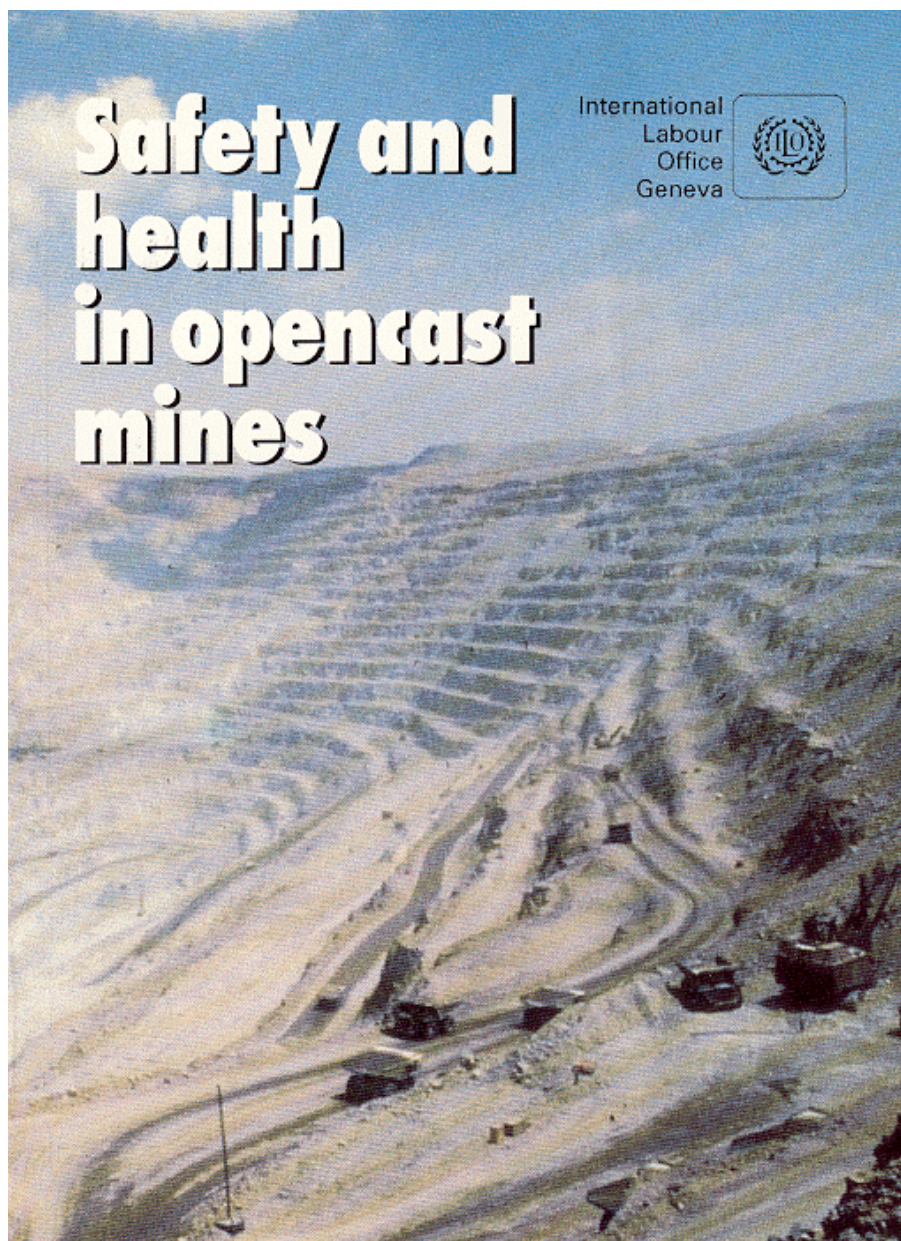


Safety and health in opencast mines

International
Labour
Office
Geneva



The International Programme for the Improvement of Working Conditions and Environment (PIACT) was launched by the International Labour Organisation in 1976 at the request of the International Labour Conference and after extensive consultations with member States.

PIACT is designed to promote or support action by member States to set and attain definite objectives aiming at "making work more human". The Programme is thus concerned with improving the quality of working life in all its aspects: for example, the prevention of occupational accidents and diseases, a wider application of the principles of ergonomics, the arrangement of working time, the improvement of the content and organisation of work and of conditions of work in general, a greater concern for the human element in the transfer of technology. To achieve these aims, PIACT makes use of and co-ordinates the traditional means of ILO action, including:

- the preparation and revision of international labour standards;
- operational activities, including the dispatch of multidisciplinary teams to assist member States on request;
- tripartite meetings between representatives of governments, employers and workers, including industrial committees to study the problems facing major industries, regional meetings and meetings of experts;
- action-oriented studies and research; and
- clearing-house activities, especially through the International Occupational Safety and Health Information Centre (CIS) and the Clearing-house for the Dissemination of Information on Conditions of Work.

This publication is the outcome of a PIACT project.

Cover photograph of Chuquicamata opencast mine, Chile, courtesy of the Corporación Nacional del Cobre de Chile.

**Safety and health
in opencast mines**

An ILO code of practice

**Safety and health
in opencast mines**

International Labour Office Geneva

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Preface

In accordance with the decision taken by the Governing Body of the ILO at its 244th Session (November 1989), a meeting of experts was convened in Geneva from 11 to 18 September 1990 to draw up a code of practice on occupational safety and health in opencast mines. Twenty-one experts were invited – seven appointed following consultations with Governments, seven following consultations with the Employers' group and seven following consultations with the Workers' group of the Governing Body¹.

¹ The following experts attended the meeting:

Experts appointed following consultations with Governments:

Mr. R. L. Arora, Director, Directorate General of Mines Safety, Dhanbad (India).
Mr. A. M. Ilyin, Chief, Department of Inspection for the Mining Industry, Gospromatomnadzor USSR, Moscow (USSR).
Dr. J. Leigh, Head, Epidemiology Unit, National Institute of Occupational Health and Safety (NIOHS), Sydney (Australia).
Mr. R. McGinn (Chairman and Reporter), Chief Inspector of Mines of British Columbia, Victoria (Canada).
Dr. G. I. Ruiz Caycho, Chief, Medical Service, Ministry of Labour and Social Promotion, Lima (Peru).
Mr. Yang Fu, Engineer, Bureau of Mine Safety and Health Inspection, Ministry of Labour, Beijing (China).

Experts appointed following consultations with the Employers' group:

Mr. F. H. Barnes, Corporate Manager, Occupational Health and Safety, Homestake Mining Company, Golden (United States).
Mr. J. C. Caputo, Manager, Hygiene, Industrial Safety and Training, Loma Negra S.A., Olavarría (Argentina).
Mr. B. Diouf, Mining Engineer, Société sénégalaise des Phosphates de Thies, Dakar (Senegal).
Mr. A. C. Habile, Safety Engineer, Maamba Collieries Ltd., Lusaka (Zambia).
Mr. J. B. S. Harris, Miller Mining, Normanton (United Kingdom).
Mr. Beh Tong Ng, Managing Director, Hwa Lian Mining Co. Ltd., Kuala Lumpur (Malaysia).

Experts appointed following consultations with the Workers' group:

Mr. L. N. Bhattacharya, Safety Officer, Indian National Mineworkers' Federation, Dhanbad (India).
Mr. C. Brown, National Secretary, Trades and Labour Council of Western Australia, East Perth (Australia).
Mr. J. Hippler, Head, Occupational Safety, Industrial Union of Mining and Energy Workers, Bochum (Germany).
Dr. F. Kikushima, Federation Nacional de Trabajadores Mineros, Metalúrgicos y Similares del Perú, Lima (Peru).
Mr. A. King, Staff Representative, Occupational Health and Safety, United Steelworkers of America, Toronto (Canada).
Mr. F. Kunda, Deputy General Secretary, Mineworkers' Union of Zambia, Kitwe (Zambia).
Mr. R. Padilla, National President, National Mines and Allied Workers' Union, Manila (Philippines).

International governmental and non-governmental organisations represented:

World Health Organization.
Commission of the European Communities.
International Social Security Association.
International Organisation of Employers.
Miners' International Federation.
World Confederation of Labour.

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The practical recommendations of this code of practice are intended for the use of all those, in both the public and private sectors, who have responsibility for safety and health in opencast mining. The code is not intended to replace national laws or regulations or accepted standards. It has been drawn up with the object of providing guidance to those who may be engaged in the framing of provisions of this kind, and in particular to governmental or other public authorities, committees, management or employers' and workers' organisations in this industrial sector.

Local circumstances and technical possibilities will determine how far it is practicable to follow its provisions. Furthermore, these provisions should be read in the context of conditions in the country proposing to use this information, the scale of operation involved and technical facilities. In this regard, the needs of developing countries have been taken into consideration.

The text of the code was approved for publication by the Governing Body of the ILO at its 248th Session (November 1990).

Note

Throughout this text, the pronoun "he" is used to refer to mine managers, mine operators, workers and others. This is not intended to imply that such occupations are exclusively performed by men (although legislation in certain countries forbids women to work in mines), and the text applies equally to women in such occupations.

World Federation of Trade Unions.
International Confederation of Free Trade Unions.
International Metalworkers' Federation.

ILO representatives:

Dr. K. Kogi, Chief, Occupational Safety and Health Branch.
Mr. V. Eskov, Mining Engineer, Occupational Health and Safety Branch.

ILO consultants:

Mr. E. J. H. Nicholas, former HM Deputy Chief Inspector of Mines and Quarries, London (United Kingdom).
Mr. A. Schuster, Mining Engineer, Honorary Director of the Labour and Mines Inspection, Lawyer, Luxembourg (Luxembourg).

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1. General provisions

1.1. Objective

- 1.1.1. The objectives of this code are:
- 1.1.1.1. to prevent accidents, harmful effects on the health of those employed and diseases arising from employment in opencast mines;
 - 1.1.1.2. to ensure the appropriate design, proper technologies and safe operation of opencast mines;
 - 1.1.1.3. to provide the means of analysing existing technologies from the standpoints of safety and health and conditions of work, and modifying these technologies to remove the hazards discovered by the analyses;
 - 1.1.1.4. to provide guidance in setting up administrative, legal and educational frameworks within which preventive and remedial measures can be implemented;
 - 1.1.1.5. to promote the fullest consultation and cooperation between governments, employers' organisations and workers' organisations in the improvement of health and safety in opencast mining.

1.2. Scope

1.2.1. This code applies to any situation or operation involving occupational safety and health aspects in opencast mines, and calls for attention to be paid to them by the competent authorities with responsibility for safety and health and working conditions with regard to opencast mining.

1.2.2. The provisions of this code should be considered as the basic requirements for protecting workers' health. The code contains recommendations; more restrictive national or international regulations or collective agreements have priority over these recommendations.

1.3. Definitions

- 1.3.1. For the purposes of this code:
- Approved type* means, in relation to equipment used in an opencast mine, any equipment which has been approved for use by the competent authority; where such equipment is exported, the approval certificate should be accompanied by a manufacturer's document which certifies that it complies in every way with the approval certificate; where importing countries specify changes in the approval certificate, the latter must state that such changes have been made and comply with the requested specifications; the competent authority and purchaser may then accept such certificates as valid for the purposes of this code.

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Authorised person means a person appointed by an opencast mine operator or manager and who is competent and responsible for the work he has been directed to perform.

Berm means a pile or mound of material placed for the purpose of effectively restraining a vehicle.

Blasting agent: see *Explosive*.

Code of practice is a document offering practical guidance on the policy and standard setting in occupational safety and health for use by governments, employers and workers in order to promote safety and health at the national level and at the level of the enterprise. A code of practice is not necessarily a substitute for existing national legislation, regulations and safety standards.

Combine means a combined excavator and belt transfer system operating under an automatic programme control system.

Competent person means a person, who in the opinion of the mine operator and the competent authority, is competent because of his knowledge, training and experience to design, organise, supervise and perform the duties for which he is appointed.

Dangerous occurrence: see *Serious personal injury*.

Dredge means a water-borne craft fitted with excavator, which breaks up the material to be won, in or under water.

Dump: see *Tip*.

Electrical apparatus includes electric cables and any part of any machinery, apparatus or appliance being a part designed for the generation, conversion, storage, transmission or utilisation of electricity.

Excavator means a machine which may be further identified as a single or a multi-bucket, fitted with devices for breaking up, loading, transporting and dumping materials without lateral movement of the whole machine.

Explosive means any substance or blasting agent approved and classified as such by the competent authority.

Grader means a machine capable of breaking up, pushing and levelling materials without loading the materials displaced.

Inspector means a person appointed by the competent authority under the relevant section of the national laws and regulations.

Insulated means separated from other conducting surfaces by a dielectric substance permanently offering a high resistance to the passage of current and to disruptive discharge through the substance; for purposes of the present definition, it is to be understood that the manner of insulation is such that it is suitable for the conditions to which it will be subjected under normal usage.

Isolated means disconnected from the normal source of energy.

Live means electrically energised.

General provisions

Loader means a machine fitted with a device for breaking up, loading, transporting and dumping materials, with transport of the material dependent on the lateral movement of the whole machine.

Machinery means every kind of mechanical appliance and every part thereof. It does not include any machinery which, for purposes of this code, is electrical apparatus.

Manager means a qualified and appointed person legally responsible for the management and technical direction of an opencast mine, whether he is the mine operator or a person appointed by him.

Mill includes any ore mill, sampling works, concentrator, and any crushing, grinding or screening plant used at, and in connection with, an opencast mine.

Mine: see *Opencast mine*.

Mine operator means any person or corporate body that is the immediate proprietor or lessee, concessionaire or occupier of any opencast mine or part thereof, including the agent or owner's representative.

Mineral means any naturally occurring solid substance taken from the earth for the production or extraction therefrom of a saleable product.

Misfire means an occurrence in relation to the firing of shots where: testing before firing reveals broken continuity which cannot be rectified, or a shot or any part of a shot fails to explode when an attempt is made to fire it.

Opencast mine means any mine other than an underground excavation. For the purpose of this code, the expression includes related expressions such as pits, surface mines, open pits, open cut and strip mines. Mine means any excavation in the earth, whether abandoned or being worked, made for the purpose of searching for or winning any mineral, and any place where a mineral deposit is being worked, but if two or more such places are being worked jointly, they may be deemed to constitute one mine. Any building, construction, dump, dam, machinery, and appliance situated at or near the mine and used for any purpose necessary or incidental to the winning and subsequent treatment of the products of the mine and the waste material emanating therefrom is considered to form part of such mine unless a line of demarcation excluding any part has been agreed by the competent authority.

Overburden is the rock, earth, together with other unconsolidated material or other matter lying on or interspersed with the mineral to be won.

Qualified person: see *Competent person*.

Rock means any portion of the earth's crust, whether consolidated or not.

Self-propelled mobile equipment includes all self-propelled vehicles used in and around an opencast mine for hauling, carrying, lifting, hoisting, scraping and similar operations.

Scraper means a machine fitted with devices which break up soft material, load, transport and dump it, with these operations performed by virtue of the movement of the whole machine.

Serious personal injury should be as defined in national laws and regulations. Dangerous occurrence should also be as defined in national laws and regulations.

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Tip means any heap, pile or other location used for the disposal of solid discard material from an opencast mine or the plant and rock or soil from overburden removal. This does not include lagoons or tailings (slurry) deposits.

Workers' representative means a person who is recognised as such under national law or practice, whether this person is (a) a trade union representative, namely a representative designated or elected by a trade union or by members of such a union; or (b) an elected representative, namely a representative who is freely elected by the workers of the undertaking in accordance with provisions of national laws or regulations or of collective agreements and whose functions do not include activities which are recognised as the exclusive prerogative of trade unions in the country concerned.

Working means a portion of an opencast mine which is in the course of being excavated, and a portion which has been excavated, whether abandoned or not.

2. General duties

2.1. Duties of governments

2.1.1.1. In countries where there is an opencast industry, it should be the duty of the government to:

- have in place or enact sufficient appropriate legislation and regulations to ensure the safe operation of mines together with the minimum of risk to health;
- formulate, implement and periodically review a coherent national policy for health and safety in opencast mines.

2.1.1.2. The legislation and national policy should be determined after consultation with the most representative organisations of employers and workers.

2.1.2.1. The government should enforce the legislation by means of an inspectorate, which should form part of the competent authority.

2.1.2.2. The government should have legislation stating the qualifications and experience of inspectors.

2.1.2.3.1. The inspectorate should be adequately empowered and maintained at a strength and at a technical standard sufficient for it to ensure that the legislation is observed at all opencast mines.

2.1.2.3.2. National legislation should make such provisions as enable the competent authority to make a minimum of two complete and unannounced inspections every year of each opencast mine within its jurisdiction.

