length at 27 ± 2 degree C using the length comparator. Place the moulds back into the Humidifier at 27 ± 2 degree C and $50 \pm 5\%$ relative humidity.

Remove the specimens from the Humidifier and measure the length at 27 ± 2 degree C using the length comparator.

After the specimens are measured at the age of 24 hours and 7 days, calculate the average difference in length of 3 specimens to the nearest 0.01% of the effective gauze length and report this difference as shrinkage.

(C) INSTRUMENTS REQUIRED FOR TESTING

- (A) Beam Mould : 25x25x282 mm Internal length IS:10086:1982
- (B) Control Cabinet :90% Humidity max 50 degree C max.
- (C) Length Comparator: As per IS:945:1980
- (D) Gauzing Trowel: 100 to 150 mm length and mass 210 ± 10 gram.
- (E) Flow Table : IS:5512:1969

2.4 METHOD OF TEST FOR FLAMMABILITY OF CASTED RESIN CAPSULE

(a) OUTLINE OF THE METHOD

The casted sheet of Resin Capsule is Subjected to a flame for specified time from Bunsen Burner and its Flammability evaluated.

(b) PREPARATION OF SPECIMEN

Resin matrix and Catalyst are mixed thoroughly and a casted sheet is prepared. From this caste sheet four specimens shall be cut not less than 150mm long, 12.0 ± 0.5 mm wide, and 3.0 ± 0.15 mm thick and a line shall be drawn, across the specimen at 75mm from the end to the longitudinal axis.

(c) PROCEDURE

Test the specimen in draught-free atmosphere (See Figure-'B'). Clamps the specimen in a rigid support at one end so that its longitudinal axis is horizontal and its transverse axis is at 45 deg. To the horizontal, and line on the specimen at 75mm is clearly visible. Clamp a piece of clear wire gauze (seven mesh per linear cm) 125mm square in a horizontal position 6mm below the specimen with 6mm of the unsupported end of the specimen projecting beyond the edge of the gauze. Place a Bunsen centrally under the free end of the specimen so that the top of the burner is 50mm vertically below the longitudinal axis of the specimen. The temperature of the flame shall be such that a piece of 0.70mm diameter copper wire held 5cm above the top of the burner melts within 6 seconds. Remove the flame after 30 seconds and record the time taken until the specimen ceases to flame or glow. In the event of the specimen extinguishing within 10 seconds of the removal of the flame, apply again the flame for a further 30 seconds.

(d) ASSESSMENT (VERY LOW FLAMMABILITY)

At least 3 or 4 specimens shall cease to flame or glow within 10 seconds of the removal of the flame and again and again within 10 seconds after the removal of the flame.

(e) INSTRUMENTS REQUIRED FOR TESTING

- (A) Draught free box (as per figure 'B')
- (B) Bunsen Burner
- (C) Stop Watch
- (D) Die Mould for Resin Cast Sheet
- (E) Screw gauze

ANNEXURE-2

IMPORTANT REQUIREMENTS OF THE MANUFACTURERS OF RESIN CAPSULES FOR USE IN MINES

1.0 For sake of ensuring the basic quality of the resin capsules being produced, the manufacturers shall process the following minimum equipments/facilities.

No	Name of Equipment	Quantity(Nos.)	Capacity
1	Gel & Setting time Measuring Apparatus	One	---
2	Humidifier	One	Humidity 90% Temp.5 to 50 ^{°C}
3	Anchorage Testing Machine	One	30 Tonnes
4	Universal Testing Machine	One	50 Tonnes
5	Stop Watch	Two	-----
6	Flammability test set up	One	----
7	Moulds	Different Sizes	-----
8	Glassware	As Per req.	-----
9	Draught free box	1	A per drawing
10	Bunsen burner	1	
11	Die mould for resin cast sheet.	1	
12	Screw gauge	1	
13	Poking rod	10	As per IS:10086:1982
14	Gauging trowel	02	100 to 150mm long & weight 210+1 ^{°C}
15	Refrigerator	1	4 ^{°C} +1 ^{°C}
16	Punching tool assembly	2	Punch dia of 12.575mm to 12.707mm to 12.723mm
17	Film(LDPE)	One 5m long roll.	Compatible with resin matrix and catalyst.
18	Beam mould	2	25mm x 25mmx282mm internal length
19	Length comparator	1	As per IS:9459:1980
20	Flow table	1	As per IS:5512:1969
21	Mercury Thermometer/ Thermo-couple	1	Upto 150 ^{°C}

2.0 In order to check the required parameters during manufacturing, it shall be required that the random sampling be collected. Atleast one lot of sample containing adequate number/quantity of resin capsules for every 10,000 pieces of resin capsules manufactured, shall be subjected to all required set of tests as prescribed (standard) above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and countersigned by quality control office posted at the manufacturing unit(s). Such records shall be maintained for the purpose of verification for a period of atleast three years from the date of manufacturing.

3.0 The manufacturing firm shall prepare an elaborate usage and storage manual in respect of the batches of resin capsules manufactured for use in mines. With every consignment of resin capsules dispatched to a user, adequate number of usage and storage manuals shall also be furnished.

- 4.0** Resin Capsules having different Gel and Setting Times may be manufactured and supplied for different applications as required by the user, but the capsule should have valid approval and the gel & setting times shall be clearly superscripted on the capsule.
- 5.0** The manufacturing firm shall ensure that every consignment resin capsules dispatched is suitably protected against exposure to extreme to weather which could alter the properties of the resin capsules.
- 6.0** In case of any particular batch of resin capsules failing to meet the standards on "Short Encapsulation Pull Test (SEPT)" performed at the user end during joint testing, the manufacturer shall taken all steps to immediately intimate all other users to withdraw that particular batch which failed, from use and also confirm in writing to this Directorate within 24 hours of being intimated by the user.

ANNEXURE-3

IMPORTANT REQUIREMENTS OF THE MINING COMPANIES USING RESIN CAPSULES

- 1.0** The mining companies using resin capsules for roof bolting purposes shall ensure the following.
- Proper arrangements are provided and maintained for storage of the resin capsules received in consultation with the respective manufacturers.
 - Adequate number of effective protective wears and gears are made available in every user mine for handling resin capsules.
- 2.0** Regular tests shall be carried out for assessment of get time and setting time in respect of the oldest batch stored in the mine, at a frequency not exceeding once a month.
- 3.0** Every mine shall carry out "short Encapsulation Pull Test (SEPT)" in a minimum of three horizons in the roof as may be determined by the Manager, in the presence of the representatives of the manufacturer. Only those batch of capsules which satisfy the following minimum performance levels of SEPT as per the table given below shall be used underground for supporting purposes by roof bolts.

Short Encapsulation Pull Test after 30 Minutes. 8 hours or 24 hours	10.0 Tonnes (for 20mm dia roof bolt). 12.0 Tonners (for 22 mm dia roof bolt) 15.0 or 20.0 Tonnes respectively
Net displacement measured during the SEPT(mm)	Not more the 15.

- 4.0** Such test shall be conducted for every batch of Resin Capsules received at mine and the results of the test shall be properly recorded in a bound paged book kept for the propose and also signed by the manager.
- 5.0** Where, the resin capsules received from a manufacture do not meet stipulated standards in respect of "Short Encapsulation Pull Test (SEPT)" as above, a repeat of the same test shall be conducted in the presence of the representative of the manufacture and the results of the joint test report of the batch of resin capsules shall be properly recorded in a bound paged book kept for the purpose and also signed by the manager and the representative of the manufacturer.
- 6.0** If any Batch/consignment is proved failed in joint testing, it shall be ensured that the particular 'failed' batch of the resin capsules supplied shall be withdrawn from use in all mines of the company and intimation thereof shall be sent to this Directorate. A representative sample of the size as required for carrying out a complete laboratory test of the resin capsules of the batch/consignment which had failed during witnessing of tests by representatives of the mine and the manufacturer shall be immediately sent for testing in one or two approved test house(s). A copy of this report of test shall be furnished to this Directorate immediately on receipt from the test house.

7.0 Additionally, every mining company shall have an elaborate and properly functional Quality Insurances mechanism at Corporate/Area/Unit levels for ensuring use of quality resin capsules in mines and also for addressing problems of defective supply of resin Capsules. This mechanic shall provide for .

- a) Timely education of all manufacturer regarding dangers due to use of bad quality rein capsules,
- b) Formulation of an elaborate code of practice for proper receipt, storage, regular testing for monitoring strength parameters during the storage period, handling and actual use in belowground working, including maintenance of signed records thereof in respect of each activity,
- c) Ensuring submission of a batch test report by the manufacture with every batch of supply of resin capsules,
- d) Regular joint sampling and testing along with manufacturer(s) at intervals as may at intervals as may be mutually agreed to, at NTH/DGMS approved laboratory for comprehensive testing of all stipulated parameters of the standard in force,
- e) Submission of information regarding failed batches of supply of resin capsules to this Directorate thought the Nominated Owner along with a detailed enquiry report, and,
- f) Taking such other steps as may be required in required in this regard in the interest of safety of persons involved.

DGMS

Technical Instruction No.01

Sub: Accidents in Opencast Mines during Transport of Minerals by Contractors –Inquiries and Actions thereafter.

1.0 BACKGROUND

Use of trucks and tippers has increased rapidly in opencast mines by contractors in extraction of coal and overburden for the last two decades. This has caused considerable increase in fatal accidents to contractual workers in these operations.

The inspections and inquiries into such accidents have revealed that:-

- (i) Lack of supervision inadequate training, poor maintenance of vehicles (Pay loaders, Tippers, Trucks & Dumpers) on part of Contractors;
- (ii) Lack of supervision, non-examination and checking of conditions of vehicles by any competent persons/engineer;
- (iii) Over speeding, unauthorized driving, violation of traffic rules;
- (iv) Extended hours of working/driving even beyond 12 hours in night shift; and
- (v) Poor conditions of haul roads including width, gradient, berms of adequate height and width and absence of general lighting and signage

are the primary causes of such accidents in the mines.

2.0 ANALYSIS AND REVIEW

Although adequate measures such as inspections and inquiries, including improvement notices and prohibitory orders are being issued by every region and zone, however the results are far from the anticipated and accepted level. A review and revisit of this issue need to be done at every level of enforcement system.

An example of an accident in this context is cited below:

While giving safe passage to a Jeep coming from opposite direction on the haul road, a Tipper fell down into an adjacent drain and tilted. Munshi along with Mining Sirdar who were riding on the tipper jumped out of the cabin to escape safety. Mining Sirdar escaped unhurt however Munchi received serious head injuries and died in the hospital while undergoing treatment.

The inquiry revealed that:-

- (i) The haul road was slippery and slushy due to mud; and
- (ii) Tipper Driver failed to control speed of his vehicle and continued driving at high speed while giving way to the jeep coming from opposite direction; which resulted into skidding and felling of tipper into the drain.
- (iii) Munshi and Mining Sirdar who were riding unauthorizely, fell down during the accident and one (Munchi) of them received serious head injuries and died in the hospital during the treatment.

The Inquiry Officer concluded that:-

- (i) The Tipper Driver was responsible for this accident for driving vehicle at high speed on slippery haul road in violation of the Traffic Rule and also allowing unauthorized riding of persons under the exemption granted vide letter No.RR/635 dated 11.5.2007 under regulation 98(1) & (3) r/w regulation 38 of the CMR, 1957.

- (ii) Acting Manager, Under Manager/Assistant Manager, Overman, Contractor's Munshi(Deceased) and the Tipper Driver were held responsible for the accident for the above mentioned violation read with relevant regulations pertaining to their duties and responsibilities.

2.1 OBSERVATION AT HQ

- (i) The responsibilities were fixed for the contravention of the provisions of exemption granted vide letter No.RR/120393/98(1) & (3)/635 dated 11.5.2007 under regulation 98(1) & (3) of the CMR, 1957, which had already expired on 11.05.2010.

That is to say that the exemption granted under regulation 98(1) &(3) was no longer valid for the mine on the date of occurrence of accident.

- (ii) Acting Manager was held responsible under sub-section (5) of section 18 and section 17(2) of the Mines Act, 1952. The Provision of sub-section(5) of section 18 required that in addition to the person who contravenes the specific provisions, the other persons such as Officials, Manager, Agent and Owner shall be deemed to be guilty of such contraventions unless he proves that due diligence was used to secure compliance and had taken reasonable means to prevent such contravention.

In the proviso to this sub-section, it is also mentioned that none of the aforesaid persons can be proceeded against unless it is proved by inquiry or investigation that he is prima facie liable.

In the Inquiry report, no mention in this regard has been made to prove that the acting manager was prima facie liable for this accident.

- (iii) In the draft statement of case, some of the delinquents itself have been proposed as prosecution witnesses and no independent witness has been proposed.

There is no restriction in delinquents making as prosecution witnesses provided they are vital to prove the facts and circumstances of the case including responsibilities of other delinquents. However, this should be supplemented by producing other documentary evidences and independent witnesses.

- (iv) There were inordinate delays in conducting the inquiry (42 Days), in finalizing the enquiry report (60 Days), in issuing show cause letters after finalizing Inquiry Report(30 Days) and in deciding to send the proposal for prosecution to HQ(30 Days).

The timelines fixed for conducting and processing the case of accident inquiry were not followed which resulted into inaction on part of this Directorate.

3.0 INSTRUCTIONS

- (I) All inspecting officers are, therefore requested to strictly adhere to the earlier instructions and guidelines issued in this regard.
- (II) Investigation Officers are required to ensure that:-

The cases are properly inquired into by collecting each and every evidence related to all the events, conditions, circumstances and environments that led to the occurrence of accident.

Efforts should be made to collect all the records and documents including prime eye-witness preferably independent, directly or indirectly related to event as primary evidence and the statements of other witnesses as secondary to ensure that even under the conditions of non-attendance of witnesses or their becoming hostile, the cases do not fail during trial in the court of law.

The conclusion should entirely be based on the records, documents and eye-witnesses, which should be chronologically, legally and critically analyzed. Due case should be exercised while framing violation(s) along with the duties and responsibilities of the delinquents.

No discretionary, doubtful or ambiguous statements be either relied upon or be given in the enquiry report. The discretion should not be the part of the process. Every decision or action should be based on evidence and in accordance with the legal requirements and in compliance thereof.

Senior Officers during examination of the enquiry report and arriving at conclusion and decision should also exercise their due role and responsibility to ensure that no loop holes or deficiencies remain undetected. The Timelines should be strictly adhered to.

- 3.1 **A Risk Assessment, Analysis and Management Programme** should be initiated on this subject at identified mines in each region to prevent recurrence of accidents due to wheeled Trackless Transport Vehicles engaged by Contractors. The Scheme should be implemented, reviewed and monitored quarterly and annually with measureable results.

(Rahul Guha)
Chief Inspector of Mines

No. DGMS(Tech) Ins.No.03 of 2013

Dhanbad, dated 25.7.2013

To

All Officers,

Sub: Delegation of power in respect of Regulation 107(3) of the Metalliferous Mines Regulations, 1961.

In partial modification of DGMS (Tech) Inst. No.1 of 2001 dated 08.10.2001, power of Chief Inspector of Mines under MMR 107(3) for extraction or splitting or reduction of pillars or blocks of minerals is hereby delegated to the concerned Director of Mines Safety dealing the case.

(Rahul Guha)
Director General of Mines Safety

No. General Instruction .No.01 of 2013

Dhanbad, dated 03.10.2013

To
All Inspecting Officers of DGMS

Sub: Inquiry into accidents due to Natural Death.

As per the General Instruction No.01 of 2006, dated the 4th December, 2006 all accident prima-facie due to natural death shall be inquired into by Deputy Director of Mines Safety (OH)/Assistant Director of Mines Safety (OH) of the zone.

In view of shortage of officers of Occupational Health Cadre in zones, it may not be possible to conduct an inquiry into a case of prima facie natural death in the mines by an officer of occupational Health Cadre posted in head office or other zones.

Under the above circumstances, it has been decided that in the zone where an officer of occupational health cadre is not posted, a case of prima facie natural death in mines shall be inquired into by Deputy Director of Mines Safety (Mining)/Director of Mines Safety (Mining) of the respective region in consultation with the Deputy Director General of Mines Safety of the zone.

(Rahul Guha)
Director General of Mines Safety

No.DGMS(Legal) Instruction No.01

/Dhanbad, dated 29.10.2013

To
All the Technical Officers,
of the DGMS.

Sub: Order dated 23.11.2012 passed by the Hon'ble Supreme Court of India in Special Leave to appeal(Criminal) 2012 and Criminal Miscellaneous Petition No.(S) 24172/2012 arising out of Criminal Miscellaneous Petition No.1415/2007 of the Hon'ble Jharkhand High Court at Ranchi.

1. It has come to the knowledge of the undersigned that, being aggrieved with the cognizance order dated 18.5.2007 passed by the Ld. C.J.M. Dhanbad in case No. C.M.A./129/2007 pertaining to fatal accident occurred at Sendra Bansjora Colliery of M/s BCL on 21.11.2006, one of the accused Sri A.K.Singh, **Chief General Manager & also Deemed Agent** filed Criminal Miscellaneous Petition No.1415 of 2007 before the Hon'ble Jharkhand High Court at Ranchi.
1. That, the Hon'ble Jharkhand High Court was pleased to quash the aforesaid cognizance order against Sri A.K.Singh, **Chief General Manager & also Deemed Agent** vide order dated 20.03.2012. A copy of aforesaid order is enclosed at Annexure-1, which is self explanatory.
2. That, the Hon'ble Supreme Court of India was also pleased to uphold the order passed by the Hon'ble Jharkhand High Court at Ranchi. A copy of the order dated 23.11.2012 passed by the Hon'ble Apex Court is enclosed at **Annexure"2"** for ready reference.

In view of above, it is therefore, advised that while recommending proposal for prosecution the I.O/Directors/and DDG(s) will ensure that the law laid down by the Hon'ble Jharkhand Court and duly upheld by the Hon'ble Supreme Court of India are fully complied with.

Director General of Mines Safety
Encl: As above.

DGMS



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खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety



No. DGMS (Approval) Circular (S&T)/ ८७ Dhanbad, Dated ३१ December, 2014

To

The Owner, Agent and Manager of all Mines

Subject: Approval of dust suppression/prevention device in drilling and boring equipment used in coal mines.

Notification No DGMS/S&T(HQ)/14/185 dated 20th January 2014, has been published in the Gazette of India Part II Section 3(i) on 8 February 2014 vide GSR 24, which is reproduced below for strict compliance.

"In exercise of powers conferred on me under regulation 123(6) of the Coal Mines Regulations' 1957, I, Rahul Guha, Chief Inspector of Mines, also designated as Director General of Mines Safety, hereby declare 28th February, 2014 as the date from which item/items considered as other equally efficient device equivalent to a jet of water directed on the cutting edge to wet the cuttings cited in regulation 123(6)(b)(ii) shall not be used in coal mines for drilling or boring in stone, unless the same has been approved by me by a general or special order in writing.

This supersedes Notification No. 16(38) 79 Genl./6095, dated 25th November 2008, published in the Gazette of India Part II Section 3(i) on 13th December 2008 vide GSR 215."

This circular supersedes the earlier issued DGMS (Approval) Circular No. 1 of 2009.


(Rahul Guha) 3.12.14

Director General of Mines Safety



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Directorate General of Mines Safety



No. DGMS (Approval) Circular (S&T)/ 10 Dhanbad, Dated 31 December, 2014

To
The Owner, Agent and Manager of all Mines

Subject: Approval of dust suppression/prevention device in drilling and boring equipment used in Metalliferous mines.

Notification No DGMS/S&T(HQ)/14/186, dated 20th January 2014, has been published in the Gazette of India Part II Section 3(i) on 8 February 2014 vide GSR 25, which is reproduced below for strict compliance.

"In exercise of the powers conferred on me under regulation 124(6) of the Metalliferous Mines Regulations' 1961, I, Rahul Guha, Chief Inspector of Mines, also designated as Director General of Mines Safety, hereby declare 28th February, 2014 as the date from which item/items considered as other equally efficient device equivalent to a jet of water directed on the cutting edge to wet the cuttings cited in regulation 124(6)(b)(ii) shall not be used in metalliferous mines for drilling or boring, unless the same has been approved by me by a general or special order in writing.

This supersedes Notification No. 16(38) 79 Genl./6095, dated 25th November 2008, published in the Gazette of India Part II Section 3(i) on 13th December 2008 vide GSR 215."

This circular supersedes the earlier issued DGMS (Approval) Circular No. 1 of 2009.


(Rahul Guha) 31.12.14
Director General of Mines Safety



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Directorate General of Mines Safety



No. DGMS/MSE/Circular (Approval) No. 01

Dated 2nd April, 2014.

To

All Owners/ Agents/ Managers of Coal and Metalliferous Mines.

Subject – Approval for use of Reflective harness (visibility harness), reusable Earplugs and Safety Goggles.

Sir,

1.0. Vide notification under reference G.S.R. 154 dated 28.07.2007 published in the Gazette of India, Part – II, Sec- 3 Visibility harness/ Reflective harness, reusable Earplugs and Safety goggles were included in the list of items requiring approval by a general or special order in writing from the Chief Inspector of Mines (CIM), now designated as Director General of Mines Safety, under Regulations 181(3) of the CMR 1957.

2.0. These items have prescribed standards (amended on date) as per details given below-

- I. Reflective Harness – *BS EN 471/2003*
- II. Safety Goggles – *IS 5983 : 1980*
- III. Reusable Earplugs – *IS 9167: 1979 & IS 6229:1980*

3.0. Approvals from this directorate were being granted on case to case basis since then and the mine managements have been using them for protection of their persons exposed to various hazards. Now it has been felt that the mines have become familiar with their necessity and have gathered sufficient experience in using such protective items.

4.0. Considering the fact that these items will be used more and more in future and the required quality can be ensured and maintained by both the manufacturer(s) and users in mines, if the laid down standards as referred above are followed strictly by them. In view of this, it is now decided to issue a general order specifying the standards to be complied with.

5.0 As provided under Regulation 181(3) of the Coal Mines Regulations, 1957 and the earlier published notification published in the Gazette of India, referred at Para 1.0. above, the standards for using them in coal mines, as stipulated at Para 2.0 above for respective items shall be considered as approved by the Chief Inspector of Mines by this general order in writing with effect from 1st May 2014. It may be noted that no specific approval will be required from this Directorate in this regard from that date.

(contd....page 2)

6.0. All Owners/ Agents/ Managers of Coal Mines using or intending to use these items are, therefore, requested to ensure at the time of procurement of these items that those conform to the relevant standards referred above, updated or amended at that point of time. A mechanism in this regard shall be developed and established by the mining companies to ensure that such items are of desired quality.


(Rahul Guha) 2.2.14

Director General of Mines safety

नामक ह० विभाग
प्रतिष्ठित बुधवार
को उनके कर्मचारी अधिकारियों के बीच
विचारित हेतु है।

को कोष सुरक्षा महाविभाग



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Govt. of India
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Directorate-General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 01

Dhanbad, dated : 10 / 03 / 2014

To

The Owner, Agent and Manager of all Mines

Subject : Campaign on "Risk Calculator"

Analysis of accidents in both coal & non-coal mines during last three decades shows more or less a static trend. With this in view, "Risk Management" as a tool for development of an appropriate health and safety management system had been discussed in detail during 9th Conference on Safety in Mines and it was recommended to prepare "Safety Management Plan(s)" on the basis of risk assessment. In the 10th Conference on Safety in Mines as well, considerable emphasis was given on development of "Safety Management Systems".

The approach helps in the switch over from "Prescriptive Legislation" to "Self-Regulation" in which the risk creator himself decides the best way to control the risk and thereby avoid the occurrence of any untoward incidents.

The risk based approach lays emphasis on prevention rather than post-incidence corrections. In view of this, risk evaluation is an important step for all activities in mines.

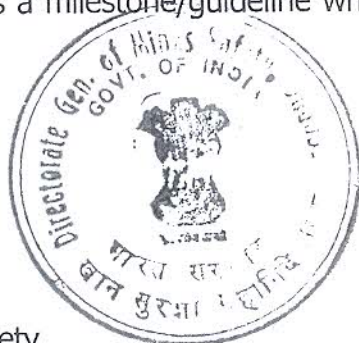
In order to understand the "Risk", a handy card has been created which can be used by Managers, Supervisors & work-persons for perception of the "Risk" in any mining operation that they have to undertake. Sample copies of the "Card" are enclosed for wide circulation in mines. The "Card" is also available in DGMS website www.dgmsindia.in or www.dgms.gov.in.

I hope this Card will prove as a milestone/guideline while assessing risk of any operation in a mine.

Yours faithfully,

(Rahul Guha)

Director General of Mines Safety



नामांक ०००००००० दिनांक ००/००/००
 प्रतिष्ठिति सुखदायक
 को उनको धन्यवाद ज्ञापित करने के साथ
 विश्वास है कि प्रेषित ।

खान सुरक्षा महानिदेशालय

RISK CALCULATOR



RISK ASSESSMENT MATRIX

Step 3 Calculate the Risk		Consequence				
		1	2	3	4	5
Probability		Catastrophic Death/Massive financial loss	Major Hospitalisation/Large Financial loss	Moderate Medical Treatment/High Financial loss	Minor First Aid Treatment/Medium Financial loss	Negligible No injuries/Minimal Financial loss
A	Almost certain Often Occurs / Once a week	Extreme Risk	Extreme Risk	Extreme Risk	High Risk	High Risk
B	Likely Could easily happen/Once a month	Extreme Risk	Extreme Risk	High Risk	High Risk	Moderate Risk
C	Possible Could happen or known it to	Extreme Risk	Extreme Risk	High Risk	Moderate Risk	Low Risk
D	Unlikely Hasn't happened yet but could/once every 10 years	Extreme Risk	High Risk	Moderate Risk	Low Risk	Low Risk
E	Rare Conceivable but only in extreme circumstances/Once every 100 years	High Risk	High Risk	Moderate Risk	Low Risk	Low Risk

ZERO HARM

RISK CALCULATOR



1. Estimate the probability of the event occurring
2. Estimate the consequences of the event occurring
3. Using your values, calculate the risk level from the matrix

RISK ASSESSMENT INPUTS

Step1 Estimate Probability			Step2- Eliminate Consequences			
			Health	Financial	Operational	Environmental
A	Almost Certain (Often occurs/ Once a week)	1	Catastrophic Death	Catastrophic Massive Financial Loss	Catastrophic Greater than one week of lost production	Catastrophic Severe environmental impact
B	Likely Could easily happen once a month	2	Major Hospitalisation	Major Large financial loss	Major 2 to 7 days of lost production	Major Major environmental impact
C	Possible Could happen or known it to happen/Once a year	3	Moderate Medical treatment	Moderate High financial loss	Moderate 12 hours of lost production	Moderate Moderate environmental impact
D	Unlikely Hasn't happened yet but could/once every 10 years	4	Minor First aid treatment	Minor Medium financial loss	Minor 8 hours of lost production	Minor Minor environmental impact
E	Rare Conceivable but only in extreme circumstances/Once every 100 years	5	Negligible No injuries	Negligible Minimal financial Loss	Negligible 1 hour or loss of lost production	Negligible Negligible environmental impact



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Directorate General of Mines Safety
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DHANBAD - 826001, JHARKAND

No. DGMS/ S&T/Tech. Cir. (Approval) No. 07 Dhanbad, 19.12.2014.

To:

The Owner, Agent, Manager of All Mines & the Manufacturers

Subject: Standard Components and Properties of Fluid expandable rock bolts to be used in Mines.

Fluid expandable rock bolts are being used as steel supports in the mines. These supports are relatively new to the Indian Mines and there are no guidelines so far for its properties and use. So, an expert committee was constituted with scientists from Central Institute of Mining & Fuel Research (CIMFR), National Institute of Rock Mechanics (NIRM) and representatives from Indian School of Mines (ISM), CMPDIL, Ranchi to formulate a set of guide lines for use of Fluid expandable rock bolts in Indian mines. A meeting of the committee was held on 24/09/2014 at DGMS, Dhanbad for detailed discussion and deliberation on the subject. Based on the recommendations made by the committee, following guidelines have been formulated for standard components and properties of Fluid expandable rock bolts to be used in the mines.

- 1.0 Before using the Fluid expandable rock bolts in a mine, its suitability of application in a particular geo-mining domain may be assessed in consultation with a scientific and research organization having experience and expertise in strata control. Fluid expandable rock bolts may be used only in such specific cases where it has been recommended by the scientific and research organization after due assessment, and subject to compliance of its recommendations.
- 2.0 The materials, metal(s), chemical(s), component(s), part(s) and accessories from which the Fluid expandable rock bolts with Washers have been manufactured, assembled, fabricated or prepared shall be as follows:
 - 2.1 Physico-mechanical Properties :
 - a) The fluid expandable rock bolts shall be manufactured from hot rolled medium and high tensile structural steel Grade Fe E-550 or above. The Yield Stress, Tensile Strength and % elongation steel Grade shall be maintained as per the IS 2062:2011 or equivalent standard.
 - b) However the minimum load bearing capacity of the fluid expandable rock bolts shall be 12 tonnes.

2.2 Chemical Composition:

Chemical composition of the steel for manufacturing of the fluid expandable rock bolts varies according to the requirement of strength characteristics and specific applications given by the manufacturer and the end user of the fluid expandable rock bolts. However certain chemical constituents of the steel which influence the required properties of steel shall conform to the IS 2062:2011 or equivalent standard.

