

An ILO code of practice

Safety and health in coal mines



36923

International Labour Office Geneva

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Preface

In accordance with the decision taken by the Governing Body of the ILO at its 226th (May-June 1984) Session, a meeting of experts was convened in Geneva from 16 to 23 April 1985 to draw up a code of practice on safety and health in coal mines. The meeting was composed of six experts appointed following consultations with governments, six experts appointed following consultations with the Employers' group and six experts appointed following consultations with the Workers' group of the Governing Body.¹

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(footnote continued overleaf)

Safety and health in coal mines

This code of practice is intended for the use of all those, both in the public and in the private sectors, who have responsibility for safety and health in coal mines. However, its contents may also be applicable to mines other than coal mines.

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, governmental or other public authorities, committees or management in related enterprises.

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The following international governmental and non-governmental organisations were represented:

World Health Organization.

Commission of the European Communities.

International Organisation of Employees.

International Confederation of Free Trade Unions.

World Confederation of Labour.

Arab Labour Organisation.

World Federation of Trade Unions.

Trade Union of Miners and Energy Workers' International.

Miners' International Federation.

International Electrotechnical Commission.

Preface

Local circumstances and technical facilities 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 the developing countries have also been taken into consideration.

The text of the code was approved for publication by the Governing Body of the ILO at its 230th (May-June 1985) Session.

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1. Definitions

In this Code, the following terms have the meanings hereby assigned to them:

- (a) *approved type* means, in relation to equipment used in a 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 purchasers may then accept such certificates as valid for the purposes of this Code;
- (b) *authorised person* means a person appointed by the mine operator or manager to carry out specified duties and who is competent and responsible for the work he has been directed to perform;
- (c) *auxiliary fan* means a fan used for ventilating a heading, drift or blind end;
- (d) *banksman* means a competent person appointed by the manager or equivalent who is in attendance for the purpose of receiving and transmitting signals at the landing in use at the top of the shaft whenever any person is about to be lowered through the shaft, and whenever any person who is to be raised through the shaft is below ground;
- (e) *booster fan* means a ventilating fan which is installed in a main airway or a district airway for the purpose of boosting, or increasing, the quantity of air in that part of the mine;
- (f) *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;

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- (g) *firedamp* means any flammable gas or any flammable mixture of gases naturally occurring in a mine;
- (h) *firedamp drainage* means the collection of firedamp from the strata or from sealed areas of the mine into a pipe range for collection and safe disposal;
- (i) *flameproof* apparatus means apparatus designed to withstand an explosion within the enclosure without transmitting flame to the outside of the enclosure;
- (j) *intrinsically safe* apparatus means apparatus incapable of producing an incendive spark;
- (k) *isolate* means disconnect from the source of energy;
- (l) *live* means electrically charged;
- (m) *manager* means a duly qualified and appointed person legally responsible for the management and technical direction of the mine, whether he is the mine operator or a person appointed by him;
- (n) *mechanical apparatus* includes any machinery, apparatus or appliance used in connection with the generation, conversion, storage, transmission or utilisation of mechanical energy, and ropes, chains, permanent haulage track and rolling stock, but excludes any machinery, apparatus or appliance which, for the purpose of this Code, is electrical apparatus;
- (o) *mine* includes all underground and opencast excavations made for the purpose of, or in connection with the getting of coal; it includes every shaft in the process of being sunk and every incline or level in the course of being driven from the surface;
- (p) *mine operator* means any person or body corporate who is the immediate proprietor or lessee, concessionaire or occupier of any mine or part thereof, including the agent or owner's representative;
- (q) *mine surface* includes all buildings, structures and works thereon used in connection with the working of the mine

and the preparation of the coal for sale; the mine surface of both underground and opencast mines is part of a mine;

- (r) *onsetter* means a competent person who is in attendance at a shaft for the purpose of receiving and transmitting signals at the entrance to that shaft from which persons are to be raised;
- (s) *shaft* refers to vertical shafts leading to the mine workings and includes staple shafts which have a similar purpose and are used for man-winding and ventilation;
- (t) *small mine* means one which, by reason of the small number of persons employed at the mine as specified by the competent authority, is exempt from certain requirements of this Code;
- (u) *substation* means any premises containing an apparatus for transforming or distributing electric energy;
- (v) *supervisory official* means a person appointed by the manager to supervise or perform certain work, or to supervise the operation of certain machinery, plant or equipment; he should be duly qualified, as required by national laws or regulations, and considered to be competent and responsible for the duties so assigned to him; he should be provided by the manager with the necessary instructions and facilities for the proper performance of these duties;
- (w) *underground mine* is a distinct mine if it has a separate system of ventilation and is operated as a unit; two or more adjoining mines which have separate systems of ventilation but are worked by the same operator under one general management may be considered for some purposes by the competent authority to be one mine.