2.1.2.4. The government may empower the competent authorities to vary regulations, for individual mining circumstances, only when all the persons affected are provided with standards of safety and health at least equivalent to those specified in this code or national legislation.

2.1.2.5. The competent authority should also have the power to object to or require the mine manager to change the rules or schemes made by him with respect to health and safety.

2.1.2.6. Inspection by a competent authority should be carried out in the presence of employers' and workers' representatives, unless the inspector decides to conduct an inspection on his own.

2.1.3.1. The government should ensure that those employed in the mines have the statutory right to appoint their representatives, who may inspect the mine workings at intervals, which should be stated in national laws or regulations, and who may deal with occupational safety and health concerns on behalf of workers.

2.1.3.2. It should also ensure that all facilities for such inspections and for the examination of mine records relating to safety and health matters should be made available by the mine operator and manager.

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2.1.3.3. Each report of an inspection made by workers' representatives should be sent to the competent authority, which should then take action appropriate to the content of the report.

2.1.3.4. Moreover, in the case of a fatal or serious accident or dangerous occurrence, such appointed representatives should have the right to examine the place where, and the circumstances under which, the accident occurred.

2.1.4.1. The government should introduce the necessary measures whereby, in cases where detailed investigation into the causes of an accident or dangerous occurrence could serve the future interests of mine safety and health, a special report be made or a public inquiry be held.

2.1.4.2. The special report or the report on the public inquiry should be published without delay.

2.1.4.3. Copies of these reports should be sent to the Director-General of the International Labour Office for study and report to the related industrial committee.

2.1.5. The government should also introduce the necessary measures to enable the competent authority:

2.1.5.1. to investigate the cause and circumstances of every fatal and serious accident and every dangerous occurrence;

2.1.5.2. to have records and returns submitted to it on such matters and in such form as it may require;

2.1.5.3. to specify which machinery, equipment and other materials should be tested and examined as well as the format and standards of the tests themselves before they are approved for use; and

2.1.5.4. to provide for the issue of certificates of competency in accordance with national legislation.

2.1.6. National laws or regulations should specify qualifications and experience of competent persons, supervisory officials and shotfirers.

2.1.7. National legislation should provide that:

2.1.7.1. a worker should be entitled to stop work or refuse work where he has reasonable justification to believe that the work situation presents an imminent and serious danger to his safety or health;

2.1.7.2. a worker who reports to his immediate supervisor that he has a reasonable justification to believe that the work situation presents an imminent and serious danger to his safety or health should not be required to return to the work situation whilst that condition persists;

2.1.7.3. no action prejudicial to the interests of a worker should be taken as a consequence of that worker having himself taken any action in good faith within the duties prescribed for his protection.

2.2. Duties of mine operators

- 2.2.1. It should be the duty of the operator of a mine:
- 2.2.1.1. to make such financial and other provisions – for example providing appropriate tools, equipment and materials as may be necessary to ensure that the mine is managed and worked in good conditions of occupational safety and health;
 - 2.2.1.2. to ensure that mines' machinery, equipment, substances, processes and systems of work are reasonably practicable, safe and without risk to health;
 - 2.2.1.3. not to interfere with the technical management of a mine unless he is a competent person and unless appointed to a position superior to the manager;
 - 2.2.1.4. to provide the necessary facilities to enable the workers' representatives to carry out their inspections and investigations and other functions prescribed by legislation and regulations; and
 - 2.2.1.5. where mining is carried out in areas of the world prone to natural disasters, to make provision in the design and operation of the mine to minimise the risks inherent in these areas.
- 2.2.2. In the appointment of officials the following provisions should be observed:
- 2.2.2.1. The mine operator should appoint a mine manager to be responsible for ensuring that the operation, technical direction and daily personal supervision of the mine complies with national legislation.
 - 2.2.2.2. The mine operator should appoint a sufficient number of assistant managers as may be appropriate to secure compliance with national laws or regulations.
 - 2.2.2.3. Operators of mines utilising power plant and other electrical machinery should appoint a competent person to have charge of the plant and machinery.
- 2.2.3. The mine operator should notify the competent authority of every appointment made in the technical management of the mine.
- 2.2.4. No person should be appointed to or take part in the technical management of a mine unless he is qualified to do so in accordance with national laws or regulations.
- 2.2.5. The mine operator should notify the workers of the proposed closure of a mine, indicating if the closure is temporary or permanent.
- 2.2.6. Any appointment or delegation of authority made under the terms of this code should not remove or diminish the duty of the mine operator to ensure the occupational health and safety of all persons employed at an opencast mine.

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2.3. Duties of mine managers and supervisory officials

2.3.1. The mine manager should be responsible for the observance and enforcement of all safety and health laws and rules laid down in national laws or regulations.

2.3.2. The mine operator or the mine manager may assign persons to assist the latter in the discharge of his duties only in so far as:

2.3.2.1. such persons are duly qualified and have been appointed in accordance with national laws or regulations;

2.3.2.2. their duties and responsibilities have been clearly defined in instructions given them in writing;

2.3.2.3. they have been given all the necessary facilities for carrying out these instructions and all other orders given them; and

2.3.2.4. an adequate and formal system of supervision and control has been instituted and maintained by the mine operator and the manager.

2.3.3. The manager should appoint a competent specialist to supervise the design, construction and maintenance of all mine tips, dams, lagoons or other major structures and to ensure their safe operation.

2.3.4. The manager should appoint a responsible official who should at all times be in charge of the mine on shifts when neither the manager nor an appointed deputy is present at the mine.

2.3.5. The manager of every mine should take such steps as are necessary to secure that a sufficient supply of suitable materials and appliances is at all times readily available for ensuring compliance with national laws or regulations.

2.3.6.1. The manager of every mine should cause to be carefully investigated any representation or complaint about any matter affecting the safety or health of the persons employed at that mine.

2.3.6.2. The manager of every mine should ensure that a competent person inquires into the cause and circumstances attending fatal accidents, serious personal injuries and dangerous occurrences in the mine. The report of every such inquiry should be available at the mine office.

2.3.7. The manager of every mine should make and ensure the implementation of arrangements whereby a correct record of the names of all persons entering and leaving the mine is made; the arrangements should also provide for recording the workplace of the individual.

2.3.8. The manager of every mine should ensure that:

2.3.8.1. there is in force a scheme, in respect of all mechanical and electrical apparatus and equipment which provides for the systematic examination and testing of all mechanical and electrical apparatus to ensure proper maintenance thereof, and

2.3.8.2. such other schemes are prepared as are required by this code.

2.3.9. The manager may appoint such assistant managers as may be necessary to ensure the application of certain of his duties.

2.4. Duties of other supervisory officials

2.4.1. Every assistant manager, where appointed, of each mine should make and maintain arrangements for conferring daily with all other officials having charge of operations within his jurisdiction.

2.4.2. A mine may be divided into sections. Where a mine is so divided each section should be in the charge of a supervisory official appointed by the manager. The size of each section should be such as to allow the supervisory official to carry out the inspections in a thorough manner.

2.4.3. Each part of a mine where persons are required to work shall be inspected by a supervisory official during each working shift and such inspections should include:

2.4.3.1. the safe condition of all working faces, walls, banks and slopes, and the implementation of corrective work where necessary;

2.4.3.2. the performance of operations preparatory to blasting and the state of equipment and vehicles used therefore;

2.4.3.3. the condition of haulage and transport equipment;

2.4.3.4. the condition of roadways;

2.4.3.5. the guarding of machinery and places of danger;

2.4.3.6. the state of dust-control equipment;

2.4.3.7. the checking of the number of workers falling within his responsibility during the shift to ensure that no worker remains at the end of the shift unless specifically authorised by him; and

2.4.3.8. the condition of any safety equipment that may be used at mine faces.

2.4.4. The supervisory official should make a written report at the end of his shift in a form designed for that purpose and advise the mine manager of any dangerous or unusual circumstances or condition. The report should be read and countersigned by the incoming supervisor.

2.4.5. The competent persons responsible for the mechanical or electrical apparatus should ensure that the staff under their charge supervise or effect:

2.4.5.1. the installation of all machinery and apparatus at the mine;

2.4.5.2. the examination and testing of all such machinery and such apparatus before it is put into use after installation, reinstallation or repair;

2.4.5.3. the maintenance in safe working conditions, in accordance with national laws or regulations, of all such machinery and apparatus at the mine;

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- 2.4.5.4. the systematic examination and testing of all such equipment at the mine in accordance with the scheme in force; and
- 2.4.5.5. the drafting and enforcement of planned schedules of preventive maintenance and for all repairs of mining, transport, road construction and all other machines of whatever description in use at the mine.

2.5. Duties of workers

2.5.1. It should be the duty of every worker while at work:

- 2.5.1.1. to take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions;
- 2.5.1.2. to comply with instructions given for his own safety and health and those of others;
- 2.5.1.3. to use safety devices and protective equipment in accordance with the instructions that he has been given;
- 2.5.1.4. to report forthwith to his immediate supervisor any situation which he may have reason to believe could present a hazard and which he cannot himself correct;
- 2.5.1.5. to report any accident or injury to health which arises in the course of or in connection with work; and
- 2.5.1.6. to cooperate with his employer or any other person with regards to any duty or requirement imposed upon them by or under any of the relevant statutory provisions, to the extent that may be necessary to enable the duty or requirement to be performed or complied with.

3. Surveyors and plans

3.1. Appointment of duly qualified surveyor

3.1.1. No opencast mine should be worked unless there is a competent person to act as the surveyor for the mine appointed by the mine operator. The mine operator should notify his appointment to the competent authority.

3.2. Duties of mine surveyor

3.2.1. It should be the duty of the surveyor of the mine:

3.2.1.1. to prepare all plans, drawings and sections of the mine which are required by national laws or regulations, or to supervise their preparation;

3.2.1.2. to establish the accuracy of any plans, drawings or sections which have not been prepared by him; and

3.2.1.3. to ensure that all working papers, calculations or other notes which were necessarily used in the preparation of any plans, drawings and sections are signed, dated, properly filed and preserved.

3.3. Plans: General

3.3.1. Every mine should keep accurate plans showing particulars of all the workings, together with such other information as may be specified by national laws or regulations.

3.3.2. All mine plans should be brought up to date as specified in national laws or regulations.

3.3.3. At every mine there should be posted in a prominent position, where it can be clearly seen by the workers, the details of an emergency preparedness plan for the mine showing such things as the position of all telephones and other communication equipment, first-aid stations, fire-fighting and rescue devices.

3.3.4. Every mine should keep a geological map of the district in which the mine is situated, and this map should contain such information as is prescribed by national laws or regulations.

3.3.5. Every mine should keep a development plan which shows proposed workings for a period which may be specified in national laws or regulations.

3.3.6. All mine plans should take into account the protection of the environment and the safety of the workers.

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3.4. Faulty plans

3.4.1. If mine plans are found to be inaccurate or deficient, the competent authority should be empowered to have the mine surveyed and new plans prepared at the expense of the mine operator.

3.5. Abandonment plans

3.5.1. No mine or part of a mine should be abandoned until the mine plans have been brought up to date.

3.5.2. Abandonment plans should contain all the information specified in national laws or regulations together with any other information not so specified which may affect the safety of the surrounding area; such plans should be endorsed with a certificate from the surveyor attesting to their accuracy and any limitations thereon.

3.5.3. Abandonment plans should be submitted to the competent authority, which should store them in a specified place and should keep a proper register of all the plans so stored; they should be made available to all persons having a proper interest in them.

4. Registration and record-keeping

4.1. Commencement and cessation of mining operations

4.1.1. The mine operator of any mine should be responsible for registering the mine with the competent authority.

4.1.2. The mine operator of any mine should notify and file plans and details of the mining scheme and the equipment with the competent authority before

- the commencement of any mining operation;
- the reopening of an abandoned or closed mine; and
- the proposed closure of a mine, indicating whether the closure is temporary or permanent.

4.1.3. Where a change occurs in the ownership or the name of a mine, the operator should, within a period which should be specified in national laws or regulations, notify the competent authority of the change.

4.2. Posting of notices

4.2.1. The manager should ensure that all notices that are required to be posted are exhibited in a prominent position and renewed as necessary to preserve their legibility.

4.2.2. The mine operator should provide, at or near the mine, suitable covered accommodation where there shall be kept legible copies of:

- 4.2.2.1. the national laws and regulations relevant to the mine;
- 4.2.2.2. all rules or procedures such as those relating to excavation, transport and shotfiring for regulating the conduct of such operations; and
- 4.2.2.3. all notices served by an inspector.

4.2.3. All the documentation thus provided shall be replaced if it becomes illegible, defaced or destroyed.

4.2.4. There should be kept posted at a mine a notice specifying:

- 4.2.4.1. the name of the mine, the name and address of the owner and of the manager;
- 4.2.4.2. the name and address of the inspectors of the mine; and
- 4.2.4.3. the location of the accommodation provided for copies of national laws and regulations and relevant documentation.

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4.3. Records and returns

4.3.1. All records, reports, plans or other documents required by national laws or regulations on matters of safety and health should be kept at the office of the mine and available for inspection by the competent authority and the workers' representatives unless the competent authority directs that these be kept at another specific place.

4.3.2. The mine operator should send to the competent authority such returns and statistics as may be required relating to the safety and health matters at the mine. These should be made available to the workers' representatives.

5. Training

5.1. The mine operator should ensure that no persons are employed in work of any description at an opencast mine unless those persons have received the necessary instruction and training so as to be able to do the work competently and safely. This duty applies to all grades and classes of workers.

5.2. Individual records of all such training, and where necessary retraining, should be maintained at the mine.

5.3. National laws or regulations should specify the broad principles of the type of training or retraining required for all the various categories of employment in the different types of opencast mines.

5.4. A training supervisor should be appointed by the manager to supervise all training activities, to maintain records of trainees and to report on training matters as required.

5.5. Where the resources of an opencast mine are insufficient to fulfil the requirements of this section, the competent authority should arrange for two or more opencast mines to hold a combined safety training scheme, or make such other arrangements as are practicable in the interests of accident prevention.

5.6. Copies of the relevant safety regulations and procedures should be given to each employee upon the commencement of and upon any change of employment.

5.7. All trainees should undergo specific training in the rules and procedures, and should not be assigned to work duties until they have assimilated thoroughly all such safe work practices.

5.8. Training programmes should be developed on a tripartite basis, including consultation with government, management and labour, on an industry-wide basis as well as at the workplace level.

5.9. Workers' representatives, members of workers' safety and health committees or joint safety and health committees, or other workers' representatives, should be given reasonable time during paid working hours to undertake appropriate training in occupational safety and health.

6. Design and methods

6.1. Design requirements

6.1.1. Where the depth of an opencast mine excavation is planned to exceed 10 m, the mine operator should, prior to the commencement of excavation, prepare:

6.1.1.1. a design report; and

6.1.1.2. an operating manual.

6.1.2. The design report should include:

6.1.2.1. maps and, where available, recent aerial photographs, showing the location and physical features of the mine area, including local drainage systems;

6.1.2.2. drawings showing:

6.1.2.2.1. the contours of the ground before any site preparation;

6.1.2.2.2. structural geology in the region of the mine;

6.1.2.2.3. a plan of the mine illustrating the projected five-year plan;

6.1.2.2.4. typical cross-section through the walls; and

6.1.2.2.5. the location of any diversionary drainage systems;

6.1.2.3. the results of any tests, studies and investigations to determine:

6.1.2.3.1. geotechnical properties of the rock and soil in the vicinity of the walls; and

6.1.2.3.2. groundwater conditions in the vicinity of the mine;

6.1.2.4. the design, position, nature of construction and stability analysis of any support structures to be incorporated in the walls;

6.1.2.5. a stability analysis including an outline of any design assumptions that were made; and

6.1.2.6. details of any testing and instrumentation which may be required to monitor wall or strata movement and groundwater conditions in the region of the mine to verify the design assumptions.

6.1.3. The operating manual should include:

6.1.3.1. specifications for the configuration of the final mine walls, including toe and crest positions, planned face slopes, average overall wall slopes, bench widths, bench intervals and any berm construction;

6.1.3.2. the method and rate of excavation to the final walls;

6.1.3.3. details of any blasting procedure to maintain control of the pit wall;

6.1.3.4. specifications for drainage and dewatering systems; and

6.1.3.5. details including location, method and frequency of reading and of maintenance of any instrumentation required to monitor wall and strata movement or groundwater conditions in the region of the mine.

