



भारत सरकार/Govt. of India  
श्रम एवं रोजगार मंत्रालय  
Ministry of Labour & Employment  
खान सुरक्षा महानिदेशालय  
Directorate General of Mines Safety



No. DGMS Circular (Tech.) No. 01

/Dhanbad, dated 21<sup>st</sup> Jan, 2016

To

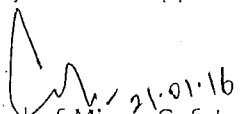
**All Owners/Agents/ Managers of Coal and Metalliferous Mines, Superintendents of mines rescue stations and Incharges of mines rescue rooms.**

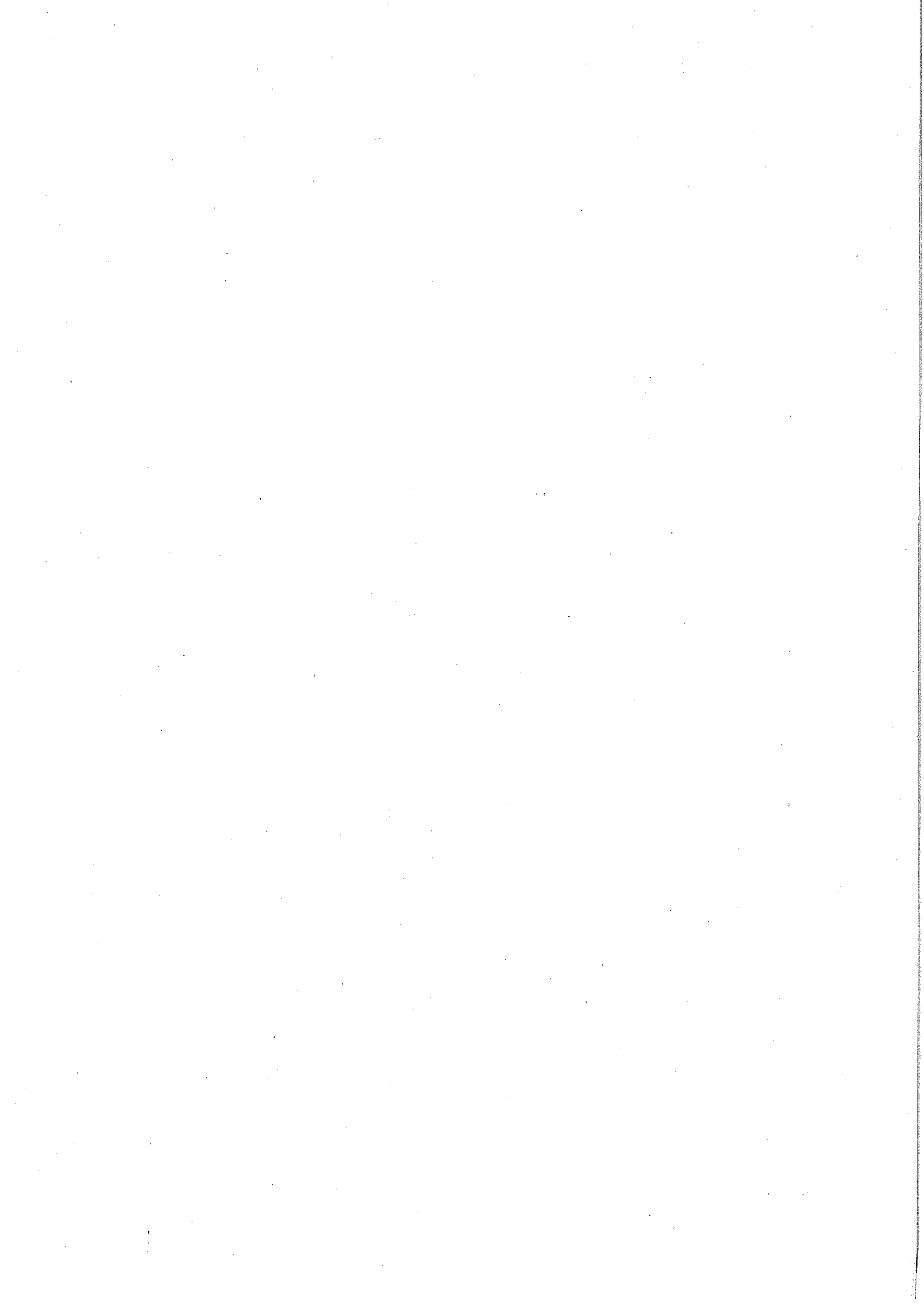
**Subject: Permission under Rule 37 and Rule 11(4) of Mines Rescue Rules, 1985 to maintain breathing apparatus of different type and make in rescue stations and rescue rooms.**

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

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No. DGMS Circular (Tech.) No. 02

/Dhanbad, dated 21<sup>st</sup> Jan, 2016

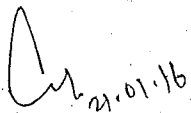
**All Owners/Agents/Managers of belowground coal and metal mines and Superintendents of rescue stations.**

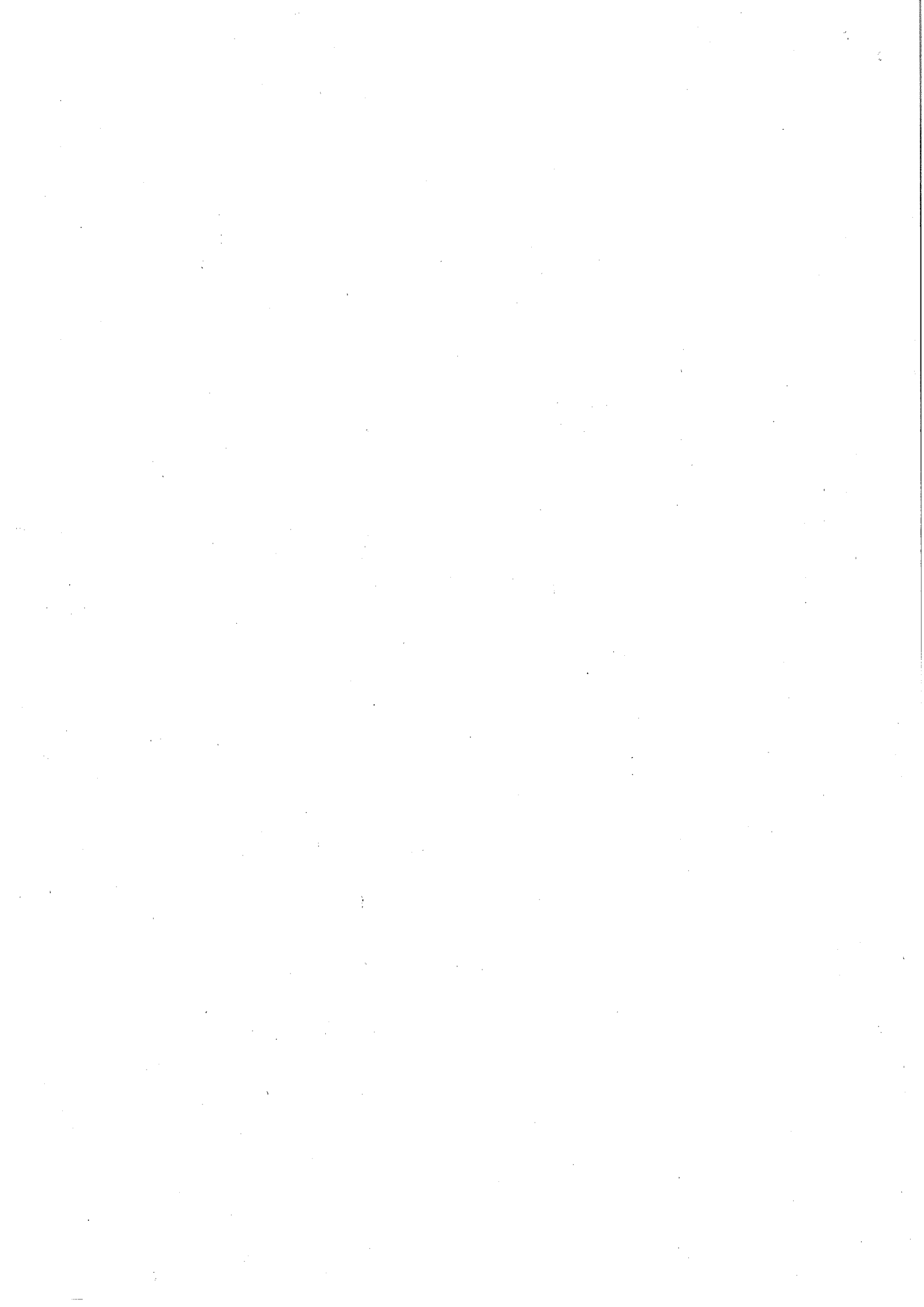
**Subject: Periodic testing of breathing apparatus, reviving apparatus etc. maintained at rescue stations and rescue rooms.**

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 <sub>2</sub> 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 applicable 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	(12) *By Pass Valve Test/ Manual Booster Valve Test	(14) Pressure in O <sub>2</sub> Cylinder (Bar) and Identification No. of the Mother Cylinder from which it is filled	(15) Date of filling of CO <sub>2</sub> 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.

