

Write short notes on (a) worker's participation in safety management in mines,  
(b) Effect of humidity on miner's health  
(c) Occupational health hazards in mines vis-à-vis medical surveillance

**(a) worker's participation in safety management in mines-**

Recognizing that greater strides in safety can be achieved by participation of workers in safety management programmes, the twin instruments of "safety committee" and "workmen's inspector" have been given statutory backing by being incorporated in Mines Rules-1955 in a new chapter IVB. A safety committee is required to be constituted at every mine employing more than 100 persons. This committee shall consist of the manager(chairman), five officials or competent persons nominated by the chairman, five workers nominated by workmen, three workmen's inspectors and safety officer(secretary). The role and functions of the committee is specified in the rule 29V of mines rules-1955. Workmen's inspectors are required to be appointed in every mine (employing more than 500 persons) in three disciplines, mining, electrical and mechanical. Their duties are prescribed in the Rules. Both this instruments are "Bi-partite" in nature i.e. they consist of management and worker's representatives. The concept underlying worker's participation in safety management is that- when workers participate in safety activities, the safety decisions are not taken by the management alone and imposed on the workers, but the problems are explained in detail and the workers are made to participate in the analysis and arriving at the decision with management's guidance. In this system, the workers are involved in the "safety-decision" making process and are committed to that extent which they can, with some justification, claim to be there own. Conforming to such decisions gives the workers a needed challenge and satisfaction in its achievement. The system meets, to some extent, the ego needs of the individuals thereby increasing, worker's motivation and creating condition for greater safety and risk reduction. Besides these "Bi-partite" forums, "Tri-partite" forums also enlist worker's participation where the trade union representatives represent the workers and others are management and government representatives. It has been recognized by I.L.O. that, "re-enforcement" of "tri-partism" is fundamental to the effectiveness of the action for the improvement of working condition and environment, which eventually leads to greater safety. There are several formal and "ad-hoc" "tri-partite" committees in mining industry at various levels for formulation of safety programmes and review of implementation thereof. The committee under section 12 of the Mines Act-1952 (amended upto 1983) is too a tripartite committee.

**(b) Effect of humidity on miner's health**

Human body produces a lot of waste heat by the process of metabolism and also physical work which has to be dissipated into the surrounding mine air. The major part of the heat produced by the body is dissipated from the surface of the skin by radiation, convection and evaporation of sweat, though a very small part is dissipated from the lung through exhaled air. During work in hot and humid atmosphere in U/G mines , as the body temperature of the miners rises above 302K, the sweat glands start functioning and now the heat transfer from the skin is mainly by the evaporation of sweat. The rate of evaporation of sweat depends on the moisture content of the ambient air and air-velocity. High humidity influences the rate of evaporative cooling of the human body. At high wet bulb temperature, the rate of cooling gets reduced. As a result , the body temperature rises. The rise in body temperature varies from person to person and depends on degree of acclimatization. A moderate rise in body temperature of the order of 1.4 K is not harmful, but when the body temperature rises above 312K and/or heart rate exceeds 140 beats/min., heat intolerance that may ultimately lead to heat stroke appears. Therefore, it may be seen, high humidity affects adversely the heat dissipation process of the body and consequently the miners health.

**(c) Occupational health hazard vis-à-vis medical surveillance**

Occupational health hazard has engaged the attention of all for quite some time. Various factors inherent in mining activities have harmful effect on miner's health; the type of work, the physical and mental effort



involved, the materials and product used/handled, the nature of the working environment-particularly presence of dust, fumes etc. the condition in which the work is performed and the way it is organized. In mining main occupational disease is pneumoconiosis caused by dust. Occupational health has been the global concern and in 1981, I.L.O. had adopted the occupational safety and health convention (convention 155) recommending action at national and enterprise level pinpointing responsibilities of employers and workers. Later in 1985, another convention namely “occupational health services convention 1985 (convention 161) had been adopted urging each member country to formulate, implement and periodically review a coherent national policy on occupational health services. In our country, besides providing statutory medical examination (initial and periodical) in Mines Rules-1955, the 7<sup>th</sup>, 8<sup>th</sup> and 10<sup>th</sup> conferences on safety in mines recommended detailed measures on occupational health, and in the 8<sup>th</sup> conference, in particular, it had been recommended that I.L.O convention no. 155 and 161 should be complied along with association of medical officers trained in occupational health and in the use of I.L.O. classification of radiograph for pneumoconiosis and provision of X-ray and lung function test facility in each medical examination centre, monitoring progress of pneumoconiosis, maintenance of records and submission of annual reports on radiological results.

#### **How the mining statutes, DGMS Circulars and Safety conferences at national level etc. have provided for “occupational health” of mine workers?**

Section 9A of the Mines Act-1952 lays down provisions for occupational health survey. As per section 25 of the Mines Act-1952, notice of “notified occupational diseases” has to be sent to CIM and other prescribed authorities. Sec. 26 empowers central govt. to conduct direct investigation of certain occupational diseases. Regulation 124 of MMR-1961 lays down detailed procedure of suppression of respirable dust, air born dust survey and action to be taken in case respirable dust concentration exceeds the permissible limit. In respect of all persons employed in mines except those who are employed purely on temporary or casual basis for a continuous period of not exceeding six months, chapter IV-A of Mines Rules-1955 (as amended upto 1989) has prescribed initial and periodical medical examination, examining authorities, notices of medical examination, standard and report of such examination (medical certificate), appeal for re-examination and compensation for occupational diseases. In respect of persons engaged in the process of mining or milling asbestos ore, periodical medical examination has been prescribed once in every 12 months and details of chest-radiography has been included in form-P ( medical standard of fitness of persons employed ). Rule 82-A prescribes disability allowance and compensation for occupational diseases. In DGMS circular no. 10 of 1974, instructions have been issued regarding active immunization for prevention of tetanus. Vide DGMS circular no. 1 (welfare) of 1975, mine management have been requested to get some of their doctors trained in specialized courses in occupational health. As per recommendations of the 7<sup>th</sup> national conference on safety in mines, for mechanized mines, need for creation of department of occupational health services has been emphasized. The staffing pattern, style of functioning, preparation of health surveillance scheme etc. have been prescribed in detail in these recommendations. In 8<sup>th</sup> national conference on safety in mines, further details on medical surveillance have been incorporated in the recommendations. Here time bound programme of air-borne dust surveys and inclusion of audiometry as a part of mandatory medical examination have been highlighted, besides reiterating the recommendations of the 7<sup>th</sup> national conference on safety in mines and advising “monitoring” the progress on medical examinations, surveillance of working environment, education and awareness activities.