6.1.4. Where an amendment to any design is proposed, the operator should prepare a report showing:

- 6.1.4.1. the extent of the land to be disturbed by any additional excavation;
- 6.1.4.2. the new design height of any wall;
- 6.1.4.3. details of any additional site preparation and excavation, including any blasting procedures that may be required; and
- 6.1.4.4. an analysis of the safety aspects of the intended design to include:
 - 6.1.4.4.1. the results of geotechnical studies, including drill hole logs, tests and groundwater measurements; and
 - 6.1.4.4.2. the results of stability studies to assess any effects of the amendment on the security of the walls.

6.2. Stripping of overburden

6.2.1. Vegetation, such as bushes and trees, must be removed from the overburden before stripping reaches the roots. Foundations of buildings should be similarly removed when stripping reaches their level.

6.2.2. When the overburden consists of unconsolidated or blasted material:

- 6.2.2.1. excavation by undercutting should not be used;
- 6.2.2.2. if mechanical equipment is not used, no place should be worked unless the material is at a stable angle; and
- 6.2.2.3. if mechanical equipment is used, no working face should have a vertical height of greater than the maximum height to which the excavation equipment in use can reach.

6.2.3. All rock, stone or other material from the stripping of overburden should be dumped or otherwise disposed of in accordance with the provisions of section 10 of this code.

6.2.4. Where mining is to be carried out in regions of heavy snowfall or heavy rainfall, particularly in areas liable to flash flooding or where monsoon conditions are prevalent, or in active seismic areas where earthquakes and landslides may be expected, or in areas of volcanic activity, special protective procedures should be developed and copies of these procedures sent to the competent authority.

6.3. Mining methods

6.3.1. Mining methods should be used that will maintain wall, bank and slope stability in places where persons work or travel in performing their assigned tasks. When benching is necessary, the width and height should be based on the type of equipment used for cleaning of benches or for scaling of walls, banks and slopes, and the safety of any persons or vehicles working or travelling thereon.

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6.3.2.1. Ground conditions that create a hazard to persons should be taken down or supported before other work or travel is permitted in the affected area.

6.3.2.2. Until corrective work is completed, the area should be posted with a warning against entry, and, when left unattended, a barrier should be installed to impede unauthorised entry.

6.3.2.3. Trimming, scaling and support should be carried out from a safe location.

6.3.3.1. The vertical height of a bench face being worked manually should not exceed 8 m, and where it is being loaded mechanically it should not exceed 20 m, unless – after inspection – the competent authority has given permission in writing for these figures to be exceeded.

6.3.3.2. This provision should not prevent a mine from being worked with two or more benches having a face height not exceeding 8 m and 20 m correspondingly.

6.3.4.1. Persons should not be permitted to work or travel between machinery or equipment and the high wall or bank where the machinery or equipment may hinder escape from falls or slides from the high wall or bank.

6.3.4.2. No person should be deployed in the determined hazard zone of mechanical equipment unless that equipment is effectively immobilised.

6.3.5.1. In cases where an opencast mine is being worked in the vicinity of any underground workings, no face of the opencast mine should be advanced over the underground workings if danger could be occasioned to persons in the underground workings or in the opencast mine unless the competent authority has been informed beforehand and approval has been obtained for the method of working to be implemented.

6.3.5.2. Blasting should not be performed in underground workings that lie within 30 m vertically below the bottom or 60 m horizontally from the wall of any opencast mine in which work is being carried out, unless consultation has taken place between the managements of both enterprises to devise and implement suitable precautionary measures to ensure safe working.

6.3.6. No person should work or climb on top of any surge stockpile in active use to which broken rock is fed from above and from which the rock is withdrawn unless all the following provisions are complied with:

6.3.6.1. he has been authorised to do so by the manager or his representative;

6.3.6.2. the feed to and from the stockpile has been stopped and locked out;

6.3.6.3. it has been established that the chute below is not in the discharging position;

6.3.6.4. he is wearing a safety belt attached to a rope of correct length, securely fixed to an anchorage above him; and

6.3.6.5. he is assisted by another person stationed at a safe vantage point above him.

6.3.7. A tunnel under a surge stockpile of broken rock or other unconsolidated material should have two entrances, except where there is only one feed chute from the stockpile and that is located at the end of the tunnel.

6.3.8. No person should be permitted to work on a face, wall or other location in an opencast mine from which a dangerous fall could occur unless he is:

6.3.8.1. wearing a safety belt of correct length, securely fixed to an anchorage above him; and

6.3.8.2. he is assisted by a competent person.

6.3.9.1. At mines where the vertical height of the face exceeds 3 m and where explosives are used, bench drilling should be carried out from the top of the bench.

6.3.9.2. This provision should not prevent the drilling and firing of toe or other holes authorised by the manager, but a combination of top-drilled and toe-drilled holes should be avoided, particularly if intended for sequential firing.

6.3.9.3. A working face should not be drilled or otherwise worked in a manner which will create an overhang of the face, and where unconsolidated rock is being mined, the face and sides should be rammed to prevent collapse.

6.3.9.4. A face should not be undercut by the excavation of a slot at the toe of the face; this provision should not, however, prevent a tunnel or adit being driven into the face for drainage purposes.

6.3.10. At a mine where rock is being sluiced or mined by jets of water or other liquid, no person should be permitted to approach the top of the mine face to within a distance equal to twice the height of the face. When working of the jets is suspended, no person may enter the zone earlier excluded unless that zone has been examined and declared to be safe by a competent person. Before the resumption of jet operation all persons must again be withdrawn from that zone.

6.3.11. The maximum height of a sand¹ working face should not exceed the vertical reach of the excavating equipment working at the face.

6.3.12.1. In cases where the projected total depth of any sand¹ pit excavation will exceed the vertical reach of the excavating equipment to be used, the pit should be worked by a series of benches.

6.3.12.2. Each bench should have separate loading arrangements and should be of sufficient length and breadth to provide safe working conditions.

6.3.13. Sand¹ pit faces should be worked over as large a width as is practicable, and at any cessation of operations for a period of time exceeding that of one shift, all pit faces should be sloped to prevent any further slump of sand.¹

6.3.14. For the purpose of the present paragraph, the walls of a sand¹ pit should be considered to be working faces.

¹ For the purposes of this section, sand includes all unconsolidated materials or deposits.

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6.3.15. Where manual workers are engaged on or ahead of overburden, stripping or mineral-winning phases, then there should either be a team of two workers or more working together, or any solitary worker should be kept under constant observation at all times.

6.4. General precautions for frozen soil and permafrost

6.4.1. Where steam-thawing operations are practised, all steam pipelines should be heat insulated.

6.4.2. Where steam lances are used for permafrost thawing, the steam hose should be firmly attached at both ends and equipped with safety chains, i.e. at the steam pipeline and at the lance point. Hoses should be regularly examined for defects and maintained in good condition.

6.4.3. Steam thawing should not be permitted under aerial power lines.

6.4.4. No person should be permitted to approach steam or hot water points located under the soil unless these are covered by gangways.

6.4.5. A steam pipeline network should be provided with pressure gauges installed at the exit of the main steam pipeline and at the end of the header into the section under treatment.

6.4.6. The main steam supply should be disconnected before proceedings to rearrange any of the distribution pipes, to tighten flange connections, to mount or dismount valves and plugs, or to connect and disconnect hoses.

6.4.7. Sink holes and fall-through funnels formed around thawing points should be fenced or closed off.

6.4.8. Electric thawing of frozen soils should only be carried out in accordance with a scheme – approved by the competent authority – which is designed to ensure that the work may be performed safely.

6.5. Design and safety requirements for ground and surface water control

6.5.1. Prior to the commencement of excavation, the operator or manager of an opencast mine should take steps to ensure that a thorough hydrological and hydrogeological assessment is made of the surface and subsurface conditions of the area to be mined.

6.5.2.1. When mining in water-bearing strata or near rivers, lakes and seas and potentially flooded underground or surface mining, provision should be made for safety pillars to be left to prevent any breakthrough. It should be the responsibility of the mine operator or manager to ensure that no mining takes place within the boundaries of such pillars.

6.5.2.2. The mine operator shall ensure that where mining is carried out in areas liable to flood from any source or because of any circumstance, special protective schemes are designed and implemented.

6.5.3. In cases where a lowered water table is maintained with the aid of drainage shafts, the following safety measures should be ensured:

- 6.5.3.1. the installed pump capacity should be such that the maximum daily inflow can be lifted in not more than 20 hours;
- 6.5.3.2. stand-by pumps should be installed with a capacity of not less than 25 per cent of the total installed capacity;
- 6.5.3.3. the electrical feed to the pumps should be duplicated, each feeder capable of carrying the maximum load of the installation;
- 6.5.3.4. stand-by pumps should be so equipped as to start automatically in case of failure of a main pump;
- 6.5.3.5. where drainage tunnels are required to be driven in water-bearing strata, pilot holes should be carried to a depth of not less than 5 m; and
- 6.5.3.6. the sump for the main pumping installation should have a capacity equal to not less than four hours of normal water inflow.

6.5.4. Sinkholes and surface subsidence occurring as a result of dewatering should be so enclosed as to prohibit access of unauthorised persons.

7. Machinery and plant

7.1. General provisions

7.1.1. All machinery and plant of whatever description or purpose used in connection with the working of an opencast mine should be of good design, sound construction, suitable material, adequate strength, free from patent defect, fitted with appropriate protective safety devices and maintained in safe condition.

7.1.2. Small mines (as defined by national laws or regulations) which do not, as individual mines, have sufficient resources to fulfil the requirements of this section of the code should pool their resources or make such other arrangements as to comply properly with the relevant requirements.

7.2. Mechanical apparatus

7.2.1.1. It should be the duty of the manager of an opencast mine to ensure that the duly competent person he is required to appoint to be in charge of the plant prepares and implements a scheme with respect to all the machinery at the mine of whatever description or purpose.

7.2.1.2. This scheme should cover:

- 7.2.1.2.1. the examination and testing of all machinery before it is used after installation, reinstallation or repair;
- 7.2.1.2.2. the systematic examination and testing of all machinery at the mine to ensure proper maintenance thereof,
- 7.2.1.2.3. the intervals, which may differ for different mechanical apparatus used and for parts of apparatus, within which all machinery must be examined and tested;
- 7.2.1.2.4. the nature of the examination and testing to be carried out;
- 7.2.1.2.5. the manner in which the results of every examination and test made pursuant to the scheme are to be recorded; and
- 7.2.1.2.6. the records of every examination or test should be kept for a period specified by national laws and regulations.

7.2.1.3. A copy of the scheme should be kept at the office of the mine, and the competent authority should request amendment where it appears necessary to secure the proper maintenance of machinery and the safety of persons working thereon.

7.2.2. No one, except a competent person or persons acting under his close personal supervision, should undertake any work on machinery and plant where technical knowledge or experience is required.

7.2.3. A sufficient number of qualified persons for the proper performance of the duties required by this section of the code should be appointed by the manager.

7.3. Protective safety devices

7.3.1. All flywheels, gears, belts and other moving parts of machinery and plant at an opencast mine which are liable to cause injury should be kept securely guarded or fenced. Additional protective safety devices should be fitted as appropriate.

7.3.2. If persons passing or working adjacent to machines or operating machines at points distant from the driving engine or motor can be endangered thereby, effective means should be installed to enable such persons to stop the engine or motor and to ensure that it is not accidentally or inadvertently restarted.

7.3.3. It should be the duty of supervisory officials and other authorised persons to keep all protective safety devices properly maintained, in good condition and correctly fitted.

7.3.4. Specific arrangements should be made to enable the requisite lubrication of equipment that requires to be guarded from a safe position outside the protective guards.

7.4. Boiler and steam plant

7.4.1. Every boiler installed at an opencast mine, whether separate or part of a range, should be provided with:

- 7.4.1.1. one or more suitable safety valves, the setting of which should not be altered by any person except with the authority of the competent person;
- 7.4.1.2. a suitable steam gauge and a suitable water gauge to show respectively the pressure and the height of the water in that boiler; and
- 7.4.1.3. an effective guard or other protection for the gauges provided on each boiler.

7.4.2. The maximum pressure at which steam should be generated and the blow-off pressure should both be marked on each steam gauge, and each boiler attendant should be made familiar with this arrangement.

7.4.3. The cleaning and maintenance of every steam boiler should be specified in the maintenance scheme prepared by the competent person.

7.5. Compressed-air equipment

7.5.1. An air compressor used at an opencast mine should be so designed, constructed, operated and maintained that:

- 7.5.1.1. air entering the compressor is as dry, clean and cool as is practicable;
- 7.5.1.2. the maximum temperature of the air in the compressor is at least 30° C below the flash-point of the compressor lubricating oil; and

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7.5.1.3. the compressor is stopped either automatically or by the engineman when the air temperature is too high or there is any interruption in the flow of fluid used in the compressor cooling system.

7.5.2. The maintenance scheme should cover all aspects of compressed-air equipment.

7.5.3.1. Air-receiver tanks should be equipped with one or more automatic pressure-relief valves. The total relieving capacity of the relief valves should prevent pressure from exceeding the maximum allowable working pressure by not more than 10 percent.

7.5.3.2. Air-receiver tanks should also be equipped with pressure gauges which accurately measure the pressure within the air-receiver tanks.

7.5.4. Except where automatic shut-off valves are installed, safety chains or other suitable locking devices should be used at connections to machines of high-pressure hose lines of 19 mm inside diameter or larger, and between high-pressure hose lines of 19 mm inside diameter or larger, where a connection failure would create a hazard.

7.5.5. At no time should compressed air be directed towards a person. When compressed air is in use, all necessary precautions should be taken to protect persons from injury.

7.6. Standards for boilers and pressure vessels

7.6.1. The competent authority should prescribe standards or recognised boiler and pressure vessel codes, to which all such items installed at an opencast mine should conform.

8. Electrical apparatus

8.1. General provisions

8.1.1. Electrical apparatus should be installed in any opencast mine or part thereof only in so far as is allowed under national law or the regulations in force at the time and under the conditions laid down therein.

8.1.2. Small mines which do not, as individual mines, have sufficient resources to fulfil the requirements of this section should pool their resources with other mines, or make such other appropriate arrangements as to enable them to comply with the relevant requirements.

8.1.3. Any opencast mine using electricity should appoint at least one competent electrician.

8.1.4.1. It should be the duty of the manager of an opencast mine to ensure that the competent person he is required to appoint prepares and implements a maintenance scheme with respect to all the electrical apparatus at the mine of whatever description or purpose.

8.1.4.2. This scheme should cover:

- 8.1.4.2.1. the examination and testing of all electrical apparatus before they are used after installation, reinstallation or repair;
- 8.1.4.2.2. the systematic examination and testing of all electrical apparatus at the mine to ensure proper maintenance thereof;
- 8.1.4.2.3. the intervals, which may differ for different apparatus and parts of the apparatus, within which all electrical apparatus should be examined and tested;
- 8.1.4.2.4. the nature of the examination and testing to be carried out; and
- 8.1.4.2.5. the manner in which the results of every examination and test made pursuant to the scheme are to be recorded.

8.1.4.3. A copy of the scheme should be kept at the office of the mine, and the competent authority should request amendment where it appears necessary to secure the proper maintenance of the electrical apparatus and the safety of persons working thereon.

8.1.5. No one, except a competent person or persons acting under his close personal supervision, should undertake any electrical work where technical knowledge or experience is required.

8.1.6. All electrical apparatus installed at a mine should be approved and marked according to national laws or regulations.

8.1.7. Notices should be posted at prominent positions around the mine:

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8.1.7.1. prohibiting any unauthorised person from handling or interfering with apparatus; and

8.1.7.2. setting out directions as to the rescue and first aid of persons suffering from electric shocks or burns.

8.1.8. National laws and regulations should specify the voltages at which electric power may be transmitted and used.

8.2. Insulation

8.2.1. All power wires and cables should be adequately insulated where they pass into or out of electrical compartments. Cables should enter metal frames of motors, splice boxes and electrical compartments only through proper fittings. When insulated wires, other than cables, pass through metal frames, the holes should be substantially bushed with insulated bushings.

8.2.2. Communication conductors for telephone and lowpotential signalling systems should be protected by isolation or suitable insulation, or both, from contacting energised power conductors or any other power source.

8.2.3. High-voltage electrical conductors should be covered, insulated or so placed as to prevent contact with low-voltage conductors.

8.2.4. The voltage on bare signal wires accessible to contact by persons should not exceed the voltage specified by national legislation.

8.2.5. In the selection of insulating material, consideration should be given to the conditions under which the conductors will be used.

8.3. Control devices

8.3.1. All electrical apparatus and circuits should be provided with properly designed switchgear to facilitate control and, when necessary, isolation.

8.3.2. Principal power switches and terminals should be labelled to show which units they control.

8.3.3. Where a motor is operated by means of remote control and is stopped from any point, the circuit should be so arranged that the motor cannot be started again except at the place from which it was stopped.