*[Signature]*  
21/01/2016



**Certificate of Fitness to be issued on or before 7<sup>th</sup> day of every month**

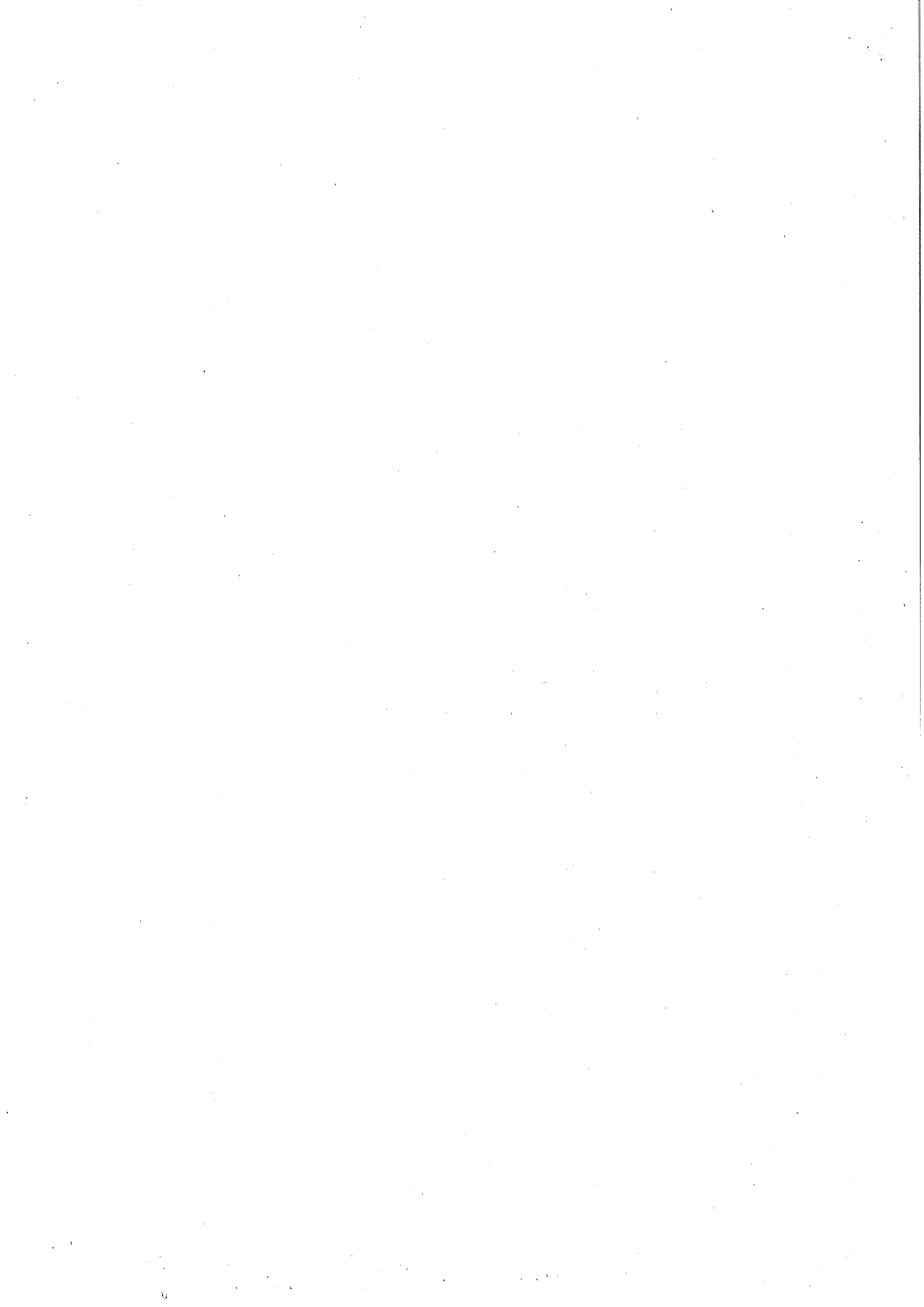
This is to certify the following equipment in the mines rescue stations/ rescue rooms and rescue rooms (whichever is applicable) as per Schedule I, II or III respectively of the Mines Rescue Rules, 1985 are maintained in perfect working order as per the tests conducted in accordance with criteria and 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 \_\_\_\_\_

gk  
21.01.2016







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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 :

- (a) 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.
- (b) 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.
- (c) 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



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Ministry of Labour & Employment  
खान सुरक्षा महानिदेशालय  
Directorate General of Mines Safety



No. DGMS Circular (Tech.) No. 84

/Dhanbad, dated 31<sup>st</sup>/10/2016, 2016

To

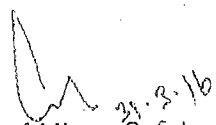
All Owners/Agents/ Managers of Coal and Metalliferous Mines, Superintendents of mines rescue stations, Incharges of mines rescue rooms and manufacturers and suppliers of breathing apparatus.

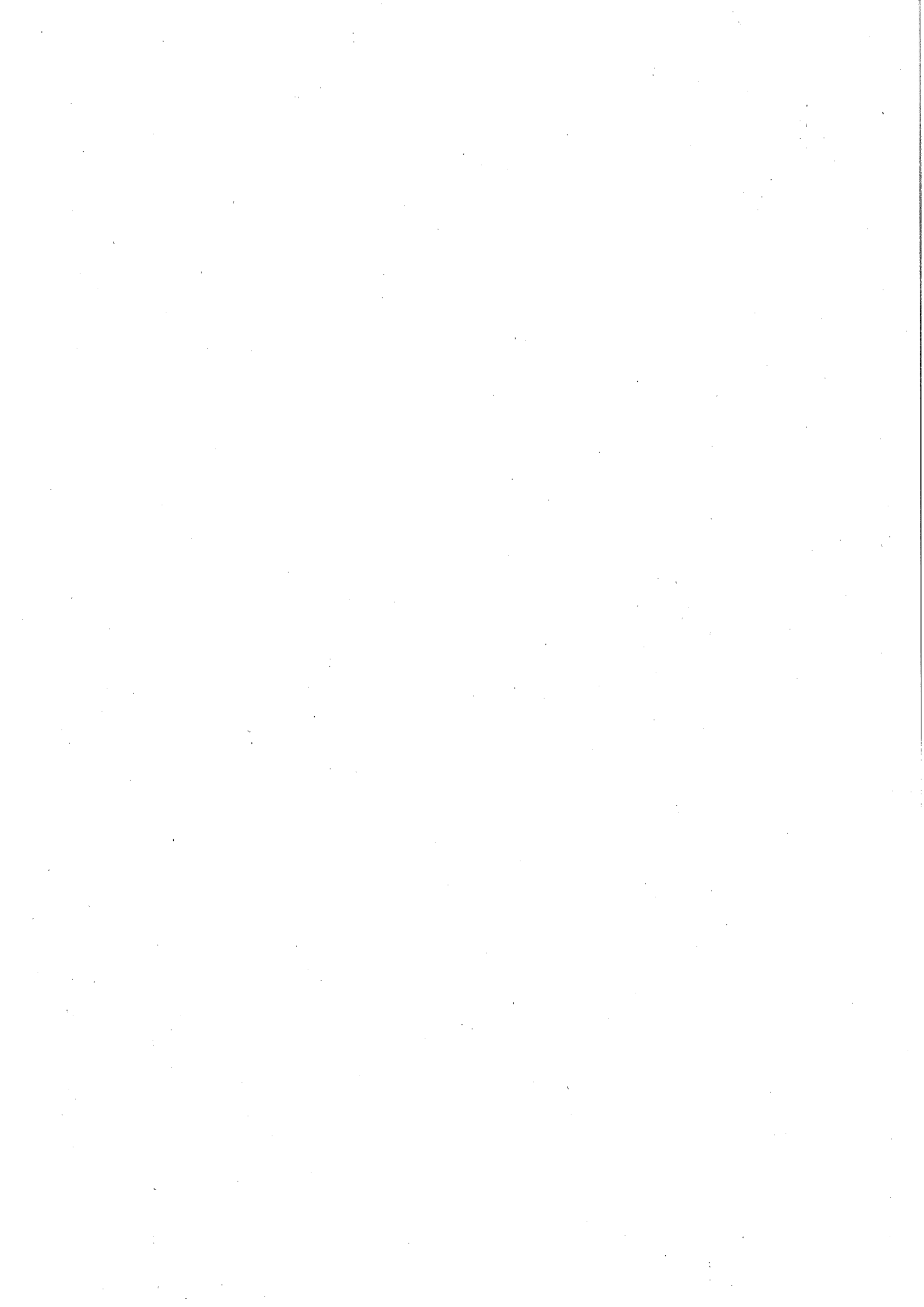
**Subject: Cylinders to be used in breathing apparatus used in mines**

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.

  
21.8.16  
Director General of Mines Safety





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Ministry of Labour & Employment

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Directorate General of Mines Safety

धनबाद / Dhanbad - 826 001.



No. DGMS (Tech.) (S&T) Circular no. 05

Dhanbad, Dated 2<sup>th</sup> April 2016

To

All Owners/ Agents/ Managers of coal and metalliferrous mines

Integrated approach for development of Safety Management Plan for coal and metalliferrous 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.

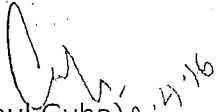
Drawing inputs from inferences drawn from several workshops on "Risk Assessment" in Indian mines conducted by DGMS, a document on "Safety Management System – A guideline for implementation" was prepared and circulated as DGMS(Tech)(S&T) Circular No. 13 of 2002. Another guideline in this regard titled "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)

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	

<b>Assessment Team (May include)</b>	
<b>Name</b>	<b>Designation</b>
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

<b>Facilitators (May include)</b>	
<b>Name</b>	<b>Designation</b>
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