2.3 Bearing Plate

- a) The Bearing Plate of the Fluid expandable rock bolts shall be Dome Washer Plate of dimension 150 x 150 x 8 (minimum) mm with compatible central hole of required size.
- b) The minimum load at which the Domed Washer Plate will become flat should be at least 12 Tonnes.

2.4 Other Properties & Parameters

a) Weatherability:

The Fluid expandable rock bolts and its components or parts shall be subjected to Accelerated Weathering Test in mine water condition for 20 days. No deterioration should occur on the Assembly.

- b) Accelerated Weathering Test (AWT) shall also be conducted in acidic water condition for 20 days during which no deterioration should occur on the Assembly.
[Note: The AWT under mine water condition generally is at pH > 4 and that under acidic water condition is considered at pH-2 (5 % HCL aqueous solution) during testing.]

c) Corrosion Resistance Test:

The Fluid expandable rock bolts Assembly shall be subjected to Field Exposure and Corrosion Resistivity Test as per IS- 5555: 1970 to test the resistance to corrosion of the steel of the Fluid expandable rock bolts and its parts. The Fluid expandable rock bolts should pass the required test.

3.0 Sampling & Testing

- 3.1 In order to check the composition and required parameters during manufacture, it shall be required that the random sampling be done @ of 5 Fluid expandable rock bolts per 1000 pieces of Fluid expandable rock bolts and its accessories manufactured in a batch which shall be subjected to the required set of tests as prescribed in the previous paragraphs above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and shall be countersigned by the quality control officer posted at the manufacturing unit(s).
- 3.2 Before using in the mines, The user shall carry out necessary Physical examination and conduct Tensile Test of the Assembly for every batch of Fluid expandable rock bolts & its Accessories received at their end to ensure that the same conform to the above requirements and shall also keep the records thereof in a bound paged book kept for the purpose.

In case the Fluid expandable rock bolts or any of its accessories fail to pass the required tests at the user's end, that batch or lot of the manufacture shall not be used in the mine and intimation thereof shall be sent to the manufacturer. A record in this regard shall be maintained at the mine/company.

- 3.3 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the manufacturing facilities at any time and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of the manufacturer.
- 3.4 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the Fluid expandable rock bolts at any time in the mine or the area of the mines and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of manufacturer or user.
- 4.0 (a) The manufacturer shall obtain a test certificate as to the conformity to the requirements stipulated in the Para 2.0 above, from a prescribed agency of the material(s), metal(s), chemical(s), component(s), part(s) and accessories used for manufacturing Fluid expandable rock bolts, and a certified copy of the same shall be attached with each consignment supplied to the user/test laboratory.
 (b) The manufacturer shall furnish all relevant information in respect of chemical composition, properties, mechanical parameters and specifications or any other information or reports pertinent to their product(s) to the user(s).
- 5.0 Before making any supply to the mines, the manufacturer shall:
 - a) Suitably indemnify the user against any loss/damage of any kind, whatsoever, during handling and use of above product in mines. However, such loss/damage shall be immediately investigated along with the representatives of the user;
 - b) Formulate and supply, Safe Operating Procedure (SOP) for storing, handling and installation of Fluid expandable rock bolts to the user mining company; and
 - c) Shall associate manufacturer's representative(s) at suitable level(s) with the user mining company for attending to technical matters pertaining to the storing, handling and installation of Fluid expandable rock bolts any other matters connected thereof.
- 6.0 Anchorage testing:
 - 6.1 (a) At least 10% of the Fluid expandable rock bolts actually installed in the belowground workings of the mines shall be regularly subjected to tests for anchorage strength on random basis.
 (b) Details of the measured anchorage strength as above shall be entered in a bound paged register maintained for the purpose and signed by the Assistant Manager In-charge and countersigned by the Manager of the mine.
 - 6.2 (a) The use of Fluid expandable rock bolts shall be discontinued whenever the anchorage strength measured is less than 12 tonnes.
 (b) An inquest shall be jointly carried out by the representative(s) of the manufacturer and user to ascertain the reasons for less than satisfactory performance, and suggest remedial measures to improve the performance. The use

of Fluid expandable rock bolts shall only be resumed after necessary rectifications are carried out, and the details are recorded in a bound paged register kept for the purpose and jointly signed by the authorised representative of the manufacturer and Manager of the mine.

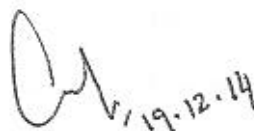
7.0 General Requirement

All the Owner, Agent and Manager including the manufacturers and suppliers shall strictly comply with this standard and in the event of finding any deviation or defects in the product supplied, use of the same shall be immediately stopped and it also be brought to the notice of this Directorate.

Manufacturers and the Users including the Test Houses, who are engaged for testing of such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

The Fluid expandable rock bolts with the Standard, Parameters and Testing as per the circular shall be considered as approved by the Chief Inspector of Mines by a general order as provided under regulation 181(3) of the Coal Mines Regulations, 1957.

Yours Faithfully,



Director General of Mines Safety



भारत सरकार
 Govt. of India
 श्रम एवं रोजगार मंत्रालय
 Ministry of Labour & Employment
 खान सुरक्षा महानिदेशालय
 Directorate-General of Mines Safety



No. DGMS (Legis) Circular (MAMID)/ 01

Dhanbad, dated : 07 / 05 /2014

To

The Owner, Agent and Manager of all Mines

Subject : Criteria to determine accidents – Mining-statistical, Mining-non statistical, Non-mining.

DGMS receives queries often on classification of accidents from the industry. Though the definition of different classes of accident had been made very clear in the past, it is felt necessary to once again bring it to the notice of all stake holders the following classifications on the subject :

(A) Mining-statistical accident

An accident shall be termed as Mining-statistical if

1. that occurred within the boundary of the mine and person(s) involved in the accident is employed in the mine and the accident occurred due to any mining operation, or by any equipment/machinery/apparatus deployed therein, or due to negligent or willful actions by a person, employed in the mine, that have endangered his life or the life of other person employed in the mine or negligently or willfully omit to do anything, necessary for safety of the persons employed therein,

and/or

2. that occurred within the boundary of the mine and person(s), employed in the mine, has/have gone in any part of the mine other than that part in which he/they work and involved in an accident due to any mining operation, or by any equipment/machinery/apparatus deployed therein, or due to negligent or willful actions by a person, employed in the mine, that have endangered his life or the life of other person employed in the mine or negligently or willfully omit to do anything, necessary for safety of the persons employed therein.

(B) Mining-non statistical accident

An accident shall be called as Mining-non statistical if

1. person(s), not employed in the mine, is/are involved in an accident, occurred within the mine boundary, due to any mining operation, or by any

equipment/machinery/apparatus deployed therein, or due to negligent or willful doing anything by a person, employed in the mine, that have endangered the life of person(s)

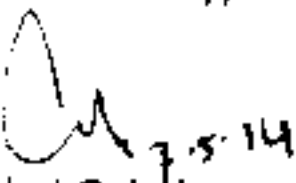
and/or

2. any accident occurred due to any operation which is incidental to mining operation, in an area outside the boundary of the mine whether person(s) involved in the accident is/are employed in the mine or not.

(C) Non-mining accident

1. An accident shall be termed as Non-mining if it occurs outside the boundary of the mine, whether person(s) involved in the accident is/are employed in the mine or not, due to any operation which is not incidental to mining operation. The consumer truck, transporting mineral, involved in an accident outside the boundary of the mine shall not be treated as an operation which is incidental to mining operation.
2. Any death due to natural cause shall also be termed as Non-mining accident.

Yours faithfully,


(Rahul Guha)

Director General of Mines Safety



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Directorate General of Mines Safety
Dhanbad -826001



Tel-0326-2221000
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No. DGMS Circular (Approval) No. 03

Dhanbad, Dated ...15th...August, 2014

To

All Owners/Agents/Managers of Coal, Metalliferous and Oil Mines

**Sub: Helmets requiring DGMS Approval for use in Coal, Metalliferous and Oil Mines-
Discontinuance of approval by a special order in writing**

- 1.0 Regulation 191 A of the Coal Mines Regulations 1957, Regulation 182 A of the Metalliferous Mines Regulation 1961 and Regulation 88 of the Oil Mines regulations 1984, require that

" No person shall go into, or work or be allowed to go into, or work in, a mine other than the precincts of a mine occupied by an office, building, canteen, crèche, rest shelter, first aid room or any other building of similar type, unless he wears a helmet of such type as may be approved by the Chief Inspector by a general or special order in writing"

- 1.1 DGMS has been according approvals under these regulations to manufactures of helmets by special orders on case to case basis for the benefit of the miners. These helmets conform to the standards as specified in IS 2925: 1984 (with amendments done in the years 1988, 1999, 2000 & 2002) of the Bureau of Indian Standard. It is required that such helmets approved by DGMS has DGMS markings along with BIS marking on them.
- 2.0 The mine management have been using helmets for protection against head injuries to persons deployed in mines. Now, the mines have become familiar with its necessity and have gathered sufficient experience in using them.
- 2.1 Considering the fact that helmets will be used in compliance to the statutory requirements in future too and required quality can be ensured and maintained by the manufacturer and users by getting the helmets tested at any Govt. or Govt. approved laboratory whenever standard of testing have changed.
- 2.2 Further, it has been felt that the process of DGMS approval need to be simplified, transparent and friendly to the mining industry and related manufacturing industries but by ensuring proper quality of the safety item as well. In view of this, it is now decided to issue a general order specifying the standards to be complied with.
- 3.0. As provided under Regulation 191 A of the CMR' 57, Regulation 182 A of the MMR' 61 and Regulation 88 of the OMR' 84, Industrial Safety Helmets conforming to the

standards as specified in IS 2925: 1984 (with amendments done in the years 1988, 1999, 2000 & 2002) of the Bureau of Indian Standard shall be considered as approved by the Chief Inspector of Mines (now designated as Director General of Mines Safety) by this order in writing with effect from 1st September, 2014. It may be noted that no specific approval will be required from this Directorate in this regard from that date.

4.0. The manufacturer shall ensure that-

4.1. Each helmet is permanently marked with the manufacturer's name / model, year & month of manufacture.

4.2 The helmet is tested at any Govt. or Govt. approved laboratory whenever standard of testing get amended or changed. **The helmet shall also bear marking of BIS licence with relevant IS number along with a declaration stating that it is "suitable for use in mines"**

5.0. However, the helmets, if having valid approval given to any manufacturer in the past by a special order by this Directorate, may continue to be procured for use in mines upto its respective last date of validity, but not so-as-to debar any other manufacturer(s) complying to the above mentioned standard approved by this general order.

6.0. All Owners/Agents/Managers of Coal, Metalliferous and Oil Mines providing, using or intending to provide or use such helmets in their mines are therefore, requested to ensure at the time of procurement of the helmets that it conforms to the prescribed standards of BIS, updated or amended at that point of time, to maintain the desired qualities. A mechanism in this regard shall be developed and established by the mining companies/mine operators / users in close liaison with the manufacturer of the helmets and approved test houses for safety of the persons deployed in the mines.


(Rahul Guha) 14-9-14
Director General of Mines Safety





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Tel-0326-2221000
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No. DGMS Circular (Approval) No. 04

Dhanbad, Dated ...15th August, 2014

To

All Owners/ Agents/ Managers of Coal, Metalliferous and Oil Mines.

Sub- Footwear requiring DGMS Approval for use in Coal, Metalliferous and Oil Mines- Discontinuance of approval by a special order in writing.

1.0. Regulation 191 of the Coal Mines Regulations, 1957, Regulation 182 of the Metalliferous Mines Regulations, 1961 and Regulation 87 of the Oil Mines Regulations, 1984, require that ,

" No person shall go into or work in or be allowed to go into, or work, in a mine, unless he wears a protective footwear of such type as may be approved by the Chief Inspector by a general or special order in writing."

1.1. There are different varieties of protective footwears suited for different working sites in the mines. DGMS has been according approval under these Regulations to the manufacturers of these shoes by special orders since long for the benefit of the miners. There are various standards framed by BIS to suit Indian mining conditions. It is required that such protective DGMS approved footwear has DGMS marking along with BIS marking on it.

2.0. TERMINOLOGY- (As per IS : 2050)

2.1. Safety footwear for professional use – footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in the working sectors for which the footwear was designed to give protection against impact when tested at an energy level of 200 J and compression at a load of at least 15 KN.

2.2. Protective footwear for professional use – footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in the working sectors for which the footwear was designed to give protection against impact when tested at an energy level of 100 J & Compression at a load of at least 10KN.

2.3. Safety Toe cap – Footwear component built into the footwear designed to protect the toes of the wearer from impacts up to an energy level of at least 200 J and compression at a load of at least 15 KN.

2.4. Protective toe cap – Footwear component built into the footwear designed to protect the toes of the wearer from impacts up to an energy level of at least 100 J & compression at a load of at least 10 KN.

2.4.1. IS:5852 of 1992 prescribes specification for protective steel toe cap for footwear. Caps made of tempered steel to the required shape of the last and used at the toe of the safety footwear. It may be placed either between the upper and the lining or may be attached externally over the upper of footwear by means of inward flanges. It forms an in-built integral part of the safety footwear and is intended to protect the toe of the user.

2.4.2. Alternately, in place of steel toe cap, non metal fibre reinforce light weight protective toe cap may also be used in future manufacturing with the concurrence with the authorities operating the mines but in case the prescribed impact energy level and compression level described above shall have to be complied with. Such type of non metallic toe cap will reduce fatigue to the miners by walking or work due to its less weight and it will in turn improve productivity.

2.5. SCOPE of Application – (Types of Boots)----

2.5.1. Type- 1 Boots are preferred for use where minimal water accumulation or in slurry condition of mining.

(NOTE: Boots are preferred for use where minimal water accumulation or in slurry condition of mining.)

Type - 2 Boots are preferred for use in dry condition of mining.

2.5.2. Special (Varieties of Shoes) –

i) Fire Resistivity

ii) Electrical Resistivity

iii) Anti Skid (Slip)

iv) Oil Resistant for oil mines or work places where oil & grease come in contact

3.0 The protective shoes used in mines are required to conform to IS:15298 (Part-1):2002 (revised 2011) /ISO 8782 : 1998. This is the mother standard under which all safety footwears are required to be manufactured and tested. It contains various parameters for testing. For the purpose of use in the mines chief parameters are given at Annexure-I which must be selected besides others required under the relevant standards of BIS during testing in Govt or Govt approved test houses.

4.0 In mines the following varieties / types of shoes have been in use –

4.1 **Canvas footwear** (Textile top) - This type of shoes is being widely used in coal mines both in underground and opencast for both men and women. Such type of shoes are required to conform to IS : 3976 of 2003. There is no specific standard for women miners.

4.2 **Leather footwear** - Such type of shoes are used in dry condition only. It has two varieties – Leather sole and Rubber sole. These two varieties are required to conform to IS : 1989 (Part – I) of 1978. At present these type of shoes are not normally in used in the mines.

This type of footwear has another variety for women workers in mines. Such leather safety footwear is required to conform to IS : 11225 of 1985.

Leather Safety Shoes are also covered under IS: 11226 of 1993 for use in general industrial area. There is no mention in this standard that it is applicable to mines or not. Therefore such type may also be selected for use in mines. Under this category, following types of shoes are manufactured-

Type 1 : Ankle Boots

Type 2 : Jodhpuri Shoes

Type 3 : Derby Shoes

For above type of shoes approval have been accorded by the Directorate for use in certain type of mines as per the need of the mine operators and as required by the manufacturer.

4.3 **Polymer footwear** (PVC/Rubber) - For such type of shoes there are following three standards –

- i. IS : 5557 of 2004 – Rubber knee boots for Type 1 & 2 are required to conform to this standard. These types 1 & 2 are designed with respect to height of the shoes (but not to be categorised for use in wet and dry conditions). This covers oil resistant variety properties for use in oily areas.
- ii. IS : 12254 of 1993 – PVC knee boot / Gum boots are required to conform to this standard.
- iii. IS : 9885 of 1982 – Rubber ankle or knee boots required for use in oil mines shall conform to this standards.

5.0 **Maintenace of Footwear** – IS : 6519 of 1971 prescribes code of practice for selection, care and repair of safety/protective footwear. Normally the working life of the shoes is designed to be not less than 9 months but the shelf life of safety boots depends upon the arrangement of inside environmental conditions

of the store house of the mine (s). The internal environment of the store house must not be humid and beyond normal room temperature ($\leq 26^{\circ}\text{C}$). Leather Safety Boot having Polyurethane sole is having shelf life of lesser period and suffers subsequent hydrolysis, and subsequent degradation. The manufacturer of such footwear should declare the same to the users about it so that these could be used before its period of expiry of shelf life.

Canvas Safety Boots are also having polyurethane sole and in such cases the above guide lines should be followed.

Footwear other than Polyurethane sole has normal shelf life provided the same is not exposed to direct sunlight, rain etc. Rubber Components are subjected to ageing and as such the shelf life in no case is exceeding a year in NTP and in cool dry place.

6.0. The manufacturers shall see that-

- 6.1. Each boot is permanently marked with manufacturer's name / model, year & month of manufacture, safety or protective boot, any other statutory marking to be made inside of tongue or at top outer face of the boot so that least damage during mining operation occurs.
- 6.2. The footwear has been tested at any Govt. or Govt approved laboratory whenever standard of testing have changed. **The footwear shall bear marking of BIS license with relevant IS number along with declaration stating that it is "suitable for use in mines"**
- 6.3. Each pair of boot is supplied with information in English and Hindi as follows:
 - (i) This footwear is not a GREEN footwear and is not BIO-DEGRADABLE.
 - (ii) This footwear is recommended/ not recommended for use in fire prone or in hot surface area (delete whichever is not applicable).
 - (iii) Name and full address of manufacturer
 - (iv) Detail of customer care service provider
 - (v) Instruction for storage and maintenance
 - (vi) Drying procedure of wet Boots and cleaning of Boots for proper service
 - (vii) Obsolescence dead line or period of obsolescence.

- 7.0. Approvals from this directorate are being granted on case to case basis being specific to the manufacturers and the type(s) of footwear they manufacture. The mine managements have been using them for protection of their persons in mines. Now it has been felt that the mines have become familiar with its necessity and have gathered sufficient experience in using such personal protective items.

- 7.1. Considering the fact it will be used complying to the statutory requirements in future and the required quality can be ensured and maintained by both the manufacturer(s) and mine users, if the laid down standards as referred above are adhered to strictly by them by getting the footwear tested in Govt or Govt approved laboratories.
- 7.2. Further, it has been felt that the process of approval need to be more simplified, transparent and friendly to the mine industry and related manufacturing industries but by ensuring proper quality as well. In view of this, it is now decided to issue a general order specifying the standards to be complied with.
- 8.0 As provided under Regulation 191 of the Coal Mines Regulations, 1957, Regulation 182 of the Metalliferous Mines Regulations, 1961 and Regulation 87 of the Oil Mines Regulations, 1984 protective footwear shall be considered as approved by the Chief Inspector of Mines (now designated as Director General of Mines Safety) by this general order in writing with effect from 1st September 2014. It may be noted that no specific approval will be required from this Directorate in this regard from that date.
- 8.1. However, the footwear, if having valid approval given to any manufacturer in the past by a special order by this Directorate, may continue to be procured for use in mines up to its respective last date of validity, but not so- as -to debar any other manufacturer(s) complying to the above mentioned standards approved by this general order.
- 9.0. All Owners/ Agents/ Managers of Coal, Metalliferous or Oil Mines providing or using or intending to provide or use such protective/ safety footwear in their mines are, therefore, requested to ensure at the time of its procurement that the footwear conform to the relevant standards referred above, updated or amended at that point of time, to maintain the desired qualities. A mechanism in this regard shall be developed and established by the mining companies/mine operators to procure, provide, maintain, storage of footwear, etc. in order to ensure safety of persons deployed in mines in compliance to the statutory requirements.

(Rahul Guha) 19-8-14
Director General of Mines Safety



(Annexure to DGMS Circular (Approval) No. 04 Dhanbad, Dated 14th August, 2014)

Chief Parameters for Performance Test of footwear for use in mines

(Complying to IS:15298 (Part-I):2011 / ISO 20344 of 2004)

Sl. No.	Minimum Parameters For Performance Testing in Govt or Govt approved Labs.	For use in Dry condition	For use in Wet condition	Remarks
1.	Impact Resistance	✓	✓	
2.	Compression Resistance	✓	✓	
3.	Minimum Inner Length of Toe cap	✓	✓	
3.	Electrical Resistance	x	✓	
4.	Flexing Resistant of sole	✓	✓	
5.	Flexing Resistant of upper body of shoe	✓	✓	
6.	Corrosion Resistant of metal toe caps or metal penetrating resistant inserts	✓	x	Only leather footwear
7.	Upper / outsole and sole interlayer bond strength	✓	✓	
8.	Leak Proof footwear	X	✓	
9.	Tear strength of upper material	✓	✓	
10.	Tear strength of sole material	✓	✓	
11.	Abrasion of outsole	✓	✓	
12.	Abrasion of insole	✓	✓	
13.	Resistant to hot contact	✓	✓	
14.	Electrical Resistant	✓	✓	for use during electrical jobs
15.	Resistance to fuel oil	✓	✓	For use in oil/grease working conditions
	✓- Test is required, X- Test not required			



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Directorate-General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 03

Dhanbad, dated : 22 / 04 / 2014

To

The Owner, Agent and Manager of all Mines

Subject: Accident due to Dump Failure

In an opencast coal mine, several villagers were fatally injured while picking/collecting remnant coal from the toe of an external overburden dump.

The enquiry into the accident revealed the following:

1. Fencing of substantial construction was not erected around the dump to prevent inadvertent entry into the dump area;
2. The dumping was made in two lifts. Overall height of the dump was about 64m and the width between the lifts was not sufficient;
3. The ground water pressure in the dump increased due to ineffective drainage system both inside and outside the overburden dump;
4. Top soil, dumped at the bottom of the overburden dump, had created an unstable base;
5. The carbonaceous shale and coal, dumped with overburden rock, had caught fire with passage of time. The creation of void due to burning of carbonaceous shale and coal had further disturbed the dump and accentuated the slide.

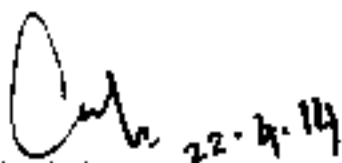
In order to prevent the recurrence of such type of accident(s) in future, you are requested to inter alia take the following steps :

1. A scientific study is to be made, in case the planned height of the dump is beyond 30m. The width of any bench in waste dumps shall not be less than its height.
2. In case of existence of any road nearby, dumping shall be done in such a way that the distance between the toe of dump and the road is not less than twice the overall dump height.
3. The top soil and sludge shall not be dumped at the floor to create the base of the dump.

4. For reducing the ground water pressure in the dump rock above phreatic surface, effective drainage system shall be provided both inside and outside the overburden dump. In this regard, the guidelines provided in DGMS Circular (Tech) No. 2 of 2001 in designing pit slope shall be followed.
5. The dump area shall be substantially fenced, in accordance with Regulation 112 of the Coal Mines Regulations, 1957, to prevent inadvertent entry of any person to the dump.
6. Precautions shall be taken to prevent spontaneous heating and fire in the carbonaceous shale and coal dumped along with overburden rock.

I am sure, that the precautions laid down above shall go a long way in preventing such accident(s) in future.

Yours faithfully,


(Rahul Guha) 22.4.14

Director General of Mines Safety



सत्यमेव जयते

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No. DGMS (Tech) Circular (MAMID)/ 05

Dhanbad, dated : 02 / 06 /2014

To

The Owner, Agent and Manager
All Underground Coal Mines.

Subject : Fatal accident to four persons due to fall of roof

Sir,

Recently, in an underground coal mine, four persons including an assistant manager died due to fall of roof in a goaved out area of a depillaring district.

The enquiry revealed the following:-

1. Diagonal line of extraction was not followed as prescribed in the permission letter issued by the Directorate for depillaring.
2. The prescribed manner of extraction was violated i.e. instead of extracting pillars by level split and dip slices, the pillars were extracted by formation of four stooks and then extracting the stooks.
3. Due to the variations, above-mentioned, from the manner of extraction, the work persons including assistant manager were employed in an area which had formed a part of goaf.
4. Goaf edge supports as prescribed in the approved Systematic Support Rules (SSR) under Regulation 108 of the Coal Mines Regulations, 1957 were not provided.
5. No convergence recorders were provided in the depillaring district at suitable point(s) to indicate the impending fall of roof well in advance.

From this incident, it appears that there is misunderstanding of the methodology of depillaring or overconfidence of official(s) employed in the depillaring district. In order to prevent recurrence of the same in future, the following steps need to be taken :-

1. After obtaining permission for depillaring and before commencement of depillaring operation, all supervisory officials and other key personals to be employed in the district shall be appraised with all conditions, stipulated in the permission letter and implication of the conditions.

2. During depillaring operation, an official from Internal Safety Organization (ISO) of the company shall inspect the district at frequent intervals to ensure the compliance of the conditions stipulated in the permission.
3. Special attention is required to be given to ensure
 - (i) installation of convergence recorder(s) at suitable place(s) to get indication of impending fall well in advance.
 - (ii) erection of skin to skin goaf edge cogs and props to prevent inadvertent entry of person(s).

Yours faithfully,


(Rahul Guha)
Director General of Mines Safety



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No. DGMS (Tech) Circular (MAMID)/ 04

Dhanbad, dated : 09 / 05 / 2014

To

The Owner, Agent and Manager
All Underground Coal Mines.

Subject: Provision of two independent intake airways for every ventilating district

Sub-regulation 3 of Regulation 135 of the Coal Mines Regulations, 1957 stipulates that "In every fiery seam or gassy seam of the second or third degree, for every ventilating district there shall be provided two main intake airways, one of which shall be used as a travelling roadway".

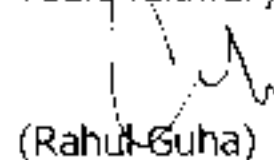
However, during the inspections of underground coal mines by officers of this Directorate, it is revealed that two main intake airways in a ventilating district were provided but rarely the airways are maintained independent from each other. The provision of two independent intake airways shall not only circulate more air in the district but also provides at least one egress in case of any eventuality like fire, major roof fall etc. in the other. The spirit of law of providing two main intake airways, independent from each other, is also to prevent short circuiting and in turn disruption of the ventilation of the district. It shall prevent the accumulation of inflammable/noxious gases to explosive/permissible limits.

The situation of disruption in ventilation system in a district happens due to disturbance in ventilation appliances viz ventilation stopping(s)/other ventilation appliance(s) broken for haulage purpose/passage of machinery etc. or damage of ventilation stopping(s) due to blasting or any other reason whatsoever.

For the reason(s) mentioned above, it is advised that the ventilation stopping(s) or other ventilation appliance(s) shall be made and maintained leak proof. No stopping shall be broken without prior approval of the manager in writing. If any stopping or other ventilation appliance is broken for any purpose, it shall be repaired immediately after the work. Any such afore-mentioned changes, made in the ventilation system, shall be recorded in a bound paged book kept for the purpose and signed by ventilation officer and countersigned by manager of the mine. In this connection, guidelines prescribed for "Specifications for Ventilation Stoppings" also shall be adhered with.

Further, it is advised that two independent intake airways be provided in all ventilating districts.

Yours faithfully,


(Rakesh Guha) 9.5.14

Director General of Mines Safety



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सं.DGMS(Exam)Circular No. 01

धनबाद, दिनांक ०३.०५, 2014

सेवा में
खान मालिक, अभिकर्ता और प्रबन्धक
सभी धात्विकीय खान।

Sub:- Practical Experience Certificate of non-producing/non-operative Metalliferous Mines.

Of late, it has been noticed that to fulfill the requirements of practical experience for the Competency Certificates, candidates are often submitting practical experience certificates of non-producing/non-operative mines, though adequate number of persons were indicated to have been employed in the mine. Practical experience of a closed or a mine having no active working cannot be considered as practical training in workings in a mine.

In order to maintain the standard of practical training, the Board of Mining Examination has decided that henceforth the practical training certificates of producing/ operative mines shall only be considered for grant of Competency Certificate(s) by the Board.

Manager's are requested to ensure compliance to the above while engaging candidates for undertaking practical training in the mine and issue experience certificates.