**(a) Explain with examples the contravention of Indian Electricity Rules which may cause accident due to shock.**

**(b) Give particulars of different notices that are required to be furnished to the electrical Inspector of mines.**

(a) Accident due to shock is caused by passage of current usually above 15 (fifteen) milli-ampere through the body to earth, one part of the body touching a live conductor or metal work connected to live wire and another part being in contact with earth. Therefore contravention of any provision of IER ensuring safeguard or protection against such eventuality will cause accident due to shock. This is illustrated by the following examples:-

(1) An electrician while replacing a street light bulb on a live 230 V overhead line received electric shock, fell down from the post and sustained fatal injuries. Had the electrician safeguarded himself against danger from live overhead conductor by taking the elementary precautions laid down in Rule 36(1) of the IER-1956, this accident could have been averted. Therefore contravention of this rule caused this accident due to shock.

(2) While a mazdoor was working in a waste dump with a hand shovel, he got a flash from 33 KV transmission line passing nearby. Had the stipulated minimum clearance with the overhead line conductor laid down under Rule-77 of IER-1956 been maintained, this accident could have been averted. Here contravention of this rule resulted in a flash with severe shock.

(3) A general mazdoor inadvertently came into contact with a charged metallic lamp post and sustained electric shock which proved fatal soon after. Had the lamp post been efficiently earthed as required under rule 90(1) of the IER-1956, this accident could have been averted. Contravention of rule 90(1) resulted in this accident due to shock.

(4) While a worker was walking bare-foot over a delivery hose –float to stop a pump working on the pontoon, his foot came in contact with one of the leads of the damaged live cable (440V) feeding the said pumping unit as a result of which he received electric shock and died almost instantly. Had the cable been maintained properly by thorough examination and protection from mechanical damage as required under rule 131(3) (a) and 122 of the IER-1956, this accident could have been averted. Contravention of the aforesaid rules caused this accident due to shock.

(b) The details of the different notices that are required to be furnished to the electrical inspector of mines are given below:-

(1) As per rule 111 of the IER-1956, annual return in annexure X on or before 1<sup>st</sup> February every year giving size and type of apparatus together with such particulars in regard to circumstances of its use.

(2) seven days prior notice in writing of the intention to bring or use any new installation in mine giving details of apparatus installed and its location.

(3) Immediate notice in writing in case of any addition or alteration to the existing low and medium voltage installation, before such additions or alteration are brought into use.

(4) Notice of accident due to electricity in annexure XIII within 48 hours of the knowledge of the accident, besides furnishing notice of such accident in form IV-A of the 1<sup>st</sup> schedule of MMR-1961 within 24 hours of such occurrence.



**What are the statutory obligations of a contractor under the Mines Act-1952? In a mine worked through a number of raising contractors, discuss the role and functions of the principal owner and manager of the mine vis-à-vis the raising contractor. Comment on the adequacy of the existing law for proper working of such a mine.**

As per the Mines Act-1952, any contractor or sub-lessee for the working of the mine or any part thereof shall be subject to this Act in like manner as if he were an owner, but not so as to exempt the owner from any liability. Therefore, a “working contractor” or “raising contractor “ has the same liability as owner under the Mines Act-1952, and he has to fulfill all the statutory obligations enjoined on him under section 18 of the Mines Act-1952. The role and functions of the principal owner and the manager has to be in conformity with their duties and responsibilities prescribed under the provisions of the section-18 of the Mines Act-1952 and regulation 44 of MMR-1961 (for the manager). The principal owner shall be responsible for making financial and other provisions and for taking such other steps as may be necessary for compliance with the provisions of the Act, Regulations, Rules, Bye-laws and orders made thereunder. Certain responsibilities like provision of crèche, canteen, appointment of agent and manager etc. shall be exclusively carried out by the principal owner. The principal owner can not take a defence in any proceedings brought against him under Mines Act-1952 that he had appointed a manager and other officials in accordance with the provisions of the Act. Manager’s statutory role is prescribed under section 17 and 18 of the Mines Act-1952 and Reg. 44 of MMR-1961 as mentioned above. He holds a very important position in the mine administration. He is responsible for overall management, control, supervision and direction of the mine and except in case of emergency, the principal owner or anyone on his behalf shall not give, otherwise, than through the manager, instructions affecting the fulfillment of his statutory duties to a person employed in a mine who is responsible to the manager. A raising contractor’s role is to raise the mineral and perform ancillary operations by employment of resources like man, machine, materials etc., but all processes shall be done strictly in conformity with the provisions of the Act, Regulations, Rules etc. and under the “direct control and supervision” of the manager. In this, respect, the raising contractor is subordinate and responsible to the manager and even the principal owner can not give any instruction to the raising contractor directly in contravention of the provisions of the Section 17(3) of the Mines Act-1952, a contractor has the status of the owner, but this status has been construed as a “liability” under Mines Act so that he can not escape his responsibilities to conduct the operation of raising minerals in compliance with the provisions of mining statutes. This status is not equivalent to the principal owner who is functionally the mine operator. A raising contractor can not appoint statutory personnel and competent persons for safe conduct of mining operation. Such persons shall be appointed only by owner/agent/manager, paid by the principal owner or agent and shall be answerable to the manager. This provision has been made to ensure supervision by the manager directly. Statutory supervision can not be performed by contractor’s man. Contractor’s men can only perform operational supervision.

Though responsibilities are well defined in the statute yet mineral raising by contractual agencies poses problems of safety to the contractor’s workers because they are, more often than not, not treated as direct workers of the management and adequate vocational training, personal protective equipment etc. are not provided to them with the result they are involved in accidents. This is a practical problem. Therefore, in my opinion, mineral winning process by contractor should be totally abolished and all mining operations, because of their hazardous nature should be conducted “directly” by management/principal owner. However, if any specialized agency is required to be appointed for “special” job which requires expertise not available with the management, then the concerned person(s) of the agency can be “authorized” under 8A of MMR-1961 to act on behalf of the owner in respect of management, control, supervision or direction of the activities of such agency. In such cases, they become “agent” under Mines Act-1952 having statutory responsibilities.