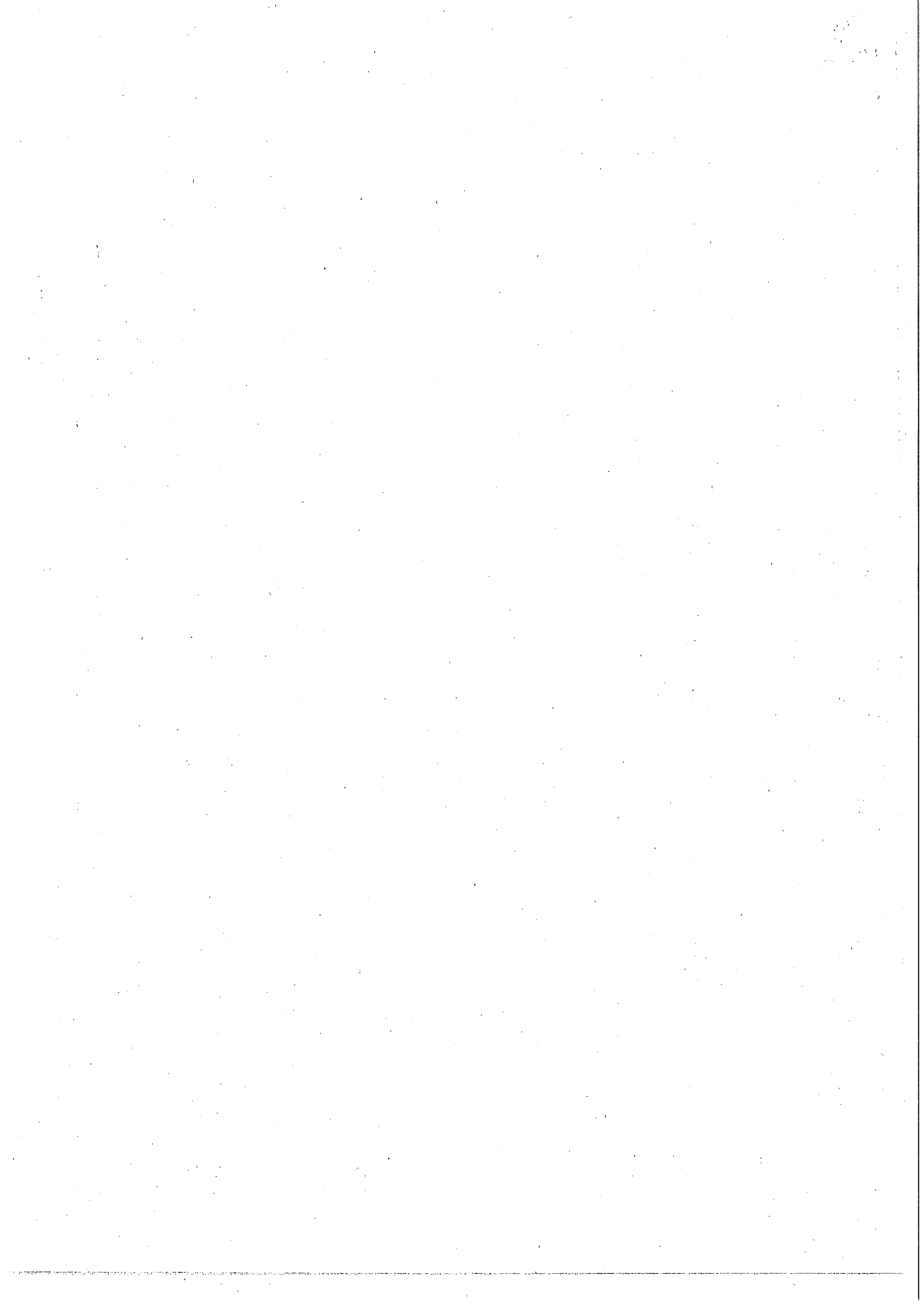
Location: DDD

Assessment Team		Facilitators (may include)	
Name	Designation	Name	Designation
EEE	Mines Manager (MM)	PPP	Deputy Director/Director, DGMS
FFF	Safety Officer (SO)	QQQ	Chief/ Deputy Chief/Member, ISO
GGG	Ventilation Officer (VO)	RRR	Area Safety Officer
HHH	Assistant Manager (AM)	SSS	Scientist, Research Institutions
JJJ	Survey Officer/ Surveyor (SURO/SUR)	TTT	Subject Expert, Educational Institutions
KKK	Workman Inspector (Mining) (WMI)	Add	Add
LLL	Overman/ Mining Sirdar (OM/MS)		
MMM	Workmen/ Safety Committee Members		
Add	Add		

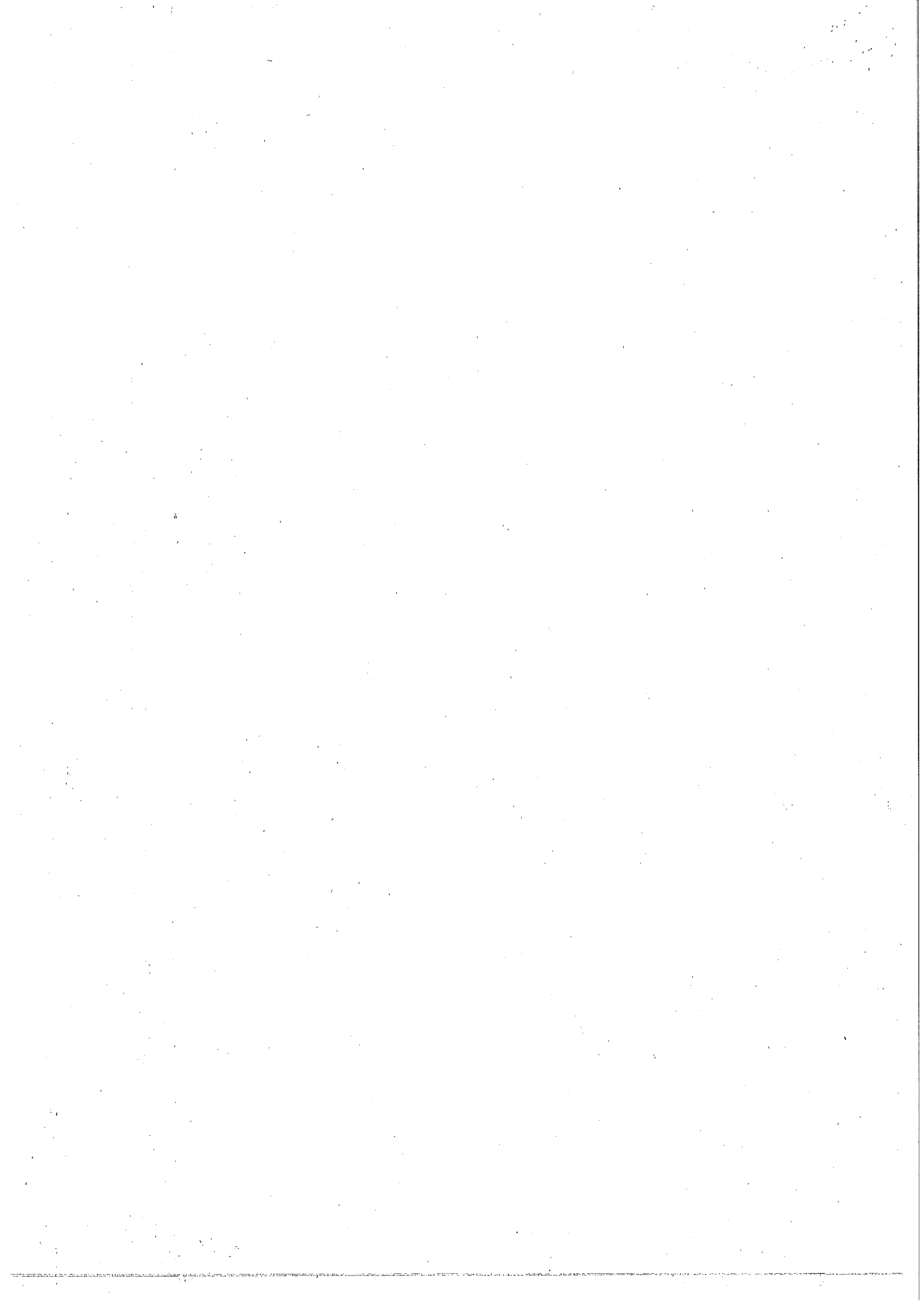
Hazard identification as regards to inundation in multiple seam underground workings with caving/ stowing.