११.०५
३.५.१४

खान सुरक्षा महानिदेशक

आपका व. दिनांक

प्रतिष्ठित तृतीयद्वारा

को उनके कर्मचारी कर्मियों के बीच
परिचालित है।

खान सुरक्षा महानिदेशक



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Directorate General of Mines Safety



सं. खा.सु.म.नि(परीक्षा)परिपत्र स. 01

धनबाद, दिनांक 03.04, 2014

सेवा में
खान मालिक, अभिकर्ता और प्रबन्धक
सभी धात्विकीय खान।

विषय – गैर उत्पादक / गैर क्रियाशील घात्विकीय खानों के व्यावहारिक अनुभव प्रमाण पत्र ।

हाल में ऐसा देखा गया है कि सक्षमता प्रमाण पत्र प्राप्ति हेतु व्यावहारिक अनुभव की आवश्यकता को पूरी करने के लिये, आवेदक गैर उत्पादक / गैर क्रियाशील खानों के अनुभव प्रमाण पत्र प्रस्तुत कर रहे हैं, यद्यपि इन खानों में पर्याप्त संख्या में कर्मियों के नियुक्ति दर्शाया जाता है । बंद खानों अथवा ऐसे खानों, जहाँ सक्रिय रूप में खनन नहीं होता है, के व्यावहारिक अनुभव को खानों में खनन के व्यावहारिक प्रशिक्षण हेतु स्वीकार नहीं किया जा सकता है ।

व्यावहारिक प्रशिक्षण के मापदंड को बनाए रखने हेतु खनन परीक्षा बोर्ड ने यह निर्णय लिया है कि अब से केवल उत्पादक / क्रियाशील खानों के व्यावहारिक प्रशिक्षण प्रमाण पत्रों को बोर्ड द्वारा जारी होने वाले सक्षमता प्रमाण पत्रों हेतु स्वीकार किया जाएगा ।

प्रबंधकों से अनुरोध है कि वे आवेदकों को खानों में व्यावहारिक प्रशिक्षण दिए जाने एवं अनुभव प्रमाण पत्र निर्गत किए जाने में उपरोक्त के अनुपालन को सुनिश्चित करेंगे ।

5/32
3.4.14

खान सुरक्षा महानिदेशक

आपका हस्ताक्षर
प्रतिनिधि सुचचार्य
को उनके अधीनस्थ अधिकारियों के बीच
परिचित हेतु संलग्न ।

उप-खास सूचना महानिदेशक



भारत सरकार
Govt. of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate-General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 02

Dhanbad, dated : 19 / 03 / 2014

To

The Owner, Agent and Manager of all Mines

Subject : Take 5 (Personal Risk Assessment)

Take 5 (Personal Risk Assessment) is a simple process to ensure that all work activities are given a final check to identify and control any potential hazards that may have not already been addressed prior to commencement of activities. This process is being used successfully by different industries including mining industry in many countries. Take 5 is to complement the "Risk Assessment" process but does not replace it.

The Take 5 process consists of the following five steps :

1. Stop, step back, observe	Observe the work area and surrounding location for hazards.
2. Think through the task	Consider the sequence of steps involved in carrying out the task from start to finish.
3. Identify any hazards	Identify the hazards associated with the task including any present in the immediate and surrounding work area, and hazards generated by the task.
4. Control the hazards	If the hazard is not controlled and the work area not safe – do not start work, report to your superior official to review the risk assessment.
5. Complete the task	Once all control measures have been safely implemented – commence the task.

A simple, user friendly "Take 5 Card" is attached which can be gainfully utilized from the very beginning to the end of any task, just by making tick(/) mark in "Yes" or "No" column from top. Use of this card by frontline supervisors/work persons before the commencement of any mining activity shall go a long way in accident prevention and control activity in mines.

Yours faithfully,

(Rahul Guha)

Director General of Mines Safety



प्रमाणित स.
 प्रतिष्ठित सुझाव
 को उनके संबंधित अधिकारियों के बीच
 परिचालन हेतु प्रेषित ।

TAKE 5 (Personal Risk Assessment)

Task.....

Location..... Date

1 STOP! THINK THROUGH THE TASK

	Yes	No
Am I clear on what the task is?	☐	☐
Do I have the required skills, training and licenses for the task?	☐	☐
Is there a Safe Operating Procedure available?	☐	☐
Is a work permit and/or an authority to work required?	☐	☐
Is my equipment correct for the task and in good working order?	☐	☐
Do I have the correct personal protective equipment?	☐	☐

2 LOOK FOR HAZARDS

	Yes	No
1 Atmospheric Weather extremes, high humidity, dust, dangerous gases, lack of oxygen...	☐	☐
2 Chemical Acids, bases, solvents, heavy metals, poisons, particulates, fumes, vapours...	☐	☐
3 Electrical Electrocution, faulty wiring or equipment earthing points, static shocks...	☐	☐
4 Environmental Confined spaces, poor lighting, loud noise, temperature, poor ventilation...	☐	☐
5 External Traffic, other workers, general public.	☐	☐
6 Fire/Explosions Open flames, combustible materials, electrical arching, chemical reactions...	☐	☐
7 Gravitational Falls, slips, trips, falling objects.	☐	☐
8 Manual Handling Lifting, pulling, pushing, twisting, awkward positions, changes in levels	☐	☐
9 Mechanical Impact, entanglement, stabbing, crushing, suction, abrasions, protrusions...	☐	☐
10 Pressure Air, water, oil, gas, vacuums, high/low pressures	☐	☐
11 Radiation UV, Infra-red, lasers, X-rays, sunlight...	☐	☐
12 Thermal Hot or cold surfaces, hot or cold liquids, steam, friction...	☐	☐

3 ASSESS THE HAZARDS

What is the risk level? E=Extreme H=High M=Moderate L=Low

SEE YOUR SUPERVISOR AND/OR COMPLETE/UPDATE SAFE E/H/M ☐ L ☐

OPERATING PROCEDURE

4 MAKE THE HAZARDS SAFE

Are all hazards removed or at a low risk level?	☐	☐
Where needed have I updated the Safe Operating Procedure for this task?	☐	☐
Does this all feel right?	☐	☐

5 COMPLETE THE TASK SAFELY

DO NOT START THE TASK! COMPLETE A HAZARD REPORT AND SEE YOUR SUPERIOR OFFICIAL(S)

TAKE 5 (Personal Risk Assessment)

1 STOP! THINK THROUGH THE TASK

Get the correct Information * Procedures/SWMS * Tools & Equipment * Permits
 Think About * The people/systems affected * Safe access/exits
 * Nearby equipment * Task setup * Environmental impact
 * Alternative methods

2 LOOK FOR HAZARDS

Look close Look after look above Look below

What hazards are there?

* Atmospheric	* Environmental	* Manual handling	* Radiation
* Biological	* External	* Mechanical	* Thermal
* Chemical	* Fire/Explosions	* Pressure	
* Electrical	* Gravitational	* Psycho-social	

What if it?

* Breaks	* Falls	* Leaks	* Spills
* Doesn't fit	* Ignites	* Shifts	
* Explodes	* Jams	* Slips	

What if it is?

* Too heavy	* Labelled incorrectly	* Sharp
* Energised	* Poisonous	* The wrong one
* Hot	* Pressurised	* Too big/small

What if I'm?

* Caught in	* In need of assistance	* Too slow
* Confused	* Struck	* Uninformed

What if I

* Inhale	* Make an error	* Slip/trip
* Let go	* Need help	

3 ASSESS THE HAZARDS

* What is the probability of the event occurring ?
 * What are the consequences of the event occurring ?
 * Calculate the risk

4 MAKE THE HAZARDS SAFE

1. Eliminate. Completely remove the hazard from the workplace.
2. Substitute. Substitute the hazard with something of a lesser risk.
3. Isolate. Isolate the hazard from anyone who could be harmed.
4. Engineer. Redesign the process or equipment to control the hazard.
5. Administer. Control the hazard by influencing others on how to reduce the risk.
6. Personal Protective Equipment (PPE). Use appropriate PPE to protect against the hazard.

5 COMPLETE THE TASK SAFELY



Govt. of India/ भारत सरकार
Ministry of Labour and Employment
 श्रम एवं रोजगार मंत्रालय
Directorate General of Mines Safety
 खान सुरक्षा महानिदेशालय
DHANBAD - 826001, JHARKAND

No. DGMS/ S&T/Tech. Cir. (Approval) No. 08 Dhanbad, 19.12.2014.

To:

The Owner, Agent, Manager of All Mines & the Manufacturers

Subject: Standard Components and Properties of Friction stabilizers (Split sets) to be used in Mines.

Friction stabilizers (Split sets) are relatively new to the Indian Mines and there are no guidelines so far for its properties and use. So, an expert committee was constituted with scientists from Central Institute of Mining & Fuel Research (CIMFR), National Institute of Rock Mechanics(NIRM) and representatives from Indian School of Mines(ISM), CMPDIL, Ranchi to formulate a set of guide lines for use of friction stabilizers(Split sets) in Indian mines. A meeting of the committee was held on 24/09/2014 at DGMS, Dhanbad for detailed discussion and deliberation on the subject. Based on the recommendations made by the committee, following guidelines have been formulated for standard components and properties of Friction stabilizers (Split sets) to be used in the mines.

- 1.0 Before using the Friction stabilizers (Split sets) in a mine, its suitability of application in a particular geo-mining domain may be assessed in consultation with a scientific and research organization having experience and expertise in strata control. Friction stabilizers (Split sets) may be used only in such specific cases where it has been recommended by the scientific and research organization after due assessment, and subject to compliance of its recommendations.
- 2.0 The materials, metal(s), chemical(s), component(s), part(s) and accessories from which the Friction stabilizers with Washers have been manufactured, assembled, fabricated or prepared shall be as follows:
- 2.1 Physico-mechanical Properties :
 - a) The friction stabilizers (Split sets) shall be manufactured from high strength steel Grade EN10149-2 S550-700MC or equivalent standard. The Yield Stress, Tensile Strength and % elongation steel Grade shall be maintained as per the EN10149-2 or equivalent standard.
 - b) However the minimum load bearing capacity of the friction stabilizers (Split sets) shall be 6 tonnes.

2.2 Chemical Composition:

Chemical composition of the steel for manufacturing of the friction stabilizers (Split sets) varies according to the requirement of strength characteristics and specific applications given by the manufacturer and the end user of the friction stabilisers. However certain chemical constituents of the steel which influence the required properties of steel shall conform to the EN10149-2 or equivalent standard.

2.3 Bearing Plate

- a) The Bearing Plate of the Friction stabilizers (Split sets) shall be Dome Washer Plate of dimension 150 x 150 x 8 (minimum) mm with compatible central hole of required size.
- b) The minimum load at which the Dorned Washer Plate will become flat should be at least 6 Tonnes.

2.4 Other Properties & Parameters

- a) Weatherability:

The Friction stabilisers (Split sets) and its components or parts shall be subjected to Accelerated Weathering Test in mine water condition for 20 days. No deterioration should occur on the Assembly.

- b) Accelerated Weathering Test (AWT) shall also be conducted in acidic water condition for 20 days during which no deterioration should occur on the Assembly.
[Note: The AWT under mine water condition generally is at pH > 4 and that under acidic water condition is considered at pH-2 (5 % HCL aqueous solution) during testing.]

- c) Corrosion Resistance Test:

The Friction stabilisers (Split sets) shall be subjected to Field Exposure and Corrosion Resistivity Test as per IS- 5555: 1970 to test the resistance to corrosion of the steel of the Friction stabilisers (Split sets) and its parts. The Friction stabilisers (Split sets) should pass the required test.

3.0 Sampling & Testing

- 3.1 In order to check the composition and required parameters during manufacture, it shall be required that the random sampling be done @ of 5 friction stabilizers(Split sets) per 1000 pieces of friction stabilisers and its accessories manufactured in a batch which shall be subjected to the required set of tests as prescribed in the previous paragraphs above and the data shall be kept recorded in a bound paged book kept for the purpose which shall be signed by the persons carrying out the test and shall be countersigned by the quality control officer posted at the manufacturing unit(s).
- 3.2 Before using in the mines, The user shall carry out necessary Physical examination and conduct Tensile Test of the Assembly for every batch of Friction stabilisers (Split sets) & Its Accessories received at their end to ensure that the same conform to the

above requirements and shall also keep the records thereof in a bound paged book kept for the purpose.

In case the Friction stabilisers or any of its accessories fail to pass the required tests at the user's end, that batch or lot of the manufacture shall not be used in the mine and intimation thereof shall be sent to the manufacturer. A record in this regard shall be maintained at the mine/company.

- 3.3 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the manufacturing facilities at any time and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of the manufacturer.
- 3.4 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the Friction stabilizers at any time in the mine or the area of the mines and get samples tested during the course of inspection or send such samples for testing at any national test houses/laboratories at the cost of manufacturer or user.
- 4.0 (a) The manufacturer shall obtain a test certificate as to the conformity to the requirements stipulated in the Para 2.0 above, from a prescribed agency of the material(s), metal(s), chemical(s), component(s), part(s) and accessories used for manufacturing friction stabilizers (Split sets) and a certified copy of the same shall be attached with each consignment supplied to the user/test laboratory.
 (b) The manufacturer shall furnish all relevant information in respect of chemical composition, properties, mechanical parameters and specifications or any other information or reports pertinent to their product(s) to the user(s).
- 5.0 Before making any supply to the mines, the manufacturer shall:
 - a) Suitably indemnify the user against any loss/damage of any kind, whatsoever, during handling and use of above product in mines. However, such loss/damage shall be immediately investigated along with the representatives of the user;
 - b) Formulate and supply, Safe Operating Procedure (SOP) for storing, handling and installation of Friction stabilizers to the user mining company; and
 - c) Shall associate manufacturer's representative(s) at suitable level(s) with the user mining company for attending to technical matters pertaining to the storing, handling and installation of Friction stabilizers any other matters connected thereof.
- 6.0 Anchorage testing:
 - 6.1 (a) At least 10% of the Friction stabilizers actually installed in the belowground workings of the mines shall be regularly subjected to tests for anchorage strength on random basis.
 (b) Details of the measured anchorage strength as above shall be entered in a bound paged register maintained for the purpose and signed by the Assistant Manager In-charge and countersigned by the Manager of the mine.
 - 6.2 (a) The use of Friction stabilizers (Split sets) shall be discontinued whenever the anchorage strength measured is less than 6 tonnes.
 (b) An inquest shall be jointly carried out by the representative(s) of the manufacturer and user to ascertain the reasons for less than satisfactory

performance, and suggest remedial measures to improve the performance. The use of Friction stabilizers (Split sets) shall only be resumed after necessary rectifications are carried out, and the details are recorded in a bound paged register kept for the purpose and jointly signed by the authorised representative of the manufacturer and Manager of the mine.

- 7.0 Immediately before installing a Friction stabilizer (Split sets) in a hole, it shall be tested for presence of inflammable gas inside and outside of the hole with a suitable detector. Installation of the Friction stabilizers (Split sets) in the hole shall not be done if the presence of the inflammable gas is detected inside or outside of it.

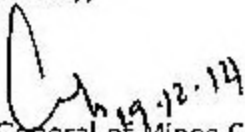
8.0 General Requirement

All the Owner, Agent and Manager including the manufacturers and suppliers shall strictly comply with this standard and in the event of finding any deviation or defects in the product supplied, use of the same shall be immediately stopped and it also be brought to the notice of this Directorate.

Manufacturers and the Users including the Test Houses, who are engaged for testing of such material, are therefore requested to ensure the above mentioned Standard and Parameters before supplying and using at the mine.

The Friction stabilizers (Split sets) with the Standard, Parameters and Testing as per the circular shall be considered as approved by the Chief Inspector of Mines by a general order as provided under regulation 181(3) of the Coal Mines Regulations, 1957.

Yours Faithfully,


Director General of Mines Safety

MINISTRY OF LABOUR AND EMPLOYMENT
(DIRECTORATE-GENERAL OF MINES SAFETY)

Notifications – 2014

Dhanbad, the 02nd April, 2014

G.S.R.275(E).- In exercise of the powers conferred on me under Sub-regulation 3 of Regulation 181 of the Coal Mines Regulations, 1957 I, Rahul Guha, Chief Inspector of Mines, also designated as Director General of Mines Safety declare 01.05.2014 as the date from which the following safety items, namely Safety Goggles, Reusable Earplugs and Visibility (Reflective) Harness will be considered approved by me for use in below ground Coal Mines by this general order in writing if they conform to the respective standards (with amendments, if any) given below:

- (i) Safety Goggles-IS5953:1980
- (ii) Reusable Earplugs-IS9167:1979 & IS 6229: 1980
- (iii) Visibility Harness-BSEN 471: 2003

This is being issued in modification of the notification published in the Gazette of India, Part-II, Section 3 (i) dated 28th July, 2007 (G.S.R.154)

[F.No.S-29022/01/2014-Gen/943]
RAHUL GUHA, Director General of Mine Safety

MINISTRY OF LABOUR AND EMPLOYMENT
(DIRECTORATE-GENERAL OF MINES SAFETY)

Notifications

Dhanbad, the 22nd August, 2014

G.S.R. 636(E)-In exercise of the power conferred on me under Regulations 191 of the Coal Mines Regulations, 1957, 182 of the Metalliferous Mines Regulations, 1961, and 87 of the Oil Mines Regulations, 1984 with respect to use supply and maintenance of Protective footwear and under Regulation 191 A of the Coal Mines Regulations, 1957, 182A of Metalliferous Mines Regulation, 1961, and 88 of the Oil Mines Regulations, 1984 with respect of use and supply of helmet respectively, I Rahul Guha, Chief Inspector of Mines, also designated as Director General of Mines Safety declare 01.09.2014 (First September two thousand and fourteen) as the date from which the Protective footwear Helmet will be considered approved by me for use in Coal, Metalliferous and Oil Mines by this general order in writing, if they conform to the respective relevant standards of BIS (with up-to-date amendments) as contained in the Circulars issued by this Directorate (DGMS) vide reference No. DGMS/MSE/Circular (approval) No.04, dated 14th August, 2014 and DGMS/MSE/Circular (approval) No.03, dated 14th August, 2014 respectively and further, a provided that these footwear and helmets intended for use in mines bear a declaration marked on them by the manufacturer that these are "suitable for use in Mins" besides markings of BIS license with relevant IS number (s).

No specific approval will be required from this Directorate (DGMS) in this regard from 01.09.2014

[F.No.S-29022/03/2014-Genl./2507]
RAHUL GUHA, Director General of Mine Safety



भारत सरकार
Government of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 01

Dhanbad, dated : 06/05/2015

To

The Owner, Agent and Manager of all Mines

Subject : Accidents/incidences due to exposure to high atmospheric temperature.

Sir,

During peak summer every year, many incidences of mine-workers getting exposed to high atmospheric temperature get reported. Some such cases had turned into fatalities. Opencast mines during summer are most vulnerable in this regard. In some cases, persons got affected due to heat in underground mines also, where ventilation was inadequate. Inquiries revealed that in most of the cases "Heat Stroke" was the major contributory cause. Heat stroke generally occurs when the body stops adjusting to the hot temperature by sweating, and can't keep up with the heat. It is characterized by hot, dry, red skin that is warm or hot to touch and immediate medical attention is needed in such cases. The other heat related disorders could be,

Heat Exhaustion

Heat exhaustion is caused by loss of large amounts of fluid from the body. A worker with heat exhaustion continues to sweat, but their body can't keep up with the heat. The worker may have a headache, fatigue, or flu like symptoms. In most cases the worker needs to rest, cool down, and drink plenty of fluid.

Heat Cramps

Workers may suffer from cramps and painful muscle spasms. This happens when workers drink water to replace the fluids they lose from sweating, but don't replace the body's loss of salt. Drinking fluids with electrolyte replacement ingredients are recommended in such cases.

Heat Syncope

Heat syncope is a fainting episode or dizziness that usually occurs with prolonged standing or sudden rising from a sitting or lying position. Factors that may contribute to heat syncope include dehydration and lack of acclimatization.

Heat Rash

Heat rash is a skin irritation caused by excessive sweating during hot, humid weather.

Neurological Effects

Excessive heat may also lower mental alertness and ability to work. Workers in extreme environments may make more mistakes and may have more injuries.

Contributing Causes

Heat can increase the risk of suffering from other illnesses and health problems.

The following precautions will go a long way in overcoming such incidences/accidents,

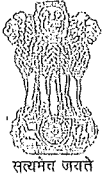
1. Slowing down the pace of work should be allowed, especially if the worker feels even slight heat strain,
2. Rest areas should be located as near to the workplace as practicable,
3. Ensure that adequate quantity of cool water and electrolyte supplements are easily available,
4. In really hot conditions, workers should drink at least a glass of water every 15-20 minutes,
5. Different schedules may be negotiated to let workers do the hardest work during the coolest parts of the day,
6. Rest timings may be re-scheduled to avoid work during high/extremely hot temperatures. Where this is not possible, a two-person crew should be assigned to perform work during extremely hot temperatures,
7. Ensure that worker do not enter/work in an atmosphere having no ventilation or inadequate ventilation in underground mines,
8. Workers must be made aware of the dangers from excessive heat and humidity and remedial measures.

Yours faithfully,



(Rahul Guha) 6.5.15

Director General of Mines Safety



भारत सरकार
Government of India
श्रम एवं रोजगार मंत्रालय
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खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/02

Dhanbad, dated : 07/05/2015

To

The Owner, Agent and Manager of all Mines

Subject: Accidents due to wheeled trackless machinery during 2014.

Sir,

At present, wheeled trackless transportation machineries like dumpers/tippers (henceforth 'dumpers' only) are used by mine operators widely in Open Cast mines. While increase in production of coal is a primary objective of the mine management, at the same time it has to ensure the safety and welfare of its workers. The coal mines in India need to use these machines in a judicious way to meet these two important goals. It is observed that during 2014, 13 accidents occurred due to dumpers out of a total of 64 fatal accidents. A detailed analysis of these fatal accidents revealed the following,

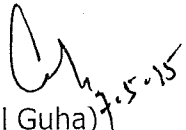
- (i) During 2014, 67 persons were killed in coal mines as a result of 64 fatal accidents,
- (ii) Out of these 64 accidents, 13 accidents involving 14 fatalities happened due to dumpers,
- (iii) Majority of accidents occurred either at the haul road or at stock yard,
- (iv) 8 operators, 3 fitters, 1 mechanic, 1 deputy supervisor and 1 tipper helper were victims,
- (v) Out of 14, 11 were regular workers and 3 worked under contractors,
- (vi) In some cases, mechanical fault of dumpers resulted into accidents indicating that the management was not vigilant enough to check the condition of dumpers before operating it,
- (vii) One of the sub-causes was identified as movement of dumper in reverse direction indicating the failure of the dumper driver/supervisory staff/management to ensure the safety and security of the workers in the vicinity and possibly non-functioning of the audio-visual reversing alarm. In a case, where a contractual light vehicle operator aged 22 years had died, it was revealed that the accident occurred while restarting a breakdown loaded dumper on the mine haul road. The dumper was moved in reverse direction mistakenly, hitting a contractual jeep driver standing behind it,
- (viii) A case had been identified where the driver of the dumper was not wearing the seat belt,

- (ix) In one case a loaded dumper with overburden material was travelling down on an unconsolidated ramp which was under preparation in an opencast coal mine. Due to this activity, the dumper fell into a sump to a depth of about 17m due to sliding of the ramp, submerging the operator cabin in sludge/water. The operator died due to drowning. Thus, if the dumper had not been allowed to operate in an unconsolidated ramp, the life of the dumper operator could have been saved.

The above mentioned analysis is brought to the notice of all concerned so that valuable lessons are learnt and similar incidents are avoided in future. I, once again reiterate the need of the following precautions among others in operation of dumpers in Open Cast mines of the country,

- (i) Ensure that dumpers are fit to operate in all respects before it is engaged in mines,
- (ii) Ensure that the path of the moving/standing dumper remains clear from objects/individuals,
- (iii) Ensure that the alarm systems of the dumper are in working condition,
- (iv) Ensure that the dumper operators use seat belt while operating the same,
- (v) Ensure that the dumpers are not overburdened due to unmanageable load of material.

Yours faithfully,


(Rahul Guha)

Director General of Mines Safety



भारतसरकार
Government of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खानसुरक्षामहानिदेशालय
Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 03

Dhanbad, dated: 29 / 06 / 2015

To

The Owner, Agent and Manager of Coal Mines

Subject: Accidents due to 'roof fall' during 2014.

Sir,

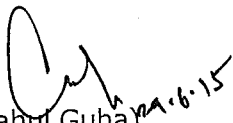
One of the major causes of accidents in underground coal mines is 'roof fall'. In the past, DGMS had issued several guidelines on the subject of 'roof fall'. While mine managements have taken considerable initiatives to reduce the risk of such accidents, but a real time analysis of incidents indicates that the industry as a whole has a long way to go to achieve 'zero incidents' in this area. It is observed that during 2014, 9 fatal accidents at coal mines occurred due to 'roof fall' out of a total of 64 fatal accidents. A detailed analysis of these fatal accidents revealed the following,

- (i) During 2014, 67 persons were killed in coal mines as a result of 64 fatal accidents,
- (ii) Out of these 64 accidents, 9 accidents (i.e. 14 percent) involving 10 fatalities happened due to 'roof fall' in the coal mines,
- (iii) 3 face workers, 3 dressers, 2 support personnel, 1 contractor's workman and 1 mazdoor were the victims,
- (iv) 55 percent (i.e. 5 out of 9) accidents due to 'roof fall' occurred while dressing freshly exposed roof,
- (v) In most of the cases, the freshly exposed roof were not supported according to Systematic Support Rules,
- (vi) In one of the cases, the person had entered beneath freshly exposed unsupported roof without the permission of a competent person/official, thereby endangering his own life.

The above analysis is brought to the notice of all concerned so that lessons are learnt and similar incidents are avoided in future. I, once again, reiterate the need of the following precautions to be taken in underground coal mines by ensuring that,

- (i) Risk due to strata control has been assessed and included in Safety Management Plan,
- (ii) Safe operating procedure has been prepared on the basis of risk assessed,
- (iii) Only trained persons employed in dressing of freshly exposed roof,
- (iv) Strict compliance to the Systematic Support Rule under Regulation 108 of the Coal Mines Regulations, 1957,
- (v) Training and re-training of workers on a regular basis,
- (vi) Discipline at work place is maintained so that indiscipline does not lead to loss of any valuable life,
- (vii) Nobody is allowed to work below unsupported roof.

Yours faithfully,


(Rahul Guha)

Director General of Mines Safety



भारत सरकार
 Government of India
 श्रम एवं रोजगार मंत्रालय
 Ministry of Labour & Employment
 खान सुरक्षा महानिदेशालय
 Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/०५

Dhanbad, dated : 15/07/2015

To

The Owner, Agent and Manager of all Mines

Subject: Effective utilization of Health & Safety Management System in mines

Sir,

DGMS has taken initiatives to bring down accidents in Indian mines to improve mine safety and health and a fresh look into mine safety & health management system. These initiatives helped in bringing down fatal and serious injuries considerably over the years. However, when we refer the accident figures of 2014, it is apparent that much needs to be done. It has been observed that during 2014, 84 fatal accidents occurred in Coal mines, 30 in Non-Coal mines and 5 in Oil mines. During the same year 2014, it has been observed that 421 serious injuries were reported in Coal mines, 33 in Non-Coal mines and 9 in Oil mines. These numbers are not acceptable at all. It is essential that Mine operators should adopt more effectively safety and health management programs, or re-examine their existing programs to better manage safety and health, eliminate hazards, and prevent injuries and illnesses.

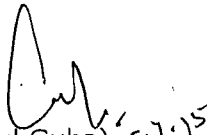
We would like to reiterate that an effective and successful safety & health management program must include as its core components the following six areas:

- (1) Management commitment;
- (2) Workers involvement;
- (3) Workplace inspection to identify hazards and violations of mandatory health and safety standards;
- (4) Hazard prevention and control;
- (5) Safety and health training; and
- (6) Program evaluation:

During evaluation of the current safety scenario, it was repeatedly a concern amongst stakeholders at grassroots level, that the miners are not actively engaged in the health and safety management programs. We need to remember that spontaneous participation of the mine workers will definitely give our initiatives towards better safety & health a quantum leap. Some steps in this regard could be,

- Encouraging the use of safety and health committees;
- Reviewing near-miss accidents with miners;
- Setting benchmarks for injury and illness reduction and regularly evaluating progress;
- Fostering effective communication at all levels;
- Providing education along with training;
- Creating adaptive and responsive approaches to finding and fixing hazards;
- Holding regularly scheduled safety meetings; and
- Empowering miners.

As we all work together to achieve the goal of "zero harm", we strongly encourage all concerned to re-look into our present health & safety management systems in mines and strengthen the present systems keeping the above mentioned core-components in mind. This will have considerable impact in ensuring that our miners come home safe after toiling hard each day at the mines.


(Rahul Guha) 15.7.15
Director General of Mines Safety



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Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/05

Dhanbad, dated: 23 / 07 /2015

To

The Owner, Agent and Manager of Non-Coal Mines

Subject: Accidents due to 'fall of persons from height/into depth' during 2014.

Sir,

One of the major causes of accidents in non-coal mines is 'fall of persons from height/in to depth'. In the past, DGMS had issued several guidelines on the subject of 'fall of persons from height/into depth'. While mine management have taken considerable initiatives to reduce the risk of such accidents, but a real time analysis of incidents indicates that the mining industry as a whole has to go a long way to achieve 'zero incidents' in this area. It is observed that during 2014, out of total 36 fatal accidents in non-coal mines, 7 occurred due to 'fall of persons from height/into depth'. A detailed analysis of these fatal accidents revealed the following,

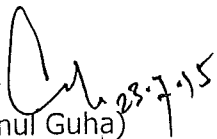
- (i) During 2014, 38 persons were killed in non-coal mines as a result of 36 fatal accidents,
- (ii) Out of these 36 accidents, 7 accidents involving 7 fatalities happened due to 'fall of persons from height/into depth',
- (iii) In 57 percent cases, the casualties occurred due to slipping from side/edge of working of the mine,
- (iv) 1 assistant rigman, 1 non-statutory supervisor, 2 loaders & 3 mazdoors were the victims. All victims were regular employees,
- (v) In one of the cases, the victim fell from a height of 7.58 meters while walking at the top of a bench. Enquiry into the accident revealed that the victim was talking over mobile phone while walking endangering his valuable life.