**As a manager of a mine what will be your statutory duties if any loss of life or serious bodily injury to a person occurs in connection with mining operation in your mine?**

On receipt of any information about loss of life or serious bodily injury to any person in or about a mine , the manager shall forthwith visit the place of accident and ascertain, prima facie, whether it is a mining accident or not. The criteria for deciding whether accidents are to be treated as mining accidents are as follows:-

- (i) the accident must take place within the mine control area
- (ii) the accident must be caused by an operation connected with mining or incidental or ancillary to mining

If it is a mining accident, causing loss of life or serious bodily injury to any person, the manager shall forthwith inform about this to the Regional inspector of mines (now designated as director of mines safety) as required under Reg.9 of MMR-1961 by telephone or express telegram or by special messenger and shall also within 24 hours of such occurrence give notice thereof in form IVA of the first schedule to the District Magistrate, CIM and RIM and shall simultaneously exhibit a copy of the notice on a special notice board outside the office of the mine where it may be inspected by trade union officials and shall ensure that the notice is kept on the board for not less than 14 days from the date of such posting. In case of accident due to electricity, the manager shall forthwith inform the electrical inspector of mines by telephone, express telegram or special messenger. If death occurs from any injury already reported as serious or if any injury, other than the serious injury, becomes serious, the manager shall within 24 hours of his being informed of the same give notice thereof to District Magistrate, CIM and RIM. In respect of every person killed or injured as above the manager shall send to the CIM particulars in form IVB, IVC of the first schedule within 7 days of the occurrence or 15 days of the injured person returning to duty as the case may be.

As required under regulation 190 of MMR-1961, the place of accident shall not be disturbed before the arrival of or without the consent of the CIM or the Inspector to whom notice of the accident is required to be given, unless such disturbance or alteration is necessary to prevent any further accident, to remove the bodies of the deceased or to rescue any person from danger, or unless discontinuance of work at the place of accident would seriously impede the working of the mine. Provided that where the CIM or the said Inspector fails to inspect the place of accident within 72 hours of the time of the accident, work may be resumed at the place of accident. But before the place of accident is disturbed or altered a sketch of the site illustrating the accident and all relevant details shall be prepared (in duplicate) and such sketch shall be duly signed by the manager or Asst. manager, safety officer, surveyor and the workmen's inspector or where there is no workmen's inspector by a work person nominated by the worker's in this behalf. Provided that, if the place is disturbed or altered to prevent further accident or rescue persons from danger before the sketch could be prepared , the same shall be prepared , immediately thereafter, giving all relevant details as existed before the place was disturbed or altered. One of the authenticated sketches shall be delivered or sent to the concerned Inspector of the mines. The manager shall himself or through an Asst. manager have an enquiry made of the causes and circumstances attending the accident and the result of every such enquiry and the plan/sketch of the site of the accidents showing details shall be recorded in a bound paged book kept for the purpose.



**What are the statutory plans and sections required to be maintained in a mechanized opencast mine?  
What are the features/things to be shown on each?**

The following plans/sections are required to be maintained in a mechanized open cast mine as per regulation 61 of MMR-1961:-

1. surface plan
2. water danger plan and section
3. geological plan and section
4. such other plan and section as required by RIM by an order in writing under regulation 61(4)(a) of MMR-1961.

Features/things to be shown on:-

**(a) SURFACE PLAN:-**

The name of the mine and the owner, purpose for which the plan is prepared like “surface plan”; true north or magnetic meridian with date; at least 25 cm. long suitably sub-divided; R.F.(2000:1); bench mark; co-ordinate lines and boundary\* as per convention of the second schedule; every surface feature within the boundary like telephone, telegraph or power transmission line, watermain, tramline, railway, road (both public and private), river, water course, reservoir, tank, borehole, shaft, incline opening, all opencast excavations, subsidence and buildings on the surface; additional details if required+

[\* boundary means the settled boundary; in case of dispute the boundaries claimed by each owner, + by RIM under regulation 61(4)(a) of MMR-1961]

**(b) WATER DANGER PLAN & SECTION:-**

Every source of water such as river, stream, water course, reservoir, water logged open cast workings; outlines of all waterlogged workings below ground lying within 60m of any part of the workings measured in any direction; surface dams to withstand a pressure of water or to control an inrush of water (with design and construction details) ; surface contour lines drawn at vertical intervals of not exceeding ten meters or in case of a mine situated in hilly terrain, such other larger interval as RIM may permit, over the whole area lying within 200 meters of any part of the workings; surface drainage system of the mine; the highest flood level of the area; bench mark together with its height above the mean sea level and warning lines to draw visual attention to dangers of inundation arising out of surface water; additional details if required by RIM under 61(4)(a) of MMR-1961.

**(C) GEOLOGICAL PLAN AND SECTION:-**

R.F. 5000:1 or any other scale of the statutory plans; details of the geological features and disturbances such as outcrop of dykes, fault planes, outcrop of reef, vein, load etc.; all information collected from GSI maps or from the locality; contour lines at suitable intervals and any other features required by RIM in writing, adequate number of sections at suitable intervals shall also be kept.

**(d) SPECIAL PLANS REQUIRED BY RIM:**

R.F. and other details as required by RIM under 61(4)(a) of MMR-1961.

Besides the features/things to be shown on the respective plans, all the above mentioned plans shall carry the signature of the manager and surveyor with date. The surveyor shall give a certificate on the plans that “the plan or section is correct” and shall be signed and dated by the surveyor and countersigned and dated by the manager on every occasion that the plan or section is brought upto date which shall be at least once in 12 months in case of open cast workings or at any time if required by an Inspector as required under Regulation 61(4)(a) of MMR-1961.



**What is the role of vocational training in mechanized open cast mine? Prepare a scheme of training for HEMM operator.**

The operation of mechanized opencast mine is full of hazards because it involves drilling deep-holes, conducting heavy blasts, handling and loading huge quantity of broken rock mass or ore, transporting them over long distances in difficult terrain and finally dumping or crushing depending on whether the material is waste or ore. In all these operations heavy machines are deployed requiring highly skilled operators. Such operators and other persons employed or to be employed in mechanized open cast mine need vocational training so that they may be aware about the risks/hazards/dangers etc. of the operation and can save themselves and others in critical situations. Vocational training has played a very important role in making workers safety conscious and alert while at work. As per Mines V.T. Rules-1966, all persons employed or to be employed in open cast mines except certain categories of persons like supervisors, blasters etc. have to undergo initial training (6 day's course as per 1<sup>st</sup> schedule for persons going to be employed) and refresher's training (once in every 5 years or on return to duty after one year's absence). Besides these, explosive carriers, candidates for blaster's examination have to undergo additional special course of training to update their knowledge and level of competence. Blasters who have not fired shots for 6 months or more have to undergo the special training. The whole concept of such training is to minimize accidents which are caused due to lack of knowledge or competence on the part of the workers.