2. General duties

2.1. Duties of governments where coal is mined

2.1.1. (1) In every country where coal is mined, it should be the duty of the government to enact sufficient appropriate legislation to ensure the safe conduct of the mines together with the minimum of risk to health.

(2) Such legislation 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 a body of persons (normally known as the inspectorate) which should form part of the competent authority.

(2) This body of persons 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 mines.

(3) The competent authority should have power to make regulations pertaining to individual mines or circumstances and to grant exemption from national laws or regulations.

(4) It should also have power to object to or amend any rule or scheme made by a mine manager.

2.1.3. (1) The government should ensure that those employed in coal 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.

(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.

(3) Each report of an inspection made by workers' representatives should be sent to the competent authority who

should then take action appropriate to the content of the report.

(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 to enable a special report to be made of or a public inquiry to be held into an accident or dangerous occurrence where the interests of mine safety and health are served best by those procedures.

(2) The special report or the report on the public inquiry should be published unless there are exceptional reasons for not so doing.

(3) Copies of all these reports should be sent to the Director-General of the International Labour Office for study and report to the Coal Mines Committee.

2.1.5. (1) The government should also introduce the necessary measures to enable the competent authority –

- (a) to investigate the cause and circumstances of every fatal and serious accident and every dangerous occurrence;
- (b) to have records and returns to be submitted to it on such matters and in such form as it may require;
- (c) to specify the tests and examinations to which machinery and supports must be subjected before they are approved for use below ground;
- (d) to provide for the issuance of certificates of competency through the appointment of an appropriate examination board and the conduct of examinations for such persons holding responsible positions in a mine as the competent authority may deem appropriate.

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2.2. Duties of mine operators

2.2.1. It should be the duty of the operator (individual or body corporate) of every mine –

- (a) to make such financial and other provision and to take other steps which may be necessary to ensure that the mine is managed and worked in accordance with national laws and regulations;
- (b) to make provision for systems of work which are, as far as practicable, safe and also not injurious to the health of the persons employed therein;
- (c) to appoint sufficient qualified and competent officials to secure the safe operation of the mine and the minimising of risks to health of the persons employed therein;
- (d) not to interfere with the technical management of a mine unless statutorily qualified and appointed to a position superior to that of the manager;
- (e) to accept full responsibility for the observance of the national laws or regulations relating to the management of the mine where, by reason of the small number of persons employed at the mine, the national laws or regulations do not require the appointment of a qualified manager. Where the competent authority deems that a qualified manager is needed at a small mine it should direct the mine operator to appoint a manager;
- (f) to provide the necessary facilities to enable the workers' representatives to carry out their inspections and investigations as required by paragraph 2.1.3.

Appointment of officials and notification to competent authority

2.2.2. The mine operator should appoint a duly qualified mine manager for the management, technical direction and daily personal supervision of every mine.

2.2.3. The mine operator should appoint a sufficient number of deputy managers and under-managers to secure compliance with national laws or regulations.

2.2.4. At every mine possessing power plant exceeding a size or horse-power which should be specified in national laws or regulations, duly qualified mechanical and electrical engineers (as the case may be) should be appointed to be in charge of that plant.

2.2.5. Operators of other mines possessing power plant and other machinery should appoint a competent and experienced person to have charge of the plant and machinery.

2.2.6. The mine operator should notify to the competent authority every appointment made under paragraphs 2.2.2, 2.2.3, 2.2.4 and 2.2.5.

2.2.7. No person should take part in the technical management of a mine unless he is qualified to do so in accordance with national laws or regulations.