The above mentioned analysis is brought to the notice of all concerned so that valuable lessons are learnt and similar incidents are avoided in future. I, once again reiterate the need of the following precautions to prevent accidents due fall of persons from height/in to depth in mines by ensuring the following,

- (i) That the sides of the opencast working is kept benched, sloped and secured whilst working the mines so as to prevent danger from fall of sides,
- (ii) That suitably anchored safety belts are worn while working at height,

- (iii) That the persons are not allowed to work at any place/edge of working from where they are likely to slip or overbalance to fall, unless they are secured by safety belt/full body harness, suitably anchored to prevent them from falling,
- (iv) That the steps, made on the slope for carrying load, are in accordance with the norms prescribed in the Metalliferous Mines Regulation, 1961,
- (v) That the road or a footpath of prescribed width, having steps of prescribed dimensions are equipped with hand rails or ladders with hand rails and platforms at intervals not exceeding 10m are provided in the mines to allow safe travel of persons, to and from their working places,
- (vi) That the use of mobile phones is restricted in the working area so that no valuable life is lost due to mobile phone induced absent mindedness,
- (vii) That proper lighting arrangements are provided in the mines, as required under provision of Regulation 146(1)(a) of the Metalliferous Mines Regulations, 1961.

Yours faithfully,


(Rahul Guha)

Director General of Mines Safety



**GOVERNMENT OF INDIA
MINISTRY OF LABOUR & EMPLOYMENT
DIRECTORATE GENERAL OF MINES SAFETY**

DGMS (Tech.) Circular No. 06 of 2015

Dhanbad, Dated 29/09/15

To

All Owners, Agents and Managers of Mines

Subject: Arrangements and facilities for occupational health surveillance of persons employed in mines.

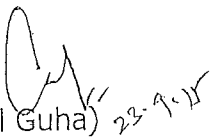
Sir,

The 39th meeting of the Standing Committee on Safety in Coal Mines was held on 13.03.2015 under the Chairmanship of Hon'ble Minister of State (I/C) Coal at New Delhi. In the meeting, among others, concerns were raised about the poor arrangements prevailing in PME Centers of the coal companies. It was highlighted that none of the hospitals / PME Centers of coal companies were properly equipped with pneumoconiosis detection kits, which might lead to the cases of pneumoconiosis being mistakenly diagnosed as tuberculosis. It was also stressed in the meeting that protocol and guidelines should be given for rehabilitation of pneumoconiosis patients.

Needless to say, pneumoconiosis is a preventable but incurable disease. As mining is a dust prone industry, it is imperative on part of the mine managements to see that all suitable measures for prevention of dust generation and for proper health surveillance of the persons employed in mines are given utmost priority and importance.

Several guidelines and directives relating to occupational health surveillance in mines, including conduct of Initial and Periodical Medical Examinations for early detection of pneumoconiosis, silicosis and other occupational diseases; training of medical officers in occupational health and for use of standard ILO chest radiograph for classification of pneumoconiosis and silicosis; measures to be taken for prevention of such diseases and rehabilitation of affected persons; and for the equipments and other arrangements to be provided in PME Centers; have already been issued by DGMS time to time through circulars, such as DGMS Circular (Tech.) Nos. 1/1989, 4/1992, 2/1994, 3/2000, 4 & 5 of 2007, 1/2008, 1/2010, 3/2011, 5/2011 and 3/2012.

The Owners, Agents and Managers of all Mines are, therefore, requested to review their occupational health surveillance facilities with reference to the above guidelines to identify the gaps and take necessary measures to strengthen such facilities. They are also requested to make a system of undertaking such reviews periodically for continual improvement.


(Rahul Guha) 23.9.15
Director General of Mines Safety



भारत सरकार / Govt. of India
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 Ministry of Labour and Employment
 खान सुरक्षा महानिदेशालय
 Directorate General of Mines Safety
 धनबाद / Dhanbad – 826 001



DGMS (Tech)(S&T) Circular No. 07 of 2015 Dhanbad, dated 23/09/2015.

To,
 The Owners, Agents and Managers of all mines.

Subject: **Application for Medical Re-examination by Appellate Medical Board, constituted under Rule 29 K of the Mines Rules, 1955 .**

It is being observed that many applications of Appellants for Medical Re-examination by Appellate Medical Board constituted under Rule 29K of the Mines Rules, 1955, are not being forwarded in accordance with the procedure specified in Rule 29J of the Mines Rules, 1955. Many applications are being forwarded by the officials other than the manager of mine, as defined in Rule 2(f) of the Mines Rules, 1955 to the Convenor, Appellate Medical Board, Directorate General of Mines Safety, Dhanbad.

The procedure for Appeal for re-examination by Appellate Medical Board constituted under the Rule 29K of Mines Rules, 1955, is as follows:

(1) A person has been declared **unfit** for employment in mines or in particular category of mines or in any specified operations in mine as a result of an Initial Medical Examination or Periodical Medical Examination under 29B of mines rules.1955, he/ she within thirty days of the receipt of a copy of Form-O, may file an appeal with **Manager of mine**, as defined in Rule 2(f) of the Mines Rules,1955, requesting him to forward the appeal to an Appellate Medical Board constituted under rule 29K of Mines Rules, 1955. The Appeal shall be signed by the appellant (in case of illiterate left thumb impression), Date of Appeal, Name of appellant and his/her complete address with pincode shall be mentioned on the appeal.

(2) Within 30 days of receipt of appeal, the appeal shall be forwarded by the **Manager of mine** to Convenor, Appellate Medical Board, Directorate General of Mines Safety, Dhanbad-826001, Jharkhand. Letter no. with date, Name of the manager of mine,

name of the mine, complete address with pincode shall be mentioned on the forwarding letter.

(3) The manager of mine shall ensure that application shall be accompanied by;

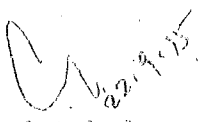
(a) A legible certified copy of medical certificate in Form- O issued under Rule 29F(2) of the Mines Rules, 1955. The signature & stamp of manager of mine shall be on the certified copy of Form-O.

(b) The appeal of appellant in original.

(4) Letter without a pincode is not accepted by the Post-Office. Therefore, application submitted without a pincode shall not be considered and may be recorded.

(5) The applications made not in accordance with above guidelines may be returned to forwarding official or appellant.

All concerns are being requested to strictly adhere with the above procedure, while forwarding applications for medical re-examination by Appellate Medical Board, constituted under Rule 29K of the Mines Rules, 1955.


(Rahul Guha)
Director General of Mines Safety



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Directorate General of Mines Safety



No. DGMS Circular (Tech.) No. 08

/Dhanbad, dated 28/09/2015

To

The Owners, Agents, Managers of Coal Mines, Superintendent of Mines Rescue Stations, Manufacturers/Suppliers of Approved type of Self Contained Self Rescuers, Test Houses conducting tests of Self Contained Self Rescuers and all Inspecting Officers of the Directorate .

Sub: Protocol on use, care, maintenance, sampling & testing of Self Contained Self Rescuer (SCSR) under Regulation 191 D (2) & (3) of the Coal Mines Regulations, 1957.

In view of the difficulties expressed by the users in use, care, sampling and maintenance of Self Contained Self Rescuers (SCSR) a meeting of users, regulators, scientific institutions, academicians and manufactures/suppliers was held on 19th May, 2015 to review issues related to use, care, maintenance, sampling & testing of Self Contained Self Rescuer (SCSR) among other issues. This was followed by another meeting on 3rd June, 2015.

After detailed deliberations, the house opined that Condition No. 6 of Clause A and Condition No. 1.1 of Clause B of DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 requires modification and two new conditions may be incorporated.

A. USE, CARE & MAINTENANCE

1. Condition No. 6 of Clause A is modified as:

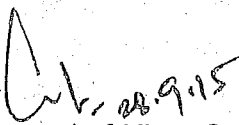
" Every Self Contained Self Rescuer (SCSR) on roll of the mine or mines rescue station shall be subjected to 'Leak Tightness Test', at least once in a quarter by a competent person duly authorized by the manager or superintendent of the mines rescue station for the purpose, in the manner as prescribed in the IS:15803-2008 (Annexure E-1) under Clause 5.7 for Leak Tightness."

2. Condition No. 1.1 of Clause B is modified as:

" Before a batch of Self Contained Self Rescuer (SCSR) is put into service, samples at the rate of three percent (3%) subject to a minimum of twelve units, for every batch of supply shall be drawn at random for the testing by a joint sampling team comprising of representatives from manufacturer/supplier and user at the user's site."

3. Batch testing of self rescuers may be performed at test houses prescribed in Clause 6.8 of the Approval Policy and in a mines rescue station, in presence of representatives of users and manufacturers who shall sign their respective attendance in a bound paged book kept for the purpose, before commencement and after completion of the tests.

4. Shelf life and service life of self rescuers shall be declared by the manufacturer, based on the prevailing practices and working environment of the mines and would be subject to fulfillment of prescribed conditions for their use. It shall be the responsibility of the user to certify the fitness of self rescuers for use in mines on quarterly basis or any other suitable interval as may be prescribed, which shall be recorded in a bound paged book kept for the purpose and duly countersigned by the mine manager/rescue superintendant/rescue room incharge.
5. All other provisions of the protocol issued vide DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 shall remain unchanged.


Director General of Mines Safety



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Ministry of Labour & Employment
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Directorate General of Mines Safety



No. DGMS Circular (Tech.) No. 08

/Dhanbad, dated 28/09/2015

To

The Owners, Agents, Managers of Coal Mines, Superintendent of Mines Rescue Stations, Manufacturers/Suppliers of Approved type of Self Contained Self Rescuers, Test Houses conducting tests of Self Contained Self Rescuers and all Inspecting Officers of the Directorate .

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After detailed deliberations, the house opined that Condition No. 6 of Clause A and Condition No. 1.1 of Clause B of DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 requires modification and two new conditions may be incorporated.

A. USE, CARE & MAINTENANCE

1. Condition No. 6 of Clause A is modified as:

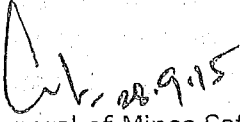
" Every Self Contained Self Rescuer (SCSR) on roll of the mine or mines rescue station shall be subjected to 'Leak Tightness Test', at least once in a quarter by a competent person duly authorized by the manager or superintendent of the mines rescue station for the purpose, in the manner as prescribed in the IS:15803-2008 (Annexure E-1) under Clause 5.7 for Leak Tightness."

2. Condition No. 1.1 of Clause B is modified as:

" Before a batch of Self Contained Self Rescuer (SCSR) is put into service, samples at the rate of three percent (3%) subject to a minimum of twelve units, for every batch of supply shall be drawn at random for the testing by a joint sampling team comprising of representatives from manufacturer/supplier and user at the user's site."

3. Batch testing of self rescuers may be performed at test houses prescribed in Clause 6.8 of the Approval Policy and in a mines rescue station, in presence of representatives of users and manufacturers who shall sign their respective attendance in a bound paged book kept for the purpose, before commencement and after completion of the tests.

4. Shelf life and service life of self rescuers shall be declared by the manufacturer, based on the prevailing practices and working environment of the mines and would be subject to fulfillment of prescribed conditions for their use. It shall be the responsibility of the user to certify the fitness of self rescuers for use in mines on quarterly basis or any other suitable interval as may be prescribed, which shall be recorded in a bound paged book kept for the purpose and duly countersigned by the mine manager/rescue superintendant/rescue room incharge.
5. All other provisions of the protocol issued vide DGMS (Tech.) Circular No. 08 of 2008 dated 27.10.2008 shall remain unchanged.


Director General of Mines Safety



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No. DGMS Circular (S&T) Tech. No. 10

/Dhanbad, dated 21st Dec, 2015

To

All Owners/Agents/Managers of coal, metal and oil mines and heads of technical institutes and research organisations.

Subject: Protocol for clearance for undertaking R & D projects in mines

As stipulated in the statute, Chief Inspector of Mines has been according approval of certain equipment/apparatuses/appliances and materials for use in mines. The Directorate has framed a policy to prescribe the procedure for according approvals to such products.

Lately, in different forums, mine operators, research organisations and equipment manufacturers have been requesting DGMS for grant of clearances for undertaking R & D projects in mines.

A meeting was held at DGMS on 23.11.2015, with participation from mining industry, research/academic institutes and DGMS, where the issue under reference was discussed and deliberated in detail. On the basis of inputs gathered from the stakeholders' meeting and in-house consultation at DGMS, a protocol for issuing clearance for undertaking R & D projects in mines have been developed.

Clearance for such R & D projects will not be within the purview of the Approval Policy of the DGMS prescribed for products which are commercially marketed by the manufacturers for use in mines.

The protocol for granting clearance for undertaking R & D projects in mines is given as Appendix with the format for submitting the application given at Annexure I.

Director General of Mines Safety

Protocol for clearance for undertaking R & D projects in mines

Abbreviations - DGMS: Directorate General of Mines Safety; R&D: Research & Development; S&T: Science & Technology; CIMFR: Central Institute of Mining and Fuel Research; CMPDI: Central Mine Planning and Research Institute; IIT: Indian Institute of Technology; ISM: Indian School of Mines; NIT: National Institute of Technology; NIRM: National Institute of Rock Mechanics; TCS: Tata Consultancy Services; CMC: Computer Management Corporation.

Considering the hazardous atmosphere and working environments in mines, the statute stipulates use of certain prescribed approved type of equipment, appliances etc. in such hazardous atmosphere. This issue of granting clearance for undertaking R&D projects in mines has been raised by mine operators and research institutes on several forums.

To facilitate technological development, it has been decided to frame a protocol for issuing clearance for undertaking R & D projects in Indian mines. Academic institutions of repute (IITs/ISM/NITs/National Universities etc.), R & D organizations recognised by Govt. of India, eminent research institutes (CIMFR, CMPDI, NIRM etc.) interested in taking up R & D projects in mining may approach DGMS requesting for clearance. It may be noted that under no circumstances, the type of equipment/appliances etc. used in the R & D project shall be considered approved by this Directorate. Clearance for such R & D projects will not be within the purview of the Approval Policy of the DGMS which stipulates the procedure for according approvals to equipment, machinery, materials and appliances, etc. which are commercially marketed by the manufacturers for use in mines.

The conditions for issue of clearance, among others, are furnished below:

- (1) Proposals shall be made in the prescribed application format (Annexure I).
- (2) An executive summary on the project specifying the technical details shall be submitted with the application.
- (3) In case of a joint venture project, a brief write-up on the background of the individual organizations and their scope in the project shall be submitted with the application.
- (4) At least one research institute/R&D organization/academic institution who will be the principal executing agency, is required to be a part of the project in case of a joint venture project.
- (5) A write up on the methodology to be adopted and the benefits expected out the project shall be submitted with the application.
- (6) One Project Head shall be nominated by the research institute/R&D organization/academic institution.
- (7) A list of all persons involved in the project with details of their academic background and relevant experience shall be submitted with the application. In case of requirement of any additional support personnel, their details shall also be furnished.

(8) The application shall specifically mention the name of the mine where it is proposed to undertake the project. Further it shall also specify the location(s) where the equipment, machinery, materials and appliances, etc. is/are proposed to be installed decided in consultation with the mine management. The consent of the Owner/Agent/Mine Manager in this regard shall be submitted with the application.

(9) Unless otherwise specified, such issue of clearance shall be mine specific and will not be permitted:

(a) In any mines/seams other than mines/seams of first degree of gassiness in case of coal mines.

(b) In zones other than Zone 2 hazardous area, in case of oil mines.

In case of metalliferous mines, there will be no such restrictions.

(10) Unless otherwise specified;

(a) In case of belowground coal mines, use of electrical equipment/apparatus forming integral part of the project may be permitted, if certified to be safe for use in mines with first degree of gassiness and subject to adherence of prescribed conditions. In case of intrinsically safe and flameproof equipment/apparatus certified as per relevant and acceptable standards, may be accepted.

(b) In case of oil mines, use of electrical equipment/apparatus forming integral part of the project may be permitted, if certified to be safe for use in mines in zone 2 hazardous area, and subject to adherence of prescribed conditions. In case of intrinsically safe and flameproof equipment/apparatus certified as per relevant and acceptable standards, may be accepted.

(11) A time frame for completion of the project shall be mentioned in the application and clearance shall be issued accordingly. Any extension beyond the declared time frame shall be based on the justification seeking such extension.

(12) Under the overall charge of the Mines manager, the execution of the R & D project shall be under the supervision of an official of the mine not below the rank of an assistant manager/ installation manager. A panel of supervisors entrusted with the task of supervision and a mechanism of supervision shall be prepared by the mine management. A copy of the mechanism shall be submitted with the application.

(13) Where special condition(s) exist, the Chief Inspector may consider issue of clearance subject to the conditions he may specify therein for:

(i) coal mines/seams other than first degree gassiness and;

(ii) zones other than zone 2 hazardous area in case of oil mines.

(14) A half yearly report on the progress of the R&D project shall be submitted to DGMS by the Project Head.


12.12.2015

Format for application for clearance for undertaking R & D Projects

(To be filled in by the Project Head)

Part I (General)

1. Title of the project:
2. Names and addresses of institutions and organisations involved in the project:
3. Name and address of the Project Head:
4. Brief Description of the project:
5. Objectives of the project:
6. Detailed methodology (Enclose a separate write-up):
7. Scope of responsibilities of the individual institutions and organisations:
8. Work plan on the projected time frame:
9. Minimum duration of the project:
10. Expected outcomes from the project:
11. Agencies which may be benefitted by the project:

Part II (Equipment/material/appliance)

1. Name of the equipment, materials or appliances involved in the project:
2. Description of the equipment, materials or appliances with specifications (Enclose as separate annexure):
3. Test reports of electrical equipment regarding intrinsically safe/flame proof characteristics if applicable (Enclose self certified copies):
4. Service life:
5. Provide details, in case the equipment, materials or appliances have approval in any industry in India or abroad:

Part III (Application Area)

1. Name and full address of the mine where it is intended to carry out the project:
2. Specify location on the mine plan with ventilation details where the concerned equipment, materials or appliances are intended to be installed (Enclose mine plan):
3. Name of the manager of the mine (Enclose copy of the consent of the Owner/Agent/Mine Manager):
4. Details of supervision (Enclose a mechanism of supervision separately):

I, hereby, certify that all information furnished in this application and documents, reports, drawings etc. enclosed with the application are correct. I also undertake to abide by all the conditions prescribed in the protocol for grant of permission and the applicable provisions stipulated in the regulations, rules etc. framed under the Mines Act, 1952.

Signature:

Name:

Designation:

Institution/organisation:

AD
18.12.2015



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Directorate General of Mines Safety



No. DGMS Circular (Tech.) No. 01

/Dhanbad, dated 21st Jan, 2016

To

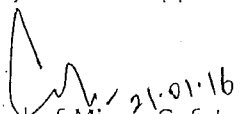
All Owners/Agents/ Managers of Coal and Metalliferous Mines, Superintendents of mines rescue stations and Incharges of mines rescue rooms.

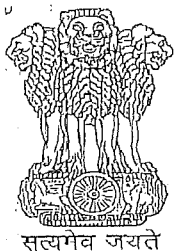
Subject: Permission under Rule 37 and Rule 11(4) of Mines Rescue Rules, 1985 to maintain breathing apparatus of different type and make in rescue stations and rescue rooms.

Rule 11 (4) of the Mines Rescue Rules, 1985 stipulates maintaining of self contained breathing apparatus in the rescue stations and the ones in rescue rooms to be of same type and make. Due to entry of new manufacturers and importers of breathing apparatus in the domestic market and continuous technical advancement of the equipment, it is observed that compliance of the above rule at times becomes impracticable. Considering the requests from users for exemption from compliance of the above rule, specific permissions under Rule 37 of the aforesaid rules are being granted to various rescue stations.

As the practice of maintaining breathing apparatus of different type and make in rescue stations and rescue rooms appears to continue by seeking permission from this Directorate, it is decided to issue this general order permitting maintenance of breathing apparatus of different type and make in rescue stations and rescue rooms subject to strict compliance of the following conditions:

- (i) In case of rescue stations and rescue rooms maintaining more than one type and/or make of breathing apparatus, the rescue superintendent shall ensure that:
 - (a) all the instructors, rescue brigade members and rescue room attendants are fully acquainted with the use, maintenance and testing of all types and makes of breathing apparatus;
 - (b) all the rescue trained persons are imparted of refresher practices with each type or make of breathing apparatus as prescribed in Schedule VII of the aforesaid rules; and
 - (c) the type/make of breathing apparatus used in each practice for all the rescue trained persons are mentioned in the training records.
- (ii) This exemption is being accorded without prejudice to any other statute which may be or may become applicable at any time.


Director General of Mines Safety



सत्यमेव जयते

भारत सरकार
Government of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety

No. DGMS Circular (Tech.) No. 02/Dhanbad, dated 21st Jan, 2016

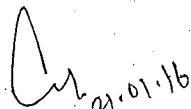
All Owners/Agents/Managers of belowground coal and metal mines and Superintendents of rescue stations.

Subject: Periodic testing of breathing apparatus, reviving apparatus etc. maintained at rescue stations and rescue rooms.

Rescue equipment like breathing apparatus, reviving apparatus etc. are statutorily required to be maintained in the rescue stations and the rescue rooms. These equipment need to undergo periodic testing at intervals of one month or at shorter intervals as may be mentioned by the manufacturers in accordance with Schedule IV of the Mines Rescue Rules, 1985 or its revised versions. Records of such testing(s) are to be maintained in the rescue stations and rescue rooms. As required under Rule 12 (2) (a) of the above rules, the Superintendent shall ensure that such equipment and apparatus are maintained in perfect working order. Also Rule 13 of the above rules requires the Instructors to make inspections, tests and adjustments of the equipment and apparatus under the direction of the Superintendent and maintain records thereof.

In order to bring uniformity in the system of maintaining records of periodic testing of breathing apparatus, a format has been developed which is given at Annexure-I. In the enclosed format, every entry of test results of every apparatus shall end with the remarks "fit for use", if found so. Every such record shall be signed by the person who has performed the test and countersigned by the Instructor, Rescue Room Incharge and Superintendent of the rescue station.

In addition to this, in every rescue station and rescue room, there shall be maintained a record signed by the Superintendent in the proforma given at Annexure-II certifying that the particular breathing apparatus is in maintained in perfect working order. Such records shall be updated at least one in every quarter based on the results of the latest tests or at interval as may be prescribed.


Director General of Mines Safety

Name of the Company _____

Mines Rescue Station/Room _____

Testing Report of Self Contained Breathing Apparatus

Name of the Apparatus _____

Set No. _____

Month _____

Date _____

(1) Apparatus Identification No.	(2) O ₂ Cylinder, Pressure Reducer, Display Unit Identification Nos. (Mention Identification No. if any)	(3) Visual Inspection (In order/ Not in Order)	(4) *Battery Charge Test (if applicable)	(5) Condition of Face Mask/(if Mouthpiece Not in Order)	(6) *Alarm System Test (if applicable)	(7) *Residual Pressure Warning Test (if applicable)	(8) *High Pressure Leakage Test	(9) *Constant Flow Test (LPM)	(10) *Demand Valve/ Minimum Valve Test	(11) *Relief Valve Test /Vent Valve Test	(12) *By Pass Valve Test/ Manual Booster Valve Test	(14) Pressure in O ₂ Cylinder (Bar) and Identification No. of the Mother Cylinder from which it is filled	(15) Date of filling of CO ₂ Absorbent and Batch No. of the Absorbent.	(16) *Low Pressure Leakage Test /Positive Pressure Leakage Test	(17) *Negative Pressure Leakage Test (if applicable)	(18) *Inhalation Valve Test	(19) *Exhalation Valve Test	(20) *Drainage Valve Test (if applicable)	(21) Fit for use (Yes/ No)	

Tested By _____

(Signature & Name)

(Signature of the Instructor/Rescue Room Incharge)

(Signature of the Superintendent)

Note- * Manufacturer's criterion prescribed for the test parameters to be mentioned.

A separate record indicating the purity of oxygen filled in the mother cylinder(s) to be maintained.


 21.01.2016

Certificate of Fitness to be issued on or before 7th day of every month

This is to certify the following equipment in the mines rescue stations/ rescue rooms and rescue rooms (whichever is applicable) as per Schedule I, II or III respectively of the Mines Rescue Rules, 1985 are maintained in perfect working order as per the tests conducted in accordance with criteria and procedure prescribed by the manufacturers on the dates given against each of them:

Sl. No.	Name & Identification No. of the equipment	Make	Date of Testing

Date: _____

Signature of Superintendent
Mines Rescue Station, _____
M/s _____
21.01.2016



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Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 03

Dhanbad, dated : 14 / 03 / 2016

To
The Owner/Agent & Mangers
All Coal, Metalliferous and Oil Mines.

Subject: Safety features to be incorporated and maintained in crawler/tyre mounted machineries deployed in mines.

A serious accident took place in an open-cast mine, in which a dozer moved forward while the dozer operator, standing on track pad, started the dozer directly by short-circuiting the self-starter, keeping the machine in gear. The dozer operator fell between the dozer blade and the track pad and was run over by the track-pad inflicting serious injuries to both his legs and right hand leading to amputation of both the legs below knee.

After the accident, a study was undertaken in which all 278 numbers of crawler and tyre mounted machineries (hereinafter called machineries) deployed in the mine were examined.

The investigation revealed the following :

- Neutral Switch electrical interlock with gear, which prevents starting of machineries if in geared position, was either not found in order or not provided in 90% of the machineries.
- Hydraulic safety valve interlock, which prevents movement of the machineries even if its engine starts in geared position; the machineries will move only when the gear is brought to neutral position and then gear lever is shifted to engaged position. This safety feature was either not found in order or not provided in 35% of the machineries.
- Self-starter protection guard, which prevents short-circuiting the terminals of self-starter motor, was either not found in order or missing in 89% of machineries.

During the period from 2012 to 2015, about 45% fatal accidents and 22% serious accidents took place due to machineries in coal mines. The same figures in non-coal mines were about 30% and 38% respectively.

The above findings of the investigation/examination highlight the need to take appropriate action in ensuring proper functioning safety devices provided in

machineries for the greater benefit of persons employed in mines and machineries deployed therein.

There is no doubt that if the machineries are maintained in safe working order, required safety devices are provided & maintained and work persons (operators/helpers/mechanics/electricians/supervisors/engineers) are adequately trained, it would be possible to eliminate recurrence such accidents in future.

I, therefore, request you to take necessary action to maintain all required safety features in crawler/tyre mounted machineries deployed in the mines, impart adequate training to all related work persons and improve safe work culture.

Yours faithfully,


(Rahul Guha) 14.03.16

Director General of Mines Safety



भारत सरकार/Govt. of India
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Ministry of Labour & Employment
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Directorate General of Mines Safety



No. DGMS Circular (Tech.) No. 84

/Dhanbad, dated 31st/10/2016, 2016

To

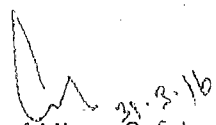
All Owners/Agents/ Managers of Coal and Metalliferous Mines, Superintendents of mines rescue stations, Incharges of mines rescue rooms and manufacturers and suppliers of breathing apparatus.

Subject: Cylinders to be used in breathing apparatus used in mines

Oxygen or compressed air cylinders are integral parts of all breathing apparatus(es). For use in Indian mines closed circuit and open circuit breathing apparatuses are accorded approval by Directorate General of Mines Safety subject to conformation of the apparatus as per standards specified in IS 10245-1 and IS 10245-2 respectively of the Bureau of Indian Standards, among other conditions. It is specified in the above standards that cylinders and valves fitted with the breathing apparatus shall comply with the provisions of the Gas Cylinder Rules, 1981 (presently Gas Cylinder Rules, 2004)

In the Approval Policy, it is stipulated that no change shall be made to the equipment which had been tested for grant of approval unless specifically approved and this is also applicable in case of cylinders used in breathing apparatus(es). In the recent years, different types of gas cylinders are available which are compatible with the breathing apparatus(es). To facilitate use of cylinder other than the ones fitted with the apparatus tested at prescribed test house for obtaining DGMS approval, the following conditions have been laid down which shall also be applicable to the cylinder currently in use:

- (i) All cylinders used with the breathing apparatus shall be approved by the Chief Controller of Explosives, PESO under the Gas Cylinders Rules, 2004.
- (ii) The valves fitted with the cylinders shall comply with the requirements of IS 7302 of the Bureau of Indian Standards as amended from time to time.
- (iii) The colour of the cylinders shall be as specified in IS 3933 of the Bureau of Indian Standards as amended from time to time.
- (iv) A certificate regarding the compatibility of the cylinder for use with the breathing apparatus shall be issued by the manufacturer to the user(s).
- (v) The stipulations made in the DGMS Circular No. 8 of 1974 regarding the material of the cylinder, shall be applicable.


Director General of Mines Safety



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Directorate General of Mines Safety
धनबाद / Dhanbad - 826 001.