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	

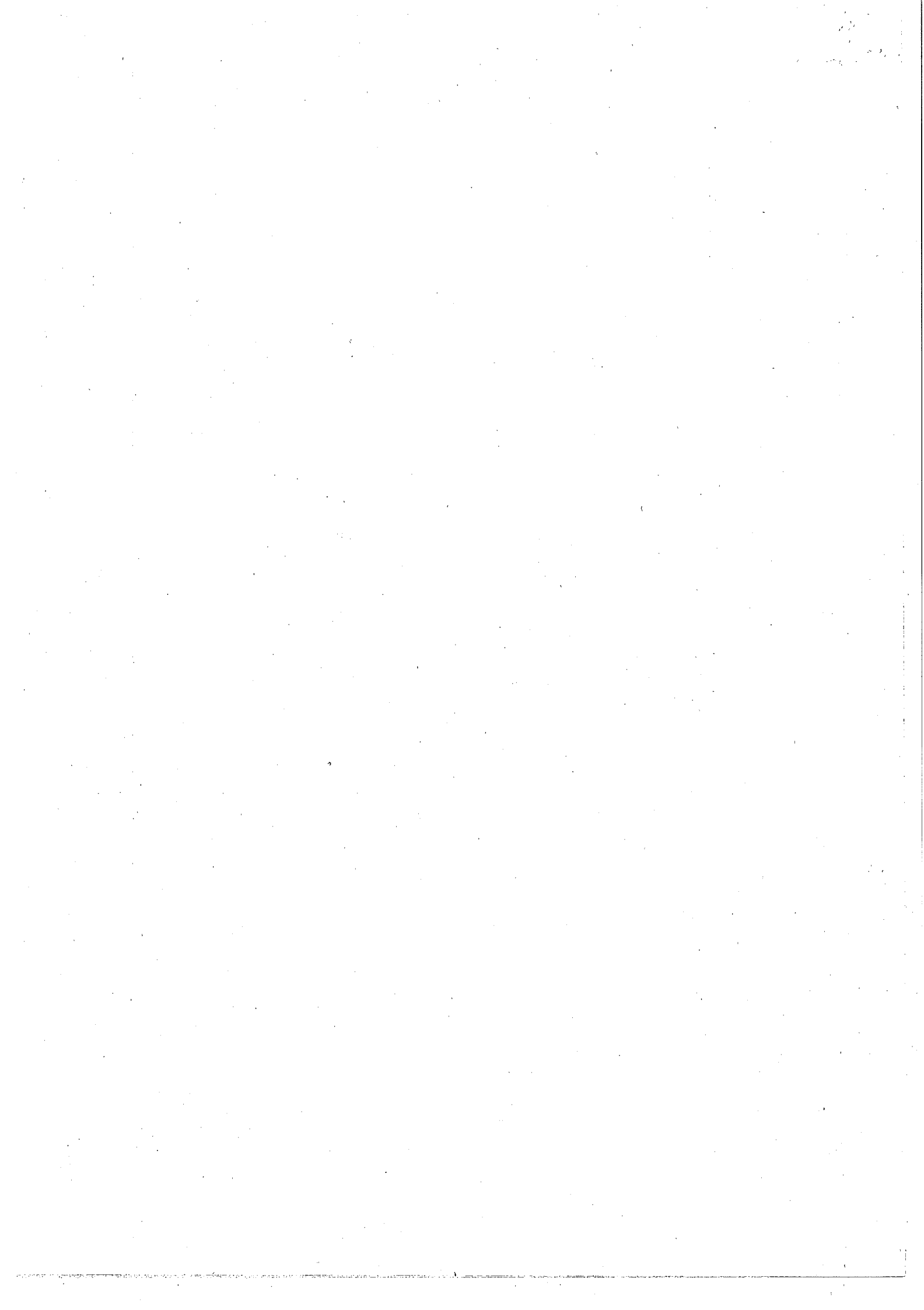


Table: 7

**Sample worksheet (Control Plan: Inundation in underground coal mines)**

Name of the Mine: AAA Name of the Company: BBB

Date Conducted: CCC

Location: DDD

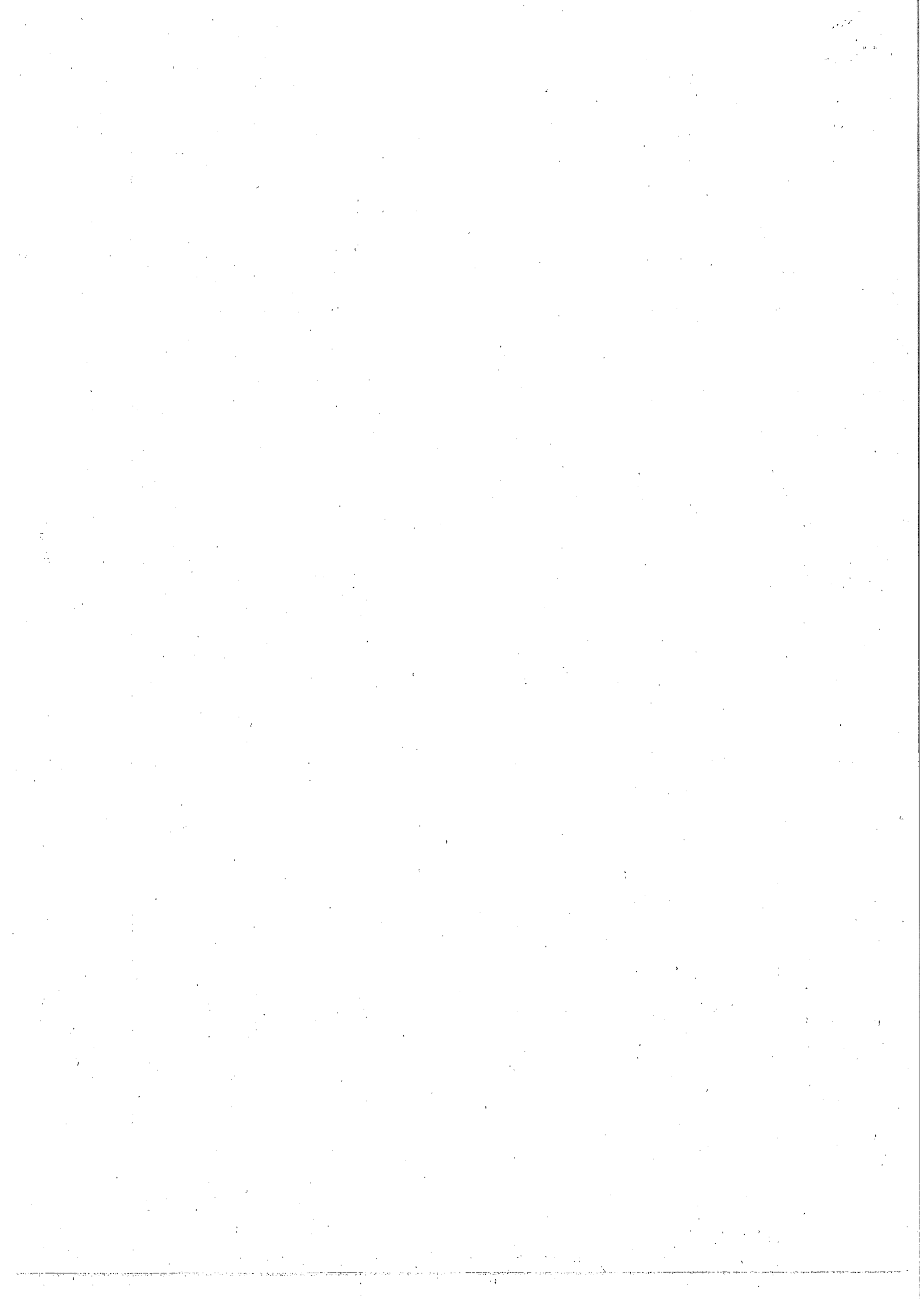
Assessment Team	
Name	Designation
EEE	Mines Manager (MM)
FFF	Safety Officer (SO)
GGG	Ventilation Officer (VO)
HHH	Assistant Manager (AM)
JJJ	Survey Officer/ Surveyor (SURO/SUR)
KKK	Workman Inspector (Mining) (WMI)
LLL	Overman/ Mining Sirdar (OM/MS)
MMM	Workmen/ Safety Committee Members
Add	Add

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.

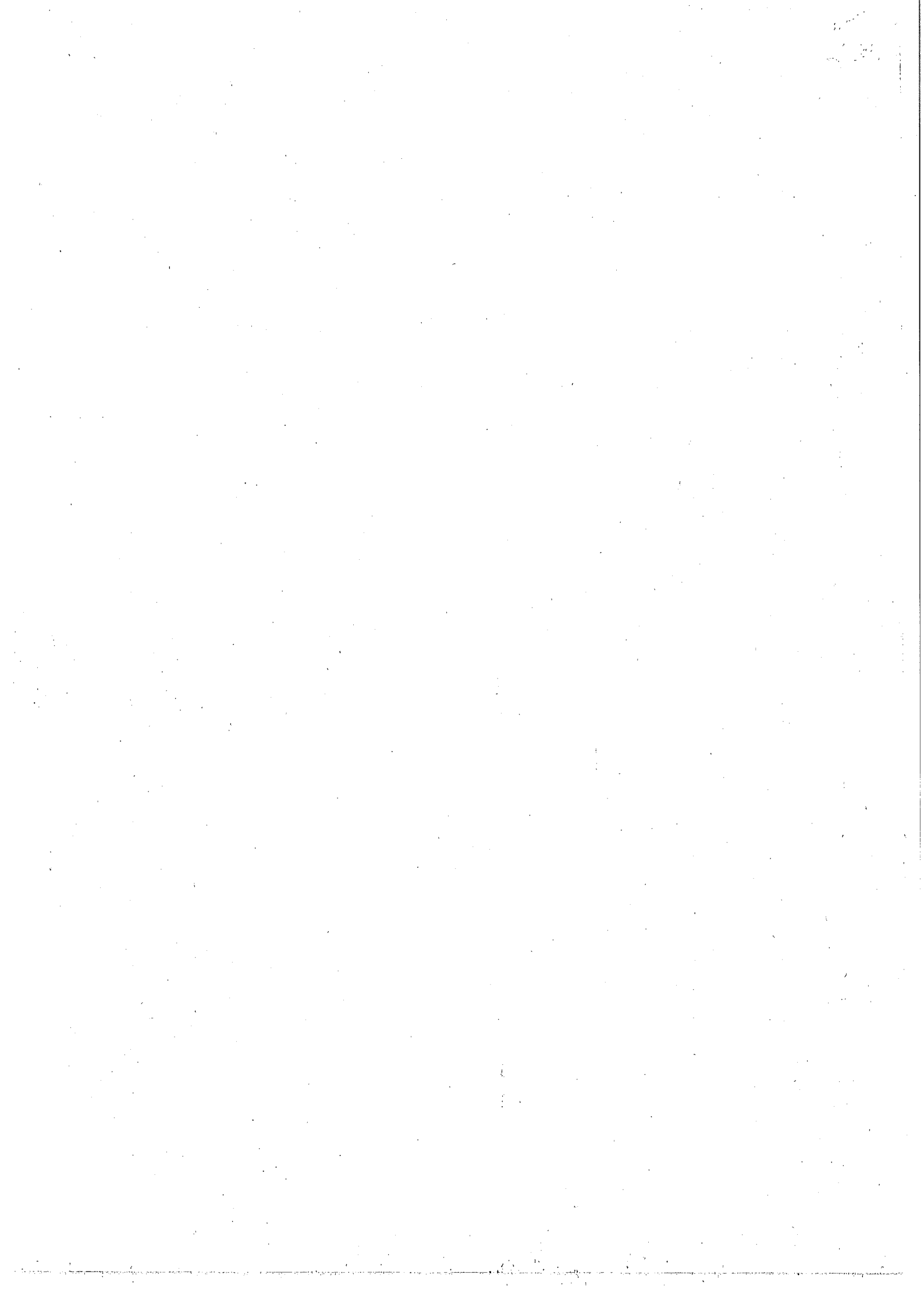
Abbreviations: **RSP**-Relevant Statutory Provisions; **DGC**- DGMS Circulars; **MG**-Management Guidelines; **ERCI**- Existing Risk Control Index; **Res**- Responsibility; **Med**- Medium; **Reg**- Regulation of draft Coal Mines Regulations'2015; **Rul (T)**: Rule of Mine Vocational Training Rules' 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).