In mechanized open cast mine, analysis has reveals that accidents due to wheeled trackless transportation machinery (dumpers, trucks, tippers etc.) constitute about 75% of all fatal accidents due to HEMM and about 58% of all fatal accidents in open cast and surface operations. Accidents due to tractors have registered rising trends currently. Therefore proper training of the HEMM operators and maintenance crew is of prime importance besides focusing attention on motivation, enforcement of discipline, development of good system and work culture. I would suggests the following scheme of training for HEMM operators:-

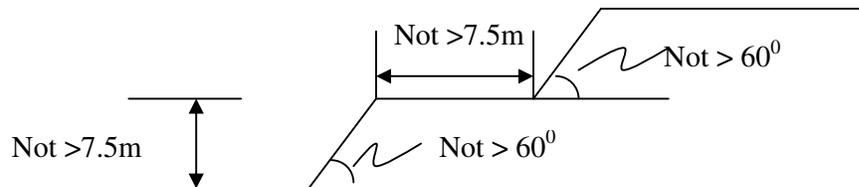
- (1) 6 day's theoretical talk (5 hrs talk on each days on the various features of HEMM, their controls, engineering aspects, craftsmanship etc.)
- (2) 12 days "on the job" training under instructor or other competent persons (6 hrs duration each day). This should include maintenance aspects of HEMM also. The instructors should be drawn from "maintenance" and "workshop" discipline.
- (3) 3 days special training ( 6 hrs. duration each) on the safety features, tests and controls of HEMM. Operation of fire fighting equipments is to be taught during this course.
- (4) 3 day's training on "motivation", "value-engineering", "attitude-building", "development of proper perception", "cost analysis", and evils of alcoholism and drug addiction etc. First aid should also be incorporated in this programme ( 6 hrs talk on each day)

Total -24 days

On conclusion of the training, the competency of the HEMM operators should be evaluated by a board constituted by the mining company.

As per Regulation 106(3) of MMR-1961, “in an excavation of any hard and compact ground, the sides shall be adequately benched, sloped or secured so as to prevent danger from fall of sides”. What in your opinion should be the adequate slope and dimensions of the benches?

As per DGMS Circular No. 42 of 1965, “generally the height of a bench in hard and compact ground should not in any case exceed 7.5m and the sides of the bench should be sloped at an angle of not more than 60° from the horizontal. The width of the benches should also be not less than height” as shown in the figure:



In my opinion, from the experience gained, in opencast mines worked by manual means, sides with slope not exceeding 75° from the horizontal may be adequate in hard and compact ground. If the height of the bench does not exceed 5m even vertical sides may be permitted. But these slopes and dimensions of the benches may be adequate upto a depth of say 60m for manually operated quarries. When the depth of workings exceeds 60m, scientific geotechnical study may be required to establish safe angle of slope in different types of strata encountered in the pit, because factor of safety of slope varies with depth besides other parameters. Such study may also be required for opencast mines using heavy earth moving machinery (HEMM). The aspect of “short-term” or “long-term” stability of the sides/slope has to be kept in mind. Long term stability of sides is called for to ensure the safety of surface structures from a possible collapse of the sides.

**What is “deep hole” coming under the purview of Regulation 106(2)(b) of MMR-1961?**

Holes more than 3m in depth may be taken as coming under the purview of Regulation 106(2)(b) of MMR-1961. It is independent of diameter.

**State the role and function of workmen’s Inspector.**

Machine can be controlled. But man has to be motivated towards safe performance and realize the intrinsic value of such efforts. This calls for active participation of workmen in promotion of safety. Their meaningful participation would mean a conscious effort by them to see that safe and healthy working condition prevails in mines at the first instance and therefore every effort is made by all concerned to maintain the safe system and curb unsafe acts. With this background, the concept of workmen’s inspection was evolved in mining industry.

**ROLE:** Mines Rules-1955 have incorporated the institution of workmen’s Inspector in Rule 29(Q to S). Their duties are indicated in Rule 29-R. But this principal rule should be to protect the interest of the workers so far as the health and safety of the workmen are concerned. In addition, he has to engender confidence in workmen that their place of work is under close watch continuously to keep it safe and healthy. Admittedly, a person called upon to play his role must enjoy the confidence of workmen. It is not possible for DGMS officials to inspect all the mines twice a week but an workmen’s Inspector can do so. Therefore, the role of the workmen’s inspector is supplementary to the Govt. enforcement agency in correct application of safe and healthy means.



**FUNCTION:** There are four main functions of workmen's Inspector as follows-

- (i) Inspection of mine workings, safety equipments and electrical machinery to identify hazardous condition and defects and to check observance of statutory safeguards. Detailed inspections made twice in week help to rectify unsafe conditions well in time and perhaps with lesser effort.
- (ii) He will accompany the Inspecting officer from DGMS in the course of his complete inspection and also during other inspections if called upon to do so by the officer to develop the art of inspection.
- (iii) In case of urgent and immediate danger, he must draw the attention of mine officials responsible for taking suitable remedial measures. He may indicate the steps that should be taken immediately to contain the danger and inform DGMS about it.
- (iv) He shall write his inspection report in form 'U'. He is also member of safety committee and has specific functions there. His participation in the deliberations of the safety committee promotes better understanding on safety and health problems and help decide the line of action. The findings of his inspection and enquiries are of immense value in these deliberation. Lastly, in case accidents causing loss of life or serious bodily injury to any person, the sketch of the accident site to be prepared before the place of accident is disturbed, is to be signed by the workmen's Inspector. This is his function in accident enquiry process.

**How and when as a manger of a mine, you will make an enquiry into the causes and circumstances attending an accident resulting in serious bodily injury to any person or loss of life, as required under regulation 44(8) of MMR-1961?**

Immediately after receipt of any information about serious bodily injury to any person or loss of life in my mine, I shall forthwith pay a visit to the place of the accident, rescue the injured person and after rendering first aid send him to hospital. If death occurs due to the accident, I shall recover the dead body with least possible disturbance to the place of accident and send the body to surface/dispensary. I shall not disturb the place of the accident as required under regulation 190 of MMR-1961, provide U-type fencing at the entrance to the site of accident as per D.G.M.S. circular no. 11 of 1959 and send information to D.G.M.S. as required under regulation 9 of MMR-1961. I shall wait for 72 hours from the time of accident for the arrival of the D.G.M.S. officers. If enquiry from D.G.M.S. is not started by then, I shall start my enquiry by pursuing the following steps:-

- (1) I shall prepare a sketch of the site illustrating the accident (in duplicate).
- (2) I shall collect all relevant details of the place of accident like situation prevailing just before the occurrence of the accident; the relevant dimensions of the work-geometry, hauling or transport system and rolling stock ( if the accident is due to transport machinery). I shall take the assistance of my Asst. Manager, safety officer and surveyor in this process. I shall also get a plan of the accident site prepared by the surveyor. I shall get the sketch signed by all of them and by the workmen's Inspector and shall myself sign it. One copy of this authenticated sketch is required to be sent/delivered to the concerned D.G.M.S. officer.
- (3) After this, I shall collect all the eye-witnesses of the accident and other relevant witnesses like co-workers, supervisory personnel etc. at the site and interrogate them to know the events prior to the accident, occurrence of the accident, rescue/recovery work (if done prior to my arrival on the site). Evidence of illiterate witnesses will be recorded first, on the spot, if possible.
- (4) Then I shall record the evidence of all other witnesses in ascending order of official status, in my office. In case of serious bodily injury, the evidence of the injured shall be recorded in the hospital/dispensary, the moment he is fit to dispose. His evidence is most important. If the injured is likely to die, his dying declaration will be recorded on top priority. Constant touch with attending medical officer is necessary for this purpose.