No. DGMS (Tech.) (S&T) Circular no. 05

Dhanbad, Dated 2th April 2016

To

All Owners/ Agents/ Managers of coal and metalliferous mines

Integrated approach for development of Safety Management Plan for coal and metalliferous mines

The ninth and tenth Conference on Safety in mines recommended adopting Risk Assessment as a tool for development of appropriate health & safety management systems in Indian mines. The eleventh Conference further recommended that the managements of every mining company should adopt the process of safety management system and commit itself for proper formulation and implementation of the same in totality.

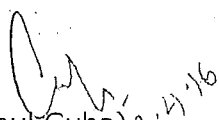
Drawing inputs from inferences drawn from several workshops on "Risk Assessment" in Indian mines conducted by DGMS, a document on "Safety Management System – A guideline for implementation" was prepared and circulated as DGMS(Tech)(S&T) Circular No. 13 of 2002. Another guideline in this regard titled "Safety Management System- Provision for auditing and review" was issued by DGMS as DGMS (Tech)(S&T) Circular No. 02 of 2011.

Successful implementation of Safety Management System in Mines would warrant sorting out perception issues among all stakeholders, and the success may depend on among others, adoption of an integrated approach.

The matter has been discussed with various stakeholders of coal and metalliferous industry in the recent past. During interaction some of the implementation issues inhibiting its outreach were flagged. They are: lack of penetration of the concept at grass root level; confusion about implementation strategy, and; lack of involvement of frontline mining personnel in developing the document.

In view of the above, an integrated implementation strategy, as a sequel to the DGMS (Tech)(S&T) Circular No. 13 of 2002 (without appendixes), has been developed and enclosed as Annexure for compliance.

You are requested to take necessary steps for development of Safety Management System in the mines under your control with the help of above guidelines. The Mine Manager shall submit a copy of the Safety Management Plan to the Regional Inspector of Mines for acceptance.


(Rahul Guha) 2.4.16

Director General of Mines Safety

Encl. – Annexure (1-10) & sample worksheet (S1-S9)

Annexure [DGMS (Tech.) (S&T) Circular No. 5 dated 2/4/2016]

1. Hazard identification & Risk Management

1.1 Formation of team: Mine Manager/Operations-in-charge as team leader, members may be suitably chosen from the following for carrying out hazard identification and risk management in mines.

- a) Safety officer
- b) Engineer (Mines)
- c) Workmen's Inspector(s)
- d) In-charge, mine production
- e) In-charge, mechanical section
- f) In-charge, electrical section
- g) In-charge, civil wing
- h) In-charge, occupational health & hygiene
- i) In-charge, mine surveying
- j) Supervisor's and/or workmen selected from activities mentioned at (d), (e), (f), (g), (h) and (i), including machine operators, fitters and electricians
- k) Rapportier(s)

For advice and technical guidance regulators, eminent mining scientists, experts from academic & research institutions and representatives from manufacturers may be invited to participate in risk assessment sessions.

Team may co-opt members if considered necessary.

1.2 Tools of Risk Management: (a) Following documents may be arranged for consideration of team.

- Minutes of safety committee meeting
- Workmen's Inspectors report
- Contraventions pointed out by regulators and action taken report
- Safety officer's inspection report
- Report (s) submitted by Internal Safety Organization, if any
- Previous risk assessment document, if any
- Report (s) on accidents and near misses

A study of the above reports may help in identifying key safety and health issues in different areas of mining operations.

(b) A computer system which supports Microsoft Office 2007 or its latest version and printer.

1.3 Getting Started – Hazard Identification

Inquest into mining accidents and incidents often reveal systems failure. The system comprises of man, machines, and materials that are designated to perform a spelled task in a specified environment. All constituent are interconnected to perform the task. A failure of any constituent can cause a failure of the system. A risk assessment exercise needs to take into account all the constituents and any associated hazards and human factors.

Every mine, operational, discontinued or abandoned has a threat perception based on systems analysis through an established procedure or by assessment of safety professionals. A control system generic or otherwise may be in place to maintain the workplace risk within acceptable level.

Looking out for hazards is to identify the (i) probable location where there is a likelihood of release of unwanted energy or object(s) (ii) medium through which the unwanted energy or object(s) may travel and, (iii) the miner may be in danger of being contacted by the unwanted energy or object(s).

While identifying hazards in a classified sector, number of workers who may be exposed need to be taken in account to ascertain possible degree of consequences in the event of a mishap in following manner:

Table 1

Serial No	Percentage of work persons employed	Impact assessment of exposure
1.	>40	Maximum
2.	20-40	High
3.	10-20	Medium
4.	5-10	Low
5.	≤5	Very Low

An example of identification of hazards and categorization thereof have been detailed in Table 2

Table 2: Initial Hazard Identification
(28 Hazards Initially Identified)

Sl. No.	Description of Hazard	Percentage of workers exposed	Cons.	Prob.	Exposure	total
1	Existing Mine Fire-potential for explosion					
2	Roof fall (Strata control)					
3	Mine Gases					
4	Waterlogged workings					
5	Survey-incorrect mine plan					
6	Improper survey instruments					
7	Lack of skilled persons/using unskilled persons in specified jobs					
8	Inundation from surface source					
9	Surface blasting and vibrations					
10	Winding (Shaft)					
11	Boilers					
12	Blasting					
13	Spontaneous Combustion					
14	Unauthorized entry to mine workings					
15	Lack of illumination					
16	Haulage & transport failure					
17	Side fall					
18	Moving machinery (including illegal man-riding on SDL etc.)					
19	Electricity					
20	Drivages not to plan					
21	Carbon monoxide poisoning					
22	Material handling					
23	Respirable dust					
24	Noise					
25	Inadequate Ventilation					
26	Slippery roadway					
27	Improper traveling roadway					

Table 3: Hazard Identification

HAZARDS IDENTIFIED AS HIGH RISK

(Risk > 200)

Requiring immediate attention

Sl. No.	Description of Hazard	Percentage of workers exposed	Cons.	Prob.	Exposure	Total
1	Existing Mine Fire-potential for explosion					
2	Roof fall (Strata control)					
3	Mine Gases					
4	Waterlogged workings					
5	Survey- incorrect mine plan					
6	Improper survey instruments					
7	Lack of skilled persons/using unskilled persons in specified jobs					
8	Inundation from surface source					

Hazard Identification (Continued)

OTHER HAZARDS IDENTIFIED AS RISKS

REQUIRING MANAGEMENT ACTION

(Risk <200 and >20)

Sl. No.	Description of Hazard	Percentage of workers exposed	Cons.	Prob.	Exposure	Total
1	Surface blasting and vibrations					
2	Winding (Shaft)					
3	Boilers					
4	Blasting					
5	Spontaneous Combustion					
6	Unauthorised entry to mine workings					
7	Lack of illumination					
8	Haulage & transport failure					
9	side fall					
10	Moving machinery (including illegal man-riding on SDL etc.)					
11	Electricity					
12	Drivages not to plan					
13	Carbon monoxide poisoning					

Hazard Identification (Continued)

OTHER HAZARDS IDENTIFIED AS LOW
RISK BUT TO BE REVIEWED
(Risk <20)

Sl. No.	Description of Hazard	Percentage of workers exposed	Cons.	Prob.	Exposure	Total
1	Material handling					
2	Respirable dust					
3	Noise					
4	Inadequate Ventilation					
5	slippery roadway					
6	Improper travelling roadway					

Table 4: Summarized Hazard Identification

11 Major Hazard Categories Identified

- (01) Mine Fires
- (02) Inundation
- (03) Machinery
- (04) Strata Control
- (05) Mine Gases
- (06) Electricity
- (07) Blasting & Use of Explosives
- (08) haulage & Transportation
- (09) Spontaneous Combustion
- (10) Occupational Health
- (11) Emergency Response

Table 5: Categorization of Identified Risks

No.	Major Hazard	Sub Category of Hazard
1	Mines Fires	: Existing Mine Fire : Lack of skilled persons/using unskilled persons : Surface blasting and vibrations : Unauthorized entry to mine workings : Coal dust - explosion : Inadequate Ventilation
2	Inundation	: Waterlogged workings : Survey- incorrect mine plan : Improper survey instruments : Lack of skilled persons/using unskilled persons : Inundation from surface source : Surface blasting and vibrations : Drivages not to plan
3	Machinery	: Lack of skilled persons/using unskilled persons : Winding (Shaft) : Boilers : Lack of illumination : Moving machinery (including illegal man-riding on SDL etc.)

Categorization of Identified Risks (continued)

No.	Major hazard	Sub Category of Hazard
4	Strata Control	: Roof fall (Strata control) : Side fall : Lack of skilled persons/using unskilled persons : Improper survey instruments : Surface blasting and vibrations : Lack of illumination
5	Mine Gases	: Mine Gases : Fire damp : Coal dust - explosion : Inadequate Ventilation
6	Electricity	: Electricity : Lack of skilled persons/using unskilled persons

Categorization of Identified Risks' (continued)

No.	Major Hazard	Sub Category of Hazard
7	Blasting & Use of Explosives	:Blasting :Lack of skilled persons/using unskilled :Coal dust - explosion :Drivages not to plan
8	Haulage & Transportation	:Lack of illumination :Haulage & transport failure :Moving machinery (including illegal man-riding on SDL etc.) :Material handling
9	Spontaneous Combustion	:Spontaneous Combustion
10	Occupational Health	:Respirable dust :Noise :Lack of illumination
11	Emergency Response	:Improper travelling roadway

1.4 Development of worksheet for Risk assessment, control and audit

The template of worksheet for risk assessment, control and audit exercise may include, among others, document number, title, name of the mine, company, date conducted, location, etc. followed by the list of assessment team members and facilitators, as below:

RA WORKSHEET-

UG-MVH/RA/

Risk Assessment - Mine Ventilation/inundation/..... in underground coal/metal mines

Name of the Mine: AAA Name of the Company: BBB

Date Conducted: CCC

Location: DDD

Assessment Team (May include)	
Name	Designation
EEE	Mines Manager (MM)
FFF	Colliery Engineer (CE)
GGG	Safety Officer (SO)
HHH	Ventilation Officer (VO)
III	Assistant Manager (AM)
JJJ	Mechanical Engineer/Asst. Mechanical Engineer (ME/AME)
KKK	Electrical Engineer/Asst. Electrical Engineer (EE/AEE)
LLL	Medical Officer (MO)
MMM	Civil Engineer (CER)
NNN	Survey Officer/Surveyor (SUO/SUR)
OOO	Workman Inspector (Mining) (WIM)
PPP	Workman Inspector (Mechanical) (WIME)
QQQ	Workman Inspector (Electrical) (WIE)
RRR	Overman/ Mining Sirdar (OM/MS)
SSS	Foreman (Mechanical/Electrical)
TTT	Electrical /Mechanical Supervisor (ES/MS)
UUU	Radiologist
VVV	Workmen/ Safety Committee Members
Add	Add

Facilitators (May include)	
Name	Designation
WWW	Deputy Director/Director, DGMS
XXX	Chief/ Deputy Chief/Member, ISO
YYY	Area Safety Officer
ZZZ	Area Medical Officer
EEFF	Area Engineer (Electrical)
GGHH	Area Engineer (Mechanical)
IIJJ	Scientist, Research Institutions
KKLL	Subject Expert, Educational Institutions
Add	Add

1.5 Risk Assessment

A sample of risk assessment exercise conducted in respect of mine inundation has been furnished as Table 6.

1.6 Risk control

While developing Risk Control plans for identified hazards, due weight age may be ascribed to the number of workers present at the place of work to assign priority.

A sample Risk Control plan pertaining to mine inundation assigning the responsibility and time limits for completing the designated action (s) has been furnished at Table 7.

1.7 Auditing

Auditing of Risk management scheme is to be conducted by trained auditors. Incomplete activities which have been assigned Immediate Action (IA) tag by auditors depending upon hazard perception, severity and exposure, need to be reported to agent(s) and owner(s) by the manager. A system may be devised to send daily/weekly/fortnightly/monthly progress report as the case may be, by the manager to agent(s) and owner(s), till the activities with IA tag are satisfactorily completed.

A sample audit sheet indicating gaps in achieving risk control within specified time frame in respect of mine inundation has been furnished at Table 8.

1.8 Emergency exercise

International best practices suggest that the exercise to be systematic in nature and consistent with the concept of mutual assistance from other mines. It should be able to make direct reference to the risks at the mine. The purview of the exercise should be inclusive of external agencies such as DGMS, police, media and senior company officials. The conduct of exercise is subject to risk assessment principles to ensure the exercises do not introduce new safety risks to persons at a mine and have an audit and evaluation process.

1.8 Concluding Remarks

The developed Safety Management Plan in respect of a coal or metal mine may contain, among others the following:

- ✓ Mine Safety & Health Policy with a plan for its implementation;

- ✓ Organizational structure and resources for implementation of (a) mine safety & health policy and (b) safety management plan
- ✓ Risk Assessment data sheets;
- ✓ Hazard Control Plans for identified hazards;
- ✓ A list of Hazard Control Plans with yellow Flag (YF);
- ✓ Audit sheets for Hazard identification and Control Plans;
- ✓ A list of Hazard Control Plans with Immediate Action Flag (IAF);
- ✓ A list of developed Code of Practices (COP);
- ✓ A list of developed schedules, schemes and strategies
- ✓ A list of developed Standard Operating Procedures (SOP);
- ✓ A list of developed processes, protocols and systems
- ✓ Emergency Management Plan including trigger action response plans (TARP) and emergency initiation protocol (EIP);
- ✓ Emergency exercise logs and recommendations;
- ✓ Maintenance schedules of electrical equipments used in the mine;
- ✓ Maintenance schedules of mechanical equipments used in the mine;
- ✓ Safety manuals of electrical & mechanical equipments used in the mine; and
- ✓ A list of trainings/refresher trainings conducted.

The list of Hazard Control Plans with yellow and Immediate Action Flag need to be accorded due priority by Agent & Owner. A schedule for implementing the recommendations made during the conduct of emergency exercise need to be drawn by the mine manager in consultation with agent/owner in a time bound manner. A copy of correspondences made with concerned authorities and agencies regarding mitigation of identified hazards in the mine may be kept for records.


(Rahul Guha)

Director General of Mines Safety

Table: 6

Sample worksheet (Risk Assessment: Inundation in underground coal mines)

Name of the Mine: AAA Name of the Company: BBB

Date Conducted: CCC

Location: DDD

Assessment Team	
Name	Designation
EEE	Mines Manager (MM)
FFF	Safety Officer (SO)
GGG	Ventilation Officer (VO)
HHH	Assistant Manager (AM)
JJJ	Survey Officer/ Surveyor (SURO/SUR)
KKK	Workman Inspector (Mining) (WMI)
LLL	Overman/ Mining Sirdar (OM/MS)
MMM	Workmen/ Safety Committee Members
Add	Add

Facilitators (may include)	
Name	Designation
PPP	Deputy Director/Director, DGMS
QQQ	Chief/ Deputy Chief/Member, ISO
RRR	Area Safety Officer
SSS	Scientist, Research Institutions
TTT	Subject Expert, Educational Institutions
Add	Add

Hazard identification as regards to inundation in multiple seam underground workings with caving/ stowing.

Abbreviations: HAZ: Hazard; CONS: Consequence; EXPS: Exposure; PROB: Probability.

HAZ NO	HAZARD	MECHANISMS	CALCULATED RISK				COMMENTS
			CONS	EXPS	PROB	RISK RATING	
1	2	3	4	5	6	7	8
UNH -1	Lack of knowledge on procedures.	Documents available are sketchy and not adequate.	05	10	10	500	Workshop on development of Safety Management Plan need to be conducted.
UNH -2	Lack of knowledge on procedures.	Workers and supervisors not trained to follow procedures.	05	10	10	500	Specialised refresher training required.
UNH -3	Lack of knowledge on procedures.	Surveillance to implement procedures.	05	10	10	500	Specialised process(es) to be devised.

HAZ NO	HAZARD	MECHANISMS	CALCULATED RISK				COMMENTS
			CONS	EXPS	PROB	RISK RATING	
1	2	3	4	5	6	7	8
UNH -4	Sudden inrush of water in underground mine workings from surface.	Failure of coal pillars due to existence of fire in underground, allowing connection through subsidence cracks with shallow surface rain water accumulation and flooding of underground.	05	10	07	350	
UNH -5	Sudden inrush of water in underground mine workings from surface.	Failure of embankment constructed at river bank due to heavy rain, and entry of water from surface through old workings and subsidence area to underground mine workings.	05	10	07	350	
UNH -6	Sudden inrush of water from workings of one seam to another seam in underground.	Failure of dam constructed in the connection drift between workings of two seams, causing sudden inrush of water from workings of one seam to another seam in underground.	05	10	07	350	
UNH -7	Sudden inrush of water in underground mine workings from surface.	Flooding of river due to heavy rain and water finding its way to underground workings through subsided area over goaf or mine entries.	05	05	07	175	
UNH -8	Sudden inrush of water from workings of same seam or from one seam to another seam in underground.	Barriers against water logged old workings failing under hydrostatic pressure causing inrush of water in underground workings.	05	10	07	150	
UNH -9	Sudden inrush of water from workings of same seam or from one seam to another seam in underground	Sudden inrush of water from old water logged workings of same seam or from one seam to another seam in underground due to accidental connection.	05	05	02	50	
UNH -10	Sudden inrush of water in underground mine workings from surface.	Failure of river bank/embankment due to damage from mine subsidence.	05	10	01	50	
UNH -11	Sudden inrush of water in underground workings from adjacent strata.	Pillar failure or creep allows goaf formation to connect with subsurface water body/aquifer.	05	10	01	50	
UNH -12	Sudden inrush of water in underground workings from adjacent strata.	Roof fall in development workings taps overlying aquifer or subsurface water accumulation.	05	1.5	02	15	
UNH -13	Sudden inrush of water in underground workings from	Mine workings intersect geological structure providing water flow channel.	01	02	01	02	

HAZ NO	HAZARD	MECHANISMS	CALCULATED RISK				COMMENTS
			CONS	EXPS	PROB	RISK RATING	
1	2	3	4	5	6	7	8
	adjacent strata.						
UNH -14	Sudden inrush of water in underground workings from adjacent strata.	Existing mine workings intersect open boreholes.	0.1	2.0	07	1.4	
UNH -15	Sudden inrush of water trapping mine workers in underground.	Proper emergency response protocol including effective communication from surface to underground. not in place.	05	02	10	100	Workshop on Emergency Preparedness & Response systems needs to be conducted.
UNH -16	Sudden inrush of water trapping mine workers in underground.	Lack of exposure and practice of workers and supervisors to follow emergency response protocol.	05	02	10	100	

Table: 7**Sample worksheet (Control Plan: Inundation in underground coal mines)**

Name of the Mine: AAA Name of the Company: BBB

Date Conducted: CCC

Location: DDD

Assessment Team	
Name	Designation
EEE	Mines Manager (MM)
FFF	Safety Officer (SO)
GGG	Ventilation Officer (VO)
HHH	Assistant Manager (AM)
JJJ	Survey Officer/ Surveyor (SURO/SUR)
KKK	Workman Inspector (Mining) (WMI)
LLL	Overman/ Mining Sirdar (OM/MS)
MMM	Workmen/ Safety Committee Members
Add	Add

Facilitators (may include)	
Name	Designation
PPP	Deputy Director/Director, DGMS
QQQ	Chief/ Deputy Chief/Member, ISO
RRR	Area Safety Officer
SSS	Scientist, Research Institutions
TTT	Subject Expert, Educational Institutions
Add	Add

Inundation Hazard Control Plan in multiple seam underground workings with caving/stowing.

Abbreviations: **RSP**-Relevant Statutory Provisions; **DGC**- DGMS Circulars; **MG**-Management Guidelines; **ERCI**- Existing Risk Control Index; **Res**- Responsibility; **Med**- Medium; **Reg**- Regulation of draft Coal Mines Regulations'2015; **Rul (T)**: Rule of Mine Vocational Training Rules' 1966; **SOP**- Standard Operating Procedure. **YF**- Yellow Flag.

Mechanism	Control	RSP/DGC/ MG	Procedure	ERCI Res	Comments
Failure of coal pillars due to existence of fire in underground allowing connection through subsidence cracks with shallow	1. Ensure efficient measures of controlling underground fire by trained personnel under competent supervision.	Reg. 137(6) & 139(5) & MG.	1. Devise a mechanism for fighting of underground fire in consultation with experts of an academic institute and implement the same under managerial supervision.	Low MM & Agent.	1. To be put in place within one month (YF).

Mechanism	Control	RSP/DGC/ MG	Procedure	ERCI Res	Comments
surface rain water accumulation and flooding of underground workings.	2. Ensure drainage of rain water from large surface depression and filling up of the same. 3. Training of mine personnel.	Reg. 150(1). Rul(T)-09; DGC- Legis 4/1975	2. Constitute a team for drainage of water from surface depression and filling up of the same, as and when required under competent supervision. 3. Conduct specialized training of mine personnel on danger of inundation.	AM & MM. MM & Agent.	2. To be put in place within fifteen days (YF). 3. To be completed within one month's time.
Failure of embankment constructed at river bank due to heavy rain and entry of water from surface through old workings and subsidence area to underground mine workings.	1. Assess the strength and stability of embankment constructed at river bank. 2. A system of sounding warning during heavy rain and withdrawal of persons from underground, if considered necessary, to be in place.	Reg 150(9) & (10); DGC2/1978. Reg 150(5); DGC2/1978.	1. Conduct a study for assessing strength and stability of embankment in consultation with experts of a research institute. Implement suggestions for strengthening embankment, if any, under competent supervision. 2. Devise a code of practice for warning during heavy rain, and evacuation of work persons from underground, if warranted.	Low Med	1. System to be put in place within two months time before onset of monsoon (YF). 2. System to be put in place within one month's time (YF).
Failure of dam constructed in the connection drift between workings of two seams, causing sudden inrush of water from workings of one seam to another seam in underground.	Assess stability of dam from available records. If need be, explore the possibility of strengthening the existing dam or construction of a new dam.	Reg 153.	1. Conduct stability assessment exercise in consultation with experts of a research/academic institute. 2. Formulate a work process for strengthening of existing dam or construction of a new dam and execute the same by trained personnel under competent supervision.	Low Low	1. Complete exercise within one month time (YF). 2. The work process to be formulated and executed within three months time (YF).
Flooding of river due to heavy rains and water finding its way to underground workings through goaf and /or mine entries.	Access rainfall data of last thirty years in the area and corresponding High Flood Level (HFL) to formulate strategy for preventing entry of water in underground workings through goaf and/or mine entries.	Reg 150(2).	Formulate strategy for preventing entry of water in the underground workings through goaf and/or mine entries and initiate action for implementing the same.	Low	System to be put in place within one month (YF).

Mechanism	Control	RSP/DGC/ MG	Procedure	ERCI Res	Comments
Barriers against water logged old workings failing under hydrostatic pressure causing inrush of water in underground workings.	Ensure maintenance of barrier as prescribed under mining laws.	Reg151(3).	Formulate and implement a work scheme to ensure maintenance of barrier as prescribed under mining laws.	Med AM & MM.	System to be put in place within one month (YF).
Sudden inrush of water from old water logged workings of same seam or from one seam to another seam in underground due to accidental connection.	Ensure leaving prescribed barrier as per the provisions of the statute from old water logged workings while advancing mine galleries in underground.	Reg151(3).	Conduct periodic mine survey and check survey to ensure maintenance of barrier as prescribed under mining laws.	Med SURO/ SUR, AM & MM.	Work to be completed within one month (YF).

Table: 8

Sample worksheet (Audit of Hazard Identification and Control Plan: Inundation in underground coal mines)

Name of the Mine: AAA Name of the Company: BBB

Date Conducted: CCC

Location: DDD

Assessment Team	
Name	Designation
EEE	Mines Manager (MM)
FFF	Safety Officer (SO)
GGG	Ventilation Officer (VO)
HHH	Assistant Manager (AM)
JJJ	Survey Officer/ Surveyor (SURO/SUR)
KKK	Workman Inspector (Mining) (WMI)
LLL	Overman/ Mining Sirdar (OM/MS)
MMM	Workmen/ Safety Committee Members
Add	Add

Facilitators (may include)	
Name	Designation
PPP	Deputy Director/Director, DGMS
QQQ	Chief/ Deputy Chief/Member, ISO
RRR	Area Safety Officer
SSS	Scientist, Research Institutions
TTT	Subject Expert, Educational Institutions

Audit of Hazard identification and Control Plan as regards to inundation in multiple seam underground workings with caving/stowing.

Abbreviations: IAF: Immediate Action Flag; SOP: Standard Operating Procedure.

Hazard identification Plan:
(General comments)

Hazard Control Plan:

Mechanism	Control	Procedure	Action Taken	Observations and Comments
Failure of coal pillars due to existence of fire in underground allowing connection through subsidence cracks with shallow	1. Ensure efficient measures of controlling underground fire by trained personnel under competent supervision.	1. Devise a mechanism for fighting of underground fire in consultation with experts of an academic institute and implement the same under managerial supervision.	1. A preliminary discussion to devise a mechanism of fighting underground fire has been held with experts of an academic institute.	1. Immediate action to be initiated by the MM & Agent to put the mechanism in place (IAF).

Mechanism	Control	Procedure	Action Taken	Observations and Comments
surface rain water accumulation and flooding of underground workings.	2. Ensure drainage of rain water from large surface depression and filling up of the same. 3. Specialized training on combating underground mine fire.	2. Constitute a team for drainage of water from surface depression and filling up of the same, as and when required under competent supervision. 3. Conduct specialized training of mine personnel on combating underground mine fire.	2. A team has been constituted with senior most Asst. Manager as team leader. 3. Training is yet to be conducted.	2. Monitoring in this regard to be done in ongoing manner by MM and Agent. 3. MM & Agent to facilitate conduct of training within one month.
Failure of embankment constructed at river bank due to heavy rain and entry of water from surface through old workings and subsidence area to underground mine workings.	1. Assess the strength and stability of embankment constructed at river bank. 2. A system of sounding warning during heavy rain and withdrawal of persons from underground if considered necessary, to be in place.	1. Conduct a study for assessing strength and stability of embankment in consultation with experts of a research institute. Implement suggestions for strengthening embankment, if any, under competent supervision. 2. Devise a code of practice for warning during heavy rain, and evacuation of work persons from underground, if warranted.	1. Discussion is in progress to engage a research institute for conducting the study. 2. A code of practice has been devised and being implemented.	1. Immediate action to be initiated by the MM & Agent for facilitating conduct of study and implementation of recommendations (IAF). 2. Ensure implementation of the code of practice by AM & MM.
Failure of dam constructed in the connection drift between workings of two seams, causing sudden inrush of water from workings of one seam to another seam in underground.	Assess stability of dam from available records. If need be, explore the possibility of strengthening the existing dam or construction of a new dam.	a) Conduct stability assessment exercise in consultation with experts of a research/academic institute. b) Formulate a work process for strengthening of existing dam or construction of a new dam, if the need be and execute the same by trained personnel under competent supervision.	a) The stability assessment exercise has been conducted by the experts of an academic institute, who recommended strengthening of the existing dam. b) The work process has been formulated. As recommended, action for strengthening of existing dam has been initiated.	MM & Agent to complete the action for strengthening of existing dam within one month's time (IAF).

Mechanism	Control	Procedure	Action Taken	Observations and Comments
Flooding of river due to heavy rains and water finding its way to underground workings through goaf and/or mine entries.	Access rainfall data of last thirty years in the area and corresponding High Flood Level (HFL) to formulate strategy for preventing entry of water in underground workings through goaf and/or mine entries.	Formulate strategy for preventing entry of water in the underground workings through goaf and/or mine entries and initiate action for implementing the same.	A scheme has been devised and proposed to be put in use shortly.	AM & MM to expedite implementation of the scheme (IAF).
Barriers against water logged old workings failing under hydrostatic pressure causing inrush of water in underground workings.	Ensure maintenance of barrier as prescribed under mining laws.	Formulate and implement a work scheme to ensure maintenance of barrier as prescribed under mining laws.	A work scheme has been formulated and in the process of being implemented.	AM & MM to keep a continuous watch over implementation of the system.
Sudden inrush of water from old water logged workings of same seam or from one seam to another seam in underground due to accidental connection.	Ensure leaving prescribed barrier as per the provisions of the statute from old water logged workings while advancing mine galleries in underground.	Conduct periodic mine survey and check survey to ensure maintenance of barrier as prescribed under mining laws.	A system of conducting barrier survey has been formulated and in the process of being implemented.	AM & MM to keep a continuous watch over implementation of the system.



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खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety



DGMS (Tech.) (S&T) Circular No. 06 of 2016 Dhanbad, dated 08/04/2016

To

All Owners, Agents and Managers of Coal Mines

Subject: Standards of illumination in opencast coal mines

Sir,

Abbreviations - DGMS: Directorate General of Mines Safety; S&T Division: Science & Technology Division; DDG(HQ): Deputy Director General (Head Quarter); CIL: Coal India Limited; SCCL: Singareni Collieries Company Limited; CIMFR: Central Institute of Mining and Fuel Research; ISM: Indian School of Mines; lux: SI unit of illuminance and luminous emittance, measuring number of lumens per square metre; H: Horizontal illuminance, the measure of illuminance taken through a light meter's sensor at a horizontal position on a horizontal surface ; V: Vertical illuminance, the measure of illuminance taken through a light meter's sensor at a vertical position on a vertical surface.