2.3. Duties of mine managers and supervisory officials

Qualifications of mine managers, managing officials and other supervisory staff

2.3.1. National laws or regulations should specify –

- (a) the qualifications, age and experience of owners' representatives, managers, deputy managers, under-managers and mine surveyors;
- (b) the qualifications, age and experience of other supervisory officials including shotfirers;
- (c) the qualifications, age and experience of electrical engineers and mechanical engineers who have charge of electrical and mechanical equipment at mines; such laws or regulations

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should also state the qualifications, age and experience of their supervisory staff;

- (d) the qualifications and experience of persons appointed to have charge of small mines.

2.3.2. Where mine tips, dams, lagoons or other structures requiring the services of a civil engineer are erected at a mine, they should be designed, erected and maintained under the supervision of a duly qualified civil engineer who should be responsible to the manager for their safe operation.

Duties of mine managers

2.3.3. (1) The mine operator, as required by section 2.2, and 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) Their duties should be deputed to subordinate officials only in so far as –

- (a) such officials are duly qualified and have been appointed in accordance with national laws or regulations;
- (b) their duties and responsibilities have been clearly defined in instructions given them in writing;
- (c) they have been given all the necessary facilities for carrying out these instructions and all other orders given them;
- (d) an adequate system of supervision and control has been instituted and maintained by the mine operator and the manager.

2.3.4. The manager should appoint a responsible official who shall always be in charge of the mine on shifts when neither he nor the deputy manager 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.

General duties

2.3.6. 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.

2.3.7. 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 on each shift by competent persons appointed by him; the arrangements should also provide for recording the location of the various workers.

2.3.8. The manager of every mine should ensure that there is in force a scheme, in respect of all mechanical and electrical apparatus, which provides for the systematic examination and testing of all mechanical and electrical apparatus to ensure proper maintenance thereof; he should also ensure that other schemes are prepared as required by this draft code.

2.3.9. The manager may appoint such deputy or under-managers as may be necessary to ensure the application of paragraphs 2.3.4, 2.3.5 and 2.3.6.

Duties of other supervisory officials

2.3.10. The deputy manager or under-manager, where appointed, of every mine should make and maintain arrangements for conferring daily with other officials having charge of operations within his jurisdiction.

2.3.11. Every mine should be divided into sections or districts and each section or district should be in the charge of a supervisory official appointed by the manager; the size of each section or district should be such as to allow the supervisory official to carry out the inspections in a thorough manner.

2.3.12. Each section or district should be inspected throughout by a supervisory official during each working shift, and such inspections should include –

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- (a) the getting of coal and the condition of coalgetting machinery and equipment;
- (b) the presence of firedamp;
- (c) the state of the general ventilation;
- (d) the state of the supports, roof and sides;
- (e) the state of dust-control equipment and the treatment of deposited coal dust;
- (f) the fencing of machinery;
- (g) the fencing of places of danger;
- (h) the condition of haulage and transport equipment;
- (i) the checking of the number of workers in the district including those left in the district at the end of the shift.

2.3.13. Irrespective of other statutory inspections, each section or district should be inspected throughout as required by paragraph 2.3.12, within a period not exceeding two hours before each shift begins work in the district.

2.3.14. (1) No unauthorised person should enter the district to begin work before such inspection has been made.

(2) The entrances to each section or district should be marked by conspicuous signs.

2.3.15. During every working shift, each section or district in which persons are at work should be inspected as required by paragraph 2.3.12, at least twice in every shift or more frequently as may be specified in national laws or regulations.

2.3.16. Every such inspection should be made with a flame safety lamp or other approved device serving the same purpose.

2.3.17. The supervisory official should make a written report after each inspection in a book provided for the purpose; the report should be countersigned by the officials superior to the official writing the report, including the manager, except where national laws or regulations make other provisions.

2.3.18. The supervisory officials of an outgoing shift should inform the supervisory officials of the next incoming shift of any dangers that require attention in the workings under their respective supervision.

2.3.19. Apart from the inspections specified in this code, every part of a mine requiring to be ventilated or part where persons may have to pass through should be inspected at intervals to be fixed by the manager; these inspections should be carried out by the manager or his deputy or by the under-manager who has jurisdiction for that part of the mine.

2.3.20. Where it is necessary to enter or explore abandoned, disused or discontinued workings, no person should enter or be caused or permitted to enter such workings or any part thereof until an examination has been carried out by appropriate means, and it has been ascertained that the safety of persons will not be endangered by the presence therein of noxious or flammable gas or an atmosphere deficient in oxygen or a dangerous accumulation of water.