- (5) All the evidences will be analyzed to conclude on the causes and circumstances leading to the accident, pin point the responsibilities (if any)
- (6) Finally, measures will be recommended to prevent similar accident in future.
- (7) Proceedings will drawn against person found responsible for this accident causation, unless the accident is treated as a case of “misadventure” i.e. nobody’s responsibility.

**Discuss the provisions of mines rules 1955 which enable the workers to participate in the safe working of the mines. Suggest what may be done to make the provisions more effective.**

Recognizing that much greater strides can be achieved by participation of workers in safety management / programmes , the twin instruments of “workmen’s inspector” and “safety committee” have been given statutory backing by being incorporated in the mines rules 1955 in a new chapter IVB (rules 29Q to 29W). As per these rules (Rule 29Q), workmen’s inspector are required to be appointed in every mine (Employing more than 500 workers) in three disciplines mining, electrical and mechanical. Their duties have been prescribed U/R 29R and includes inspection of workplace , roadways ,equipment; intimation to the manager and inspector about urgent and immediate danger; suggestion of immediate measures to avoid dangers; accompanying inspector of mines in course of complete inspection or if so required by him otherwise; and preparation of reports in form “U”. As per rule 29T, safety committee is required to be constituted at every mine employing more than 100 persons, and this committee shall consist of manager (chairman), 5 officials or competent persons nominated by chairman, 5 workers nominated by workmen, the three workmen’s inspector’s (mining, electrical and mechanical) and safety officer (or senior most mine official next to manager where there is no so) as secretary. The functions of safety committee are prescribed in Rule 29V which includes discussion on ‘remedial measures’ against unsafe conditions and practices as pointed out in “U” forms by the workmen’s inspector or otherwise brought to the notice of the committee and making recommendations ; consideration of the proposed safety and health measures before commissioning of any new district , of new electrical and mechanical installation or introduction of new mining technique and making appropriate recommendation ;discussion on the reports of enquiry into accidents; formulation of safety campaign based on accident analysis and serving as a “Forum” for communication on safety and occupational health matter. The safety committee shall meet once in 30 days .Both these instruments are “bi-partite” in nature i.e. they consist of managements and workers representatives. The concept underlying this concept is that when workers participate in safety activities, the safety decisions are not taken by management alone and imposed on the workers, but the problems are explained in details and the workers are made to participate in the analysis and arriving at decision with management guidance. In this system, the workers are “involved” in the “safety decision making process” and are committed to that extent which they can, with some justification, claim to be their own .Conforming such decision gives the worker a needed challenge and satisfaction on it’s achievements, The system meets to some extent the ego needs of individuals thereby increasing worker’s motivation and creating conditions for greater safety and risk reduction.

**MEASURES SUGGESTED TO MAKE PROVISIONS MORE EFFECTIVE:**

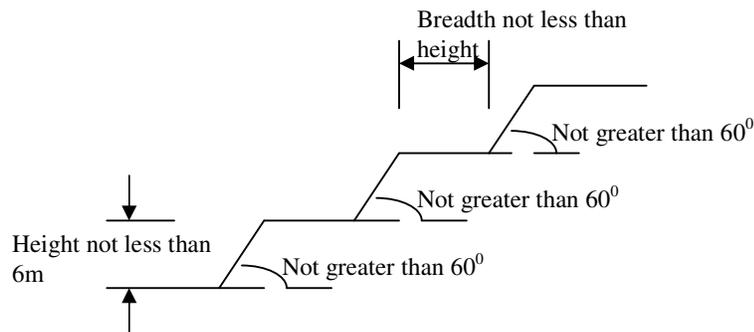
1. The training imparted to workmen’s inspector should be more intensive and purpose oriented .They should be made to realise that their main role is to protect the interest of workers as far as their health and safety are concerned and has to engender confidence in workmen that their place of work is under close watch continuously to keep it safe and healthy.

2. The members of safety committee should be thoroughly trained so that they may feel important, involved and committed. The training should include inculcation of better attitude towards work, improved motivation, perception-conditioning etc. They should act as “catalyst” in promoting better work environment, work-practice and quality of work life(QWL)
3. The safety committee meetings should be attended by senior officials above manager rank to boost the morale of the participants.
4. Better IR between management and workers; otherwise the workers representative may feel that their participation is in the interest of the management and not oriented to the health, safety and welfare of the workers.
5. Last but not the least, the workmen’s inspector and the member of the safety committee should be made “value oriented” in their approach by selling the “motto” that “skill-rich” approach will not achieve the desired results unless it is “value rich” also. “Desirable values” should be incorporated in the “means” to achieve the “end” of “Desired value”.

**What are the requirements of MMR-1961 as regards formation of benches/ sloping of sides in opencast workings for different types of strata, worked manually as well as by the help of heavy machinery?**

**Manual quarry** (i) In alluvial soil, morum, gravel, clay, debris or other similar ground- sides to be sloped at an angle of safety not exceeding  $45^{\circ}$  from horizontal or such other angle stipulated by RIM or kept benched of height not greater than 1.5m and breadth less than the height. In case of special difficulties, CIM may grant exemption.

(ii) Float ore on a sloping face: benched and sloped sides; slope not greater than  $60^{\circ}$  from horizontal; bench height not greater than 6m and breadth not less than height like this:-



(iii) In ore body of comparatively hard and compact rock RIM may permit height of the bench upto 7.5m, while its width not less than 6m, subject to certain conditions. CIM, however can relax the provisions where special difficulties exist.