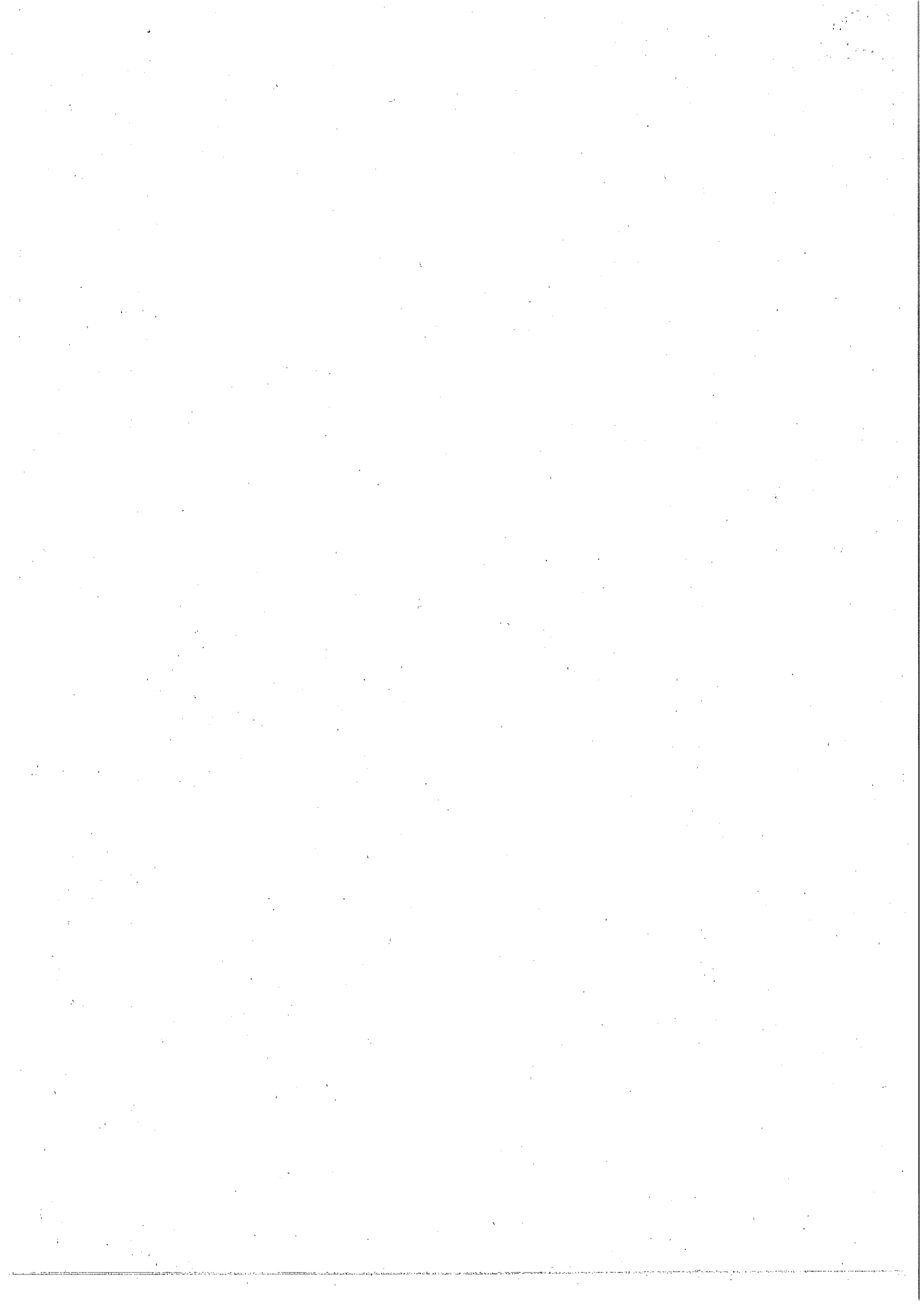




Mechanism	Control	RSP/DGC/ MG	Procedure	ERCI Res	Comments
surface rain water accumulation and flooding of underground workings.	<p>2. Ensure drainage of rain water from large surface depression and filling up of the same.</p> <p>3. Training of mine personnel.</p>	Reg. 150(1).	<p>2. Constitute a team for drainage of water from surface depression and filling up of the same, as and when required under competent supervision.</p> <p>3. Conduct specialized training of mine personnel on danger of inundation.</p>	AM & MM.	<p>2. To be put in place within fifteen days (YF).</p> <p>3. To be completed within one month's time.</p>
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.	<p>1. Assess the strength and stability of embankment constructed at river bank.</p> <p>2. A system of sounding warning during heavy rain and withdrawal of persons from underground, if considered necessary, to be in place.</p>	Reg 150(9) & (10); DGC2/1978.	<p>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.</p> <p>2. Devise a code of practice for warning during heavy rain, and evacuation of work persons from underground, if warranted.</p>	Civil Engineer, AM & MM.	<p>1. System to be put in place within two months time before onset of monsoon (YF).</p> <p>2. System to be put in place within one month's time (YF).</p>
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.	<p>Assess stability of dam from available records. If need be, explore the possibility of strengthening the existing dam or construction of a new dam.</p>	Reg 153.	<p>1. Conduct stability assessment exercise in consultation with experts of a research/academic institute.</p> <p>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.</p>	Civil Engineer, AM & MM.	<p>1. Complete exercise within one month time (YF).</p> <p>2. The work process to be formulated and executed within three months time (YF).</p>
Flooding of river due to heavy rains and water finding its way to underground workings through goaf and /or mine entries.	<p>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.</p>	Reg 150(2).	<p>Formulate strategy for preventing entry of water in the underground workings through goaf and/or mine entries and initiate action for implementing the same.</p>	Mine Planning Engineer, AM & MM.	<p>System to be put in place within one month (YF).</p>



Mechanism	Control	RSP/DGC/ MG	Procedure	ERC/ 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

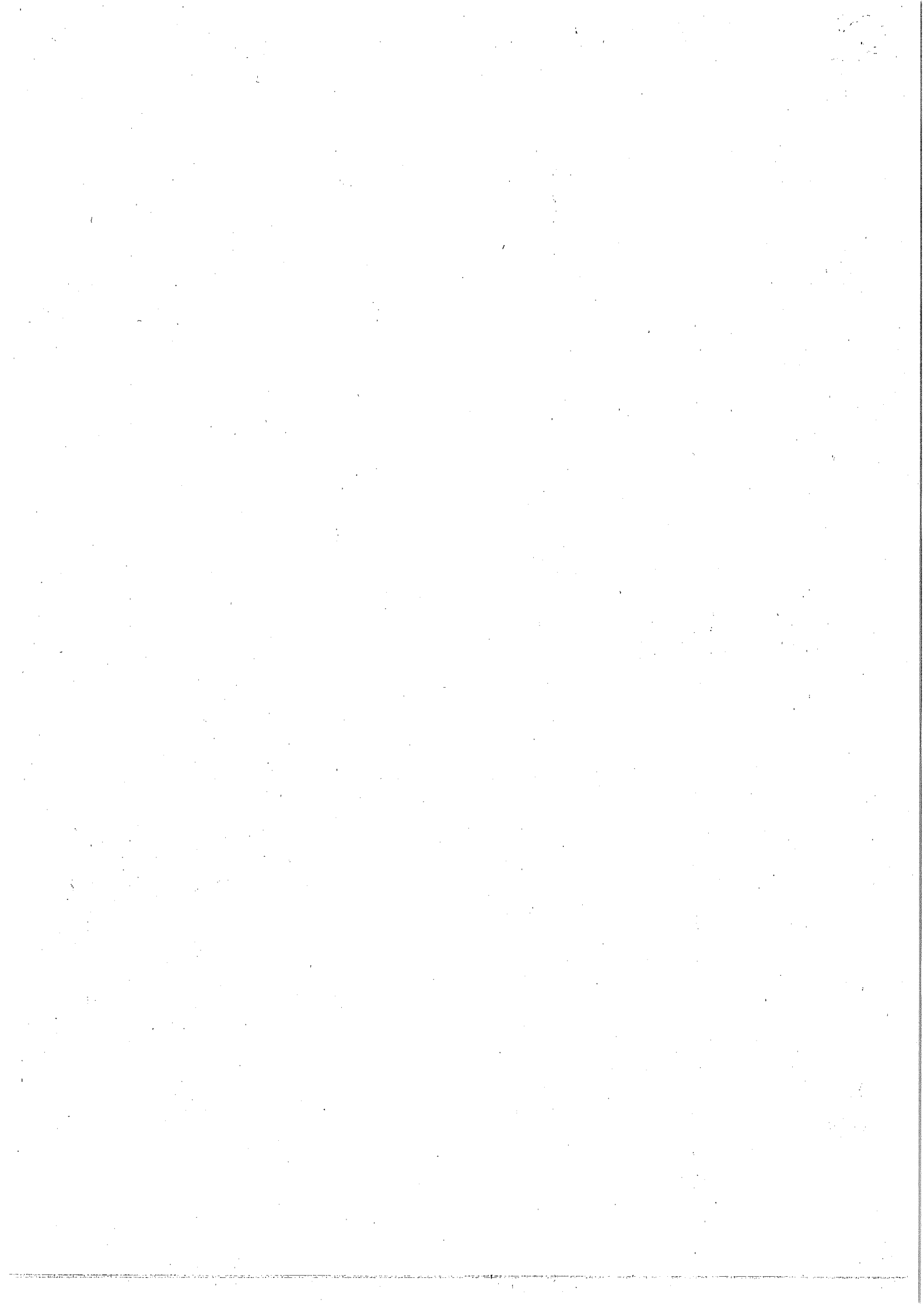
Facilitators (may include)	
Name	Designation
PPP	Deputy Director/Director, DGMS
QQQ	Chief/ Deputy Chief/Member, ISO
RRR	Area Safety Officer
SSS	Scientist, Research Institutions
TTT	Subject Expert, Educational Institutions

Audit of Hazard identification and Control Plan as regards to inundation in multiple seam underground workings with caving/stowing.

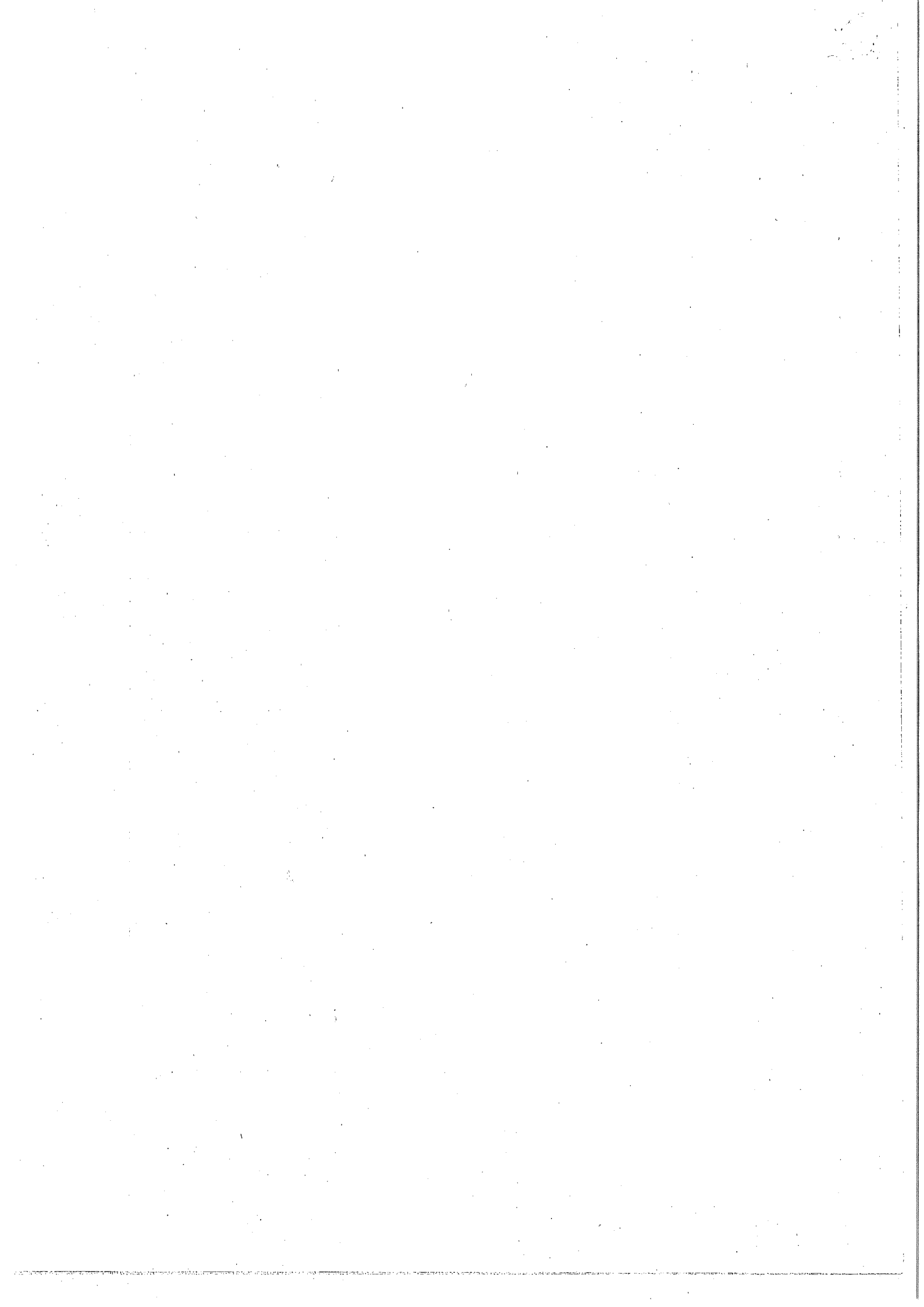
Abbreviations: IAF: Immediate Action Flag; SOP: Standard Operating Procedure.