2.3.21. Every entrance to abandoned, disused or discontinued workings should be kept securely fenced across its whole width to prevent unintentional access of persons to such workings.

2.3.22. The mechanical or electrical engineer, as the case may be, appointed under paragraph 2.2.4, and the competent person appointed under paragraph 2.2.5 should ensure that the staff under their charge supervise or effect –

- (a) the installation of all apparatus at a mine;
- (b) the examination and testing of all such apparatus before it is put into use after installation, reinstallation or repair;
- (c) the maintenance in safe working condition, in accordance with national laws or regulations, of all such apparatus at the mine;

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- (d) the systematic examination and testing of all such apparatus at the mine in accordance with the scheme referred to in paragraph 2.3.8.

2.4. Duties of workers

2.4.1. It should be the duty of every miner while at work –

- (a) to take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions at work;
- (b) to co-operate with his employer or any other person with regards to any duty or requirement imposed on them by or under any of the relevant statutory provisions, so far as is necessary to enable that duty or requirement to be performed or complied with.

3. Surveyors and plans

3.1. Appointment of duly qualified surveyor

3.1.1. No mine should be worked unless there is a surveyor for the mine appointed by the mine operator; the surveyor should be qualified as specified by national laws or regulations and 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 –

- (a) to prepare or supervise the preparation of all plans, drawings and sections of the mine which are required by national laws or regulations;
- (b) to establish the accuracy of any plans, drawings or sections which have not been prepared by him;
- (c) 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 and dated, properly filed and preserved.

3.3. Plans: general

3.3.1. Every mine should keep accurate plans showing separately for each seam worked particulars of all the workings, as well as a surface plan showing, as far as possible, the boundaries of the mine and the position of the workings with regard to the surface, and such other information as may be specified by national laws or regulations. (See also paragraph 9.1.6.)

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

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3.3.3. At every mine, there should be posted on the surface, where it can be clearly seen by the workers, a plan of the mine showing the main roads, the means of egress from each part of the mine to the surface, and the position of all telephones.

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.

3.4. Faulty plans

3.4.1. If mine plans are found to be inaccurate or deficient in any other matter, 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. Where abandonment results from any unforeseen emergency which makes access to the mine workings highly dangerous, the requirements under paragraph 3.5.1 should not apply; in such a case, as much relevant information as possible should be collected for the purpose of bringing the plan up to date.

3.5.3. 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 neighbouring mine workings; such plans should be

endorsed with a certificate from the surveyor attesting to their accuracy and any limitations thereon.

3.5.4. Abandonment plans should be examined by the competent authority for compliance with the requirements of national laws or regulations; they should then be stored in a place specified by the competent authority and a proper register should be kept of all plans so stored; the register and plans should be made available to persons having a proper interest in them.

3.6. Small mines

3.6.1. In the case of small mines which may be operated without the services of a qualified mine surveyor, the competent authority should take the necessary steps for the recording of such operations to ensure safety.

4. Commencement and cessation of mining operations; posting of notices; records and notification of accidents, dangerous occurrences and notifiable diseases

4.1. Commencement and cessation of mining operations

4.1.1. Every mine should be registered with the competent authority by the mine operator.

4.1.2. It should be the duty of the mine operator to notify the competent authority –

- (a) before any mining operations are commenced at a new mine;
- (b) before any new working is commenced for the purpose of:
 - (i) opening any new shaft, other outlet or seam;
 - (ii) exploiting a new level, or any other important extension of an existing mine where required by national laws;
- (c) before recommencing the working of any shaft or outlet, or of any seam after their abandonment or discontinuance for a period to be defined by national laws or regulations;
- (d) of the abandonment or discontinuance of any mine or seam or, where national laws or regulations so require, the abandonment or discontinuance of any area of a mine or seam, within a period which should be specified in national laws or regulations.

4.1.3. National laws or regulations should require such precautions on abandonment as are necessary to ensure the safety of workings in adjacent mines or in parts of the mine where work is to be continued.