Proper illumination is desirable and can be an effective aid to tackle hazards in coal mines. Existing illumination standards are several decades old, necessitating a comprehensive review in the backdrop of recent developments in mine technology and lighting.

For appraisal of present status of illumination in coal and metalliferous mines, and formulation of draft revised standards thereof, a project was undertaken by Science & Technology Division of DGMS. As a part of the project, illumination surveys were carried out in coal and metalliferous mines. Based on the inputs derived from illumination surveys and also from international best practices, a draft illumination standard for opencast coal mines was prepared.

A meeting was convened on 17.02.2016 at DGMS, Dhanbad, under the chairmanship of Shri P. Ranganatheeswar, DDG(HQ), with a view to review and finalize the standard of lighting to be provided in the specified areas or places of opencast coal mines, earlier stipulated and specified vide Govt. Notification No. GSR-804, dated 18.06.1975, published in the Gazette of India, dated 28.06.1975, Part-III Section 3(i), also reproduced by the DGMS Circular (Legis.) No. 1/1976 under Regulation 154(2) of the Coal Mines

1 of 5

Regulations, 1957, in which twenty-four officials from different stake holders, like DGMS, CIL, SCCL, ISM and CIMFR participated.

After detail discussions and deliberations, the minimum illumination levels to be provided at different places of working in opencast coal mines along with general guidelines for mine lighting were suggested and finalized by the participating members, which are detailed below:

STANDARDS OF ILLUMINATION IN OPENCAST COAL MINES

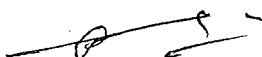
Serial No.	Places to be illuminated	Minimum standards of illumination to be provided (in lux)
1	Work place of Heavy Machinery	15 H, 25 V (so as to cover depth and height through which the machine operates.)
2	Drilling operations	
	(i)Area where drilling rig works	25 V (so as to illuminate full height of the drilling rig)
	(ii)Area where drill holes exists	15 H
3	Places where manual work is done	15 H, 25 V
4	Places where loading, unloading or transfer, loading of dumpers, trucks or train is carried on (including OB Dump and Coal Stack Yard)	15 H, 15 V
5	Operators cabins of machines or mechanisms	50 H at all places of operation
6	Haul roads for Trucks and Dumpers	10 H
7	Rail haulage track in the pit	10 H
8	Roadways and foot paths from bench to bench	10 H
9	Permanent paths for use of persons employed etc.	10 H
10	In-pit Crusher/Feeder Breaker	40 H
11	Hand Picking Points	50 H
12	Conveyers	
	(a) Transfer points and drive/tail end area	40 H
	(b) Along conveyor	20 H

13	Coal Handling Plant	
	(a) Places of crushing, screening, segregation and loading/unloading	40 H
	(b) Operation points	50 H
	(c) Other places (in general)	20 H
14	Pumping Station	40 H
15	(i) Electrical Sub-station	100 H, 50 V
	(ii) Other places of operation of electrical apparatus/equipment	20 H, 20 V
16	First Aid station	50 H
17	Rest shelter	30 H
18	Workshop	100 H, 50 V
19	Parking Yard	50 H
20	General working areas as determined by the Manager in writing	10 H at the level of surface to be illuminated

Guidelines for mine illumination

1. The mine lighting should be designed and installed with proper lamps and fixtures in regard to height, orientation, spacing and reflectors or other accessories, so as to secure a uniform distribution of light on the work area for visual comfort and avoiding objectionable shadows, sharp contrasts of intensity, glare, light clutter (excessive groupings of light) and light pollution to prevent strain on the eyes of the workmen, work fatigue and medically defined stress.
2. Portable lighting shall be provided at places, where the permanent/fixed lighting is not possible.
3. At strategic locations like electric substation, and any other places as determined by the Manager, emergency lighting arrangement by separate source shall also be provided.
4. In case of haul roads, orientation of light fittings should be kept so adjusted as to have emittance of light across the road and not along the road. Where the width of haul roads is more, the lighting arrangements shall be provided either by rows of lights erected on both sides of the road or by a centrally erected row, so as to maintain illumination as per standard.

5. Lighting arrangement at working places of heavy machineries, dump/stack yard and other loading/unloading areas shall be such that the formation of dark zone is avoided.
6. Considering high mobility of hydraulic excavators, the faces/benches worked by such machineries shall, as far as practicable, be illuminated by light source of matching mobility so as to avoid chances of lag for want of shifting.
7. Dump/stack yards shall be illuminated by suitable numbers of high mast towers/light source. It shall also be ensured that adequate light reaches up to edges of the active dump.
8. For better implementation of these standards, the manager of every mine shall formulate a detailed written "Illumination Scheme", which may include an "Illumination Plan" and duties and responsibilities of key officials for the purpose.
9. In respect of any particular place or operation in a mine, where due to existence of some special conditions the manager is of the opinion that compliance as per stipulated minimum standard is not reasonably practicable, he may provide illumination in variance thereof, if he has indicated the modified minimum illumination to be provided for such place or operation, as the case may be, in the "Illumination Scheme" with proper justification for the same and submitted a copy thereof to the Regional Inspector.
10. Illumination Survey:
 - (i) The manager of every mine shall arrange to conduct Lighting Survey once at least in every month to ensure adequacy of illumination.
 - (ii) While making such survey, the measurement of lighting shall also be taken at the point farthest from the source of light lying within the limit of the work place or in haul road or travelling or haulage roadway, as the case may be.
 - (iii) A record of every such survey shall be maintained and signed by the competent person making the survey and countersigned and dated by the manager.
11. Illumination Plan:
 - (i) The manager of every mine shall ensure that an Illumination Plan, indicating the location of places, type of illuminating devices, fixtures, lamps, supports, any other devices for illumination and showing required as well as measured value of light at various places to be illuminated, is maintained. Where any area of the mine is not in use or not needed to be lighted, the same shall be clearly marked and demarcated on the plan with reasons to be recorded. The plan shall be kept signed and dated by the surveyor and the official authorized for maintaining the lighting standard and countersigned and dated by the manager.



- (ii) The Illumination Plan shall be brought up to date in every month based on the monthly illumination survey and considering the current status of workings.

This circular supersedes the DGMS Circular (Legis.) No. 1/1976. Action is also being taken to forward a copy of this revised standard for notification in the Gazette of India.

All Owners, Agents and Managers of coal mines are advised to ensure strict compliance with this circular.


(Rahul Guha) 8.4.16
Director General of Mines Safety



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Directorate General of Mines Safety



DGMS(Tech.) (S&T) Circular No. 07 of 2016 Dhanbad, dated 08/04/2016

To

All Owners, Agents and Managers of Coal Mines

Subject: Standards of illumination in underground coal mines

Sir,

Abbreviations - DGMS: Directorate General of Mines Safety; S&T Division: Science & Technology Division; DDG(HQ): Deputy Director General (Head Quarter); CIL: Coal India Limited; SCCL: Singareni Collieries Company Limited; CIMFR: Central Institute of Mining and Fuel Research; ISM: Indian School of Mines; lux: SI unit of illuminance and luminous emittance, measuring number of lumens per square metre; H: Horizontal illuminance, the measure of illuminance taken through a light meter's sensor at a horizontal position on a horizontal surface; V: Vertical illuminance, the measure of illuminance taken through a light meter's sensor at a vertical position on a vertical surface.

Proper illumination is desirable and can be an effective aid to tackle hazards in coal mines. Existing illumination standards are several decades old, necessitating a comprehensive review in the backdrop of recent developments in mine technology and lighting.

For appraisal of present status of illumination in coal and metalliferous mines, and formulation of draft revised standards thereof, a project was undertaken by Science & Technology Division of DGMS. As a part of the project, illumination surveys were carried out in coal and metalliferous mines. Based on the inputs derived from illumination surveys and also from international best practices, a draft illumination standard for underground coal mines was prepared.

A meeting was convened on 17.02.2016 at DGMS, Dhanbad, under the chairmanship of Shri P. Ranganatheeswar, DDG(HQ), with a view to review and finalize the existing guidelines issued on standards of illumination under regulation Reg.151 of Coal Mines Regulations, 1957 vide DGMS circular No. 14/1964 for underground coal mines, in which twenty-four officials from different stakeholders, like DGMS, CIL, SCCL, ISM and CIMFR participated.

After detail discussions and deliberations, the minimum illumination levels to be provided at different places of working in underground coal mines along with general guidelines for mine lighting were suggested and finalized by the participating members, which are detailed below:

STANDARDS OF ILLUMINATION IN UNDERGROUND MINES

S.N	Important places to be illuminated	Minimum level of illumination to be provided (in lux)
1	At every shaft landing and shaft bottom or siding which is in regular use	50 H
2	Travelling roadway and Haulage road way, including Man-riding roadway and every incline in use	10 H, 10 V
3	Haulage Roadway (junctions) at which tubs are coupled or uncoupled	30 H
4	At every places of loading and unloading	30 H, 20 V
5	At every room and place containing any engine, motor or other apparatus in regular use	30 H
6	Any working face and Goaf Edges of depillaring panels	20 H, 30 V
7	Ladder way/Man way	15 H
8	Pumping Station	30 H
9	Area under filling /stowing	10 H
10	Conveyors	
	(i) Transfer points and drive/tail end area	40 H
	(ii) Along conveyor	20H
11	Hand picking points	50 H
12	Loco charging station	50 H
13	Underground Garage/workshop	50 H
14	(i) Electrical substation	100 H, 50 V
	(ii) Other places of operation of electrical apparatus/equipment	20 H, 20 V

15	At every First -aid station	50 H
16	Miners station/ Rest shelter	25 H
17	Coal Handling Plant	
	(i) Places of crushing, screening, segregation and loading/unloading	40 H
	(ii) Operation points	50 H
	(iii) Other places (in general)	20 H
18	workshop at surface	100 H, 50 V
19	General working areas as determined by the Manager in writing	10 H at the level of surface to be illuminated

Guidelines for mine illumination

1. The mine lighting should be designed and installed with proper lamps and fixtures in regard to height, orientation, spacing and reflectors or other accessories, so as to secure a uniform distribution of light on the work area for visual comfort and avoiding objectionable shadows, sharp contrasts of intensity, glare, light clutter (excessive groupings of light) and light pollution to prevent strain on the eyes of the workmen, work fatigue and medically defined stress.
2. Portable lighting shall be provided at places, where the permanent/fixed lighting is not possible.
3. At strategic locations like electric substation, winding engine room and any other places as determined by the Manager, emergency lighting arrangement by separate source shall also be provided.
4. For better implementation of these standards, the manager of every mine shall formulate a detailed written "Illumination Scheme", which may include an "Illumination Plan" and duties and responsibilities of Key officials for the purpose.
5. In respect of any particular place or operation in a mine, where due to existence of some special conditions the manager is of the opinion that compliance as per stipulated minimum standard is not reasonably practicable, he may provide illumination in variance thereof, if he has indicated the modified minimum illumination to be provided for such place or operation, as the case may be, in the "Illumination Scheme" with proper justification for the same and submitted a copy thereof to the Regional Inspector.
6. Illumination Survey:
 - (i) The manager of every mine shall arrange to conduct Lighting Survey once at least in every month to ensure adequacy of illumination.

- (ii) While making such survey, the measurement of lighting shall also be taken at the point farthest from the source of light lying within the limit of the roadways and work place, as the case may be.
- (iii) A record of every such survey shall be maintained and signed by the competent person making the survey and countersigned and dated by the manager.

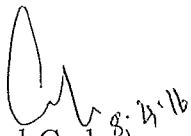
7. Illumination Plan:

- (i) The manager of every mine shall ensure that an Illumination Plan, indicating the location of places, type of illuminating devices, fixtures, lamps, supports, any other devices for illumination and showing required as well as measured value of light at various places to be illuminated, is maintained. Where any area of the mine is not in use or not needed to be lighted, the same shall be clearly marked and demarcated on the plan with reasons to be recorded. The plan shall be kept signed and dated by the surveyor and the official authorized for maintaining the lighting standard and countersigned and dated by the manager.
- (ii) The Illumination Plan shall be brought up to date in every month based on the monthly illumination survey and considering the current status of workings.

In addition to the above, the roof and sides of the aforesaid places belowground shall also be kept effectively whitewashed as required under Reg. 150 of Coal Mines Regulations, 1957 or such other corresponding regulations which may come into force in future, which would further help in significantly improving the underground visual environment and level of illumination.

This circular supersedes the DGMS circular No. 14/1964.

All Owners, Agents and Managers of coal mines are advised to ensure compliance with this circular.


(Rahul Guha)

Director General of Mines Safety



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 Directorate General of Mines Safety



DGMS (Tech.) (S&T) Circular No. 08 of 2016 Dhanbad, dated 03/05/2016

To

All Owners, Agents and Managers of Coal Mines

Subject: Emergency Management Plan for Indian coal and metal mines

Sir,

Abbreviations - DGMS: Directorate General of Mines Safety; CIL: Coal India Limited; SCCL: Singareni Collieries Company Limited; CIMFR: Central Institute of Mining and Fuel Research; ISM: Indian School of Mines; MOIL: Manganese Ore India Limited; UCIL: Uranium Corporation of India Limited; HCL: Hindustan Copper Limited; HZL: Hindustan Zinc Limited; HINDALCO: Hindalco Industries Limited; SAIL: Steel Authority of India Limited.

Regulation 199A of the Coal Mines Regulations'1957 & Regulation 190A of the Metalliferous Mines Regulations'1961 stipulates preparation of an emergency plan for every mine having workings belowground for use in time of emergency. The emergency plan shall incorporate provision for mock rehearsals at regular intervals.

Recently, a DGMS (Tech.) (S&T) Circular no.05 dated 2nd April 2016 was issued, detailing an integrated approach for development of Safety Management Plan for coal and metalliferous mines and also underlining the concept of emergency exercise.

On 22nd April 2016, a workshop on "Emergency Preparedness and Response System" was organized at DGMS, Dhanbad, for facilitating discussion and deliberations on recent developments in emergency management in mines and suggests inputs for drawing up a roadmap to effect a qualitative improvement in

the system in vogue. Eighty five mine safety & rescue experts from different stakeholders like CIL, SCCL, HCL, MOIL, HINDALCO, Tata Steel, SAIL, UCIL, ISM, CIMFR and DGMS participated in the workshop.

Based on the simulated emergency exercises conducted by DGMS and inputs gathered from the workshop, a guideline for developing emergency management plan for Indian coal and metal mines is enclosed as Appendix.

All Owners, Agents and Managers of coal & metalliferous mines are advised to ensure compliance with this circular.


(Rahul Guha)

Director General of Mines Safety

Appendix to DGMS (Tech.) (S&T) Circular No. 08 of 2016, dated 03/05/2016

1. Introduction

Scenario planning & Hypothesis testing exercise may be conducted to consider different hypothetical (but likely) scenario of mine emergencies vis-à-vis barriers to prevent, in the backdrop of risk assessment and initiated hazard control measures. Mine officials of neighboring mines with decent exposure to risk assessment process may be engaged to conduct the exercise with facilitation by experts.

During interaction sessions efforts would be made to search for solutions/controls of possible hazards and risks that may not have been previously identified.

One of the critical decisions to be made following an emergency is the classification of that event to initiate appropriate level of response. Often it has been observed that several events, some resulting in multi fatalities, could not be designated as emergencies promptly enough, thus critically delaying the initiation of appropriate responses. The management and control of any event, whether involving one or several persons, is always best controlled through an effective and automatic response plan initiated at the earliest possible time.

2. Trigger action response plan and emergency initiation protocol

Regular inspections are to be made as per the established protocol to identify the possible sources of hazards and initiate remedial measures by activating mechanism of control/elimination. Taking due account of situations prevailing at mine site, 'Trigger Action Response Plans' (TARP's) and 'Emergency Initiation Protocols' (EIP's) need to be devised, for each level in the order of their seriousness and gravity.

3. Self rescue and aided rescue

Objective evidence gathered during the course of conducting emergency exercises worldwide demonstrated that adoption of self-escape philosophy offers the best chance of survival to the underground personnel, when ably supported by an aided rescue strategy, which provides for external assistance to those persons unable to

reach a place of safety, unaided. Ingraining the philosophy, an action plan for formulation of an emergency management plan (EMP) has been illustrated in Figure -1 for Indian mines.

4. Simulated emergency exercise

The structure of the simulated emergency exercise may be envisaged encompassing following features in view:

- Systematic and consistent with the concept of mutual assistance from other mines;
- Directly addresses the risks prevailing at the mine;
- Inclusive of external agencies such as mines rescue station, DGMS, senior company officials, district administration, medical services and media representatives;
- Incorporates an assessment and evaluation process;
- In tune with risk assessment principles to ensure that the exercises do not introduce new safety risks to persons at a mine

The main function of aided rescue is to provide external assistance to those work persons unable to reach a place of safety, on their own. The main features of an aided rescue protocol are furnished below:

- Incident management teams; formation thereof, placement of a code detailing roles, responsibilities and authorities of persons engaged in the exercise and inclusion of such details in duty cards, which are essential tools that act as critical memory prompts and provide a valuable recording and reporting function. It is also imperative to set up verifiable communication channels for accurate and timely flow of information, both on and off side.
- Control room set up; may include among others, the following:

Requisite facilities for recording and analysis of data; ready availability of external expert assistance of academic and research institutions; and, an

efficient electronic communication system for in-mine as well as external communication.

- Mine rescue organizations; essential features are:

Efficient management, manned by a team of dedicated and competent personnel. Comprehensive mine rescue protocols and guidelines need to be in place. A well coordinated and structured system of training and retraining of rescue personnel is a necessary component of any mine rescue management system.

5. Barriers to re-entry

Initiation of a process of hazard analysis and risk assessment is an essential prerequisite to the event of re-entry. Thereafter, barriers to re-entry may be critically examined and evaluated and recovery be effected as per devised rescue protocols and guidelines.

6. Simulated emergency exercise at Coal Mine- A & Coal Mine- B

Two emergency exercises were conducted at Coal Mine-A and Coal Mine-B to assess the emergency preparedness and response systems in Indian coal mines.

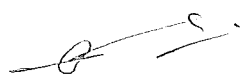
6.1 Observations

In general, all coal mine personnel were committed to the exercise and the underground workers participated fully and in good spirit under difficult circumstances. All workers reached places of safety in good time in Coal Mine – A, whereas 12 persons at Coal Mine – B could not. Samples of (a) exercise event log and (b) assessment data sheets are enclosed for reference.

The outcome of the exercise, summarized below, also very clearly underlined the fact that there are ample opportunities for inducing a qualitative and quantitative improvement in the existing scenario:

- ❖ Majority of work persons were not able to don their self rescuer's correctly;

- ❖ Little efforts were made by workmen to communicate their circumstances to surface;
- ❖ There were little deliberations/planning among the team members before commencing their evacuation, which resulted in non-adoption of defined order of travel, agreed route of travel, means to ensure they stayed together;
- ❖ Some teams had no gas monitoring equipment and others who possessed them, left the instruments in hurry while evacuating;
- ❖ The teams did not make any efforts to ascertain the atmospheric conditions and was not in a position to evaluate the degree of danger to which they are exposed even after donning the self rescuer's which was of 30 minutes duration;
- ❖ There was little, if any discernable ventilation flow to assist the teams in directional orientation;
- ❖ Escape ways were not maintained properly and contained numerous trip hazards & obstructions;
- ❖ In poor visibility, signs posted in primary escape ways were of little or no use;
- ❖ Alternative escape routes were not sign posted;
- ❖ Not all team leaders (overman/mining sirdar) were carrying hand plans;
- ❖ There was an urgent need for:
 - developing awareness among work persons about the hazards and implications of the underground mine fires;
 - training the work persons in the prevention and combat of underground mine fires;
- ❖ There was considerable under estimation of expected evacuation/travel times at Coal Mine – A;
- ❖ Fire fighting capabilities and resources available at Coal Mine – B needs urgent review; and
- ❖ The main rescue van was under repair and the backup rescue van was not in full standby mode at Coal Mine – A.



7. Recommendations

Based on the inferences drawn from the review of existing practices and conducted simulated emergency exercises, it is suggested that the following issues may be kept in perspective while formulating an emergency response management scheme:

- a) Consequent upon Risk assessment exercise, control measures may be formulated detailing responsibility of concerned mine officials with a protocol of implementation, to obviate the possibilities of dangerous occurrence in a coal mine.
- b) Scenario planning & hypothesis testing sessions may be conducted to search for possible solutions/controls of hazards and risks which may have not been previously identified.
- c) Details of ventilation net works with airflows and quantity may be incorporated in ventilation plan.
- d) A schedule of training and re-training need to be drawn up for all persons on the correct donning and wearing procedures for self rescuers.
- e) Use of gas chromatography equipment need to be considered for mine gas analysis purposes.
- f) Current standing orders be reviewed with a view to incorporate concepts like developing trigger action response plans to establish specific trigger points.
- g) Release of stink gas as a mode of emergency initiation protocol need to be considered to advise all work persons in the mine, particularly those without easy access to telecommunication system of an order of evacuation.
- h) Establishment of procedures detailing standard methods for deciding plans/options with work persons prior to evacuation, including routes of travel, modes of travel, order of travel, use of link lines, communications, signaling, etc.

- i) Primary and secondary escape routes be established and maintained. The escape ways may be fitted with guide ropes, clearly sign posted and facilities like fluorescent droppers, embossed printing be used to make them identifiable in poor visibility.
- j) In each working district, places need to be identified where workmen can gather in the event of an emergency. Such places are to be equipped with telephones, mine plans, link lines and blind -man walking sticks.
- k) Development of duty cards that individually detail the expected roles, responsibilities and authorities of all persons in charge of coordinating and/or controlling an emergency response, which may be kept at a number of designated places around the mine site.
- l) The construction of 'refuse chamber' need to be given a serious consideration to mitigate the hazards associated with extensive workings and steep gradient in coal mines like Coal Mine-B.
- m) A comprehensive re-training program may be put in place to raise the awareness of work persons on the circumstances to be expected in the vicinity of an underground fire. Additional training should be conducted on the options available to combat underground fires and the risks and hazards associated with each.



(Rahul Guha) 3.5.16

Director General of Mines Safety

SAMPLE EMERGENCY EXERCISE EVENT LOG**Coal Mine – A**

START TIME	EVENTS	ELAPSED TIME
11:40	Assessment team in lower Seam advise workers of thick choking smoke entering their workplace.	0:00
11:45	Assessment team in upper Seam advise workers of thick choking smoke entering their workplace.	0:05
11:50	Mine workers donned Self Rescuers and commenced evacuation.	0:10
11:54	Sirdar from Escaping team 1 advised surface of circumstances.	0:14
11:58	Acting Manager telephones Mines Rescue Brigade.	0:18
12:03	Escaping team 3 arrive at pit-bottom (shaft).	0:23
12:05	One worker each from Escaping teams 1 and 2 simulate collapse (unconscious) from carbon monoxide poisoning.	0:25
12:05	Escaping team 4 arrive at pit-bottom (shaft).	0:25
12:08	Mines Rescue Brigade ready to leave station – six persons, fully equipped.	0:28
12:09	Escaping teams 1 and 2 arrive at pit-bottom (shaft) and contact the Onsetter and the surface Banksman. Escaping teams 1 & 2 demanded cage to complete evacuation to surface.	0:29
12:11	Escaping team 3 & 4 demanded cage to complete evacuation to surface.	
12:13	Ambulance arrives on surface.	0:33
12:15	Escaping team 1 & 2 arrived at surface Attendance Cabin.	0:35
12:30	Escaping team 3 & 4 arrived at surface Attendance Cabin.	
12:38	Exercise Terminated.	0:58

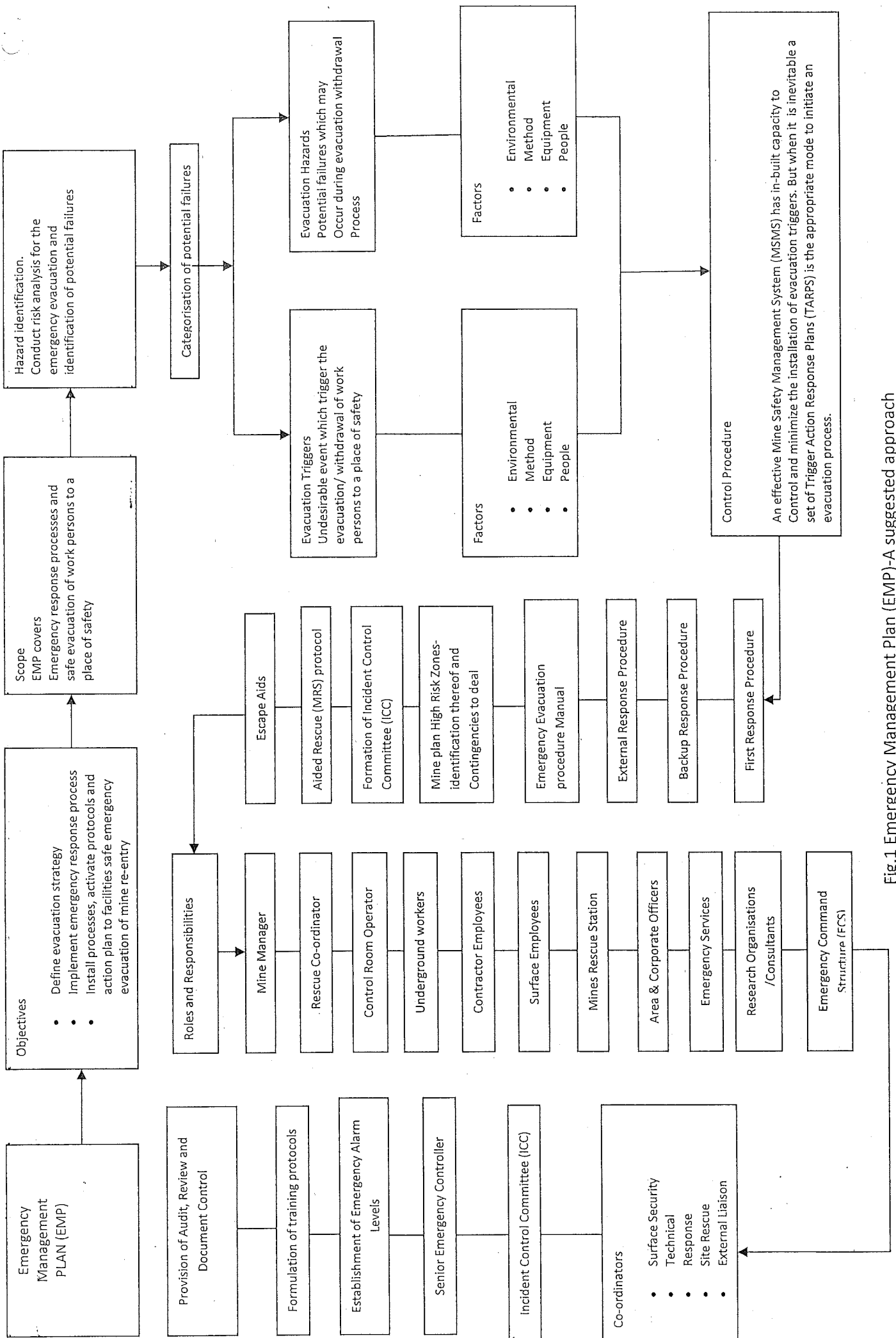


Fig.1 Emergency Management Plan (EMP)-A suggested approach

Coal Mine – A Sample assessment sheet (Emergency evacuation): Team 4 at 35 Stopping, lower Seam
Assessors: Three officials (Coal company – one; International Expert-one; DGMS -one)

ELEMENT	PERFORMANCE CRITERIA	OBJECTIVE EVIDENCE SOUGHT	OBSERVATION
Information about the emergency circumstance to the Sirdar present at 35 stopping of lower seam. [Information given by the Assessor at 11.45am.]	Thick Choking Smoke coming down intakes.	Recognition of changed circumstances.	# Mining Sirdar immediately stopped working and started evacuating. # Counted number of workmen present in the workplace. # Sirdar did not cross-check the information.
Mine workers to be notified by Sirdar about the incident.	- All mine workers were notified and accounted for; and - Mine workers marshaled together.	- Location of outbye workers considered; and - Log times.	# All Mine workers were located & accounted for. They were marshaled together within 8 minutes. # Efforts were not made to inform mine workers located in the outbye area.
Mine atmosphere and evacuation strategy. [Assessor informed that: - Canary birds were found unconscious; - Nil methane observed, and - Flame safety lamp still burning].	Understanding the situation and recognition of the risks while evacuation. - Self rescuers fitted correctly; and - Fitted in sufficient time.	- Ability to identify risks and chalk out evacuation plan accordingly; - Team discussion initiated by the leader to consider options for evacuation and decide route of travel; and - Use of devices and methods to assess the atmospheric condition while evacuation.	# Lack of understanding displayed by Sirdar. # No time logged while evacuating. # Sirdar did not discuss about the options for safe evacuation and decided the route of evacuation. # No briefing provided to crew by the Sirdar about expected route of travel, method of travel or method to ensure no-one is left behind. # While evacuating, checking of atmospheric conditions by methanometer and flame safety lamp was not carried out by the Sirdar.
Donning of Self Rescuers and its applicability under present circumstances.	- Self rescuers fitted correctly; and - Fitted in sufficient time.	Recognition of expected duration of evacuation vis-à-vis working life of self rescuers.	# Self rescuers donned in two minutes time. Three crew members put self rescuers on satisfactorily, and two crew members put head straps on over helmets. # Life of self rescuer vis-à-vis travel time was not assessed by Sirdar before commencing evacuation.
Incident Equipment. [May be carried by workmen & Sirdar.]	What extra equipment is taken [Put smoke glasses on all crew members and one assessor.] [Supply blind man canes]	Record equipment taken	Sirdar carried methanometer and flame safety lamp.