8.4. Distribution boxes

8.4.1.1. Distribution boxes should be provided with a disconnecting device for each branch circuit. Such disconnecting devices should be equipped or designed in such

a manner that it can be determined visually when the device is open and the circuit de-energised.

8.4.1.2. Distribution boxes should be labelled to show which circuit each device controls.

8.4.2. Inspection and cover plates on electrical equipment and junction boxes should be kept in place at all times, except during testing or repair.

8.5. Earthing systems

8.5.1. All earthing conductors should be electrically continuous throughout, and in effective electrical connection with earth and with the apparatus they are intended to earth. Individual earthing conductors should be connected in parallel and it should be strictly forbidden to connect these in series.

8.5.2.1. All metal enclosing or encasing of electrical circuits should be earthed or provided with equivalent protection.

8.5.2.2. This requirement does not apply to battery-operated equipment.

8.5.3. Frame earthing or equivalent protection should be provided for mobile equipment powered through trailing cables.

8.5.4. Metal fencing and metal buildings enclosing electrical apparatus should be earthed.

8.5.5. A specific requirement should be established within the scheme of maintenance for verifying resistance and continuity of earth leads and establishing that the maximum resistance specified in national regulations is not exceeded.

8.6. Overload protection

8.6.1. The current in all systems should be so controlled that when, in any circuit, the current exceeds a specified value, it is automatically cut off.

8.6.2. National laws or regulations should specify the conditions under which automatic earth leakage protection is required together with the levels at which the circuit breaker should operate.

8.6.3.1. Fuse links of all fuses should be calibrated by the manufacturer and the rated current should be indicated.

8.6.3.2. The use of unmarked or uncalibrated fuses should be prohibited.

8.7. Transformers

8.7.1. Transformers should be suitably housed and where necessary fenced.

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8.7.2. Transformer enclosures, where provided, should be kept locked against unauthorised entry.

8.7.3. Any transformer, installed for the first time, should not contain polychlorinated biphenyls (PCBs) or other materials likely to release toxic gases when ignited.

8.8. Conductors

8.8.1. National laws or regulations should specify the types of conductors that may be used and the conditions under which they may be used.

8.8.2. All aerial power lines should be constructed and maintained in accordance with the requirements of national laws or regulations.

8.8.3. Temporary aerial power lines in opencast mines should conform with the following requirements:

8.8.3.1. a table of distances of the lowest phase wire of a power line to the ground should be prepared by the competent person and enforced;

8.8.3.2. no piles of rock, ore, sleepers, rails and other materials should be made below aerial power lines; and

8.8.3.3. no excavator or other machine with extensible or lifting arms should be used under or near power lines unless the lifting or extending part of the machine does not approach nearer than 1 m for lines up to 1 kV, 3 m from 1-110 kV, or 4 m for lines in excess of 110 kV. Where the rating is unknown, the distance should be no nearer than 5 m.

8.8.4. Trailing cables should be attached to machines in a suitable manner to protect the cable from damage and to prevent strain on the electrical connections.

8.8.5. Surplus trailing cable on excavators, cranes and similar equipment should be:

8.8.5.1. stored in cable boats;

8.8.5.2. stored on reels mounted on the equipment; and

8.8.5.3. otherwise protected from mechanical damage.

8.8.6. Workers who manually handle trailing cables in the course of their duties should be provided with the necessary equipment such as insulated hooks, tongs, gloves and aprons for this purpose.

8.8.7. Trailing cables feeding mobile machinery should be so laid as to avoid the probability of their being damaged, run over, or freezing to the ground. In inundated areas, cables should be laid on supports.

8.8.8. A cable that has been mechanically damaged may be repaired to complete the shift if a mine electrician, after causing the cable to be tested, considers that he can make a safe and efficient temporary repair. Notwithstanding this provision, a damaged cable should be taken out of service for permanent repair or replacement within a period which should not exceed 12 working hours.

8.8.9. Any cable requiring repair should be disconnected from the feed point, and any residual electrical charges should be discharged.

8.8.10.1. All aerial and cable power lines located within the danger zone during blasting operations should be de-energised during the blast, and should be inspected before being re-energised.

8.8.10.2. The results of the inspection should be recorded in a book provided for the purpose.

8.8.11. Work on electric power lines during thunderstorms should be prohibited.

8.8.12. Permanent splices and repairs made in power cables, including the earth conductor where provided, should be:

8.8.12.1. mechanically sound and with electrical conductivity which is not significantly less than that of the original;

8.8.12.2. insulated to a degree at least equal to that of the original, and sealed to exclude moisture; and

8.8.12.3. provided with damage protection as near as possible to that of the original, including good bonding to the outer jacket.

8.8.13. Power cables energised to potentials in excess of 150 volts, phase-to-earth, should not be moved by equipment unless sleds or slings, insulated from such equipment, are used. When such energised cables are moved manually, insulated hooks, tongs, ropes or slings should be used unless suitable protection for persons is provided by other means. This does not prohibit pulling or dragging of a cable by the equipment it powers when the cable is physically attached to the equipment by suitable mechanical devices, and the cable is suitably insulated from the equipment.

8.9. Switchboards and switchgear

8.9.1. Switchboards and switchgear should be so installed, located and guarded that:

8.9.1.1. the control means will be safely and readily accessible to authorised persons;

8.9.1.2. live parts will be inaccessible to unauthorised persons;

8.9.1.3. adequate working space is provided for manual operation where required, including at the back of any switchboard having exposed live parts lower than 2.5 m from the ground;

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- 8.9.1.4. a clear space of not less than 1 m is provided between the top of the equipment and any ceiling having exposed combustible material;
- 8.9.1.5. adequate illumination is provided;
- 8.9.1.6. interrupting capacity adequate to handle the short circuit current of the system is incorporated;
- 8.9.1.7. access to unauthorised persons is prohibited and a notice to this effect posted at the entrance; and
- 8.9.1.8. a notice is posted describing the procedure for first aid in case of electric shock.

8.10. Protection of portable, transportable and mobile machines

8.10.1. Transportable and mobile machines and their associated trailing cables operating at a voltage above extra low (normally not exceeding 32 volts AC or 115 volts DC) should be protected by approved automatic earth leakage equipment and should, in addition, where required by the competent authority, be protected by approved automatic earth continuity equipment capable of cutting off the voltage in the event of a break in the earth conductor of the cable between the supply or control box and the machine.

8.10.2. In the case of the earth leakage apparatus and related equipment, national laws or regulations should specify:

- 8.10.2.1. the leakage current at which the equipment should be set to operate;
- 8.10.2.2. the operating time of the equipment; and
- 8.10.2.3. in the case of any portable machine or apparatus and its associated trailing cable operating at a voltage above extra low voltage, the value in milliamps at which an instantaneous-type earth leakage tripping device should be set to operate.

8.10.3. When required by the competent authority, portable machines and apparatus and flexible cables should be protected by approved automatic continuity protection, capable of cutting off the voltage in the event of a break in the earth conductor of the cable between the supply or control box and the machine.

8.10.4. Any device limiting the fault current should have a time rating which is certified as being manufactured to an approved standard.

8.11. Miscellaneous safety procedures

8.11.1. Mobile equipment should not run over power conductors, nor should loads be dragged over power conductors, unless the conductors are properly bridged or otherwise protected.

8.11.2. Power circuits should be de-energised before work is done on such circuits unless hot-line tools are used. Suitable warning signs should be posted by the persons doing the work. Switches should be locked out or, where not possible, other measures taken to prevent the power circuits from being energised without the knowledge of the persons working on them. Such locks, signs or preventive devices should be removed only by the person who installed them or by authorised personnel.

8.11.3. Electrically powered equipment should be de-energised before mechanical work is done on such equipment. Power switches should be locked out or, where not possible, other measures taken to prevent the equipment from being energised without the knowledge of the persons working on it. Suitable warning notices should be posted at the power switch and signed by the persons who are to do the work. Such locks, notices or preventive devices should be removed only by the persons who installed them or by authorised personnel.

8.11.4. Equipment other than a trolley locomotive should not be moved or operated near energised high voltage power lines where the clearance is less than 3 m, unless the lines are de-energised or other precautionary measures taken.

8.11.5. When a potentially dangerous condition is found, it should be corrected before equipment or wiring is energised.

8.11.6. Suitable danger signs should be posted at all major electrical installations.

8.12. Electrical trolley locomotives

8.12.1. Electrical trolley locomotives should be equipped with guards to prevent access to the roof of the locomotives and the high voltage electrical components when the pantograph is in contact with the supply line.

8.12.2. Intersections of electric railway lines and roads, as well as areas where loading and unloading of railway cars occurs, should be well lit and equipped where necessary with illuminated warning signs.

9. Surface buildings and structures

9.1. Safety of buildings

9.1.1. All buildings and structures on an opencast mine should be maintained in safe condition, and, wherever possible, they should be constructed of fire-resistant material. Where necessary the design must recognise the need to protect against the effects of earthquakes or tremors.

9.2. Safe means of access

9.2.1. Safe means of access to every place or building where any person has to pass or work should be provided and maintained in good condition.

9.2.2.1. Where any person can fall a distance of 2 m, or any other distance specified in national laws or regulations, secure footholds, handholds and fences should be provided as are necessary to prevent danger.

9.2.2.2. Where these provisions are not practicable, approved safety harnesses should be provided and used.

9.3. Provision of emergency lighting

9.3.1.1. Stand-by emergency lighting should be provided for use in the event of a failure of the power supply:

9.3.1.1.1. at the medical or first-aid room and, where appropriate, the rescue station;

9.3.1.1.2. at changing rooms and wash houses;

9.3.1.1.3. in crusher houses and treatment plants where stairways, walkways or ladders are normally used by operating personnel;

9.3.1.1.4. at all emergency escapeways; and

9.3.1.1.5. at all places where a reduction or failure of artificial illumination is likely to result in enhanced risk to the workers employed there.

9.3.1.2. The competent authority may grant exemption or relief from the provisions of this section if workers are not present during the hours of darkness or where individual lamps are provided.

9.4. General provisions

9.4.1. All buildings and constructions should comply with the requirements of national building laws and regulations.

10. Tips, dams and lagoons

10.1. Tips

10.1.1.1. It should be the duty of the manager of every opencast mine, where it is proposed to tip mine discard or refuse of any kind, to establish that the proposed site is suitable and safe in all respects, taking into account the protection of the environment in the vicinity.

10.1.1.2. In assessing safety and suitability, consideration should be given to safeguarding the safety of the population during normal tipping operations and also in the event of a tipslide.

10.1.1.3. Tips and stockpiles should be so designed and operated as to ensure the necessary on-site safety.

10.1.2.1. A competent person should conduct investigation of the foundations and analysis of the possible causes of failure, and then design all proposed tips. The competent person should also prepare operating procedures for each tip which should specify a maintenance and inspection schedule and detail the problems and signs of weakness or danger in the vicinity which must be drawn to the mine operator's attention.

10.1.2.2. A geological map of the area should also be provided.

10.1.2.3. The plans, sections and geological map should be kept at the office of the mine.

10.1.3. A record of the refuse tipped should be kept by the person responsible for the safety of the tip.

10.1.4. It should be the duty of the manager to appoint competent persons who will supervise tipping operations, inspect and report upon the safety of the tip and be responsible for its general security.

10.1.5. It should be the duty of the manager to prepare tipping rules which should include:

10.1.5.1. provisions for a system of drainage for the tip;

10.1.5.2. the maintenance in proper order of the drainage system;

10.1.5.3. the manner in which tipping operations are to be carried out in order to avoid any dangerous occurrence and prevent danger to persons;

10.1.5.4. the nature and frequency of tip inspections, including the examination of movement monitoring systems, where necessary, and the reporting thereon; and

10.1.5.5. the action to be taken in the event of a defect or other dangerous condition.

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10.2. Dams and lagoons

10.2.1. The provisions for tips should apply to dams and lagoons in the same way as they apply to tips, but substituting references to tips for those to dams and lagoons, as necessary.

10.2.2. National legislation should specify for major waste dumps, water reservoirs and tailings lagoons at opencast mines that:

- 10.2.2.1. prior to construction, a competent person should conduct a detailed site investigation, analyse the potential causes of failure and their impacts in the event of a failure and then prepare a design acceptable to the competent authority;
- 10.2.2.2. the designer should file annually a report with the competent authority detailing the construction activity and performance of the structure; and
- 10.2.2.3. prior to construction, a competent person should prepare an operating manual acceptable to the competent authority detailing the frequency and method of monitoring, the frequency of surveys and inspections to be conducted as well as the methods and procedures to be followed during construction and repair of cracks, settlements and partial failure of the structures.

10.2.3. The manager should ensure that the minimum freeboard of any water storage dam or tailings lagoon is maintained at less than 1 m.

10.2.4. The manager of the mine should appoint a qualified and competent specialist engineer to be responsible for the maintenance and security of each dam and lagoon.

10.3. Reporting of dangerous occurrences

10.3.1. National laws or regulations should specify what constitutes a dangerous occurrence in relation to tips, dams and lagoons.

10.3.2. Such dangerous occurrences should be reported forthwith to the competent authority, which should take appropriate action.

11. Fire protection and fire-fighting

11.1. General provisions

11.1.1. The mine manager should ensure that efficient means of protection in all buildings and at all points in or about an opencast mine where a fire hazard exists are available at all times.

11.1.2. The manager should designate a competent and experienced person who will:

- 11.1.2.1. prepare a fire precaution plan showing all locations in the mine where a fire hazard exists, the nature of the hazard, and the location and type of fire-fighting equipment provided;
- 11.1.2.2. make a regular check of all the strategic points in or about the mine and of the fire-fighting equipment; and
- 11.1.2.3. record the results of this examination in a report book provided for the purpose.

11.1.3. The manager should establish emergency procedures for fire fighting, evacuation and rescue together with a fire alarm system to give a prompt warning to persons who may be endangered by a fire.

11.2. Precautions against fire

- 11.2.1. All storage tanks for flammable or combustible liquids should be:
- 11.2.1.1. so designed and constructed as to be capable of resisting the working pressures and stresses, and made of suitable material for any projected contents;
 - 11.2.1.2. maintained such that leakage is prevented;
 - 11.2.1.3. isolated or separated from ignition sources and combustible material;
 - 11.2.1.4. vented or otherwise constructed to prevent development of pressure or vacuum as a result of filling, emptying or atmospheric temperature changes; and
 - 11.2.1.5. contained within structures capable of holding 110 per cent of the contents of the largest tank.
- 11.2.2. All piping, valves and fittings should be capable of withstanding working pressures and stresses.

11.3. Provision of fire protection

11.3.1. Amongst other places, fire protection should be specifically provided:

- 11.3.1.1. wherever grease or other flammable material is stored;
- 11.3.1.2. at haulage terminals or vehicle stops;
- 11.3.1.3. at every engine room, boiler house, locomotive or vehicle garage, workshop, warehouse or other structure;
- 11.3.1.4. on all vehicles; and
- 11.3.1.5. at all refuelling points for vehicles.

11.3.2.1. Covered metal containers or their equivalent should be provided wherever waste combustible materials, including liquids, may temporarily accumulate.

11.3.2.2. These containers should be emptied regularly and their contents disposed of in a safe and environmentally sound manner.

11.4. Fire-fighting and rescue

11.4.1. The manager of an opencast mine should provide for the establishment of a team or teams of trained persons, compatible with the size of the mine and the number of persons employed, to work under the direction of the designated competent person in case of fire or other emergency.

11.4.2. Mobile or portable fire-fighting equipment and, where appropriate, fire hydrants, should be kept available for use at any time.

11.4.3. Where an outside fire-fighting organisation may be relied upon, uniform fittings or readily available adaptors should be provided for all hydrants.

11.4.4. Suitable rescue equipment, including self-contained breathing apparatus, should be kept easily available; persons who may need to use it should be properly instructed and regularly trained in its use.

12. Explosives and shotfiring

12.1. General provisions: Explosives

12.1.1. Only explosives and detonators approved by the competent authority and provided by the mine operator should be used in a mine.

12.1.2. National laws or regulations should define the term "explosive" and specify the conditions governing its manufacture, transport and usage.

12.2. Storage of explosives

12.2.1. A magazine built at a mine where explosives are to be stored should be constructed in accordance with the requirements of, and should be licensed by, the competent authority.

12.2.2. Detonators and detonating accessories should not be stored in the same magazine as other explosives unless kept in a separate approved compartment.

12.2.3.1. Every main magazine should be under the charge of a person appointed by the manager for the purpose who should be responsible for the safe keeping of the keys of the magazine and for the safe storage and issue of the explosives.