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.	<p>2. Ensure drainage of rain water from large surface depression and filling up of the same.</p> <p>3. Specialized training on combating underground mine fire.</p>	<p>2. Constitute a team for drainage of water from surface depression and filling up of the same, as and when required under competent supervision.</p> <p>3. Conduct specialized training of mine personnel on combating underground mine fire.</p>	<p>2. A team has been constituted with senior most Asst. Manager as team leader.</p> <p>3. Training is yet to be conducted.</p>	<p>2. Monitoring in this regard to be done in ongoing manner by MM and Agent.</p> <p>3. MM &amp; Agent to facilitate conduct of training within one month.</p>
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.	<p>1. Assess the strength and stability of embankment constructed at river bank.</p> <p>2. A system of sounding warning during heavy rain and withdrawal of persons from underground if considered necessary, to be in place.</p>	<p>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.</p> <p>2. Devise a code of practice for warning during heavy rain, and evacuation of work persons from underground, if warranted.</p>	<p>1. Discussion is in progress to engage a research institute for conducting the study.</p> <p>2. A code of practice has been devised and being implemented.</p>	<p>1. Immediate action to be initiated by the MM &amp; Agent for facilitating conduct of study and implementation of recommendations (IAF).</p> <p>2. Ensure implementation of the code of practice by AM &amp; MM.</p>
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.	<p>Assess stability of dam from available records. If need be, explore the possibility of strengthening the existing dam or construction of a new dam.</p>	<p>a) Conduct stability assessment exercise in consultation with experts of a research/academic institute.</p> <p>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.</p>	<p>a) The stability assessment exercise has been conducted by the experts of an academic institute, who recommended strengthening of the existing dam.</p> <p>b) The work process has been formulated. As recommended, action for strengthening of existing dam has been initiated.</p>	<p>MM &amp; Agent to complete the action for strengthening of existing dam within one month's time (IAF).</p>





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.





भारत सरकार / Govt. of India  
श्रम एवं रोजगार मंत्रालय  
Ministry of Labour and Employment  
खान सुरक्षा महानिदेशालय  
Directorate General of Mines Safety



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**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. Ranganatheswar, 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

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**

<b>Serial No.</b>	<b>Places to be illuminated</b>	<b>Minimum standards of illumination to be provided (in lux)</b>
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 Handing 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	
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	
17	Rest shelter	
18	Workshop	
19	Parking Yard	
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







भारत सरकार / Govt. of India  
श्रम एवं रोजगार मंत्रालय  
Ministry of Labour and Employment  
खान सुरक्षा महानिदेशालय  
Directorate General of Mines Safety



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**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. Ranganatheswar, 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

*AS*

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



सत्यमेव जयते

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Directorate General of Mines Safety



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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 2<sup>nd</sup> 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 22<sup>nd</sup> 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

*[Handwritten signature]*

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) 3-5-16

Director General of Mines Safety

## **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

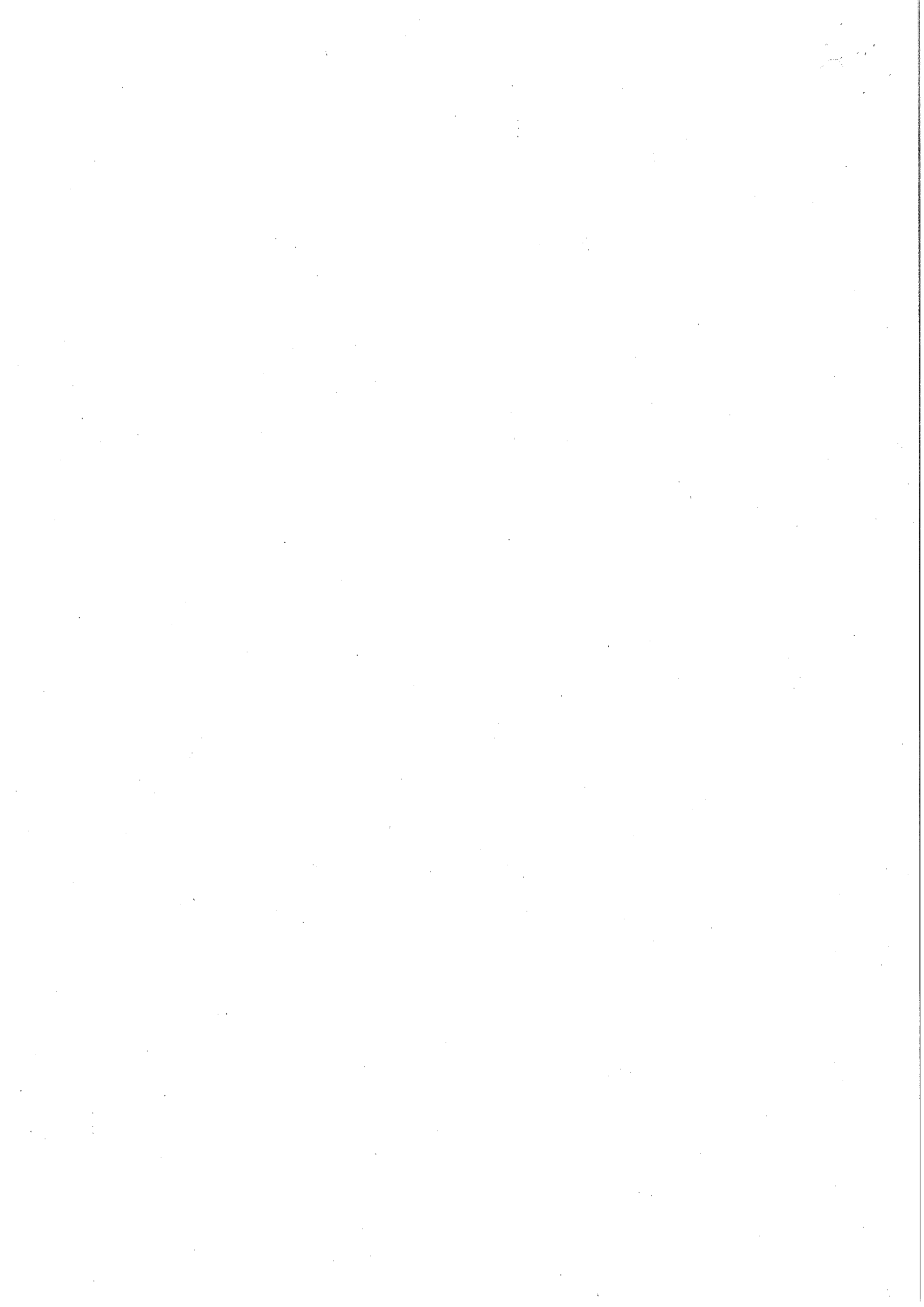
Director General of Mines Safety

## SAMPLE EMERGENCY EXERCISE EVENT LOG

### Coal Mine – A

<b>START TIME</b>	<b>EVENTS</b>	<b>ELAPSED TIME</b>
<b>11:40</b>	Assessment team in lower Seam advise workers of thick choking smoke entering their workplace.	<b>0:00</b>
<b>11:45</b>	Assessment team in upper Seam advise workers of thick choking smoke entering their workplace.	<b>0:05</b>
<b>11:50</b>	Mine workers donned Self Rescuers and commenced evacuation.	<b>0:10</b>
<b>11:54</b>	Sirdar from Escaping team 1 advised surface of circumstances.	<b>0:14</b>
<b>11:58</b>	Acting Manager telephones Mines Rescue Brigade.	<b>0:18</b>
<b>12:03</b>	Escaping team 3 arrive at pit-bottom (shaft).	<b>0:23</b>
<b>12:05</b>	One worker each from Escaping teams 1 and 2 simulate collapse (unconscious) from carbon monoxide poisoning.	<b>0:25</b>
<b>12:05</b>	Escaping team 4 arrive at pit-bottom (shaft).	<b>0:25</b>
<b>12:08</b>	Mines Rescue Brigade ready to leave station – six persons, fully equipped.	<b>0:28</b>
<b>12:09</b>	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.	<b>0:29</b>
<b>12:11</b>	Escaping team 3 & 4 demanded cage to complete evacuation to surface.	
<b>12:13</b>	Ambulance arrives on surface.	<b>0:33</b>
<b>12:15</b>	Escaping team 1 & 2 arrived at surface Attendance Cabin.	<b>0:35</b>
<b>12:30</b>	Escaping team 3 & 4 arrived at surface Attendance Cabin.	
<b>12:38</b>	Exercise Terminated.	<b>0:58</b>