Sirdar to contact Surface control on phone.	Describe circumstances; Inform about number of workmen accounted for; and Expected route of travel.	Provide complete and correct information; and Log times.	Sirdar could not contact surface as no phone was available for the purpose.
Route of travel. <i>[To be decided by the Sirdar after studying the mine plan and team deliberation with team members.]</i>	Appropriate means decided; All workmen traveled together; Pace of travel appropriate; Correct escape route was followed; Use of blind-man canes; and Use of link-lines	Monitor and record significant incidents; and Log times.	- The team led by Sirdar commenced evacuation at 11.47 am. - No discussion was held about method or route of travel. - No discussion was held on order of travel i.e. who should lead – who to follow last, how to stick together. - Lead person changed four times as team members walked past each other. - Workers were acquainted with escape route. - Speed of travel was satisfactory. - Body contact between some workers was excellent – others walked on their own. - Obstructions along escape route were navigated well. - Contact with team members was maintained by "humming" through mouthpieces.
Action at Pit bottom (shaft).	Contact made with On-setter; and Contact made with Banksman/Surface officials.	Correct Information passed on; and Log times.	The team established contact with onsetter at 12.34 pm, and thereafter made contact with Banksman /Officials present at the surface.
Actions on surface.	Contact made with attendance clerk; and De-briefing.	Accounting of workmen who exited the mine after emergency; and Debriefing – record information sought and passed on.	- Workmen led by Sirdar marked out and accounted for by the attendance clerk in the attendance register. - Debriefing of Sirdar and team members were done by a team of assessors. While some team members exhibited a fair understanding, yet in general, there exist critical gaps in the implementation module of emergency preparedness and response system of the mine.



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Directorate General of Mines Safety



No. DGMS (Tech) Circular (MAMID)/ 09

Dhanbad, dated: 08 / 06 / 2016

To

The Owner, Agent and Manager of All Mines

Subject: Online maintenance of registers/records mandated by the Mines Act, 1952 and allied legislation by mines.

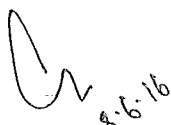
Sir,

As you are aware that the Mines Act, 1952 and allied legislation mandate maintenance of physical registers and documents by mines. These registers and records have to be produced/made available to the inspectors/authorities during the inspection of the mine or on other occasions as per law. In this context, it is observed that digitization of these Registers and other documents has the potential to achieve large productivity improvement, both in terms of simplifying processes and data management as well as improving the ease of monitoring by Directorate General of Mines Safety (DGMS) and other regulatory authorities.

Moreover, Section 4 of the Information Technology Act, 2000, provides that "where any law provides that information or any other matter shall be in writing or in the typewritten or printed form, then notwithstanding anything contained in such law, such requirement shall be deemed to have been satisfied if such information or matter is rendered or made available in an electronic form; and accessible so as to be usable for a subsequent reference". In view of this provision, it has been decided that that if any mine management makes available such registers/records in electronic form and accessible to the inspector/authority so as to be usable for a subsequent reference, then that mine management need not be required to produce print/hard copy of these registers, records or documents.

Thus, it has been decided to move towards a regime of online maintenance of registers/records mandated by the Mines Act, 1952 and allied legislation, by mine and integrate the same with the Shram Suvidha Portal so that the information is available on real time to both the mine management as well as the DGMS. As a first step to move in this direction, it is required to have all registers/documents maintained in digital/electronic form.

Yours faithfully,



(Rahul Guha)

Director General of Mines Safety



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Directorate General of Mines Safety



DGMS(Tech.) Circular No. 10 of 2016

Dhanbad, dated 25/06/2016

To

All Owners, Agents and Managers of Metalliferous Mines

Subject: Standards of illumination in underground metalliferous mines

Sir,

Abbreviations - DGMS: Directorate General of Mines Safety; S&T Division: Science & Technology Division; DDG(HQ): Deputy Director General (Head Quarter); CIL: Coal India Limited; SCCL: Singareni Collieries Company Limited; CIMFR: Central Institute of Mining and Fuel Research; ISM: Indian School of Mines; lux: SI unit of illuminance and luminous emittance, measuring number of lumens per square metre; H: Horizontal illuminance, the measure of illuminance taken through a light meter's sensor at a horizontal position on a horizontal surface; V: Vertical illuminance, the measure of illuminance taken through a light meter's sensor at a vertical position on a vertical surface.

Proper illumination is desirable and can be an effective aid to tackle hazards in metalliferous mines. The minimum standards of illumination to be provided at different places of working in underground metalliferous mines assume significance in the backdrop of recent developments in mine technology and lighting.

For appraisal of present status of illumination in metalliferous and coal mines, and formulation of minimum standards thereof, a project was undertaken by Science & Technology Division of DGMS. As a part of the project, illumination surveys were carried out in coal and metalliferous mines.

Based on the inputs derived from illumination surveys, international best practices and a meeting of different stakeholders held on 17.02.2016, the minimum standards of illumination to be provided at different places of working in underground metalliferous mines along with general guidelines for mine lighting were finalized, which are detailed below:

[Handwritten signature]

**STANDARDS OF ILLUMINATION IN UNDERGROUND METALLIFEROUS
MINES**

S.N	Place/Area to be illuminated	Minimum level of illumination to be provided (in lux)
1	At every shaft landing and shaft bottom or siding which is in regular use	50 H
2	Travelling roadway and Haulage road way, including Man-riding roadway and every incline in use	10 H, 10 V
3	Haulage Roadway (junctions) at which tubs are coupled or uncoupled	30 H
4	At every places of loading and unloading	30 H, 20 V
5	At every room and place containing any engine, motor or other apparatus in regular use	30 H
6	Any working face and stopes	20 H, 30 V
7	Ladder way/Man way	15 H
8	Pumping Station	30 H
9	Area under filling /stowing	10 H
10	Conveyors	
	(i) Transfer points and drive/tail end area	40 H
	(ii) Along conveyor	20H
11	Hand picking points	50 H
12	Loco charging station	50 H
13	Underground Garage/workshop	50 H
14	(i) Electrical substation	100 H, 50 V
	(ii) Other places of operation of electrical apparatus/equipment	20 H, 20 V
15	At every First -aid station	50 H
16	Miners station/ Rest shelter	25 H

17	Mineral Handling Plant	
	(i) Places of crushing, screening, segregation and loading/unloading	40 H
	(ii) Operation points	50 H
	(iii) Other places (in general)	20 H
18	workshop at surface	100 H, 50 V
19	General working areas as determined by the Manager in writing	10 H at the level of surface to be illuminated

Guidelines for mine illumination

1. The mine lighting should be designed and installed with proper lamps and fixtures in regard to height, orientation, spacing and reflectors or other accessories, so as to secure a uniform distribution of light on the work area for visual comfort and avoiding objectionable shadows, sharp contrasts of intensity, glare, light clutter (excessive groupings of light) and light pollution to prevent strain on the eyes of the workmen, work fatigue and medically defined stress.
2. Portable lighting shall be provided at places, where the permanent/fixed lighting is not possible.
3. At strategic locations like electric substation, winding engine room and any other places as determined by the Manager, emergency lighting arrangement by separate source shall also be provided.
4. For better implementation of these standards, the manager of every mine shall formulate a detailed written "Illumination Scheme", which may include an "Illumination Plan" and duties and responsibilities of Key officials for the purpose.
5. In respect of any particular place or operation in a mine, where due to existence of some special conditions the manager is of the opinion that compliance as per stipulated minimum standard is not reasonably practicable, he may provide illumination in variance thereof, if he has indicated the modified minimum illumination to be provided for such place or operation, as the case may be, in the "Illumination Scheme" with proper justification for the same and submitted a copy thereof to the Regional Inspector.
6. Illumination Survey:
 - (i) The manager of every mine shall arrange to conduct Lighting Survey once at least in every month to ensure adequacy of illumination.
 - (ii) While making such survey, the measurement of lighting shall also be taken at the point farthest from the source of light lying within the limit of the roadways and work place, as the case may be.

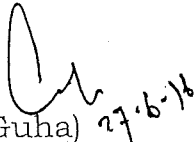
- (iii) A record of every such survey shall be maintained and signed by the competent person making the survey and countersigned and dated by the manager.

7. Illumination Plan:

- (i) The manager of every mine shall ensure that an Illumination Plan, indicating the location of places, type of illuminating devices, fixtures, lamps, supports, any other devices for illumination and showing required as well as measured value of light at various places to be illuminated, is maintained. Where any area of the mine is not in use or not needed to be lighted, the same shall be clearly marked and demarcated on the plan with reasons to be recorded. The plan shall be kept signed and dated by the surveyor and the official authorized for maintaining the lighting standard and countersigned and dated by the manager.
- (ii) The Illumination Plan shall be brought up to date in every month based on the monthly illumination survey and considering the current status of workings.

In addition to the above, the roof and sides of the aforesaid places belowground shall also be kept effectively whitewashed, which would further help in significantly improving the underground visual environment and level of illumination.

All Owners, Agents and Managers of metalliferous mines are advised to ensure compliance with this circular.


(Rahul Guha) 27.6.18
Director General of Mines Safety



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DGMS(Tech.) Circular No. 11 of 2016

Dhanbad, dated 27/06/2016

To

All Owners, Agents and Managers of Metalliferous Mines

Subject: Standards of illumination in opencast metalliferous mines

Sir,

Abbreviations - DGMS: Directorate General of Mines Safety; S&T Division: Science & Technology Division; DDG(HQ): Deputy Director General (Head Quarter); CIL: Coal India Limited; SCCL: Singareni Collieries Company Limited; CIMFR: Central Institute of Mining and Fuel Research; ISM: Indian School of Mines; lux: SI unit of illuminance and luminous emittance, measuring number of lumens per square metre; H: Horizontal illuminance, the measure of illuminance taken through a light meter's sensor at a horizontal position on a horizontal surface; V: Vertical illuminance, the measure of illuminance taken through a light meter's sensor at a vertical position on a vertical surface.

Proper illumination is desirable and can be an effective aid to tackle hazards in metalliferous mines. Existing illumination standards are several decades old, necessitating a comprehensive review in the backdrop of recent developments in mine technology and lighting.

For appraisal of present status of illumination in opencast metalliferous and coal mines, and formulation of draft revised standards thereof, a project was undertaken by Science & Technology Division of DGMS. As a part of the project, illumination surveys were carried out in opencast metalliferous and coal mines.

Based on the inputs derived from illumination surveys, international best practices and a meeting of different stakeholders held on 17.02.2016, the minimum standards of illumination to be provided at different places of working in opencast metalliferous mines along with general guidelines for mine lighting were finalized which are detailed below:

STANDARDS OF ILLUMINATION IN OPENCAST METALLIFEROUS MINES

Serial No.	Place/Area to be illuminated	Minimum standards of illumination to be provided (in lux)
1	Work place of Heavy Machinery	15 H, 25 V (so as to cover depth and height through which the machine operates.)
2	Drilling operations	
	(i) Area where drilling rig works	25 V (so as to illuminate full height of the drilling rig)
	(ii) Area where drill holes exists	15 H
3	Places where manual work is done	15 H, 25 V
4	Places where loading, unloading or transfer, loading of dumpers, trucks or train is carried on (including OB Dump and Mineral/Ore Stack Yard)	15 H, 15 V
5	Operators cabins of machines or mechanisms	50 H at all places of operation
6	Haul roads for Trucks and Dumpers	10 H
7	Rail haulage track in the pit	10 H
8	Roadways and foot paths from bench to bench	10 H
9	Permanent paths for use of persons employed etc.	10 H
10	In-pit Crusher/Feeder Breaker	40 H
11	Hand Picking Points	50 H
12	Conveyers	
	(a) Transfer points and drive/tail end area	40 H
	(b) Along conveyor	20 H

13	Mineral/Ore Handling Plant	
	(a) Places of crushing, screening, segregation and loading/unloading	40 H
	(b) Operation points	50 H
	(c) Other places (in general)	20 H
14	Pumping Station	40 H
15	(i) Electrical Sub-station	100 H, 50 V
	(ii) Other places of operation of electrical apparatus/equipment	20 H, 20 V
16	First Aid station	50 H
17	Rest shelter	30 H
18	Workshop	100 H, 50 V
19	Parking Yard	50 H
20	General working areas as determined by the Manager in writing	10 H at the level of surface to be illuminated

Guidelines for mine illumination

1. The mine lighting should be designed and installed with proper lamps and fixtures in regard to height, orientation, spacing and reflectors or other accessories, so as to secure a uniform distribution of light on the work area for visual comfort and avoiding objectionable shadows, sharp contrasts of intensity, glare, light clutter (excessive groupings of light) and light pollution to prevent strain on the eyes of the workmen, work fatigue and medically defined stress.
2. Portable lighting shall be provided at places, where the permanent/fixed lighting is not possible.
3. At strategic locations like electric substation, and any other places as determined by the Manager, emergency lighting arrangement by separate source shall also be provided.
4. In case of haul roads, orientation of light fittings should be kept so adjusted as to have emittance of light across the road and not along the road. Where the width of haul roads is more, the lighting arrangements shall be provided either by rows of lights erected on both sides of the road or by a centrally erected row, so as to maintain illumination as per standard.

5. Lighting arrangement at working places of heavy machineries, dump/stack yard and other loading/unloading areas shall be such that the formation of dark zone is avoided.
6. Considering high mobility of hydraulic excavators, the faces/benches worked by such machineries shall, as far as practicable, be illuminated by light source of matching mobility so as to avoid chances of lag for want of shifting.
7. Dump/stack yards shall be illuminated by suitable numbers of high mast towers/light source. It shall also be ensured that adequate light reaches up to edges of the active dump.
8. For better implementation of these standards, the manager of every mine shall formulate a detailed written "Illumination Scheme", which may include an "Illumination Plan" and duties and responsibilities of Key officials for the purpose.
9. In respect of any particular place or operation in a mine, where due to existence of some special conditions the manager is of the opinion that compliance as per stipulated minimum standard is not reasonably practicable, he may provide illumination in variance thereof, if he has indicated the modified minimum illumination to be provided for such place or operation, as the case may be, in the "Illumination Scheme" with proper justification for the same and submitted a copy thereof to the Regional Inspector.
10. Illumination Survey:
 - (i) The manager of every mine shall arrange to conduct Lighting Survey once at least in every month to ensure adequacy of illumination.
 - (ii) While making such survey, the measurement of lighting shall also be taken at the point farthest from the source of light lying within the limit of the work place or in haul road or travelling or haulage roadway, as the case may be.
 - (iii) A record of every such survey shall be maintained and signed by the competent person making the survey and countersigned and dated by the manager.
11. Illumination Plan:
 - (i) The manager of every mine shall ensure that an Illumination Plan, indicating the location of places, type of illuminating devices, fixtures, lamps, supports, any other devices for illumination and showing required as well as measured value of light at various places to be illuminated, is maintained. Where any area of the mine is not in use or not needed to be lighted, the same shall be clearly marked and demarcated on the plan with reasons to be recorded. The plan shall be kept signed and dated by the surveyor and the official authorized for maintaining the lighting standard and countersigned and dated by the manager.

- (ii) The Illumination Plan shall be brought up to date in every month based on the monthly illumination survey and considering the current status of workings.

This circular supersedes the DGMS Circular (Legis.) No. 3/1976. Action is also being taken to forward a copy of this revised standard for notification in the Gazette of India.

All Owners, Agents and Managers of metalliferous mines are advised to ensure strict compliance with this circular.


(Rahul Guha) 27.6.16
Director General of Mines Safety



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 Directorate General of Mines Safety



DGMS(S&T)(Tech.) Circular No. 12-

Dhanbad, Dated 20/07/ 2016

To

All Owners, Agents and Mangers of Coal Mines

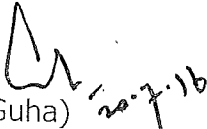
Subject: Treatment of coal dust with incombustible dust in the workings of belowground coal mines and sampling thereof.

Sir,

Detailed provisions pertaining to treatment of coal dust in the workings of belowground coal mines with fine incombustible dust and sampling of the mine dust have been made under regulations 123A and 123B respectively of the Coal Mines Regulations, 1957. However, based on the feedback received from various sources, it has come to the notice of this Directorate that the ground reality of treatment of the coal dust and sampling of dust in mine workings is not up to the mark. In most of the mines, the supply of incombustible (stone) dust is not only far less than the actual requirement, but the same is also irregular, resulting in absence of a system of regular treatment and sampling of the dust.

Needless to say, regular sampling and adequate treatment of the dust in belowground coal mines is of paramount importance as the same have got direct bearing on mitigation of explosion hazard. Recently, in a meeting of experts from ISM, CIMFR, CMPDIL and DGMS held on 04.07.2016 at DGMS Dhanbad, serious concerns have been raised on the poor status of compliance of the above provisions in Indian coal mines.

The Owners, Agents and Mangers of all belowground coal mines are, therefore, advised to give due importance to the above issue and take special care to ensure regular sampling and treatment of coal dust in the mine workings as stipulated under regulations 123A and 123B of the Coal Mines Regulations, 1957.


 (Rahul Guha) 20.7.16
 Director General of Mines Safety



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Directorate General of Mines Safety



No. DGMS(S&T)/ (Tech.) Circular No. 01 of 2017 /Dhanbad, Dated 17/05/2017

To

The Owner, Agent and Manager of all Coal Mines

Sub: Strata monitoring in longwall workings in coal mines –reg.

Effective strata control is vital for safe and productive longwall operation in any geomining condition. Effectiveness of strata control can be evaluated by a suitable strata monitoring system. During operation of a longwall panel, a thorough investigation of the associated strata and support systems is required to understand the geo-mechanical behaviour of the strata and the performance of the support systems. This enables in effective tackling of the problems arising from strata and in ensuring safety of the men and machineries.

Monitoring of strata behaviour during extraction of longwall panel is not only required for ensuring safety and stability of longwall workings but also to get essential inputs for verification of existing design parameters of the panel, proper planning of future longwall panels, assessing suitable support requirements, etc. Therefore, it is felt that a standard protocol is required for strata monitoring in longwall workings.

In view of the above, a technical workshop was conducted on "latest trends in strata control in longwall mining with a special reference to strata monitoring techniques" on 20.1.2017 at DGMS, Dhanbad, which was attended by 57 participants from different stakeholders like mining industry, research & academic institutions and DGMS. Based on the inputs drawn from the deliberations made in the workshop, the following guidelines have been formulated for strata monitoring in longwall workings:

I. Strata monitoring plan

The Owner, Agent or Manager of every mine shall formulate and implement a strata monitoring plan for every longwall panel in the mine under the guidance of a scientific agency having expertise in this field. The plan shall contain:

- i) proposed instrumentation scheme
- ii) monitoring schedules,
- iii) list of the persons engaged in implementation of the plan and their duties & responsibilities,

- iv) formats for documentation and records of the readings of strata monitoring, and
- v) Any other information related to strata monitoring.

II. The strata monitoring plan referred under Para I above, shall be prepared based on the geo-technical studies by a scientific agency having expertise in this field and every such plan, shall, inter alia, include:-

1.0 Monitoring of gate roadways

- 1.1 Roof to floor convergence of tail and main gate roadways shall be monitored on regular basis by convergence indicators, once at least in every shift up to a distance of atleast 40m from the face at an interval not exceeding 10m.
- 1.2 Load cells shall be installed in main gate and tailgate roadways up to a distance of minimum 40 m from the face at an interval not exceeding 10 m on hydraulic/friction props or with the roof bolts as the case may be. Readings of the load cells shall be recorded in every shift.
- 1.3 The convergence measurements as required under clause no. 1.1 and load cell readings as required under clause no. 1.2 above shall be taken simultaneously.
- 1.4 If roof bolts are used as roof supports in gate roadways, at least 2 to 3 instrumented roof bolts shall be installed in each gate roadway at strategic places to determine the loading pattern on the bolts.
- 1.5 Multi point extensometers/ Tell tales/Sonic probe extensometers shall be installed in main gate and tail gate roadways at an interval not exceeding 50m to monitor dilation/ bed separation in the roof strata. The instruments shall be constantly maintained in the gate roadways of the panel at least upto a distance of 400 m from the face.

2.0 Monitoring of vertical induced stresses (abutment stresses) in barrier/chain pillars and longwall pillar

- 2.1 To predict abutment stresses in longwall pillar under extraction, stress cells shall be installed in the longwall pillar ahead of the face from main gate and tail gate roadways at an interval of 100 m. The stress cells shall be constantly maintained in the longwall pillar at least upto a distance of 400m from the face. The first stress cell shall be installed at the expected main weighting position.
- 2.2 To monitor the stability of the barrier/chain pillars and predict magnitude and location of the abutment stresses in it, stress cells shall be installed in the barrier/chain pillars from main gate and tailgate roadways at an interval of 200 m up to a distance of minimum 400 m from the face. The first stress cells shall be installed at the expected main weighting position.

3.0 Monitoring of load and convergence of Powered Roof Supports (PRS)

- 3.1 Pressure in the gauges fitted in leg circuits of the Powered Roof Supports (PRS) at the face shall be recorded once at least in every shift.
- 3.2 If there is no automatic continuous monitoring system of leg closure of PRS, measurement of convergence (leg closure) of the PRS shall be carried out by tape measurements at least once in every shift during idle period and daily once in other cases.
- 3.3 If there are no automatic continuous monitoring system of leg pressure and leg closure of PRS, the load on and convergence of at least 10 PRS at strategic locations shall be continuously monitored with data loggers to understand the loading pattern on PRS and its response.

4.0 Progressive caving of strata in the goaf

To study progressive caving behaviour of roof strata in the goaf with face retreat, at least three (3) multi-point Borehole Extensometers shall be installed from the surface along the central line of the longwall panel at not more than 500 m interval. In case of presence of goaved-out workings in the overlying seams vertically above the longwall panel, the location and interval between such Extensometers may vary to the extent that may be required to avoid drilling of boreholes through such goaved-out workings.

5.0 Subsidence study

Subsidence survey and maintenance of its records shall be done as per the DGMS circular no 4 of 1988 or its revised version.

6.0 If the roof strata of a longwall panel has been categorised as cavable with substantial difficulty or cavable with extreme difficulty based on Caving Index, the following additional precautions shall also be taken in the panel;

- 6.1 Continuous monitoring of strata shall be done using micro-seismic monitoring system with geophones installed from the surface to analyse the possible time of failure and location of the failure zones within the roof strata.
- 6.2 Leg pressures and leg closures of Powered Roof Supports (PRS) shall be monitored continuously by using real time monitoring and automatic data acquisition and interpretation systems.

7.0 In the proximity of the geologically disturbed areas of a longwall panel, during development (drivage of gate roadways and set up gallery) and salvaging of longwall panels the strata monitoring shall be carried out as per the instrumentation scheme suggested by the scientific agency referred under para-I above.

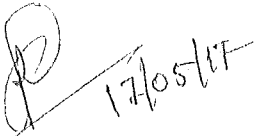
8.0 For every longwall panel, suitable trigger action response plans shall be formulated and integrated with emergency initiated protocols.

9.0 Plan: A part plan of the longwall workings depicting strata monitoring instrumentation with suitable index, shall be kept and maintained in the office of the mine.

10.0 Supervision

In every longwall panel, strata monitoring plan shall be kept under the charge of an Assistant Manager holding 1st Class Manager's Certificate of Competency with relevant experience in longwall, who shall also be assisted with adequate number of trained supervisors and manpower.

The owners, Agents and Managers of all coal mines having longwall workings are advised to ensure compliance with this circular.


(Prasanta Kumar Sarkar)
Director General of Mines Safety



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Directorate General of Mines Safety



DGMS(Tech)(MAMID)Circular No. 02-of 2017

Dhanbad : 15/06/2017

To

All Owner, Agent & Managers of Coal Mines.

Sir,

Subject : LOCK OUT & TAG OUT – Energy shut down procedures

In coal mines, about 3% of accidents were caused due to Electricity. Majority of these accidents were caused by unexpected energization or startup of machines / equipment or by uncontrolled release of energy. The electrical accidents can be prevented by proper Lock out / Tag out procedures. The philosophy of LOCK OUT/ TAG OUT – Energy shut down Procedures is as such, not new in our country and being followed in oil field installations of CAIRN INDIA and in cement industry (including mines) of reputed organizations.

Electrical Safety is observed in mines (as well as in other Industries) as per laid down Practices of Indian Standards / NEC and Provisions of Legislation of Indian Electricity Act, 2003 and Regulations of Central Electricity Authority Regulations, 2010. As such, the provisions made there under are adequately covering the requirements of safe work practices and thereby to eliminate risks associated in unsafe working methods on use of Electricity. However, when it comes to underground mines, the prescribed work permit procedure as per BIS: 5216 is not sufficiently followed for varied reasons. This is more so in the case of coal underground mines where the workforce at lower levels, generally, prefers simple methods of working and goes away. For lack of working discipline, adequate monitoring and control, people tend to go in short cut methods and invite risks.

The Lock out and Tag out energy shutdown procedures could well be an answer, in case of our underground mines, bringing some changes to suit our conditions of working and without compromising on the philosophy of work permit procedures laid down by BIS under standard: 5216.

Philosophy: To perform a service and maintenance work on industrial equipment safely, you must understand the importance of energy control. A LOCKOUT is a method of preventing mishaps by keeping equipment from being accidentally started or switched ON. This method can be used for disconnecting switches, circuit breakers, valves or

other isolation mechanisms and to put them in safe / off position. It is physically an attachment of lock so that the equipment cannot be energized. In a TAGOUT, the energy isolating device is placed in safe position and a written warning is attached to it.

LOCKOUT means to physically neutralize all energies in a piece of equipment before beginning any maintenance or repair work. Lock out involves stopping all energy flows by turning off switches on supply lines. It also involves locking physically the switches and securing the machine, device or supply lines in a de-energised state.

TAGOUT means placing a warning tag or sign (TAGOUT device) on an energy isolating device, warning not to operate the machinery until the TAGOUT device is removed. The purpose is to alert other employees about the status of a machine or a system, why it has been taken out of service and identity of the individual who has applied the LOCKOUT.

Principles of practices:

These LOCKOUT and TAGOUT materials are to be supplied by the employer to their employees and the employer brings out a policy of answerability, accountability for all their acts / decisions taken during production, maintenance, servicing installation, dissembling of machines etc., which are generally, the areas where accidents take place in a work place.

- This Energy isolation and LOCKOUT / TAGOUT are to be carried out by trained employees who are also authorised to perform service or maintenance.
- Before applying LOCKOUT / TAGOUT, all employees who work in the affected area must be notified.
- The control of hazardous energy or sources is to be done according to a six step procedure.

Ground for shutdown: Before any equipment is turned off in order to lock or tag it out, It is required to know the types and amounts of energy that power it, the hazards of that energy and how that energy can be controlled.

Equipment shutdown: The OEM's recommended procedures by using operating controls shall be followed to shut the system down for the equipment so that no one is endangered during shutdown.

Equipment isolation:

- (i) All energy isolating devices shall be installed so that the equipment is isolated from its energy sources.
- (ii) All primary and secondary power supplies shall be isolated as well so as to avoid any back feeding of source of supply into the equipment under service / maintenance of job. No short cut methods are to be employed by just removing fuses and it shall be ensured a total disconnection of source of energy of power.

Lockout / Tagout: All energy isolating devices are to be locked, tagged or both according to recommended and framed safety LOCKOUT / TAGOUT procedures put in place as a policy. Only standardized devices supplied by the employer shall be used and they are not be used for anything else. If lock cannot be placed directly on the energy control, lockout devices can be used. When lockout is used, every other employee can also lockout a single energy isolating device by using multiple locks. For big jobs, lockout box can be used to maintain control over large number of padlocks and keys. The tags are to be used along with the locks by attaching them at same points as locks are placed or as close to it as possible. The Tags are to be filled completely and correctly.

How to control stored energy: The following steps are necessary to guard against stored energy left in the equipment after it has been isolated from its energy sources.

- (i) Inspect the system to make sure all parts have stopped.
- (ii) Install ground wires i.e. discharge rod connecting to earth.
- (iii) In case of other sources as applicable, relieve trapped pressure, release tension on the springs or block the movement of spring driven parts, block or brace the parts that could fall because of gravity.

Equipment isolation verification

- (i) The work areas where there is likelihood of causing danger should be free of personnel.
- (ii) Verify that the main disconnecting switch cannot be moved to ON position.
- (iii) Use a testing meter to check the switch that source of power is fully isolated.
- (iv) Press all ON buttons and other activating controls on equipment itself to verify that the source is isolated.
- (v) Shut off all machine controls when the testing is finished.