12.2.3.2. The mine manager should keep a record book which should show the quantities of explosives on hand and the quantities of explosives received or issued, as well as the dates and times at which they were received or issued, and to whom.

12.2.4.1. Explosives which have deteriorated should be destroyed in an approved manner in accordance with the manufacturer's instructions.

12.2.4.2. Where operations at a mine or part of a mine are to cease or be suspended, all explosives should be removed to a safe place or destroyed in an approved manner.

12.2.5.1. Excepting explosives, articles likely to cause a fire or explosion should not be taken into or permitted to remain in a magazine.

12.2.5.2. Persons may not smoke or permit an open flame to be within 6 m of any place where explosives are stored, transported or used.

12.2.6. Every magazine should be kept clean, dry and adequately ventilated and the roof and walls maintained in good and safe condition.

12.2.7. The area surrounding a magazine should be kept free of dry grass, bush, rubbish and other flammable material for a distance prescribed in national legislation and, where practicable, enclosed by a fence.

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12.3. Transport of explosives

12.3.1. The manager should prepare rules to regulate the transport of all explosives and detonators at the mine.

12.3.2. Vehicles used for the transport of explosives should comply with the following requirements:

- 12.3.2.1. they should have substantially constructed bodies, no sparking metal exposed in the cargo space, and should be equipped with suitable sides and tail gates;
- 12.3.2.2. they should be equipped with suitable fire extinguishers, wheel chocks and, when powered by an internal combustion engine, a battery isolating switch;
- 12.3.2.3. when transporting explosives or detonators, they should be posted with proper warning signs;
- 12.3.2.4. if they are parked whilst containing explosives or detonators, the brakes should be set, the ignition switched off, the vehicle blocked securely against movement and never left unattended;
- 12.3.2.5. when required to be taken to a garage or repair shop for any purpose, they should be emptied and cleaned out; and
- 12.3.2.6. their trailers, if used, should be fitted with efficient brakes and coupled to the towing vehicle by a properly designed, rigid tow bar and safety chain couplers.

12.3.3.1. Explosives should be transported in separate vehicles from detonators, unless both materials are housed in separate and properly constructed containers.

12.3.3.2. National laws or regulations should state the maximum quantities of explosives and detonators which shall be transported.

12.3.3.3. When explosives and detonators are hauled by trolley locomotive, they should be placed in covered, electrically insulated cars.

12.3.3.4. Explosives or detonators should not be transported on locomotives.

12.3.4.1. Only the necessary attendants should be allowed to ride on or in vehicles containing explosives or detonators.

12.3.4.2. Explosives or detonators should not be transported on or with man-riding trains.

12.3.5. Explosives and blasting agents should be correctly and stably loaded, and transported without undue delay, over routes and at times that expose the minimum number of persons.

12.3.6. Other materials or supplies should not be placed in or on the cargo space of a conveyance containing explosives, detonating cord or detonators. Safety fuses contained in properly secured non-sparking containers used expressly for the transport of such fuses may be placed in the conveyance.

12.3.7.1. Substantial non-conductive containers should be used to carry explosives to blasting sites.

12.3.7.2. Substantial non-conductive containers with tight fitting covers should be used to transport or carry capped fuses and electric detonators to blasting sites.

12.3.8. Vehicles containing detonators or explosives, other than blasting agents, should not be left unattended except in blasting areas during loading or charging operations.

12.3.9. Separate containers for explosives, detonators, blasting agents, fuses and detonating accessories should be provided and used where these are carried manually.

12.4. General provisions: Shotfiring

12.4.1.1. National laws or regulations should specify the extent of the danger zone surrounding opencast blasting operations, procedures to protect persons and property at risk of being affected by shock waves, flying fragments and dust from blasting operations.

12.4.1.2. No person should be permitted to fire shots or use explosives unless he is the holder of a certificate of competence.

12.4.1.3. Trainee shotfirers may be authorised by the manager to fire shots under the supervision of and in the immediate presence of a competent person.

12.4.1.4. No person may charge explosives unless authorised by the manager to do so, and any person thus authorised must be under the supervision of the shotfirer.

12.4.2. The following precautions should be observed in the preparation for blasting:

- 12.4.2.1. explosives should be kept separate from detonators until charging is started;
- 12.4.2.2. primers should be made up immediately prior to use, and as close to the blasting area as conditions allow;
- 12.4.2.3. only wooden or other non-sparking implements should be used to open cases of explosives and to punch holes in an explosive cartridge; and
- 12.4.2.4. blasting caps should be crimped to fuses only with implements designed for that specific purpose.

12.4.3. A charge of explosive should not be fired in an opencast mine unless and until:

- 12.4.3.1. the person in charge of the blast has cleared all persons from the danger zone, and has posted sentries at all points of entry to prevent inadvertent access;
- 12.4.3.2. proper warning has been given in all adjacent areas from which a person might approach the danger zone;
- 12.4.3.3. all persons who are in places where they might be injured by the blasting have been warned; and

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12.4.3.4. all such persons have taken adequate shelter or left the area.

12.4.4. Where blasting in an opencast mining operation could constitute a public nuisance or danger, the competent authority may require the installation and operation of an audible warning device.

12.4.5. Where surplus or deteriorated explosives have to be disposed of, the advice of the manufacturer should be sought, and the destruction carried out in accordance with an agreed and developed procedure laid down by the manager.

12.4.6. When blasting operations are to be carried out in hot strata, the manager should ensure that a scheme, acceptable to the competent authority, has been prepared to deal with the specific hazards of this type of operation.

12.5. Misfires

12.5.1. The manager of every mine where shotfiring is practised should draw up a scheme specifying the procedure to be followed in the event of a misfire.

12.5.2. When a misfire is known or suspected to have occurred in an opencast mining operation, no work should be done at the site until the shotfirer or other experienced person has inspected the site at which the misfire occurred and taken such action as may be necessary to ensure that further work may be safely continued.

12.5.3.1. No person should approach a misfired hole:

12.5.3.1.1. when a safety fuse has been used, until at least 30 minutes have elapsed since the time of lighting the fuse; and

12.5.3.1.2. when electrical firing has been used, until the shotfiring lines have been disconnected from the source of electric power and been short-circuited, and then that at least 15 minutes after that have elapsed.

12.5.3.2. After the prescribed time interval the shotfirer should inspect, or where he cannot do so, instruct another competent person to inspect the bench or face and take such action as may be necessary to ensure that further work may be safely continued.

12.5.3.3. A record of the inspection and of the action taken should be made, in a book kept at the mine for the purpose, at the end of the shift by the person making the inspection.

12.6. Electrical firing

12.6.1. Electric detonators of different types should not be used in the same round.

12.6.2.1. All necessary testers, exploders, switches, fuses, electrical conductors and other necessary apparatus should be suitable for the conditions under which they are to be used, and should be provided by the operator or manager of the mine.

12.6.2.2. No meter or device for the purpose of testing the resistance or continuity of circuits intended for electrical firing should be used, unless it is of a type which has been approved by the competent authority.

12.6.3. Except when being tested with an approved instrument:

12.6.3.1. electric detonators should be kept shunted until they are being connected to the blasting line or wired into a blasting round;

12.6.3.2. wired rounds should be kept shunted until they are being connected to the blasting line; and

12.6.3.3. blasting lines should be kept shunted until immediately before blasting.

12.6.4. When blasting electrically in opencast mine operations, an instrument specifically designed and approved for testing blasting circuits should be used to test:

12.6.4.1. the continuity of each detonator in the borehole, prior to the addition of stemming;

12.6.4.2. the resistance of individual series or the resistance of multiple balanced series to be connected in parallel, prior to their connection to the blasting line;

12.6.4.3. the continuity of blasting lines, prior to the connection of electric detonator series; and

12.6.4.4. the total blasting circuit resistance, prior to connection to the power source.

12.6.5. Where firing is carried out by means of electric power circuits:

12.6.5.1. the voltage and current should be adequate for the number of detonators and type of circuit, and the voltage used should not exceed medium voltage;

12.6.5.2. the shotfiring cables should be isolated from the source of power by a double throw switch, by means of which the cables are short-circuited and earthed when disconnected from the source of power;

12.6.5.3. the isolating switch should be housed in a box with a locked door; and

12.6.5.4. the shotfiring leads are connected to the firing cables through two-pin plugs fitted to appropriate bases connected to the firing cables.

12.6.6.1. Immediately after firing any charge, the shotfirer should disconnect the firing cable from the source of power and lock the box.

12.6.6.2. The key to the door of the isolating switch box should not, under any circumstances, pass from the personal custody of the shotfirer on duty.

12.6.7.1. An exploder may be used for firing:

12.6.7.1.1. single electric detonators; or

12.6.7.1.2. electric detonators wired in series.

12.6.7.2. An exploder should not be used for firing electric detonators wired in a circuit which combines series and parallel wiring unless authorised by the manager.

12.6.7.3. The exploder should have adequate capacity for the number of detonators to be fired in the circuit.

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12.6.7.4. The exploder should be in the charge of the shotfirer on duty and should be fitted with a handle, key, or other device, the removal of which will render the exploder inoperative.

12.6.7.5. It should be the duty of the shotfirer to ensure that the exploder is inoperative when not in use for firing and the handle, key, or other device should remain in his personal custody while he is on duty.

12.6.8.1. A hole being charged with ammonium nitrate blasting agent should be loaded so as to obtain a continuous explosive line.

12.6.8.2. For charging purposes where other means are not practicable, ammonium nitrate blasting agent may be poured into a hole.

12.6.8.3. Pneumatic loading of ammonium nitrate blasting agent should not be used unless adequate steps have been taken to eliminate the hazard of static electricity including the grounding and bonding of the conductive parts of the pneumatic loading equipment.

12.6.8.4. The loader and its associated equipment, when earthed, should give a total resistance to earth of not more than one megohm.

12.6.8.5. Water lines, compressed air lines, wire-covered hoses, rails or permanent electrical earthing systems should not be used as a means of earthing.

12.6.9. Permanent blasting cables should be properly supported, insulated and maintained in good repair by a qualified mine electrician.

12.6.10. Conductors for blasting lines should:

12.6.10.1. be readily identifiable as being for blasting use;

12.6.10.2. be waterproofed;

12.6.10.3. consist of two insulated conductors; and

12.6.10.4. be kept as far as possible from any power or lighting cable, and kept out of contact with any pipes, rails or other conductive materials.

12.6.11. Detonators should not be used in the presence of radio transmitters or other radio-frequency fields except in accordance with standard distances provided for in national regulations, unless the detonators are coupled to transformers which are specifically designed to prevent induction of electrical current sufficient to activate the detonator.

12.6.12. No attempt should be made to charge, connect or fire a blast electrically if there is any sign of thunderstorm activity.

12.6.13. If the presence of static electricity or stray currents is detected during charging up with electric detonators, charging should be stopped immediately and only resumed after the condition has been remedied.

13. Drilling and rotary jet piercing

13.1. General safety precautions

13.1.1. Before the commencement of drilling operations, the area should be carefully inspected for misfires, sockets and other hazards.

13.1.2. After a hole has been drilled, it should be closed off by a plug.

13.1.3. The manager should be responsible for ensuring that standard instructions are prepared and followed for each type of drilling employed.

13.2. Drilling rigs

13.2.1.1. Drilling rigs should be operated on a level surface. If working on a bench, the rig should be located at a distance of not less than 3 m from the bench crest, especially when drilling the nearest hole to the crest – in this case, the operator should have his back to the crest.

13.2.1.2. Whilst in operation, a drilling rig should be so arranged that its longitudinal axis is perpendicular to the bench crest.

13.2.2.1. When a drill is being moved from one drilling area to another, drill steel, tools and all other parts of the machine should be secured, and the mast placed in a safe position.

13.2.2.2. If a drill helper assists the drill operator during the movement of a drill to a new position, the helper should be in sight of, or in communication with, the operator at all times.

13.2.3.1. No person should be on a rig mast while the drill-bit is in operation unless he is provided with a safe platform from which to work and is wearing a safety belt.

13.2.3.2. When the rig mast is being raised or lowered, persons should not be permitted to remain in front of or behind a drilling rig.

13.2.3.3. Tools or other objects which might cause injury to personnel should not be left loose on the mast or drill platform.

13.2.4. With rotary drilling rigs for which the assembly and dismantling of the drilling set and the cleaning of the mouth of the hole are not mechanised, the augers should be enclosed and they should be interlocked with the electric power supply to the rotary driving motor.

13.3. Rotary jet piercing

13.3.1. Jet piercing drills should be provided with:

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13.3.1.1. a system to pressurise the operator's cab in all cases where a cab is provided;
and

13.3.1.2. a protective cover over the oxygen flow indicator.

13.3.2. Oxygen hose lines should be provided with:

13.3.2.1. an oxygen intake coupling on the drill so constructed that only the oxygen hose can fit and be coupled to it; and

13.3.2.2. safety chains or other suitable locking devices across the connections to and between high pressure oxygen hose lines of 25 mm inside diameter or larger.

13.3.3. A suitable means of protection should be provided for the operator when lighting the burner.

13.3.4. Thermal drilling in rocks that may be inflammable should be prohibited.

13.3.5. When rotary jet piercing equipment requires refuelling at locations other than properly equipped fuelling stations, a system for fuelling without spillage should be provided.

13.3.6. The combustion chamber of a jet drill stem which has been sitting in a drill hole without being operated should be flushed with a suitable solvent after the stem has been pulled up.

13.3.7.1. Smoking and open flames should be prohibited in the vicinity of the oxygen storage and supply lines.

13.3.7.2. Signs warning against open flames and smoking should be posted in these areas.

14. Excavation and loading

14.1. Duty of mine manager

14.1.1. The manager should prepare written excavation and loading rules detailing the procedures to be followed during such operations.

14.2. Excavation

14.2.1. Electrically powered equipment should be disconnected before mechanical work is done on such equipment. Power switches should be locked out or other measures taken to prevent the equipment being connected again without the knowledge of the persons working on it. Such locks or protective devices should not be removed except by the person who installed them or by an authorised person.

14.2.2. In case of an unforeseen interruption of the electric power supply, the operator should immediately return all starters and control levers to the "stop" or "zero" positions.

14.2.3.1. A technical instruction sheet approved by the mine manager or a competent person should be prepared for each machine in operation. In addition to technical details relating to the machine, the information to be contained on this sheet should include the permissible dimensions of working places, bench heights, stability angles and distances that should be maintained by mining machines and transport equipment from working faces, dumps and tipping points.

14.2.3.2. This information sheet should be posted in the proximity of the operator's position on the machine concerned.

14.2.4. The cabins of all excavating machines should be so equipped that the operator can always keep that part of the face adjacent to the machine in sight.

14.2.5. All sites where excavating machines are operating should be equipped with a means of communication with the machine operator.

14.2.6. Rail-mounted excavators should not be set in operation unless the tracks have been examined and pronounced safe.

14.2.7. No unauthorised person should be allowed in the cabin or on the external platforms of an operating excavator.

14.2.8. Cab windows should be of safety glass or equivalent, in good condition and should be kept clean.

14.2.9. No person should mount or enter any excavator being operated and capable of movement without first attracting the operator's attention.

14.3. Single-bucket excavators

14.3.1.1. When moving an excavator, the driven axle should always be positioned either at the downhill end or at the rear if the machine is level. The bucket should be empty and maintained at a height of not more than 1 m above the ground. The jib should face in the direction of motion.

14.3.1.2. In the case of a walking excavator, the bucket must be empty and the jib should face backwards, i.e. opposite to the direction of movement.

14.3.1.3. When moving on a gradient, all possible precautions should be taken against sliding of an excavator.

14.3.2. All movements of an excavator should be performed with the aid of an assistant to the operator. The assistant should use approved signals and should be within sight of the operator at all times. In the case of walking excavators, it may be necessary to transmit signals from the operator's assistant through a third member of the team.

14.3.3. Excavators should stand on a firm and level base, with a gradient not exceeding the permissible gradient specified in the technical instruction sheet. In all cases, the distance from the flank of a bench or dump or any transport vehicle to the counterweight of an excavator should not be less than 1 m, and the cabin of the machine during operation should be placed in such a way that danger to the operator is minimised.

14.3.4.1. The manager should establish a special code of signals for the operators of excavators to be applied to the loading operation. This code of signals should be posted on the excavator in a prominent position.

14.3.4.2. During the loading of rail cars by excavators and the unloading of cars at dumping positions, the train team should follow the signals given by the excavator operator's assistant. These signals should correspond to those envisaged in the railway operating rules.

14.3.5. A free passage should be maintained at all times to enable an excavator to be speedily removed from a mining face.