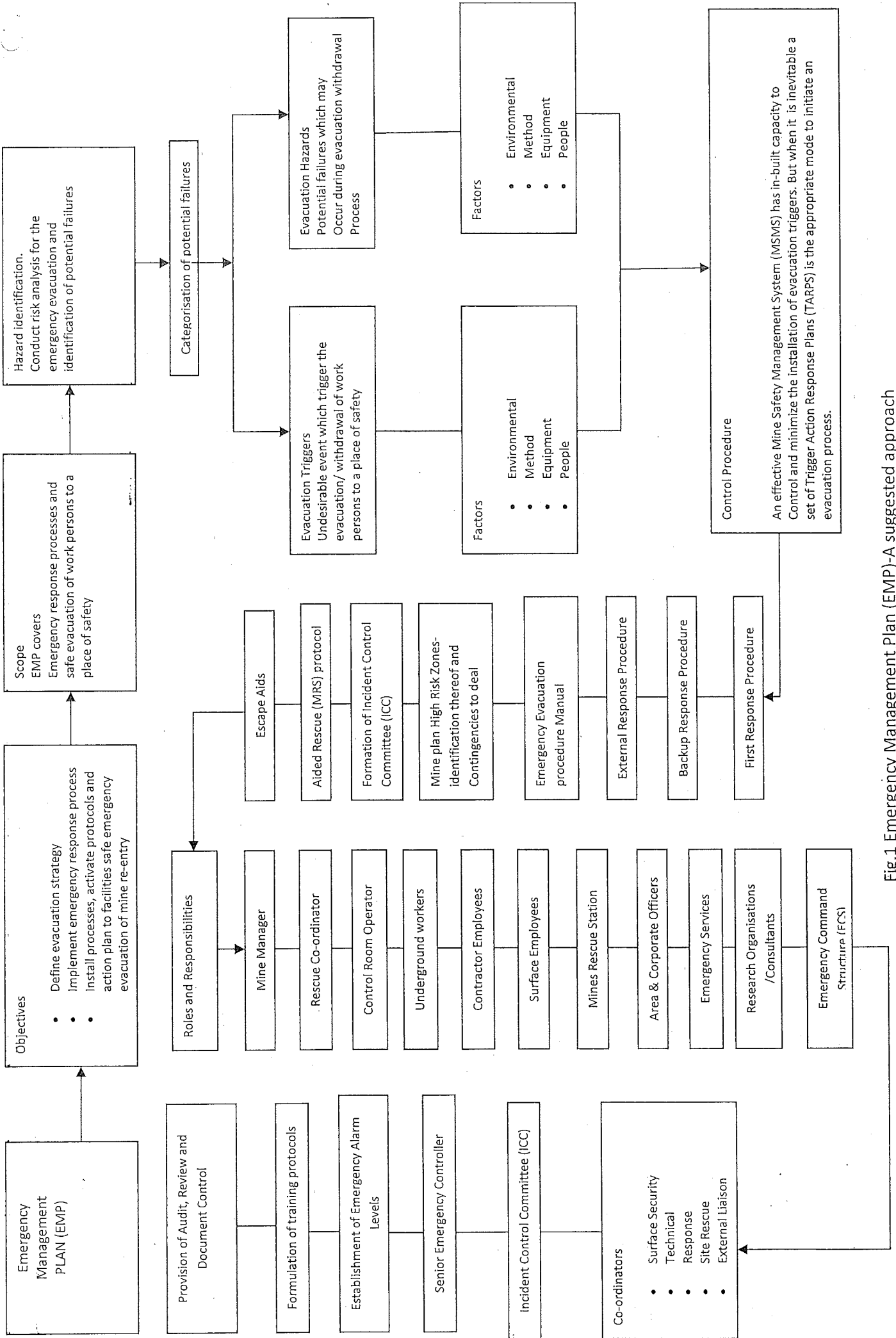
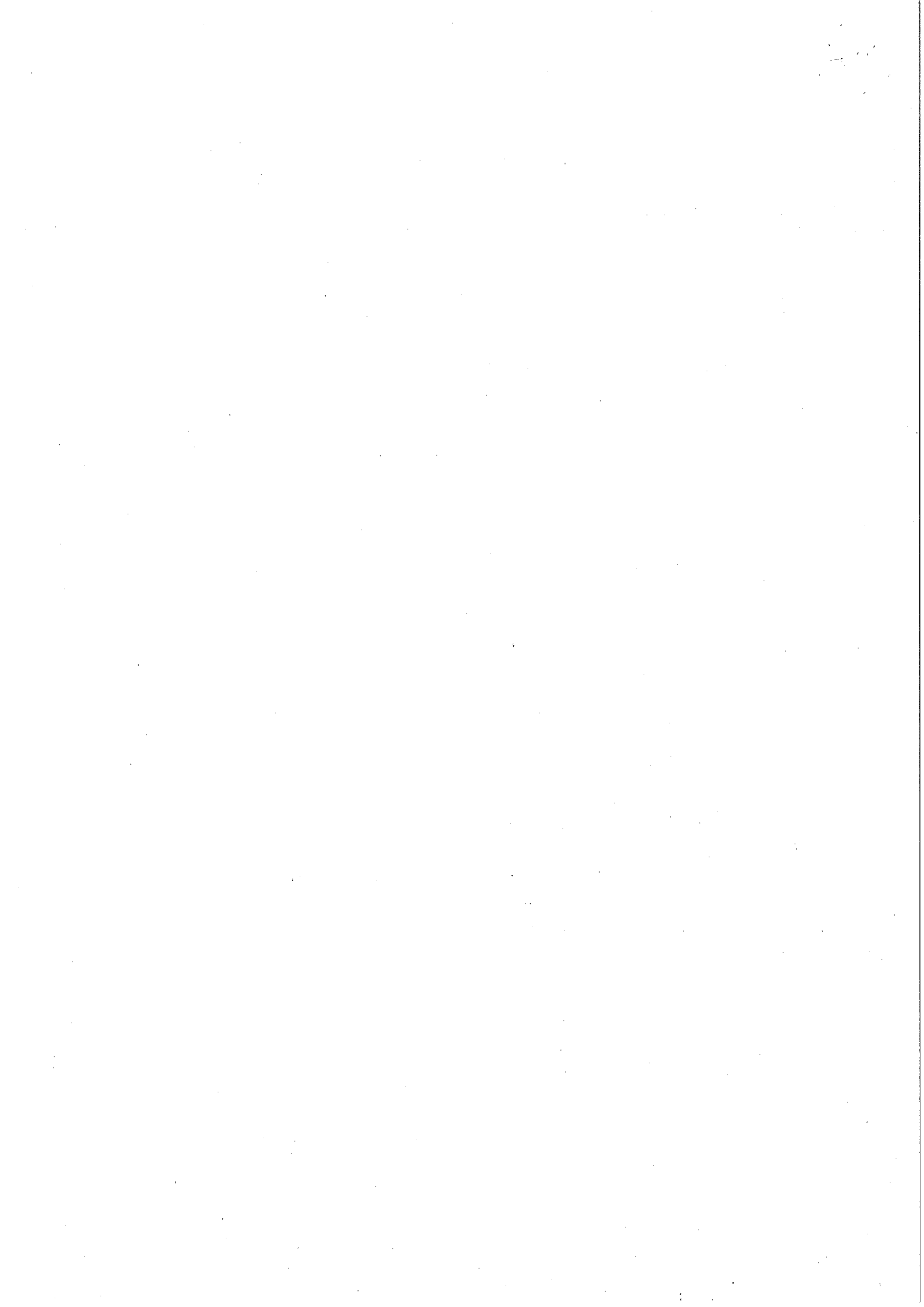


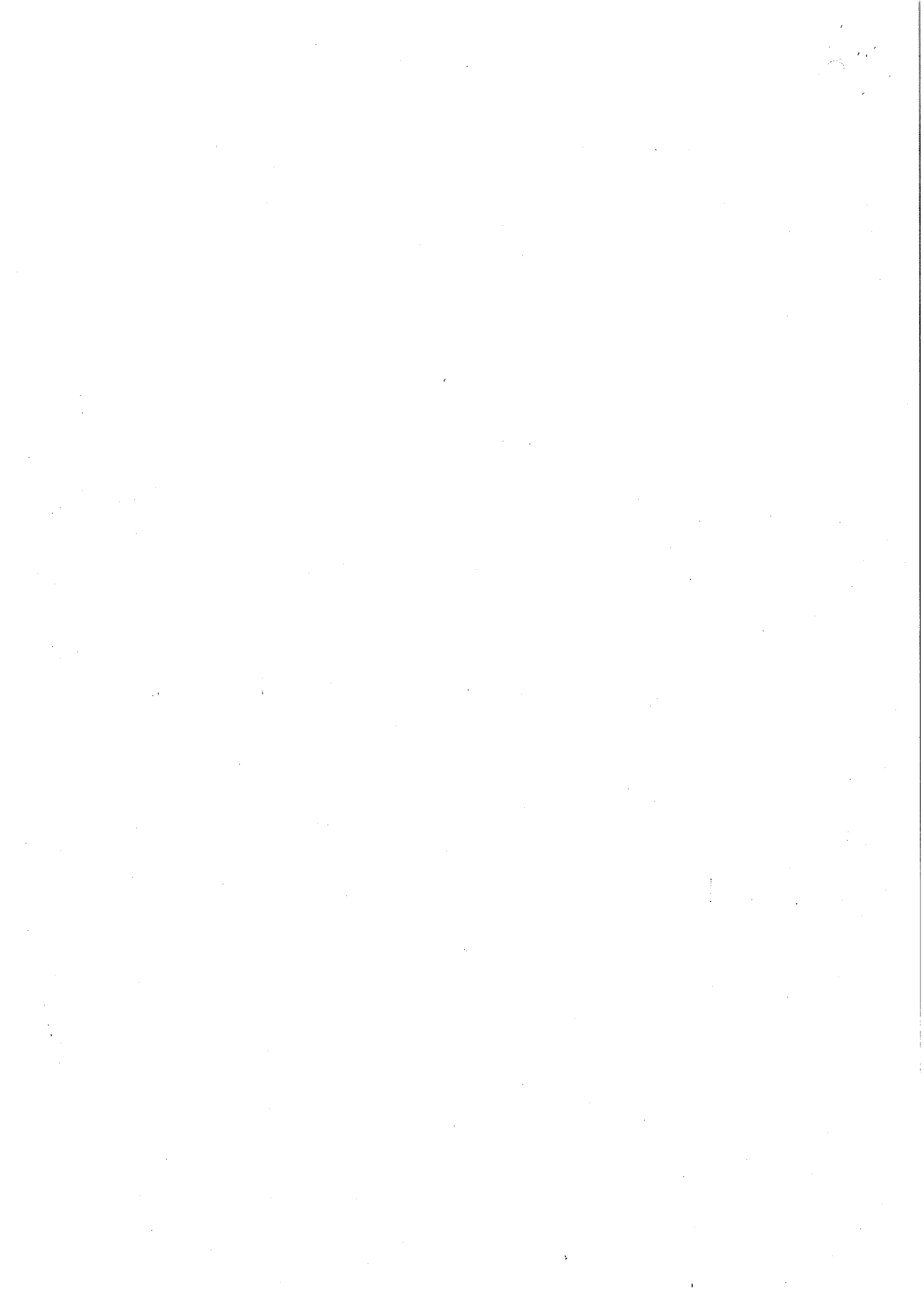
Fig.1 Emergency Management Plan (EMP)-A suggested approach