**Mechanized quarry** (i) In alluvial soil, morum, clay or other similar ground, where compliance with the provision of Regulation-106(1) of MMR-1961, is not possible, while employing heavy machinery, not less than 60 day’s prior notice is required to be submitted to CIM and RIM and no work shall be commenced or carried out except in accordance with the conditions specified by the order in writing. That means, in soft strata, if heavy machinery is proposed to be deployed and worked in such a manner which will not permit formation of benches of height not greater than 1.5m and width not less than height or maintain angle of safety of the slope not greater than  $45^{\circ}$  from the horizontal, permission under 106(2)(b) Of MMR-1961 is



required to be obtained from DGMS and formation of benches/slope of sides etc. will be strictly in accordance with the conditions stipulated in the permission. Normal stipulations are- (a) the height of the benches in overburden, ore-body or other rock formation shall not be more than the digging height of the excavator, provided that in case of uniformly soft rock, RIM may permit the extension of the height upto 3m above the digging height. (b) the width of the bench shall not be less than (i) the width of the widest machine plying on the bench plus 2 meters or if dumpers ply on the bench, three times the width of the dumper or the height of the bench whichever is more. CIM, however, may permit lesser width of the benches than the height subject to certain conditions.

MMR-1961 is however silent on “whether permission under 106(2)(b) is required from DGMS when the strata is not soft as indicated under 106(1) but is hard and compact where the provisions of regulation 106(3) of MMR-1961 are applicable which reads “in an excavation of any hard and compact ground or in prospecting trenches or pit, the sides shall be adequately benched, sloped or secured so as to prevent danger from fall of sides.”

Conventionally, permission under regulation 106(2)(b) of MMR-1961 is obtained by mine operators, in all types of strata whenever it is proposed to work by a system of deep hole blasting and/or with the help of heavy machinery for digging, excavation/removal etc.

**What should be the sampling procedure of air-born dust in Mechanized Opencast mine? Describe with line diagram the principle of operation of a Gravimetric dust sampler approved by DGMS.**

**1) General sampling procedure:**

In mechanized Opencast mine sampling by “Personal” samplers is considered more reliable than sampling by fixed point sampler. However, sampling by fixed point sampler should be taken at the working places near the persons. It should be carried out with the air inlet to the instrument facing the return side of the point of dust generation. Direction of the air current should be kept in mind and instrument should be kept horizontal and positioned at about breathing level. NCB/MRE Gravimetric Dust Sampler Type 113A or its approved equivalent may be used for such fixed point sampling. Personal Samplers also should be of approved type. Personal samplers give the assessment of the dust dose of an individual during a shift whereas a fixed type sampler gives mainly the assessment of the work place environment.

**2) Sampling Position:** Personal sampler shall be attached to the worker. fixed type sampler should be placed as follows. A) The sampler should be placed adjacent to the operator within one meter, in by of his normal working position and on the return side of the point of dust generation B) in no case shall the device be installed behind the operator.

**3) Duration of sample:** A working place should be sampled continuously during the whole of the working shift from the time men reach the working place to the time they live. In case of personal sampler the sampler shall be attached to the person from the time he enters the mine to the time he leaves the mine.

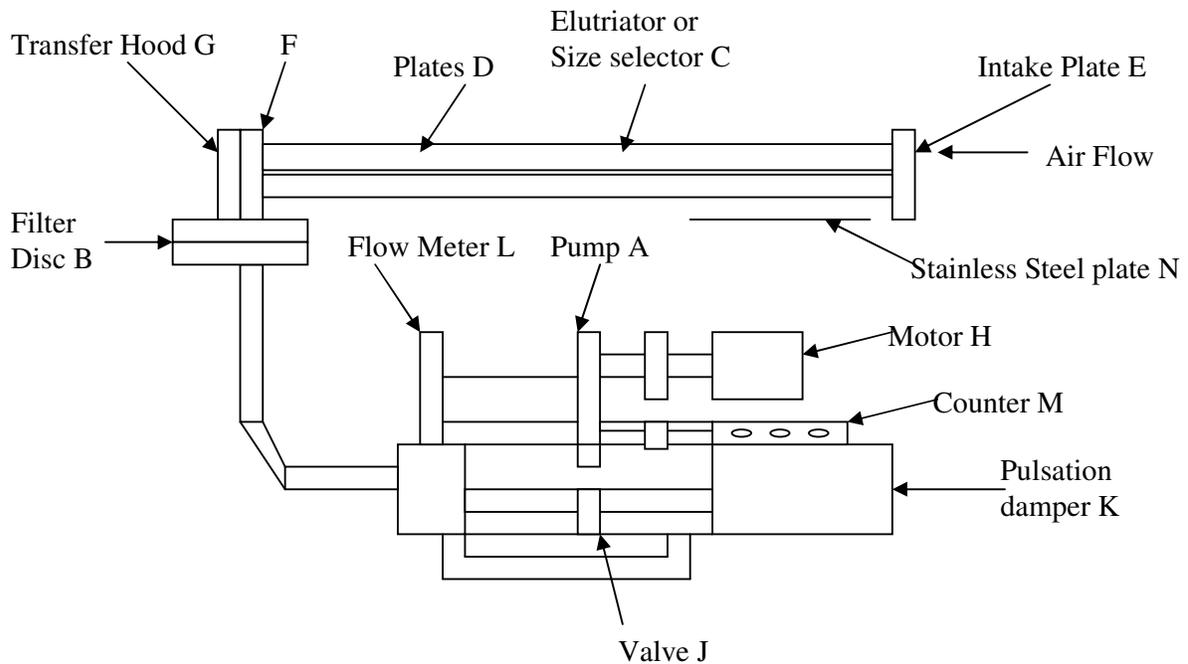
**4) Frequency of Sampling:** Every place where people are at work shall be sampled once in every month. If the respirable dust concentration exceeds the T.L.V prescribed for the type of dust. Then the face shall be sampled again for 5 times in the next 7 successive shifts and continue till the concentration comes within T.L.V. Once the respirable dust content falls to TLV. or below, the monthly sampling schedule shall be followed.

**5) Quartz content:** since the TLV of dust concentration is related to % silica content in the respirable dust, the quartz or free silica content of each sample of air borne dust shall be ascertained to determine the TLV of respirable dust of all ores except manganese and asbestos.

**6) Defective sample:** if the analyzing laboratory is of the opinion that the sample is not representative of the mine atmosphere, the sample should be disregarded and fresh sample should be taken.

7) **Recording of results:** record of respirable dust content and the quartz content of the samples shall be kept in a bound paged book. The record should include the place of drawing sample and date of sampling. The place where samples were drawn should be shown on a plan in a suitable scale.