14.3.6. An excavator in operation should be stopped and removed immediately to a safe place when any dangerous conditions are detected, and particularly when there is a likelihood of rock falls from the face or when misfires have been located in the working area.

14.3.7. In cases where stripping and loading operations are performed with the aid of a dragline excavator, safety rules should be established by the manager and brought to the attention of all concerned. In particular, safe distances between machines should be established when two or more types of machines are working together.

14.4. Multi-bucket and rotary excavating machines

14.4.1.1. The technical instruction sheet should specify the permissible limits for gradients and radii of curvature for railway tracks and roads used by tracked and wheeled excavating machines and walking excavators.

14.4.1.2. Track gauges and other devices used for making observations on variations in track width and gradients should be checked at least once a month.

14.4.1.3. The results of the checks should be recorded in the book kept at the mine for that purpose.

14.4.1.4. No excavating machine should be operated if the gauges and devices for variations in track width and gradient are missing or defective.

14.4.2. Rotary excavating machines with extractable booms which cannot be retracted should be fitted with automatic devices to ensure that the specified rates of movement and angles of turn of the rotary boom are not exceeded.

14.4.3. Multi-bucket excavating machines should be fitted with devices for preventing the bucket frame, rotary boom and conveyor from lifting, lowering or turning through angles greater than those provided for in the machine design.

14.4.4. The operator's cabin of an excavating machine should be equipped with an alarm signalling board and with instruments for controlling:

14.4.4.1. the rate of motion and turning angle of the rotary boom;

14.4.4.2. the rate of motion of the excavating machine; and

14.4.4.3. the voltage and power load at the lead-in of the machine.

14.4.5. During operation of a multi-bucket excavating machine, no person should be allowed adjacent to or between the cars being loaded, below loading and unloading points and conveyors or reloading devices, or under the chassis frame of the excavating machine.

14.4.6. Before starting a new cut with a multi-bucket excavating machine, the shift supervisor or foreman should inspect the face and take any necessary steps for the removal of foreign bodies such as large tree roots, pieces of timber, metal objects and the like along the entire front of operation of the machine and to the full width of cut, taking into account the angle of response.

14.4.7. A multi-bucket machine with bottom digging should not be operated where there is a possibility of rocks sliding on the face, and where the required stability of the slope and that of the working surface cannot be ensured.

14.4.8.1. In a combined operation involving a rotary excavator with conveyors and overburden spreaders, or a multibucket excavating machine which loads spoil on to a conveyor, the controls of the excavators/conveyors/ spreaders should be interlocked.

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14.4.8.2. In order to carry out repair and adjustment work, measures should be provided for manual control of each separate machine.

14.5. Scrapers and bulldozers

14.5.1. Drag cable scrapers should not be used on bench slopes having an inclination in excess of 35.

14.5.2. No scraper plant should be started up unless a prior warning signal has been given; during the operation of a scraper, no person should attempt to make repairs or adjustments, to stand near the rope, or to guide the rope by hand.

14.5.3. Whilst operating on a bench, self-propelled and tractor-hauled scrapers should not approach within 2 m of the bench crest. No scraper should be permitted to move backwards downhill when unloading.

14.5.4. Scrapers hauled by wheeled tractors should not be permitted to negotiate access roads having a gradient greater than:

14.5.4.1. 15 in the case of a loaded machine; or

14.5.4.2. 25 in the case of an empty machine.

14.5.5. When operating a tractor-type bulldozer, it should be prohibited to:

14.5.5.1. leave a machine with the engine running and the blade lifted;

14.5.5.2. stand on the blade frame or on the blade;

14.5.5.3. operate a machine that is not fitted with an interlocking device to prevent the engine from starting when it is in gear; and

14.5.5.4. operate a machine that is not fitted with a device which requires the engine to be started from within the cab.

14.5.6.1. All repairs, lubrication or adjustments to a bulldozer should be performed with the machine on level ground, the engine switched off and the blade lowered to the ground.

14.5.6.2. Where, because of failure or defect, a bulldozer is stopped on a slope, steps should be taken to block the machine in position so as to avoid any downhill movement before repairs are attempted.

14.5.7. Should it be necessary to carry out an inspection of the underside of a bulldozer blade, the blade should be lowered on to firm supports and the engine stopped. No person should be permitted to go under a lifted blade except if it is firmly chocked up and permission has been given by the competent person.

14.5.8. On every face or bench where a bulldozer may be called upon to operate, written instructions should be prepared, based on the conditions at each working place, and stating clearly the distance from the edge which no bulldozer may cross.

14.5.9. Bulldozers should not be permitted to operate on slopes where the inclination measured along the steepest plane exceeds 25 or on any slope which has a dangerous cross inclination.

14.6. Loading

14.6.1. The mine operator should ensure that all equipment and vehicles in use for these operations are of an approved type and conform with such specifications and requirements for safety as may have been laid down in national laws or regulations.

14.6.2. The following precautions should be adopted during loading operations:

- 14.6.2.1. a driver of any truck should not enter or leave his cab;
- 14.6.2.2. the loaded bucket of any shovel or loader should not be traversed over the driver's cab of a truck or other motor vehicle;
- 14.6.2.3. all persons should keep clear of the area between the loading unit and the mine face, and the area traversed by the loading bucket during loading operations;
- 14.6.2.4. all rocks that are too large to be handled safely should be broken before loading; and
- 14.6.2.5. transport equipment should be loaded in a manner to minimise spillage during haulage.

14.6.3. The following precautions should be adopted during dumping operations:

- 14.6.3.1. where there is a possibility that the ground at a dumping place may fail to support the weight of a vehicle, loads should be dumped back from the edge of the bank;
- 14.6.3.2. a vehicle should not be permitted to dump a load over a bank or into a bin, unless there is an effective back stop provided, or otherwise (if necessary) a person is safely stationed and properly equipped to guide and direct the driver to a safe dumping position;
- 14.6.3.3. when dumping is carried out, whether by day or by night, marker guides or other effective signs should be placed to indicate to the driver the limit of his safe approach to the tipping area;
- 14.6.3.4. when dumping is carried out during the hours of darkness, the area should be illuminated by lighting units so placed as to give effective illumination to the working area and to the edge of the dump area; and
- 14.6.3.5. the mine operator or manager should ensure that adequate artificial lighting is provided at all points where poor visibility or work during the hours of darkness may present a hazard.

15. Dredges and other floating installations

15.1. Scope

15.1.1.1. For the purpose of this section, the term "dredge" includes any floating vessel used for cutting, pumping or treatment purposes, and other machinery to be used for or in connection with mining by means of dredging.

15.1.1.2. The term does not include a barge, workboat, tender, anchor punt or other boat ancillary to dredging operations.

15.1.1.3. Nothing in this section should be construed as limiting or affecting such other laws or regulations as may apply to river or sea-going vessels.

15.2. Approval by the competent authority

15.2.1.1. A dredge, floating treatment plant or other vessel should not be used in mining unless it has received the authorisation of the competent authority.

15.2.1.2. The application for authorisation or use by the competent authority should be accompanied by:

15.2.1.2.1. drawings and specifications of the dredge, floating treatment plant or other vessel;

15.2.1.2.2. buoyancy calculations in respect of the vessel made by a competent person; and

15.2.1.2.3. the results of all buoyancy tests carried out in respect of the vessel.

15.2.2.1. In giving authorisation, the competent authority should specify therein the approved load line that has been assigned to the dredge or floating treatment plant.

15.2.2.2. The competent authority should not assign to any vessel a load line such that the vessel would thereby have a freeboard of less than 150 mm.

15.2.2.3. The load line so assigned to a dredge or floating treatment plant should be clearly marked in an approved manner.

15.3. Personnel

15.3.1. No person should act, or be permitted or employed to act, as a winchman or winch or cutter operator unless he has been authorised by the manager, who has satisfied himself as to the competence of the operator.

15.4. Safety precautions on board dredges

15.4.1.1. The hull of a dredge or other vessel used for mining should be kept sound and watertight.

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15.4.1.2. The interior of the hull compartments should be kept clean and, with the exception of those compartments in which the storage of ballast has received the approval of the competent authority, free of water as far as is reasonably practicable.

15.4.2.1. A dredge or floating treatment plant should be provided with:

- 15.4.2.1.1. four lifebuoys, two of which should be located in the bow and two towards the stern;
- 15.4.2.1.2. suitable lifelines fitted around the vessel at a convenient height;
- 15.4.2.1.3. a boat containing a lifeline not less than 15 m in length and a boat-hook, and equipped ready for use with oars and rowlocks or other effective means of propulsion;
- 15.4.2.1.4. an adequate number of life-jackets; and
- 15.4.2.1.5. notices so displayed as to indicate clearly the location of all life-saving appliances.

15.4.2.2. The life jackets provided should be worn by all persons when on board or when there is a danger of drowning.

15.4.2.3. All life-saving appliances should be maintained in good order and condition and should be kept in a readily accessible location.

15.4.2.4. All employees engaged on or in connection with dredgers should be given training and instruction in life-saving techniques.

15.4.3. All dredges should be fitted with the following safety devices:

- 15.4.3.1. an electric return signalling system between the winch room and the discharge end of the screen;
- 15.4.3.2. an automatic alarm bell that is designed to sound when the load line assigned to the vessel has been submerged;
- 15.4.3.3. a pendulum or other device to show the list of the vessel;
- 15.4.3.4. a means of indicating an obstructed discharge from the dredge or treatment plant;
- 15.4.3.5. a means of indicating the dredging depth; and
- 15.4.3.6. in the case of a bucket dredge, an automatic device to ensure immediate stopping of the dredging machinery in the event of an overload of the dredge.

15.4.4.1. Warning notices should be posted in conspicuous places to warn persons of danger from head and side lines.

15.4.4.2. The head and side lines of a dredge or treatment plant should have free and unobstructed play between the anchors and the dredge or floating treatment plant.

15.4.4.3. It should be the duty of the manager of every dredge and of every person in charge of a dredge to remove all obstacles likely to impede the free play of the head lines or to elevate the head lines over such obstacles.

15.4.4.4. A deflecting sheave, if used between the anchor and the dredge or floating treatment plant, should be securely anchored.

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15.4.4.5. No unauthorised person should be allowed to work in the vicinity of the head or side lines whilst the dredge is operating.

15.4.5. Every anchor for a head line or side line of a dredge or floating treatment plant should be of adequate capacity to hold the vessel under all working conditions.

15.4.6. No unauthorised person should be permitted to interfere with any machinery, line or other appliance used in a dredging operation.

15.5. Miscellaneous protective precautions

15.5.1. Hatchways and all other deck openings should be fitted with watertight seals or safeguarded by coamings not less than 400 mm in height.

15.5.2.1. The competent authority may require every open side of the deck of a dredge or floating treatment plant to be provided with guard-rails and stanchions suitable to prevent persons falling overboard.

15.5.2.2. The following provisions should apply to all guard-rails:

- 15.5.2.2.1. stanchions should be secured to the deck and spaced not more than 2.5 m apart;
- 15.5.2.2.2. the guard-rails should consist of an upper rail located 1 m above the deck and a lower rail located 250 mm above deck;
- 15.5.2.2.3. guard-rails should be constructed of suitable timber, scaffold tube, steel wire rope or chain and, in the case of steel wire rope or chain, should be kept taut by means of turn-buckles or other suitable devices; and
- 15.5.2.2.4. guard-rails should be kept in place except when removed temporarily for access purposes.

15.5.3.1. Where the competent authority directs, a dredge or floating treatment plant working close to a bank should be provided with a gangway not less than 600 mm wide and of sufficient length to reach from the bow to a firm and stable position on the bank, or from the stern to the tailings dump, according to the instructions of the competent authority.

15.5.3.2. The gangway should be provided with a substantial handrail and shall be secured to the deck of the dredge or floating treatment plant.

15.5.4. Every place where men are working should be adequately illuminated during the hours of darkness.

15.5.5. The following safety requirements should be observed by all persons working on a dredge used for mining purposes:

- 15.5.5.1. every member of a dredge crew when employed in outboard work on the dredge should use safety belts or life-jackets;
- 15.5.5.2. in the event of a man going overboard, the bucket line or cutter and suction equipment should be stopped immediately and the alarm given; and

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15.5.5.3. no person should step on any bucket, chain or revolving screen whilst it is in motion, nor ride on them.

15.5.6.1. It should be the duty of the mine operator or manager to appoint a competent person to carry out specific inspections and controls daily before the commencement of operations, namely:

15.5.6.1.1. soundings of all hull compartments;

15.5.6.1.2. inspection of the freeboard on the bow, stern, port and starboard; and

15.5.6.1.3. inspection of the dredging depth or ladder angle, in a bucket dredge where the dredging depth is not recorded automatically.

15.5.6.2. The person who makes the checks should record the results forthwith in a log-book to be kept on board.

15.6. Emergency provisions

15.6.1. Immediately after the sounding of any emergency alarm, the winchman or other person in charge of the dredge or other vessel concerned should:

15.6.1.1. cease digging and take all necessary measures to correct the defect causing alarm; and

15.6.1.2. not recommence digging until the defect triggering the alarm has been effectively corrected.

15.6.2. After the operation of the automatic overload stopping device, digging should not be permitted to recommence until the winchman has ascertained that the overload has been cleared.

15.7. Other matters

15.7.1. The maximum number of persons that may be carried at one time in a dredge or other vessel used in connection with dredging or mining operations should be fixed by the competent authority. A prominent notice of this figure should be kept posted on the dredge or other vessel.

15.7.2. Warning notices for the public should be posted in a conspicuous position in all cases where head or side lines cross a path or thoroughfare.

15.7.3. Every dredge should be provided with suitable toilet accommodation and latrines.

15.7.4. All dredges and other floating installations should be provided with fire-fighting facilities in a quantity to be agreed with the competent authority.

16. Transport and handling of material

16.1. Non-rail vehicles

16.1.1. This section of the code is concerned with two types of vehicles:

16.1.1.1. all rubber-tyred or tracked, self-propelled mobile equipment used in or about an opencast mine for hauling, transporting, personnel carrying, lifting, hoisting, scraping and similar operations, and having a gross vehicle weight (GVW) in excess of 1,000 kg; and

16.1.1.2. vehicles whose GVW is below 1,000 kg, including amongst others jeeps, vans, four-wheel drive vehicles and the like, which are classified as light vehicles.

16.1.2.1. The competent authority should set standards for safety equipment and protective devices to be incorporated in mobile plant and should, for vehicles newly purchased after a date to be prescribed, specify the necessary safety equipment and protective devices against falling objects, vehicle roll-over and workers falling out of the vehicle.

16.1.2.2. Tests may be prescribed by the competent authority to ensure safe operation of the equipment and devices concerned.

16.1.2.3. All mobile equipment used in an opencast mine should be of an approved type and carry an identity number.

16.1.3.1. The manager should draw up transport rules to regulate the movement of all vehicles and their operation in an opencast mine.

16.1.3.2. The transport rules should be posted and a copy given to all drivers and equipment operators.

16.1.4.1. All self-propelled mobile equipment should be provided with adequate braking systems, capable of effectively stopping and holding the vehicle stationary when fully loaded, under any conditions of operation when driven correctly.

16.1.4.2. No vehicle should be left unattended unless:

16.1.4.2.1. the controls are in the neutral position and the parking brakes fully applied;

16.1.4.2.2. if it is a tracked and wheeled vehicle parked on a grade, that it is blocked or turned into a rib or bank;

16.1.4.2.3. the movable parts of equipment such as dippers, buckets, scraper blades are secured or lowered to the ground when not in use; and

16.1.4.2.4. the master switch of electrically powered mobile equipment is in the off position, all operating controls are in the neutral position, and the brakes are set or other equivalent precautions are taken against rolling.

16.1.5.1. When a vehicle is in motion between work areas, the movable parts of the equipment should be secured in the travel position.

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16.1.5.2. Tipping body props or other devices should be provided and these should be capable of preventing a skip collapsing, and their mode of operation should be independent of the tipping mechanism.

16.1.6. The engine exhaust gases from mobile equipment operated by an internal combustion engine should be discharged at a point remote from the operator's position and from any air-conditioning intake where fitted.

16.1.7. All motor vehicles should be equipped with:

16.1.7.1. effective headlights, tail-lights and clearance lights; and

16.1.7.2. an effective audible warning signal should be sounded whenever the driver wishes to move the vehicle without having clear vision immediately in front and behind.

16.1.8.1. The operator's cab of any vehicle used for rock haulage should be so constructed or reinforced as to resist damage by spillage.

16.1.8.2. The operator's cab should not be additionally equipped, altered or otherwise modified in a manner which impairs operating visibility.