A clear well defined policy supported by administrative and control procedures and proper training is essential for lockouts to be effective. A systematic approach would be drawn to develop a lockout policy.

- ✓ The policy is required to identify lockout situations, to develop procedures, to train workers and to enforce as per the prescribed recommendations.
- ✓ The written lockout policy should make reference to Employer's general safety policy and reference to applicable statutes / laws. It should clearly outline responsibilities and refer to procedures to be followed. The policy should state employer's intent and commitment to protect the safety of personnel and equipment.
- ✓ The policy should identify all activities, machines, equipment and processes where lockout is required.
- ✓ Appropriate persons shall be made responsible for lockouts and to be ensured lockout are performed by authorised persons only.
- ✓ Procedures are to be framed for each lockout situation and training of those who perform lockouts is an important aspect of policy.

- ✓ The policy thus framed is required to be reviewed and updated as per the changing situations.

How to identify lockout situation:

- It is required to assess all processes, work activities and machinery and, where and when lockouts are needed to be identified.
- Maintenance work will be a major area where lockout needs are more. The Information may be through work place inspections, recommendations through ISO and Inspections by statutory authorities.
- Every machine, device or process that will require a lockout is to be listed. More than one lockout may be required for a single machine or system.

LOTO procedures

- ❖ Procedure should be in writing and communicated to all employees and departments concerned.
- ❖ They should include the Supervisors in the work areas.
- ❖ All lockouts are to be authorised by work permit.
- ❖ Lockout shall stay, if work is not completed at the end of the shift.
- ❖ Completed work is to be reported to the person in-charge for signing off the work permit.
- ❖ The procedures should identify person responsible for performing lockout, person responsible for ensuring the lockout properly, energy sources to be controlled in the lockout, location of control panels, power sources, special hazards, personnel protective equipment, step by step lockout procedure, testing procedure etc., to ensure that all energies are controlled safely.
- ❖ Step by step procedure for removing the lockout etc.,

Lockout material including key operated Locks, locking devices shall be sturdy for issuing to workers who service or maintain equipment. An identification tag must be securely attached to the lock. Each worker will be issued only one key. It is important that for their personal protection, each worker and /or for person working in or on a machine places his / her safety lock on the disconnecting switch. It is ensured that tags are used to spotlight the work in progress, giving details of work being done. Only when the work is completed and the work permit is signed off, each worker is allowed to remove his or her lock. The last lock to be removed should be that of a person supervising the lock out. This lockout should be the removed by the person in charge and this responsibility should not be delegated.

Requirements of Training

All workers performing lockouts and their supervisors must receive training. The training should address importance of lockouts, legal requirements of lockouts, safety and employer's policy, energy forms, hazards and procedures on administrative and work related that must be followed.

The importance of procedures, lockout errors such as the equipment is inoperable or too small to warrant a lockout etc., shall be brought out in methodology of training. The use and care of personal protective equipment, proper use of tools etc., shall be addressed in the training. In the training sessions, mock lockouts shall be conducted and tested, and refresher classes shall be provided periodically.

Enforcement and updating lockout policy

The Enforcement of policy will be effective, if persons responsible are identified and accountable for lapses. The best way is to include in their job descriptions. The policy should also put emphasis on individuals' achievements for duly rewarding them where it resulted in productivity with high safety standards.

It is also required to review lockout procedures periodically and revise them in light of any problems that may have been identified. When change in a process or equipment, Lockout requirements also change and require Review and revision.

Yours faithfully,


15/06/17

(P.K. Sarkar)

Director General of Mines Safety



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Directorate General of Mines Safety



DGMS(Tech)(MAMID)Circular No. 03 of 2017

Dhanbad : 15/06/2017

To

All Owner, Agent & Managers of Coal Mines

Subject : Occurrence of accidents – Alert thereof.

Sir,

Sharing of information about accidents/incidents and injuries is one of the effective strategies to bring awareness about the cause of accidents/incidents in order to sensitized all concerned so that remedial measures can be taken to prevent recurrence of similar type of accidents/incidents. A menu "Alert/Hazard" has been provided in DGMS website www.dgmd.gov.in where alerts regarding accidents/incident are uploaded.

You are requested to view the website regularly so as to get latest information of accident occurring in mines with a view to take necessary measures to eliminate/reduce such risk(s) in your mine(s).

Proactive action(s), taken at your end, shall go a long way in reducing the recurrence of similar type of accidents/incidents in future.

Yours faithfully,


(P.K. Sarkar)

Director General of Mines Safety

15.06.17



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Directorate General of Mines Safety



DGMS(Tech)(MAMID)Circular No. 04 of 2017

Dhanbad : 16 / 06 / 2017

To

All Owner, Agent & Managers of Coal Mines

Subject : Providing Environmental Monitoring System in belowground coal mines.

Sir,

Of late there were incidences of fires in sealed off areas of underground coal mines which remained unnoticed till general body of air outside the area became contaminated with Methane, Carbon Monoxide, Hydrogen and other Hydrocarbons. In one such case the situation demanded withdrawal of persons from belowground workings and fighting of fire from surface by injecting/pouring Carbon Dioxide through boreholes, keeping main mechanical ventilator running at 25% of its normal water gauge. It was also inferred from the analysis of the air samples from the environment inside the sealed off area that series of explosions had taken place resulting increase of Hydrogen during distillation of coal. It is pertinent to note that any such hazardous situation could have caused disaster in the mine in case of firedamp or coal dust explosion, resulting huge loss of lives & properties.

In this regard your attention is drawn to the Recommendation of 7th National Conference on Safety in Mines wherein it was suggested to provide necessary facilities for continuous type monitoring of the environmental parameters in respect of combustible and toxic gases in belowground coal mine workings in gassy seam of third degree and other coal mines having active underground fire. Noticing increasing trend of incidences of fire in coal mines; 8th, 9th, 10th & 11th Conference on Safety in Mines carried forward the said Recommendation.

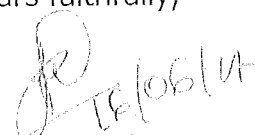
This Directorate, through DGMS (Tech) Circular No. 08 of 2012 dated 23.03.2012, expressed concern for not abiding by the above-mentioned recommendation.

While taking stock of the situation as regard to installation of Environmental Monitoring System in gassy seam of third degree and fiery coal seams, after a series of fire in coal mines, it was noted that progress made toward the recommendation was minimal. It was further revealed that had such continuous monitoring system been installed in

degree three coal seams/fiery coal seams, detection of fire in early stage could have been possible and preventive action could have been taken.

Therefore, all concerned are requested to initiate procurement of approved Environmental Monitoring System immediately for all belowground coal mine workings in third degree gassy seams & fiery coal seams.

Yours faithfully,


(P.K. Sarkar)

Director General of Mines Safety



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No. DGMS(S&T)/ (Approval) Circular No. ०१ of 2017 /Dhanbad, Dated 10/03/2017

To
The Owner, Agent and Manager of all Coal Mines

Subject: Approval of dust suppression/prevention devices fitted in drilling and boring equipment used in coal mines under regulation 123(6)(b)(ii) of Coal Mines Regulations' 1957.

At present, dust suppression/prevention devices, other than jet of water directed on the cutting edge to wet the cuttings, fitted in drilling and boring equipment for drilling or boring in stone on surface or belowground in coal mines are required to be approved by Chief Inspector of Mines under regulation 123(6)(b)(ii) of Coal Mines Regulations' 1957. A Gazette Notification was also issued in this regard vide GSR 24, published in the Gazette of India Part II Section 3(i) on 8 February 2014.

Based on the above notification, this Directorate has been approving such devices for use in coal mines by issue of special orders on case to case basis. Now, in order to bring further simplification in its approval, it has been decided that the subject matter may be brought under the domain of general approval. In view of this, a meeting was held on 04.7.2016 at DGMS (HQ), Dhanbad, for technical deliberations on the subject, in which experts from CIMFR, ISM, CMPDI and DGMS participated. After detailed deliberations, a draft standard for manufacturing, testing and use of dust suppression/prevention devices fitted in drilling and boring equipment used in coal mines was finalized, which was further discussed in the meetings of approval Committee of DGMS. Based on the above inputs, the standards and parameters for manufacturing, testing and use of such dust suppression/prevention devices are prescribed below:

1.0 General requirements

- 1.1 The dust suppression/prevention device or any part thereof fitted with drilling and boring equipment used in belowground coal mine shall not be made of alloy and metals likely to give incensive frictional sparks as required under Circular No. DGMS Tech. Circular no. 08 of 1974 or its revised version.
- 1.2 The flame proof and intrinsically safe features of electrical items of the dust suppression/prevention device to be used in belowground coal mines shall also conform to the standards specified in Circular No. DGMS Tech. Circular (Electrical), (Approval) no. 23 dated, 21.12.2015 or its revised version.

- 1.3 (a). The device shall be capable of suppressing/preventing the liberation or release of airborne dust while drilling or boring to such extent as to keep the concentration of respirable dust in the mine atmosphere within the permissible limit prescribed under regulation 123(2) of Coal Mines Regulations' 1957 or as amended from time to time.
- (b). To ensure compliance of clause 1.3(a), amongst others, the dust survey shall be conducted with approved type of dust samplers as specified in regulation 123(2) of Coal Mines Regulations' 1957 or as amended from time to time. During such survey, the dust concentration shall be measured at the exit point of exhaust air of the dust suppression device, at the nearest point of drilling or boring where persons are required to be present and also at operator's normal working position (nose position), while the drilling or boring machine is in operation. The result of every such survey shall be recorded, signed and dated by the official carrying out the survey and the same shall be countersigned by the Manager.
- (c). When result of the dust survey is found in excess of the permissible limit of dust concentration as stipulated under clause 1.3(a), the normal operation of the drilling or boring equipment shall be ceased and it shall not be resumed until the defect therein has been rectified and the requirements of Para 1.3(a) above has been found complied by conducting a dust survey in the manner specified under para 1.3(b) above. Every such incident shall be recorded in a book kept for the purpose and signed and dated by the official carrying out the survey and the same shall be countersigned by the Manager.
- (d) Frequency of the dust survey: The dust survey shall be carried out in respect of every such drilling or boring equipment at the time of its first installation and thereafter at an interval of not exceeding one month as specified in clause 1.3.(b).

2.0 **Testing of the dust suppression/prevention devices**

Prototype Tests: At least one proto type sample of the device shall be subjected to tests by a test house prescribed under the para 6.0 of Approval policy, 2015(II Revision) of DGMS or its revised version, subject to the compliance of clause 1.3(a) of this general approval.

3.0 **Marking**

The following details shall be conspicuously marked on the body of the dust suppression / prevention device:

- Name of the manufacturer or registered trade mark;
- Date of its manufacturing and model;
- Additional marking required by the applicable industrial safety standards.

4.0 Manufacturer's Responsibilities

4.1 The manufacturer shall -

- i. furnish all the relevant information in respect of specifications and certified copy of test reports or any other information pertinent to their product(s) to the user(s), along with each consignment;
 - ii. supply the certified drawing and specifications of the dust suppression/prevention device, which shall not be at variance with the prototype sample as mentioned in Para 2.0, to the user(s); and
 - iii. arrange to provide an instruction manual on the storage, maintenance, handling, installation and use of the dust suppression/prevention device to the user(s) along with each consignment.
- 4.2 The manufacturer shall supply to the user a copy of such valid certificates and test report(s) mentioned in the aforesaid Paras and also a compliance report against conditions mentioned in para No. 1.1 and 1.2 to facilitate use of the dust suppression/prevention devices with drilling or boring machines in the mine.

5.0 Responsibilities of Owner, Agent and Manager (User)

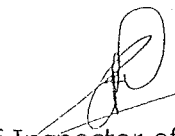
- 5.1 Before using the dust suppression/prevention device in drilling or boring machines in the mines, the user shall ensure that the device conforms to the above mentioned standards.
- 5.2 The user shall ensure that the manufacturer possesses adequate facilities for manufacturing and testing of the dust suppression/prevention devices.
- 5.3 The users shall obtain copies of all valid certificate(s) and test report(s) from the manufacturer while purchasing and before using the dust suppression/prevention device in drilling or boring machines in the mine.
- 5.4 The performance tests required under clause (a), (b), (c) and (d) of para 1.3 shall be the responsibility of the user.
- 5.5 The user shall ensure that the storage, maintenance, handling, installation and use of the dust suppression / prevention device are done as per the Manual / Operating instructions of the device.

6.0 Miscellaneous

- 6.1 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the manufacturing facilities of the dust suppression/prevention devices at any time and get samples tested during the course of inspection or send such samples for testing at any prescribed test houses/laboratories at the cost of the manufacturer.

- 6.2 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the dust suppression/prevention devices fitted in drilling or boring machines at any time in the mine and get samples tested during the course of inspection or send such samples for testing at any prescribed test houses/laboratories at the cost of Owner, Agent or Manager of the mine.
- 6.3 All users and the manufacturers shall be required to comply with this standard and any deviation or defects found in the product supplied or used in the mine, shall be brought to the notice of this Directorate.
- 6.4 The manufacturers, and the test houses, who are engaged for testing of such dust suppression/prevention devices, and the users shall adhere to the above mentioned standards and parameters while testing, before supplying and using the dust suppression/prevention devices fitted in drilling or boring machines in the mine.
- 7.0 The dust suppression/prevention devices fitted in drilling and boring equipment, with the standards, parameters and testing as mentioned above in this circular, shall be considered as approved by the Chief Inspector of Mines under regulation 123(6) (b) (ii) of the Coal Mines Regulations, 1957.

The dust suppression/prevention device having valid special approval by DGMS shall also be considered at par with those devices approved under this general approval for use in coal mines.


10/03/17
Chief Inspector of Mines





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Directorate General of Mines Safety



No. DGMS(S&T)/ (Approval) Circular No. 02 of 2017 Dhanbad, Dated 10/03/2017

To

The Owner, Agent and Manager of all Metalliferous Mines

Subject: Approval of dust suppression/prevention devices fitted in drilling and boring equipment used in metalliferous mines under regulation 124(6)(b)(ii) of Metalliferous Mines Regulations' 1961.

At present, the dust suppression/prevention devices, other than a jet of water directed on the cutting edge to wet the cuttings, fitted in drilling and boring equipment for drilling or boring on surface or belowground in metalliferous mines are required to be approved by Chief Inspector of Mines under regulation 124(6)(b)(ii) of Metalliferous Mines Regulations' 1961. A Gazette Notification was also issued in this regard vide GSR 25, published in the Gazette of India Part II Section 3(i) on 8 February 2014.

Based on the above notification, this Directorate has been approving such devices for use in metalliferous mines by issue of special orders on case to case basis. Now, in order to bring further simplification in its approval, it has been decided that the subject matter may be brought under the domain of general approval. In view of this, a meeting was held on 04.7.2016 at DGMS (HQ), Dhanbad, for technical deliberations on the subject, in which experts from CIMFR, ISM, CMPDI and DGMS participated. After detailed deliberations, a draft standard for manufacturing, testing and use of dust suppression/prevention devices fitted in drilling and boring equipment used in metalliferous mines was finalized, which was further discussed in the meetings of approval Committee of DGMS. Based on the above inputs, the standards and parameters for manufacturing, testing and use of such dust suppression/prevention devices are prescribed below:

1.0 General requirements

- 1.1 (a) The device shall be capable of suppressing/preventing the liberation or release of airborne dust while drilling or boring to such extent as to keep the concentration of respirable dust in the mine atmosphere within the permissible limit prescribed under regulation 124(2) of Metalliferous Mines Regulations' 1961 or as amended from time to time.
- (b) To ensure compliance of clause 1.1(a), amongst others, the dust survey shall be conducted with approved type of dust samplers as specified in regulation 124(2) of Metalliferous Mines Regulations' 1961 or as amended from time to time. During such survey, the dust concentration shall be measured at the exit point of exhaust air of the dust suppression device, at the nearest point of drilling or boring where persons are required to be present and also at operator's normal working position (nose position), while the drilling or boring machine is in operation. The result of every such survey shall be recorded, signed and dated by the official carrying out the survey and the same shall be countersigned by the Manager.

- (c) When result of the dust survey is found in excess of the permissible limit of dust concentration as stipulated under clause 1.1(a), the normal operation of the drilling or boring equipment shall be ceased and it shall not be resumed until the defect therein has been rectified and the requirements of Para 1.1(a) above has been found complied by conducting a dust survey in the manner specified under para 1.1(b) above. Every such incident shall be recorded in a book kept for the purpose and signed and dated by the official carrying out the survey and the same shall be countersigned by the Manager.
- (d) Frequency of the dust survey: The dust survey shall be carried out in respect of every such drilling or boring equipment at the time of its first installation and thereafter at an interval of not exceeding one month as specified in clause 1.1(b).

2.0 Testing of the dust suppression/prevention devices

Prototype Tests: At least one proto type sample of the device shall be subjected to tests by a test house prescribed under para 6.0 of Approval policy, 2015 (II Revision) of DGMS or its revised version, subject to the compliance of clause 1.1(a) of this general approval.

3.0 Marking

The following details shall be conspicuously marked on the body of the dust suppression / prevention device:

- Name of the manufacturer or registered trade mark;
- Date of its manufacturing and model
- Additional marking required by the applicable industrial safety standards.

4.0 Manufacturer's Responsibilities

4.1 The manufacturer shall -

- i. furnish all the relevant information in respect of specifications and certified copy of test reports or any other information pertinent to their product(s) to the user(s), along with each consignment;
- ii. supply the certified drawing and specifications of the dust suppression/prevention device, which shall not be at variance with the prototype sample as mentioned in Para 2.0, to the user(s); and
- iii. arrange to provide an instruction manual on the storage, maintenance, handling, installation and use of the dust suppression/prevention device to the user(s) along with each consignment.

4.2 The manufacturer shall supply to the user a copy of such valid certificates and test report(s) mentioned in the aforesaid Paras to facilitate use of the dust suppression/prevention devices with drilling or boring machines in the mine.

5.0 Responsibilities of Owner, Agent and Manager (User)

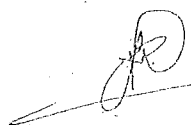
5.1 Before using the dust suppression/prevention device in drilling or boring machines in the mines, the user shall ensure that the device conforms to the above mentioned standards.

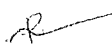
- 5.2 The user shall ensure that the manufacturer possesses adequate facilities for manufacturing and testing of the dust suppression/prevention devices.
- 5.3 The users shall obtain copies of all valid certificate(s) and test report(s) from the manufacturer while purchasing and before using the dust suppression/prevention device in drilling or boring machines in the mine.
- 5.4 The performance tests required under clause (a), (b), (c) and (d) of para 1.1 shall be the responsibility of the user.
- 5.5 The user shall ensure that the storage, maintenance, handling, installation and use of the dust suppression / prevention device are done as per the Manual / Operating instructions of the device.

6.0 **Miscellaneous**

- 6.1 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the manufacturing facilities of the dust suppression/prevention devices at any time and get samples tested during the course of inspection or send such samples for testing at any prescribed test houses/laboratories at the cost of the manufacturer.
- 6.2 The Chief Inspector of Mines or an Inspector of Mines may inspect, check and examine the dust suppression/prevention devices fitted in drilling or boring machines at any time in the mine and get samples tested during the course of inspection or send such samples for testing at any prescribed test houses/laboratories at the cost of Owner, Agent or Manager of the mine.
- 6.3 All users and the manufacturers shall be required to comply with this standard and any deviation or defects found in the product supplied or used in the mine, shall be brought to the notice of this Directorate.
- 6.4 The manufacturers, and the test houses, who are engaged for testing of such dust suppression/prevention devices, and the users shall adhere to the above mentioned standards and parameters while testing, before supplying and using the dust suppression/prevention devices fitted in drilling or boring machines in the mine.
- 7.0 The dust suppression/prevention devices fitted in drilling and boring equipment, with the standards, parameters and testing as mentioned above in this circular, shall be considered as approved by the Chief Inspector of Mines under regulation 124(6) (b) (ii) of the Metalliferous Mines Regulations, 1961.

The dust suppression/prevention device having valid special approval by 'DGMS' shall also be considered at par with those devices approved under this general approval for use in metalliferous mines.


10/03/12
Chief Inspector of Mines





भारत सरकार
Government of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate General of Mines Safety



DGMS Circular (Legislative) No. 04

/Dhanbad, dated 27th, April, 2017

To

All Owners /Agents/ Managers of Mines

Subject: Amendment in the Mines Rules, 1955 vis-à-vis promulgation of "Ease of compliance to maintain registers under various Labour Laws Rules, 2017."

1.0 Government of India has taken several initiatives including legislative and procedural reforms to reduce the complexity of compliance of labour laws and make them user friendly. While reviewing the requirement of maintaining various Registers/Forms provided under various labour laws, it was observed that under 9 (nine) Central Acts, including the Mines Act 1952, governing employment of labour in mines, factories and establishments required 56 different Registers/Forms to be maintained. These Registers/Forms had multiplicity in entries which were overlapping in nature. Many of the fields in some Forms and Registers were, as on date, redundant too.

An exercise was undertaken in the Ministry of Labour and Employment, Government of India, to do away with maintenance of multiple Forms and Registers and bring about commonality in the data/fields of such Registers/Forms, and reduce the number of Registers & Forms required to be maintained under various Central Acts, so as to promote ease of compliance of various labour laws and also reduce the cost of maintenance of such Registers/Forms.

In this regard, the Ministry of Labour and Employment, Govt. of India has notified **"Ease of compliance to maintain registers under various Labour Laws Rules, 2017"** on 21st February, 2017 which has in effect replaced 56 Registers/Forms by 5 Registers/Forms that shall now be required to be maintained under the new Rules.

These Rules are available on the website of the Ministry of Labour and Employment at the Link <http://labour.gov.in/whatsnew/ease-compliance-maintain-registers-under-various-labour-laws-rules-2017>.

2.0 After coming into force of these new Rules, only five Registers/Forms are required to be maintained under the Mines Rules, 1955. The salient points of amendments made in the Mines Rules, 1955, are briefly given hereunder:

- (i) The registers required to be maintained in Form B, Form C, Form D, Form E, Form F, Form G, Form H and Form I have been omitted.

- (ii) The Registers/Forms now required to be maintained (in lieu of the above-mentioned Registers/Forms) under the Mines Rules, 1955, shall now be maintained in the Forms specified in the schedule to the "Ease of compliance to maintain Registers under various Labour Laws Rules, 2017" which is summarized below:

Sl. No.	Forms earlier required to be maintained under Mines Rules, 1955	Corresponding new Forms under the "Ease of compliance to maintain registers for various Labour Laws Rules, 2017"
1	Form B	Form A
2	Form C, D & E	Form D
3	Form F	Form E
4	Form G & H	Form E
5	Form I	Form B

The Registers/Forms can be maintained either in electronic form or otherwise and shall be provided to the concerned Inspector when required.

If any Register is maintained in electronic form, then, layout and presentation of such register may be adjusted without changing the integrity, serial number and contents of the columns of the register, but not otherwise.

In this regard your attention is drawn to sub-rule (2) & (3) of Rule-2.

All concerned are requested to take necessary action to comply with the provisions of "Ease of compliance to maintain registers under various Labour Laws Rules, 2017".


Director General of Mines Safety



भारत सरकार
Government of India
श्रम एवं रोजगार मंत्रालय
Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय
Directorate-General of Mines Safety



संदर्भ. डी.जी.एम.एस.(विधि) सं. ०१

धनबाद, दिनांक 27th April/2017

सेवा में,

सभी खानों के मालिक/ सभी खानों के अभिकर्ता/ सभी खानों के प्रबंधक।

विषय:- "विविध श्रम कानून नियम, 2017 के अधीन पंजिकाओं का रख-रखाव करने का अनुपालन की सुविधा" का प्रख्यापन के तुलना में खान अधिनियम 1955 में संशोधन।

1.0 भारत सरकार ने अनेक पहल की है जिसमें श्रम कानूनों के अनुपालन की जटिलता में कमी लाने हेतु वैधानिक एवं प्रक्रियात्मक सुधार करना एवं श्रम कानूनों को अधिक सहज बनाना शामिल है। विविध श्रम कानूनों के तहत विविध पंजीकाओं/ प्रपत्रों का रख-रखाव करने की आवश्यकता की समीक्षा करने के दौरान यह पाया गया कि नौ (9) केन्द्रीय अधिनियमों, जिसमें खान अधिनियम, 1952 भी शामिल है, तथा जिनके द्वारा खानों, कारखानों तथा स्थापनाओं में श्रम नियोजन को प्रशासित किया जाता है, के लिए भी 56 विविध पंजिकाओं/ प्रपत्रों का रख-रखाव किया जाना अपेक्षित था। इन पंजिकाओं/ प्रपत्रों की प्रविष्टियों में विविधताएँ होने के कारण एक दूसरे पर व्यापित प्रकृति के थे। कुछ प्रपत्रों/ पंजिकाओं के अधिकांश भाग अद्यतन तिथि में निरर्थक थे।

श्रम एवं रोजगार मंत्रालय भारत सरकार द्वारा विविध प्रपत्रों एवं पंजिकाओं के रख-रखाव में सुधार कर डाटा/ प्रपत्रों एवं पंजिकाओं के क्षेत्रों में एकरूपता बनाये रखने तथा विविध केन्द्रीय अधिनियम के तहत श्रम कानूनों के अनुपालन को सरल एवं पंजिकाओं/ प्रपत्रों के रख-रखाव के लागत को कम करने के लिए प्रयास किया गया है।

इस संबंध में श्रम एवं रोजगार मंत्रालय भारत सरकार ने दिनांक 21.02.2017 को "विविध श्रम कानूनों 2017 के तहत पंजिकाओं का रख-रखाव करने हेतु अनुपालन में सहूलियत" को अधिसूचित किया है, जिसमें प्रभावित 5 पंजिकाओं प्रपत्रों द्वारा 56 पंजिकाओं/ प्रपत्रों द्वारा प्रतिस्थापित किये जाने की जरूरत है।

ये नियमों श्रम एवं रोजगार मंत्रालय के बेवसाइट लिंक [http:// labour.Gov.in/whatsnew/ease-Comliance-maintain-registers-under-various-labour-laws-rules-2017](http://labour.Gov.in/whatsnew/ease-Comliance-maintain-registers-under-various-labour-laws-rules-2017) पर उपलब्ध है।

2.0 इन नये नियमों का प्रभाव में आने के उपरान्त केवल पाँच पंजिकाये/ प्रपत्र को ही खान नियम, 1955 के तहत रख-रखाव किये जाने की आवश्यकता है। खान नियम 1955 में किये गये संशोधनों की मुख्य बिंदुएं संक्षिप्त रूप से नीचे दिये गये हैं:-

- (i) प्रपत्र B, C, D, E, F, G, H तथा I में रख-रखाव किये जाने वाले पंजिकाओं को हटा दिया गया है।
- (ii) खान नियम, 1955 के तहत रख-रखाव किये जाने वाले पंजिकाओं/ प्रपत्रों (उपरोक्त वार्षिक पंजिकाओं/प्रपत्रों के एवम में) को अब विविध श्रम कानून नियम, 2017 के तहत पंजिकाओं का रख-रखाव में अनुपालन का सुविधा अनुसूची में विनिर्दिष्ट प्रपत्र में रख-रखाव किया जायेगा जिसका संक्षिप्त विवरण निम्नवत है:-

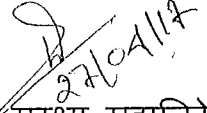
क्रमांक	खान नियम 1955 के तहत रख-रखाव किये जानेवाले पूर्व के प्रपत्र	विविध श्रम कानून नियम, 2017 के तहत पंजिकाओं का रख-रखाव में अनुपालन की सुविधा
1	प्रपत्र B	प्रपत्र A
2	प्रपत्र C, D, तथा E	प्रपत्र D
3	प्रपत्र F	प्रपत्र E
4	प्रपत्र G तथा H	प्रपत्र E
5	प्रपत्र I	प्रपत्र B

पंजिकाओं/ प्रपत्रों का रख-रखाव इलेक्ट्रॉनिक प्रपत्र या अन्य तरीके से किया जा सकता है, तथा यथापेक्षित संबंधित निरीक्षक को सौंपा जायेगा।

यदि किसी पंजिका का रख-रखाव इलेक्ट्रॉनिक प्रपत्र में किया जा रहा है तो ऐसे पंजिका का विन्यास तथा प्रस्तुती करण को उसकी अखंडता क्रम पंजिका के कॉलम में दिये गये विवरण को बिना बदले समायोजित किया जा सकता है, किन्तु अन्य तरीके से नहीं।

इस संबंध में आपका ध्यान नियम-2 के उपनियम (2) एवं (3) की ओर आकृष्ट किया जाता है।

सभी संबंधित व्यक्तियों से अनुरोध किया जाता है कि वे "विविध श्रम कानून नियम 2017 के तहत पंजिकाओं का रख-रखाव का अनुपालन में सुविधा" के प्रावधानों का अनुपालन करने संबंधित आवश्यक कार्रवाई करें।


 27/04/18
 खान सुरक्षा महानिदेशक

स्वच्छ भारत, स्वस्थ भारत की ओर अग्रसर



एक कदम स्वच्छता की ओर



DGMS- 1902 से खनिकों की रक्षा