#### SCHEMATIC DIAGRAM OF MRE/NCB GRAVIMETRIC DUST SAMPLER-TYPE 113A



NCB/MRE Gravimetric Dust Sampler-type 113A is approved by CIM for sampling air-borne dust in mines. It is a self-powered, portable, intrinsically safe instrument for obtaining Gravimetric samples of respirable air-borne dust in mines. An electrically driven pump A (shown by diagram above) draws air to be sampled through a filter disc B at 2.5 liters per minute so that only respirable fraction of air-borne dust is collected. A size selector C is used before air is passed through filter paper. Size selector is multi channel horizontal plate elutriator allowing only the respirable fraction of air borne dust slotted intake plate E fitted over elutriator entry minimizes effects of external air flow and gives pressure stabilization and equalization in elutriator plates. Rear of each horizontal plate is lipped at F to prevent accidental shaking on to filter disc of oversize dust deposited in elutriator. Transfer hood G between end of elutriator and filter disc is held in position by two screws. Motor H runs at constant speed controlled electronically. Flow of air via leaf valve J and pulsation damper K passes through flow meter L. Counter M is geared to the motor and displays total air flow in liters. After clean air passes through flow meter it exhausts inside the main case and maintains it at a slight pressure thus preventing dust entry. The weight of the instrument is 4 Kg.

[In 1959, Johannesburg International Conference on Pneumoconiosis recommended that mass concentration of respirable dust (determined by weighing) was best descriptive parameter to measure Pneumoconiosis hazard. Earlier, the index for measurement of dustiness was number of particles per unit volume of air breathed (p.p.a.e) - particles per cubic centimeter. Gravimetric- means by "weight"]



**What are the occupational diseases notified by Central Govt. as diseases “connected with mining operation” under Sec.25 of the Mine’s Act 1952? What is the “Manganese Poisoning”? What are the symptoms and preventive measures?**

The following diseases have been notified by Central Govt. under” Sec.25 of the Mine’s Act 1952 as diseases “connected with mining operation:-

- 1) Silicosis
- 2) Pneumoconiosis
- 3) Manganese Poisoning
- 4) Asbestosis
- 5) Cancer of Lung or the stomach or the pleura and peritoneum (i.e.mesotheliomas)

**Manganese Poisoning** is an occupational disease notified by Central Govt.under Sec.25 of the Mine’s Act 1952 and is compensable. It is caused by the inhalation of fine manganese dust in contamination of food stuff by manganese dust if taken without washing the hands and mouth. It incapacitates a person if the dose exceeds a certain limit. The poison attacks the brain and affects the so-called extra pyramidal system. It develops drowsiness and insomnia as well. Other symptoms are muscular pain cramps, stiffness of limbs and involuntary tremors. It affects the nervous system resulting in occasional uncontrollable laughter and/or crying. There may be impulsive acts such as running, dancing, singing etc. The victim may be aggressive and his speech disturbance may also occur. There is no specific remedy for this disease and the effected patient should be rehabilitated in new occupation suitable to their physical condition. If no such alternative employment is available, such person shall be paid disability allowances as per Rule 82 A of Mine’s Rule 1955.

As regards preventive measures DGMS Circular No.25 of 1961 had prescribed ventilatory standards to obviate the Manager dust hazard in underground mines besides prohibiting dry drilling Reg. 124 of MMR,1961 had been later amended in 1988to incorporate the time weighted average concentration of Mn-dust not more than 5 mg. per cubic of air sampled by a gravimetric dust sampler of a type approves by CIM and as determined in accordance with the procedure specified by him by general or special order, besides detailed dust sampling procedure.

[ventilation standard recommended in CIM Circular no. 25 of 1961” A minimum air velocity of 15m/min. at the work faces and dead ends at points not more than 1.5m away from the face.”]

**What is the minimum standard of illumination prescribed for different places or areas where natural light is insufficient in open cast metalliferous mines, the manner and the plane level in which the illumination is to be provided during working hours?**

In pursuance of sub-regulation (2) of Reg.148 of MMR-1961 the standard lighting prescribed is indicated below-

Sl.No.	place/Area to be illuminated	Manner in which it is to be illuminated	Minimum standard of illumination (LUX)	plane/level where illumination is to be provided
1	General working areas as determined by the manager in writing		0.2	At the level of the surface to be illuminated
2	Work place of heavy	So as to cover the depth		

	machinery	and height through which the machinery operate	5.0 10.0	Horizontal Vertical
3	Area where drilling rig works	So as to illuminate the full height of the rig	10.0	Vertical
4	Area where Bull-Dozer or other tractor-mounted machine works		10.0	At the level of the Crawler tracks
5	Places where manual work is done	To be provided at the level of the surface on which such work is done	5.0 10.0	Horizontal Vertical
6	Places where loading, unloading or transfer, loading of dumpers, trucks or train is carried on		3.0	Horizontal
7	Operator's cabins of machines or Mechanisms	To be provided upto a height of 0.8 m from floor level	30.0	Horizontal
8	At hand picking points along a conveyor belt	To be provided upto a distance of not less than 1.5m from the picker	50.0	On the surface of the conveyor belt
9	Truck Haulage Road	To be provided at the level of the road	0.5 to 3.0	Horizontal
10	Rail Haulage track in the pit	To be provided at the level of the road	0.5	Horizontal
11	Roadways and footpaths from bench to bench		3.0	Horizontal
12	Permanent paths for use of persons employed etc.		1.0	Horizontal

**What are the statutory restrictions/requirements for working a quarry in the vicinity of a river? What precautions should be taken to guard against danger if inundation of the difference between highest known flood level of a river and top of a quarry is 1.0 meter?**

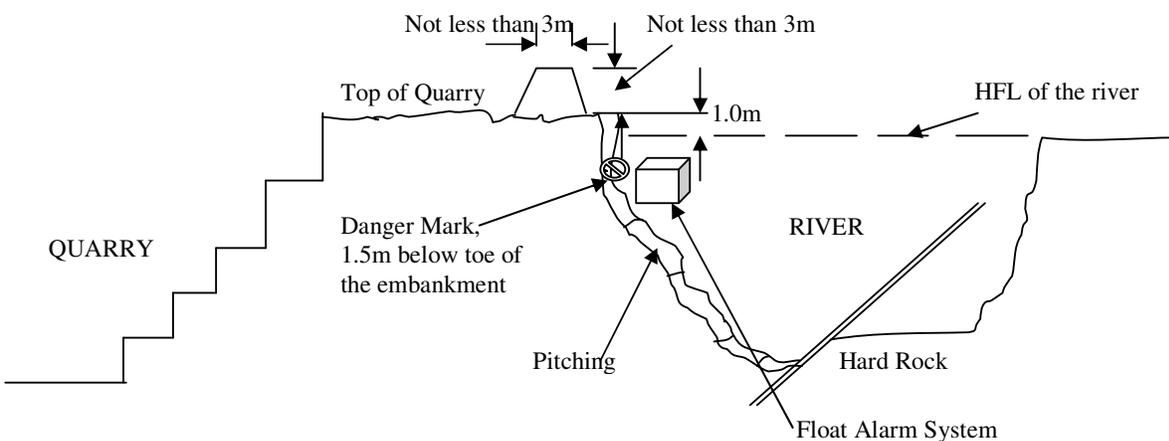
**Statutory restrictions/requirements for working a quarry in the vicinity of a river:-**