16.1.8.3. Cab windows should be of safety glass or equivalent, in good condition and should be kept clean.

16.1.8.4. Cabs of mobile equipment should be kept free of extraneous materials.

16.1.9. The design and layout of operators' positions and controls should conform with best ergonomic principles. Particular attention should be given to:

16.1.9.1. layout and direction of movement of all control devices;

16.1.9.2. the operator's seating;

16.1.9.3. protection against environmental hazards, including inclement weather, heat, cold, noise and airborne dust; and

16.1.9.4. safe entry and exit for the operator.

16.1.10. Fire extinguishers of a certified type and capacity should be installed on all mobile equipment.

16.1.11. A person should not operate, or be employed or permitted to drive, a motor vehicle in an opencast mine unless:

16.1.11.1. he holds a current operator's licence for that vehicle; and

16.1.11.2. he has satisfied the manager or his representative that he is competent to operate that vehicle.

16.1.12.1. All opencast mine roads should be of such width as will adequately contain the vehicles using them and be provided with a shoulder barrier of a size acceptable to the competent authority.

16.1.12.2. Where appropriate, passing places should be provided on single-lane roads which should be clearly visible from both directions.

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16.1.12.3. The gradient and radius of any part of a road should be such that vehicles can negotiate the road in safety.

16.1.12.4. The manager should cause to be erected such signs as may be necessary to control the speed and movement of all vehicles making use of the roads.

16.1.12.5. All low points on mine roads should be adequately drained so as to eliminate accumulations of standing water.

16.1.12.6. Roads subject to freezing conditions should be cleaned systematically of snow and ice and strewn with sand, gravel, slag or other suitable material.

16.1.12.7. Haulage roads with planned gradients in excess of 5 per cent should have emergency escape roads, which should:

16.1.12.7.1. be spaced throughout the length of the haulage road; and

16.1.12.7.2. ensure that a runaway vehicle entering an emergency escape road can be safely brought to rest.

16.1.13. The operating speed of mobile equipment should be consistent with conditions of roadways, grades, clearances, visibility, traffic and the type of equipment used.

16.1.14.1. All operators should maintain full control of the mobile equipment while it is in motion.

16.1.14.2. Haulage equipment should be operated under power control at all times.

16.1.14.3. No person shall mount or enter any haulage machine being operated and capable of movement unless he has attracted the operator's attention.

16.1.15. Where loads are carried which project beyond the sides of vehicles, or by more than 1.2 m beyond the rear of the vehicles, there shall be attached at the end of the projection:

16.1.15.1. a warning light during the hours of darkness or in limited visibility; and

16.1.15.2. a clearly visible warning flag of suitable size in daylight conditions.

16.1.16. Where overhead clearance is restricted, warning devices should be installed and the restricted area should be conspicuously marked.

16.1.17. Where the regular transport of persons is required, buses or other specially fitted vehicles should be used, equipped with seating and safe means of entry and exit.

16.1.18. The transport of persons should be prohibited:

16.1.18.1. in or on mobile equipment, loaded or unloaded, unless special arrangements have been made for their safety, and such transport is authorised by the manager;

16.1.18.2. outside the cabs and beds of mobile equipment; and

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16.1.18.3. in vehicles equipped with unloading devices, unless means have been provided to prevent accidental operation of the unloading mechanism.

16.1.19. All ramps and dumping facilities should:

16.1.19.1. be of substantial construction; and

16.1.19.2. have suitable width, clearance and headroom to accommodate the equipment using the facilities.

16.1.20. Berms, bumper blocks, safety hooks or similar means should be provided and maintained as required to prevent overtravel and overturning at all tipping and dumping locations.

16.1.21.1. Chute loading installations should be so designed and installed that the persons operating them are not required to be in a hazardous position whilst at work.

16.1.21.2. Any attempt to free a blockage in a chute should only be made by a competent person who fully understands the hazards involved.

16.1.22.1. All grizzlies, grates and similar stationary sizing devices should be securely mounted and anchored.

16.1.22.2. Persons required to work on a grizzly while breaking rocks should be provided with and should wear a securely anchored safety belt.

16.1.23. Mobile equipment used in dumping and tipping operations should be provided with an automatic reverse signal alarm which is audible above the surrounding noise level, or should have an observer to enable reversing to be carried out in safety.

16.2. Rail transport

16.2.1. The manager of an opencast mine should prepare a set of plans showing every part of a proposed rail system whose primary use will be for the transport of ore. A copy of the plans shall be kept at the office of the mine.

16.2.2.1. The manager of an opencast mine should prepare railway operating rules, including signals and signal codes and inspection and maintenance procedures to apply to all railway operations.

16.2.2.2. No change should be made to these rules except in the case of an unforeseen occurrence, mishap or defect.

16.2.3.1. Every person employed on a railway operation on an opencast mine should be provided with a copy of the operating rules, signals and signal codes applicable to that mine.

16.2.3.2. Before any person is employed as a train controller, locomotive driver, member of a train crew or as driver of any rail track vehicle, he should satisfy the manager or his deputy that he is fully conversant with the relevant operating rules, signals and signal codes and is competent to discharge his duties.

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16.2.3.3. No person should be permitted to take or have charge of a locomotive on a mine railway unless he is the holder of a locomotive driver's certificate issued by the competent authority.

16.2.3.4. A person undergoing instruction may operate a locomotive under the supervision of a certified locomotive driver.

16.2.4. Road-beds, rails, joints, switches, frogs and other elements of every rail track as well as bridges, culverts and other structures supporting it should be designed, installed and maintained in a safe manner consistent with the speed and type of haulage.

16.2.5. Locomotives, rolling stock, tracks and all other equipment used in the operation of a railway system should be maintained in a safe condition and should be subject to regular inspection at intervals to be laid down in the operating rules.

16.2.6.1. Every train should be equipped with an effective braking system.

16.2.6.2. Every locomotive, rail car, truck, wagon or other rail track vehicle should be provided with effective brakes which should be capable of being operated individually by hand and by the train braking system when forming part of a train.

16.2.6.3. The requirement to provide effective brakes need not be enforced in the case of a single vehicle attached to the end of a train, nor does it need to be enforced in the case of a single vehicle being towed by a self-propelled vehicle, the brakes of which are adequate for the task.

16.2.7.1. A train should not be left unattended unless brakes of sufficient strength to hold the whole train stationary have been applied.

16.2.7.2. No rail car, truck, wagon or other rail track vehicle should be left detached from a train unless its brakes are applied or unless it is otherwise secured to prevent a runaway.

16.2.7.3. Positive-acting stopblocks, derail devices or other adequate means should be installed wherever necessary to protect persons from runaway or moving railroad equipment.

16.2.8. Every locomotive should be equipped with the following devices and systems, which should be maintained in good working order:

16.2.8.1. effective headlights and rear-lights;

16.2.8.2. at least two braking systems (hand brakes and pneumatic or electric);

16.2.8.3. a whistle or siren capable of giving clear and distinct warnings and signals;

16.2.8.4. sanding devices;

16.2.8.5. speedometers;

16.2.8.6. adequate fire extinguishers; and

16.2.8.7. first-aid equipment.

Transport and handling of material

16.2.9.1. Only authorised persons should be permitted to ride on trains or locomotives and only in positions of safety.

16.2.9.2. In cases of accident or emergency, the manager may authorise the carriage of persons.

16.2.10. All loads must be securely attached to the rail vehicles.

16.2.11. Rocker-bottom and bottom-dump railcars should be equipped with locking devices.

16.2.12. Persons should not attempt to mount or dismount from moving equipment unless national legislation specifically permits it.

16.2.13. Cars shall not be coupled or uncoupled manually, unless the driver and the shunter are within clear view of each other, or they have some effective means of signalling to each other, or the cars are so designed and equipped as to minimise any hazard while performing this operation.

16.2.14. A driver who has not clearly recognised a signal given by the brakeman when the train is under the direction of the latter must assume it to be a stop signal.

16.2.15. No person should pass over, under or between cars unless the train is stationary and the driver has been informed and has clearly understood what is being done.

16.2.16.1. Railcars should not be left on side tracks unless ample clearance is provided for traffic on adjacent tracks.

16.2.16.2. A locomotive on one track should not be used to move equipment on a different track unless a suitable system has been devised to do so safely.

16.2.17. Where necessary, bumper blocks, buffers or the equivalent should be provided at track dead-ends.

16.2.18. Track guard-rails, lead rails, frogs and guide rails should be protected or blocked so as to prevent a person's foot from becoming wedged.

16.2.19. Public and permanent railroad crossings should be posted with warning signs or signals, or should be guarded when trains are passing and should be planked or otherwise filled in between the rails.

16.2.20. If repairs are being carried out adjacent to rail tracks, special rules must be drawn up by managers and implemented to provide for the safety of personnel and the safe movement of trains.

16.3. Aerial ropeways

16.3.1. The buckets of aerial ropeways should not be overloaded, and the feed should be regulated to prevent spillage.

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16.3.2. Positive-action-type brakes – or devices which apply the brakes automatically in the event of a power failure – should be provided on all aerial ropeways.

16.3.3. Track cable connections should not obstruct the passage of carriage wheels.

16.3.4. All towers should be suitably protected from swaying buckets.

16.3.5. Guard nets or other suitable protection should be provided where aerial ropeways pass over roadways, walkways or buildings.

16.3.6. Persons other than maintenance persons should not ride aerial ropeways unless the following features are provided:

16.3.6.1. two independent brakes, each capable of holding the maximum load;

16.3.6.2. direct communication between terminals;

16.3.6.3. power drives with emergency power available in case of primary power failure; and

16.3.6.4. buckets equipped with positive locks to prevent accidental tripping or dumping.

16.3.7. Persons should only be permitted to ride on aerial ropeways in accordance with the manager's transport rules for the mine, which should forbid riding on loaded buckets.

16.3.8. Whenever possible, operators must ascertain that all persons are clear before starting an aerial ropeway system and should give clear, audible warning of any impending start.

16.4. Conveyors

16.4.1.1. No conveyor should be operated unless it is provided with a system for stopping the belt from any point along its length.

16.4.1.2. Footbridges with handrails or rope bridges should be provided at intervals not exceeding 500 m in the case of combined excavator and belt transfer systems.

16.4.2.1. If the entire length of a conveyor is visible from the starting switch, the operator should visually check to make certain that all persons are clear of the conveyor before starting it. A positive audible or visual warning system should be installed and operated to warn persons that the conveyor is about to be started.

16.4.2.2. If required by the competent authority, a conveyor belt should be provided with a device permitting any person, from any point along its length, to stop the belt and prevent it from being restarted.

Transport and handling of material

16.4.3. No person should ride on a conveyor belt, except as specifically permitted in the manager's rules and as approved by the competent authorities.

16.4.4. No person should clean underneath a moving conveyor, nor any part of a moving conveyor, unless approved and adequate protective guards are in place.

16.4.5. Moving conveyors should not be crossed except at designated points.

16.4.6. All head, tail and tension pulleys of a conveyor should have their nip points guarded for a distance of at least 1 m.

16.5. Conveyor bridges and overburden spreaders

16.5.1. Structural members of conveyor bridges, overburden spreaders and excavating machines, together with all ladders and platforms thereon, should be cleaned off before the commencement of every shift.

16.5.2. All automatic control, tele-automatic and remote-control systems should be provided with interlocking devices to interrupt the power supply in case of defective operation.

16.5.3. Conveyor bridges and overburden spreaders should be equipped with instruments for automatic continuous measurements of wind velocity and direction, interlocked with an emergency signalling system and a system of undercarriage control of overburden spreaders, as well as with control and measuring instruments, limit switches, signalling and intercommunication devices. In addition to automatic brakes, the bridge undercarriages must be equipped with intact hand brakes. No machine should be operated unless the above-mentioned instruments, switches and devices are in good working order.

16.5.4. During repairs to a conveyor bridge, the simultaneous disassembly of the automatic brakes and the hand brakes should be prohibited.

16.5.5. Any counterweight located close to a road or travelling way should be effectively guarded.

16.5.6.1. Conveyor lines on conveyor bridges and overburden spreaders should be provided with servicing platforms guarded on both sides.

16.5.6.2. No passageway along a conveyor should be less than 700 mm in width.

16.5.7. During inclement weather, thunderstorms, snowstorms, heavy rain or fog, when the visibility is less than 25 m, the passage of persons or work on a conveyor bridge should be suspended.

16.5.8. No conveyor bridge should be permitted to approach a structure or any mining and transport equipment to within a distance of less than 1 m or to operate in a position above other operating mining and transport equipment.

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16.5.9. Conveyor bridge railway tracks should not be used when they are under water.

16.5.10. When an overburden spreader of the walking or railway-walking type is in motion, no persons, nor transport vehicles, machines or other equipment should be permitted to pass under the dumping cantilever of a conveyor bridge.

16.5.11. The vertical distance between the end of a dumping cantilever of a conveyor bridge and the crest of the dump should not be less than 3 m; for overburden spreaders which move periodically and use a cantilever-type belt conveyor, this distance should not be less than 1.5 m.

16.5.12. If there are signs of a rock slide on a waste dump, a conveyor bridge should immediately be removed from the danger zone.

16.6. Stockpiles, bins and storage silos

16.6.1. The following precautions must be taken for all bunkers, silos, ore passes and storage piles:

- 16.6.1.1. wherever practicable, special devices should be incorporated for breaking down material which has caked up, or for clearing other obstructions which have formed in the material;
- 16.6.1.2. no person should be permitted to enter or work in such locations until all conveyors are locked out and other tipping activities have been stopped. A permit-to-work system should be devised for this specific purpose;
- 16.6.1.3. persons should only enter under the supervision of the foreman or equivalent competent person;
- 16.6.1.4. work involving entry into bunkers, silos or ore passes should be entrusted to experienced persons who have been specially instructed in the hazards involved;
- 16.6.1.5. all persons entering should wear safety belts attached to a secure fitting at the entrance;
- 16.6.1.6. where appropriate, permanent ladders should be attached to the walls;
- 16.6.1.7. the support structures of bins and silos should be protected against collision with moving equipment; and
- 16.6.1.8. bins and silos should be regularly inspected by a competent person for hidden corrosion and wear.

16.6.2. When handling coal or other material which is liable to emit harmful gases, the atmosphere in the bunker or silo should be sampled and analysed before access is permitted.

16.6.3. Tunnels below coal stockpiles and silos should be ventilated so as to maintain concentrations of firedamp below 1 per cent.

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16.6.4. When it is necessary for a tunnel to be closed at one end, an escapeway of not less than 750 mm in diameter, or equivalent, should be provided, equipped with ladders as necessary, which extends from the closed end of the tunnel to a safe location on the surface.

17. Mobile and travelling cranes

17.1. General requirements

17.1.1. The mine operator should ensure that all cranes, lift trucks and similar handling equipment in use at an opencast mine are constructed, operated and maintained in accordance with the relevant national standards and the manufacturer's instructions.

17.1.2. No modifications or major repairs should be carried out on a crane unless these are performed by a person competent in this field.

17.2. Safety precautions

17.2.1. The following precautions should be adopted in the operation of cranes and lifting devices:

- 17.2.1.1. hitches and slings used to hoist materials should be suitable for the material being handled and should be in good condition;
- 17.2.1.2. taglines should be attached to loads that may require steadying or guidance while suspended;
- 17.2.1.3. persons should stay clear of suspended loads;
- 17.2.1.4. no material should be dropped from an overhead elevation unless the drop area has been cleared of personnel and either guarded or a suitable warning given; and
- 17.2.1.5. only trained and competent workers should be authorised to sling loads.

17.2.2. Fork and other types of lift trucks should be operated with:

- 17.2.2.1. the upright tilted back to secure the load;
- 17.2.2.2. the load kept in the upgrade position when ascending or descending grades in excess of 8 per cent;
- 17.2.2.3. with the exception of minor adjustments, the load should not be raised or lowered en route; and
- 17.2.2.4. the load-engaging devices should be on the downgrade side when travelling unloaded on all grades.

18. Hazards in the working environment and environmental protection

18.1. General provisions

18.1.1. It should be the duty of the operator of an opencast mine to ensure that persons are not exposed to airborne contaminants, harmful physical and chemical agents or other hazards present in the working environment.

18.1.2. The manager should establish a suitable system of determining the quality of the air, and identifying any physical or chemical agent likely to be hazardous in the atmosphere in the vicinity of the mining operation, and of all locations in or about the mine where workers may be called upon to work or travel.

18.1.3. National laws or regulations should specify and regularly review exposure limits for all airborne contaminants, harmful physical and chemical agents, and other hazards which may be encountered in the working environment.