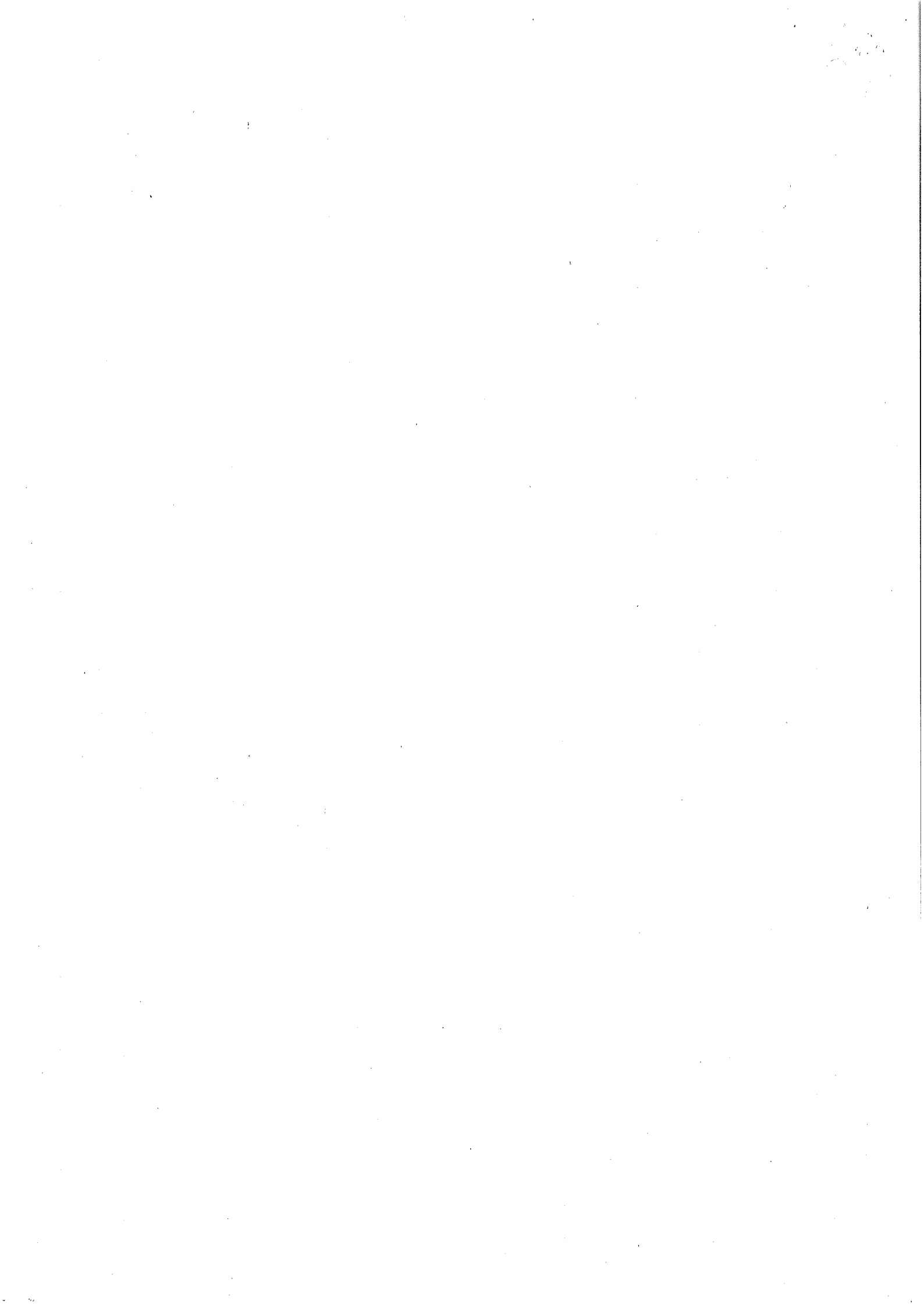


**Coal Mine – A                      Sample assessment sheet (Emergency evacuation):    Team 4 at 35 Stopping, lower Seam**  
**Assessors: Three officials (Coal company – one; International Expert-one; DGMS -one)**

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>	<b>OBJECTIVE EVIDENCE SOUGHT</b>	<b>OBSERVATION</b>
<p>Information about the emergency circumstance to the Sirdar present at 35 stopping of lower seam. [Information given by the Assessor at 11.45am.]</p>	<p>Thick Choking Smoke coming down intakes.</p>	<p>Recognition of changed circumstances.</p>	<p># Mining Sirdar immediately stopped working and started evacuating. # Counted number of workmen present in the workplace. # Sirdar did not cross-check the information.</p>
<p>Mine workers to be notified by Sirdar about the incident.</p>	<p>❖ All mine workers were notified and accounted for; and ❖ Mine workers marshaled together.</p>	<p>❖ Location of outbye workers considered; and ❖ Log times.</p>	<p># All Mine workers were located &amp; accounted for. They were marshaled together within 8 minutes. # Efforts were not made to inform mine workers located in the outbye area.</p>
<p>Mine atmosphere and evacuation strategy. [Assessor informed that: ❖ Canary birds were found unconscious; ❖ Nil methane observed, and ❖ Flame safety lamp still burning].</p>	<p>Understanding the situation and recognition of the risks while evacuation.</p>	<p>❖ 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.</p>	<p># 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.</p>
<p>Donning of Self Rescuers and its applicability under present circumstances.</p>	<p>❖ Self rescuers fitted correctly; and ❖ Fitted in sufficient time.</p>	<p>Recognition of expected duration of evacuation vis-à-vis working life of self rescuers.</p>	<p># 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.</p>
<p>Incident Equipment. [May be carried by workmen &amp; Sirdar.]</p>	<p>What extra equipment is taken [Put smoke glasses on all crew members and one assessor.] [Supply blind man canes]</p>	<p>Record equipment taken</p>	<p>Sirdar carried methanometer and flame safety lamp.</p>



<p>Sirdar to contact Surface control on phone.</p>	<ul style="list-style-type: none"> <li>❖ Describe circumstances;</li> <li>❖ Inform about number of workmen accounted for; and</li> <li>❖ Expected route of travel.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide complete and correct information; and</li> <li>❖ Log times.</li> </ul>	<p>Sirdar could not contact surface as no phone was available for the purpose.</p>
<p>Route of travel. [To be decided by the Sirdar after studying the mine plan and deliberation with team members.]</p>	<ul style="list-style-type: none"> <li>❖ Appropriate means decided;</li> <li>❖ All workmen traveled together;</li> <li>❖ Pace of travel appropriate;</li> <li>❖ Correct escape route was followed;</li> <li>❖ Use of blind-man canes; and</li> <li>❖ Use of link-lines</li> </ul>	<ul style="list-style-type: none"> <li>❖ Monitor and record significant incidents; and</li> <li>❖ Log times.</li> </ul>	<ul style="list-style-type: none"> <li># The team led by Sirdar commenced evacuation at 11.47 am.</li> <li># No discussion was held about method or route of travel.</li> <li># No discussion was held on order of travel i.e. who should lead – who to follow last, how to stick together.</li> <li># Lead person changed four times as team members walked past each other.</li> <li># Workers were acquainted with escape route.</li> <li># Speed of travel was satisfactory.</li> <li># Body contact between some workers was excellent – others walked on their own.</li> <li># Obstructions along escape route were navigated well.</li> <li># Contact with team members was maintained by "humming" through mouthpieces.</li> </ul>
<p>Action at Pit bottom (shaft).</p>	<ul style="list-style-type: none"> <li>❖ Contact made with On-setter; and</li> <li>❖ Contact made with Banksman/Surface officials.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Correct Information passed on; and</li> <li>❖ Log times.</li> </ul>	<p>The team established contact with onsetter at 12.34 pm, and thereafter made contact with Banksman /Officials present at the surface.</p>
<p>Actions on surface.</p>	<ul style="list-style-type: none"> <li>❖ Contact made with attendance clerk; and</li> <li>❖ De-briefing.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Accounting of workmen who exited the mine after emergency; and</li> <li>❖ Debriefing – record information sought and passed on.</li> </ul>	<ul style="list-style-type: none"> <li># Workmen led by Sirdar marked out and accounted for by the attendance clerk in the attendance register.</li> <li># 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.</li> </ul>





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खान सुरक्षा महानिदेशालय  
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,

A handwritten signature in black ink, appearing to be 'Rahul Guha', with a date '8.6.16' written below it.

(Rahul Guha)

Director General of Mines Safety



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Directorate General of Mines Safety



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DGMS(Tech.) Circular No. 10 of 2016

Dhanbad, dated 22/06/2016

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:

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**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



भारत सरकार / Govt. of India  
श्रम एवं रोजगार मंत्रालय  
Ministry of Labour and Employment  
खान सुरक्षा महानिदेशालय  
Directorate 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 conveyer	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.

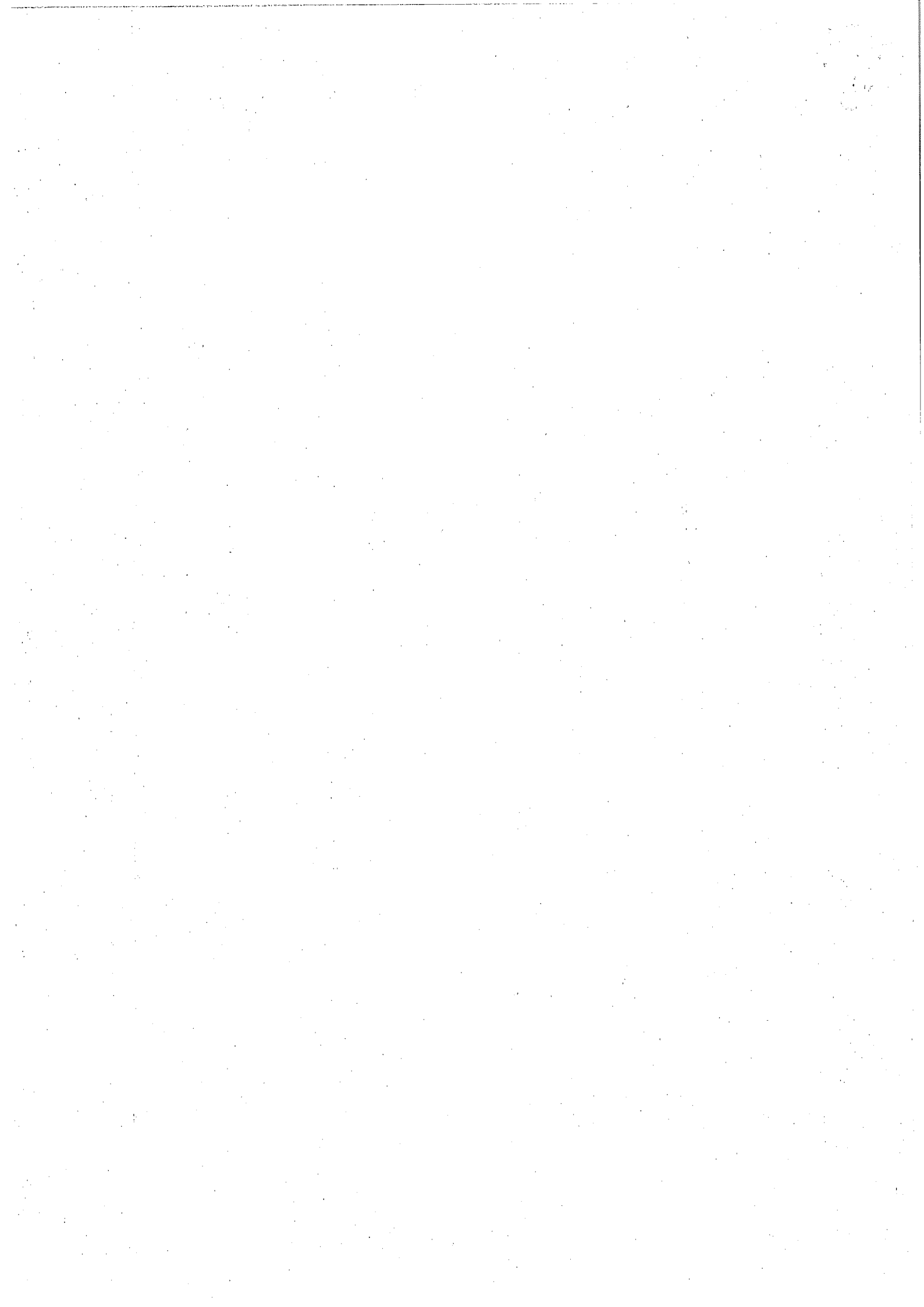
5. Lighting arrangement at working places of heavy machineries, dump/stack yard and other loading/unloading areas shall be such that the formation of dark zone is avoided.
6. Considering high mobility of hydraulic excavators, the faces/benches worked by such machineries shall, as far as practicable, 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

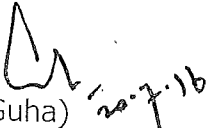
**Subject:** Treatment of coal dust with incombustible dust in the workings of belowground coal mines and sampling thereof.

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