1. As per Reg.127(1) of MMR-1961, where a quarry is so situated that there is any danger of inrush of surface water into it, adequate protections against such inrush shall be provided and maintained, and if any dispute arises as to whether such protection is adequate or not it shall be referred to CIM for decision.
2. As per Reg.127(2)(b) of MMR-1961, no part of the quarry shall be extended to any spot lying within a horizontal distance of 15 meters from either bank of river except with the permission in writing of the CIM and subject to such conditions as he may specify therein.
3. If any part of the quarry is proposed to be extended to within 15m of either bank of the river, permission has to be sought from CIM by submitting application accompanied by two copies of plan and sections showing the existing position of the quarry, the proposed extension, depth of the quarry from surface, any fault or other geological disturbances and such other particulars as may affect the safety of the quarry or of the persons employed therein.

**Precautions against danger of inundation in the quarry:-**

The difference of level between the top of the quarry and the H.F.L. of the river is 1.0 meter. It is not considered to be adequate because of possibility of change of HFL due to various reasons. As per CMR-1957 (Reg. 126(1)(b)) this difference of level shall not be less than 1.5m without permission from CIM. Therefore, I propose the precautions as per details below:-

1. Provisions of embankment of pure earth/clay, the height of which will be not less than 3m from the HFL of the river.
2. The width of the top of the embankment shall not be less than 3m.
3. The water course side of the embankment shall be pitched by stone blocks of at least 0.3m thickness cemented with each other and the pitching shall be extended upto the hard rock of the river bed as shown in the sketch below:-



4. The embankment shall be strong enough to withstand (i) the static head and the dynamic stresses of flowing water & (ii) eroding effect of water. Civil engineering and soil mechanics experts may be consulted before construction of the embankment.
5. A danger mark, 1.5m below the toe of the embankment shall be fixed provided with float alarm signaling system for withdrawal of man and machines from the quarry, when water rises upto the danger mark in the river. System of communication from float alarm switch to the different paths of the mine and other places shall be regularly checked for its effectiveness.
6. Danger mark, however shall be fixed taking into consideration the rate of rise of water level in the river under the most adverse condition, time taken for conveying alarm to the prescribed places, time taken by the officials to collect men and machine and remove them to safe place, margin of safety etc.
7. Besides these, adequate lighting arrangement at the float switch for night inspection and patrolling during rainy seasons should be arranged.
8. The manner of withdrawal shall be incorporated in standing order for withdrawal of persons.
9. Constant watch against obstruction of flow of water in the river.
10. Mock-Rehearsal of withdrawal practice to maintain the level of alertness and safety consciousness amongst all.



**What do you mean by classification of accidents? How is it significant? What is ILO Classification of accidents and what classification is followed by DGMS?**

Accidents are classified cause-wise, place-wise, type-wise, agency-wise, nature of injury-wise, bodily location of injury-wise etc. to identify the actual causes and circumstances leading to accidents so that remedial measures could be evolved and implemented to avoid similar accidents in future. Classification helps detailed analysis of the data collected and pin-point weak areas contributing to accident causation. In this respect classification of accident is significant in formulating accident prevention programmes. There are many different methods of classifying accidents to causes, some are known as simple classification and others are multiple classification system.

ILO in 1923 had adopted a simple classification which had been replaced by a multiple classification of system in 1962. According to this system, industrial accidents are classified under each of the following headings:-

- (a) The type of accident, e.g. fall of person, struck by falling object, caught in-between objects etc.
- (b) The agency, e.g. machines, means of transport, pressure vessels
- (c) The nature of injury e.g. fracture, dislocation, burns etc.
- (d) The bodily location of injury e.g. head, upper limb, neck etc.

In DGMS basically, the statutory requirement of classifying accidents as per instructions annexed to the Form IV-A of the first schedule U/R 9 of MMR-1961 is enforced which is cause-wise classification like explosion and ignition of inflammable gas, falls of ground, haulage, explosive, machinery etc. This relates to fatal and serious bodily injuries only in which case form IV-A is required to be submitted to DGMS. In respect of other injuries, reportable and minor, classification of accidents by place of work and by cause had been prescribed in Annexure I&II to form J (Return of reportable accidents). Thus cause wise & place wise classification with detailed sub-classification had been so far the system adopted by DGMS. In DGMS circular No. 40 of 1972 and No.3 (General) of 1978, new classification codes on this basis had been circulated. But recently DGMS follows a code of classification, the details of which are given below-

**CLASSIFICATION OF ACCIDENTS & ITS CODE NOS**

**PLACE CODE**

CODE	LONG NAME
1	Below ground
2	Opencast
3	Above ground

**WORKING CODE**

CODE	LONG NAME
1	Development
2	Longwall
3	Depillaring/ Stopping
4	Coal/ore bench
5	O/B Bench
6	Waste dump
7	Others

**CAUSE CODE**

CODE	LONG NAME
0111	Fall of roof
0112	Fall of sides

**DESIGNATION CODE**



0199	Other falls of ground
0121	Overwinding of cages/ Skips etc.
0299	Other accidents/ Dangerous occurrences Due to winding
0332	Rope haulage
0834	Conveyors
0335	Dumpers
0339	Other wheeled trackless
0399	Other non winding Machinery
0448	HEMM other than Dumpers
0499	Other machinery
0500	Explosives
0600	Electricity
0775	Spontaneous heating
0799	Other accidents/ Dangerous occurrences Due to dust/fires
0881	Fall of persons
0883	Fall of objects
0899	Others ( falls other than Ground movement)
0999	Other than above

CODE	LONG NAME
20	Management
30	Subordinate supervisory officials
41	Loaders
42	Support personnel
43	Dresser
44	Shotfirer
49	Other B/G face worker
50	Other B/G worker
59	Trammer
60	Fitter
71	Dumper operator
72	Truck etc. operator
79	Other operators
99	Any other

**SITE CODE**

CODE	LONG NAME
1	Haul road
2	Rope haulage road
3	Other roadways
4	Miscellaneous

**INJURY CODES**

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

**PARTS OF BODY CODES**

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