18.1.4. The mine operator should make the necessary provisions to ensure that:

18.1.4.1. the safe working methods and, as far as is reasonably practicable, the safest physical and chemical agents are chosen and used;

18.1.4.2. special procedures, approved by the competent authority, are enforced wherever workers may be exposed to ionising radiation hazards from any source; and

18.1.4.3. the exposure limits specified by national laws and regulations are not exceeded.

18.1.5. Where it is necessary in order to minimise the risk to workers, the manager should prepare written instructions specifying the correct procedure to be observed in these circumstances. The manager should also take the necessary steps to inform all workers of the possible hazards and the precautions to be taken when hazardous substances are likely to be encountered at the mine.

18.1.6. National legislation should specify the standards necessary to protect workers in opencast mines situated at high altitudes. Specific regard should be paid to the particular characteristics of these mines and the hazards to which the miners are exposed because of the location of such mines.

18.2. Precautions against airborne dust

18.2.1. Where dust is being produced during the course of operations in or about a mine the manager should:

18.2.1.1. make provision for such dust to be controlled or suppressed; or

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18.2.1.2. where the above recommendation is not practicable, supply and cause to be constantly used such appliances as will prevent the dust from being breathed by those persons.

18.2.2. Suitable arrangements should be made to control airborne dust at all working places, loading and tipping points, material transfer points, crushing stations and haulage roadways where hazards to persons may be created as a result of impaired visibility.

18.2.3. In implementing precautions against airborne dust, special attention should be paid to the following circumstances, operations or locations:

18.2.3.1. in the immediate period following blasting operations;

18.2.3.2. the operation of drilling rigs or other rock drills which are not fitted with effective dust collection or suppression devices;

18.2.3.3. loading or unloading points, particularly under dry conditions;

18.2.3.4. all mine haulage roadways;

18.2.3.5. all crushing, screening and treatment plants, particularly at conveyor belt transfer points;

18.2.3.6. stone-cutting and polishing operations; and

18.2.3.7. worked-out areas, dumps and similar sites where windblown dust may become excessive.

18.2.4. The manager of a mine should make provision for mechanical ventilation to be supplied and used in all stagnant zones, dead-end tunnels and other poorly ventilated places.

18.2.5. The competent authority should specify standards of dust concentrations and sampling methods for opencast mines.

18.3. Precautions against harmful gases

18.3.1.1. In every case where toxic gases or fumes are liable to be present or to escape from any furnace or other plant used in connection with any process or operation, approved devices should be installed to ensure that such fumes or toxic gases are neutralised, suppressed or otherwise rendered harmless.

18.3.1.2. Such devices should be operated at all times in an approved manner.

18.3.2. If there is a danger of an explosion of gas, dust or vapour in any part of an opencast mine, the manager should take adequate precautions to prevent such an explosion, and inform the competent authority of the precautions that have been taken.

18.3.3. In cases where waste gases are discharged into the atmosphere, the emissions should conform with the requirements of national laws or regulations.

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18.3.4. Persons should not be permitted to enter the vicinity of a working face after shotfiring until the gaseous products of the blast have dissipated.

18.3.5.1. In cases where harmful gases may be given off by fluid or slurry drained or pumped from any source, all sumps, manholes, tanks or other collection points should be closed off effectively.

18.3.5.2. The supervisory official, before allowing persons to enter such a locality, should ensure that it has been thoroughly ventilated and freed from water if practicable, and the atmosphere within tested to ensure its purity.

18.3.5.3. Where such tests have not been performed, or where there may be an oxygen deficiency, workers entering the pit should be equipped with approved respiratory devices.

18.3.5.4. Any person required to enter such a locality should be trained in the use of the respiratory device provided and be assisted by a second person stationed in fresh air.

18.4. Noise

18.4.1. The competent authority should set standards for the maximum noise dose considered acceptable in the working environment on a daily basis and for the maximum peak noise level.

18.4.2. No worker in any part of a mine should be exposed to a daily noise dose or peak noise level in excess of the standard laid down by the competent authority unless wearing an approved hearing protection device.

18.4.3.1. It should be the duty of the manager to cause to be conducted periodically a survey of the noise levels to which each worker in every surface installation and worksite is exposed during his normal workshift.

18.4.3.2. A record should be maintained of the noise level survey results and kept available at the office of the mine.

18.5. Vibration

18.5.1. The manager of every surface mine should take such measures as are practicable to minimise the adverse effects of vibration on miners' health.

18.6. Toxic substances

18.6.1. All toxic substances used in or about an opencast mine should be stored, handled and used in a manner approved by the competent authority.

18.6.2.1. Access to any toxic substance at an opencast mine should be restricted to competent persons authorised by the manager.

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18.6.2.2. Emergency showers and eye wash stations shall be provided where necessary at appropriate points.

18.6.3. Where operations on or about an opencast mine are discontinued or abandoned, any toxic substance should be removed from the mine and disposed of in an approved manner.

18.7. Protection of the environment

18.7.1. In accordance with national laws, the operator of an opencast mine should ensure the introduction of a programme of environmental management to be taken into account at every stage of a mining project from the feasibility study, through the planning and operational phases, up to the closure of the mine and during subsequent monitoring.

18.7.2. The environmental management programme for an opencast mine should provide guidelines covering:

18.7.2.1. the siting of the mine;

18.7.2.2. a hydrological study;

18.7.2.3. the method of operation;

18.7.2.4. evaluation and monitoring of discards, slurry and other residues;

18.7.2.5. control of spontaneous combustion and air pollution from waste dumps;

18.7.2.6. a rehabilitation plan; and

18.7.2.7. procedures for the closure, abandonment, replanting and after-care of the site such that there are no external environmental impacts and no safety hazards.

18.7.3. The programme of environmental management should be submitted to the competent authority for approval before the commencement of operations.

18.8. Testing and measurement

18.8.1. Details of any testing methods and instrumentation used to monitor airborne pollution, liquid effluents and physical hazards should be as specified by the competent authority.

19. First aid and medical services

19.1. First-aid requirements

19.1.1. National laws or regulations should specify the minimum first-aid equipment to be kept, having regard for the different types of opencast mines and the size of the operation, as well as the qualifications and numbers of first-aid attendants.

19.1.2. The following facilities for first aid and emergency treatment in case of accident should be provided at any opencast mine:

- 19.1.2.1. a suitable, regularly replenished and properly maintained first-aid outfit should be kept at the mine for use in case of accident, and a suitably trained first-aid attendant should be on duty at all times when the mine is in operation;
- 19.1.2.2. dressings and disinfectant shall be made available at all points where mining operations are performed; and
- 19.1.2.3. a conveniently sited and suitably accessible room which permits the transfer of patients by stretcher should be set aside for the sole use of first aid, medical examination and ambulance work. This room to be maintained to a suitable level of hygiene and condition, as may be specified in national laws.

19.1.3. At every mine where the total number of persons employed on one shift exceeds a figure to be specified by national laws or regulations, it should be the duty of the mine operator or manager of an opencast mine to provide a convenient location furnished with a sufficient number of beds, together with the necessary equipment and supplies, for the preliminary treatment of injuries or illness and suitable for the temporary use of persons injured at the mine, unless:

- 19.1.3.1. there is a hospital or other suitable medical facility nearby and conveniently accessible to the mine; and
- 19.1.3.2. there is a suitable ambulance properly maintained and available at all times during working hours.

19.1.4. The manager of an opencast mine should make arrangements as necessary for the transportation of injured persons to a hospital or similar treatment centre.

19.1.5.1. A first-aid register should be kept in each first-aid room for recording the names of persons to whom first aid has been rendered and the particulars of injuries and treatment.

19.1.5.2. The register should be accessible only to authorised persons.

19.2. First-aid training

19.2.1.1. As far as is reasonably practicable, selected supervisory employees should undergo a training programme to enable them to qualify for a recognised first-

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aid certificate. Such training programmes should be made available to such other employees as may wish to take part.

19.2.1.2. In the case of small mines which do not have the facilities required to arrange such programmes, every effort should be made to ensure that at least one employee per shift is the holder of a valid first-aid certificate.

19.3. Medical examinations

19.3.1. National laws should specify the conditions governing medical surveillance and examination including audiometric testing of mineworkers, and should indicate the intervals at which they are performed.

19.3.2. A person should undergo an approved medical examination prior to the commencement of employment in an opencast mine.

19.3.3. Workers who so request should have personal health examinations following exposure to potentially hazardous conditions by an appropriately qualified medical practitioner of their choice.

19.3.4. Individual medical records shall be kept confidential, only open to the relevant medical staff, unless the worker has explicitly consented in writing to the release of all or part of such information.

19.3.5. All medical examinations required under this section should be provided free of charge by the mine operator.

20. Recording and notification of accidents, notifiable diseases and dangerous occurrences

20.1. All accidents causing loss of life or serious personal injury and such other accidents as may be specified in national laws or regulations should be notified forthwith, by the quickest practicable means, to the competent authority and the workers' representative.

20.2. All other accidents causing incapacity for work, for such periods as may be determined by the competent authority, should be notified to the competent authority within such time and in such form as may be specified in national laws or regulations.

20.3. Such dangerous occurrences as may be specified in national laws or regulations should be notified forthwith to the competent authority and the workers' representative, whether or not any personal injury has been caused. Such dangerous occurrences should include amongst others: flooding of any considerable portion of the workings; inrushes of water; any occurrences which indicate that a tip, dam or lagoon is liable to become insecure; any accident due to explosives; or any accidental ignition or detonation of explosives.

20.4.1. Whenever an accident has caused loss of life or serious personal injury, the site of the accident should be left undisturbed until it has been inspected by the competent authority. Where compliance with this requirement would impede rescue operations or tend to increase or continue a danger that would seriously affect the working of the mine, the site may be disturbed, provided a competent person has visited it and recorded such measurements, photographs and notes as will enable an accurate plan of the accident site to be prepared.

20.4.2. Upon completion of the examination of the site of the accident, the inspector or person acting on behalf of the competent authority shall notify the manager in writing that work may be resumed at the site of the accident.

20.5. The mine operator should keep records, in the form required by national laws or regulations, of the accidents and acute exposures to hazardous substances which occur at the mine, and should make annually, or at other specified intervals, a full report of accidents to the competent authority.

20.6. National laws or regulations should specify that all occupational diseases should be notified to the competent authority and that the mine operator should make, annually or at other specified intervals, a full report of all notifiable diseases which have occurred at the mine.

21. Consultation on health and safety

21.1.1 Cooperation between management and workers should be an essential element in applying the provisions regarding occupational safety and health at an opencast mine.

21.1.2. The measures taken to facilitate the cooperation should include, where appropriate and necessary, the appointment of workers' representatives and workers' safety and health committees or a joint safety and health committee. In a joint safety and health committee, workers should have equal representation with employers' representatives.

21.1.3. Workers' representatives and workers' safety and health committees or joint safety and health committees should:

- 21.1.3.1. be given adequate information on safety and health matters, enabled to examine factors affecting safety and health, and encouraged to propose measures on the subject;
- 21.1.3.2. be consulted when major new safety and health measures are envisaged and before they are carried out, and seek to obtain the support of the workers for such measures;
- 21.1.3.3. be consulted in planning alterations of work processes, work content or organisation of work which may have safety or health implications for the workers;
- 21.1.3.4. be given protection from dismissal and other measures prejudicial to them while exercising their functions in the field of occupational safety and health as workers' representatives or as members of safety and health committees;
- 21.1.3.5. be able to contribute to the decision-making process at the level of the enterprise regarding matters of safety and health;
- 21.1.3.6. have access to all parts of the workplace and be able to communicate with the workers on safety and health matters during working hours at the workplace;
- 21.1.3.7. be free to contact labour inspectors;
- 21.1.3.8. be able to contribute to negotiations in the enterprise on occupational safety and health matters;
- 21.1.3.9. have reasonable time during paid working hours to exercise their safety and health functions and to receive training related to these functions;
- 21.1.3.10. have recourse to specialists to advise on particular safety and health problems; and
- 21.1.3.11. have authority to consult and be represented by their respective organisations, provided this involvement does not result in the disclosure of commercial secrets.

Consultation on health and safety

21.2. The safety and health committee should meet regularly to examine any aspects of safety and health and related problems that have been encountered at the mine and to propose measures on the subject.

21.3. The competent authority should, as far as is reasonably practicable, provide guidance and assistance to safety and health committees in order to promote the effectiveness of their work in the interests of improved safety and health at work.

22. General welfare

22.1. National laws or regulations should specify the requirements for the changing, storing and drying of clothes, and for canteen, rest-room and laundry facilities, as well as toilets, showers and wash-basins to be provided at mines.

22.1.1. It should be the duty of the mine operator to provide at each mine:

22.1.1.1. sufficient and suitable toilets, showers, wash-basins and laundry facilities;

22.1.1.2. adequate supplies of wholesome drinking-water in suitable places and properly maintained; and

22.1.1.3. adequate facilities for the changing, storage, laundering and drying of clothes.

22.2. In opencast mines where it is not practicable to set up canteens providing wholesome meals, and, if necessary, in mines where such canteens already exist, messroom facilities should be provided for individual workers to prepare food or to heat and eat meals brought by themselves.

22.3. Where practicable, mobile canteens for the sale of wholesome meals to workers should be provided.

22.4. Workers should be protected from extremes of temperature and extreme weather conditions, and should be provided with suitable protection.

22.5. It should be the duty of the manager to ensure that the necessary arrangements are made to ensure the regular maintenance in a clean and sanitary condition of all the facilities provided under the terms of the present section.

22.6.1. When required, the mine operator should arrange for adequate transport facilities to be available to meet the needs of shiftworkers at suitable times of the day and night.

22.6.2. Where, in the interests of safety and to avoid excessive fatigue, it appears necessary for persons to be transported to and from their places of work, the mine operator should arrange for such transport to be provided.

23. Protective clothing and equipment

23.1. National legislation should specify the personal protective equipment and clothing that is to be worn when the presence of hazards cannot be avoided. Such specifications should include the following:

- 23.1.1. suitable protective clothing or equipment and face shields or goggles when welding, cutting or working with molten metal or when other hazards to the eyes exist;
- 23.1.2. suitable protective clothing to cover the whole body when handling corrosive or toxic substances or other materials which might cause injury to the skin;
- 23.1.3. protective gloves when handling materials or performing work which might cause injury to the hands; however, gloves should not be worn in cases where they would create a greater hazard by becoming entangled in the moving parts of equipment;
- 23.1.4. a safety helmet where falling objects may create a hazard;
- 23.1.5. suitable protective footwear;
- 23.1.6. safety belts and lines where there is a danger of falling;
- 23.1.7. life-jackets or belts where there is a danger of falling into water;
- 23.1.8. closely fitting clothing when working around moving machinery or equipment;
- 23.1.9. hearing protection equipment; and
- 23.1.10. when necessary, fluorescent strips for safety helmets and highly visible clothing.

23.2. Protective clothing and devices should conform with such standards as may have been specified by the competent authority.

23.3. National legislation should specify the personal protective equipment and clothing to be provided free of charge by the mine operator.

24. Miscellaneous provisions

24.1 General conduct

24.1.1. Any person who observes any danger to life and limb or to the mine should:

24.1.1.1. take immediate steps to remove the danger; and

24.1.1.2. if this is not possible, he should immediately warn persons in danger, advise them to withdraw, withdraw himself and notify the nearest available supervisory official.

24.1.2. Persons with infirmities should be employed only on work at which they cannot endanger themselves or others and they should receive adequate instruction and training to permit them to work without danger.

24.1.3. Every person employed at an opencast mine should obey any instruction given to him by an official of the mine who has responsibility for such instructions in the matter of safety, health or welfare.

24.1.4. No person should obstruct or impede another person engaged in the proper performance of his duties.

24.2. Employment of workers speaking different languages

24.2.1. In those regions where workers speaking different languages may be employed, or where illiterate workers may be found, national laws or regulations should prescribe the measures to be taken to ensure that such workers are enabled to understand such regulations, instructions, orders and signs as may have bearing on the safe performance of their duties with minimum risk to the safety and health of both themselves and others.

24.3. Admission of outside persons

24.3.1. No unauthorised person may enter a mine. Any person permitted by the authority of the manager to do so must be accompanied by a responsible person.

24.3.2. All persons who enter an opencast mining site, for whatever purpose, must comply with the provisions of national laws or regulations and with any instructions given by the manager; supervisory officials or the accompanying responsible person, so as to ensure their safety and the safety of the workers and of the mine.

24.4. Safety signs

24.4.1. As far as is practicable, all opencast mines should use the same system of signs and safety colours.

24.4.2. Road signs governing the circulation of vehicles at an opencast mine should be in accordance with those approved by the relevant national authority.

24.4.3. All safety signs and colours should be explained to any person entering the mine for the first time.

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