Commencement and cessation of mining operations

4.1.4. 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 mine operator should, in the manner prescribed by national laws or regulations, bring to the notice of all concerned –

- (a) laws or regulations relating to safety and health or such extracts from them as may be prescribed by the competent authority;
- (b) instructions issued by the competent authority in matters of safety and health, or such extracts from them as may be prescribed by the competent authority;
- (c) instructions drawn up by the mine manager in matters of safety and health, or extracts from these instructions, the preparation of which is prescribed by the competent authority.

4.2.2. All notices that are required to be posted should be promptly renewed when they become defaced, obliterated or destroyed; as far as practicable, such notices should be protected from the effects of weather.

4.3. Records and returns

4.3.1. All records, reports, plans or other documents required by national laws or regulations 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 otherwise.

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.

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4.4. Notification of accidents, dangerous occurrences and notifiable diseases

4.4.1. 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 to the competent authority and the workers' representative.

4.4.2. 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.

4.4.3. 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 underground fires, ignitions or explosions of firedamp or coal dust, breakage of winding ropes or cage suspension gear, cases of overwinding, intrushes of water, outbursts of gas, or any occurrences which indicate that a mine tip, dam or lagoon is liable to become insecure.

4.4.4. 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 visited by the competent authority; where compliance with this requirement would impede rescue operations or tend to increase or continue a danger or would seriously impede the working of a mine, the site may be disturbed provided a competent person has visited it and taken such measurements and made such notes as will enable a plan and section of the accident site to be prepared.

4.4.5. The mine operator should keep records, in the form required by national laws or regulations, of the accidents which occur at the mine, and should make annually, or at other specified intervals, a full return of all accidents to the competent authority.

Commencement and cessation of mining operations

4.4.6. National laws or regulations should specify which occupational diseases are notifiable to the competent authority; the mine operator should make, annually or at other specified intervals, a full return of all suggested notifiable diseases which have occurred at that mine.

5. Means of access and egress, including winding of persons and material

5.1. Provision of means of access and egress

5.1.1. Except for the duration of shaft sinking or the drivage of other means of access and egress from the mine, together with the necessary development work, there should be, at all times, two separate means of access to and egress from the underground workings.

5.1.2. At each working level or inset for the means of access and egress specified in paragraph 5.1.1 where persons are expected to ride or be wound, there should be a way to the alternative means which should follow a direct route and should be travelling with reasonable convenience.

5.1.3. As far as is reasonably practicable, two ways should be provided from every working place, and each of these should be connected to a separate and alternative means of egress to the surface.

5.1.4. Where places in the workings of the mine do not contain the two means of egress from each working place as specified in paragraph 5.1.2, with each of them crossing a common junction, the national laws or regulations should state the maximum number of persons allowed in such places; however, where a junction consists of an explosionproof crossing, this should not be considered to be a common junction.

5.1.5. In a case where the two separate and independent means of egress are not situated in the same mine, each manager should be responsible for that part of it situated in his mine; any occurrence that may affect the safe use of such means of egress should be immediately reported to the competent authority and to the manager of the mine affected.

Means of access and egress

5.1.6. Both the means of egress and the equipment used therein for the transport of persons should be kept constantly in safe condition to facilitate ease of travelling and a ready means of egress.

5.1.7. All practicable precautions should be taken to ensure that, where the only means of egress are winding shafts or unwalkable outlets, the winding or haulage engines, as the case may be, do not fail simultaneously; in particular, in the case of electric winding or haulage engines, an alternative electric power supply should be available.

5.1.8. (1) The operator of every mine where there are man-winding shafts more than 50 metres deep should ensure that there is at all times in force a scheme to provide and maintain apparatus by which persons employed below ground in the mine have means of egress in an emergency.

(2) The scheme should provide for –

- (a) the constant availability of emergency winding apparatus; or
- (b) the use of gravity winding apparatus capable of withdrawing the persons underground safely and efficiently;
- (c) such emergency winding apparatus to be tested at specified intervals if it is not in regular use.

5.1.9. All shafts and outlets should be thoroughly examined by a competent person at intervals which should be stated in national laws or regulations.

5.1.10. The surface entrance to every mine shaft and every other entrance, whether above or below ground, should be provided with an efficient enclosure so designed and constructed as to prevent any person accidentally falling down the shaft or coming into contact with a moving part of the winding equipment provided in the shaft.

5.1.11. All entrances to shafts should be –

- (a) adequately illuminated throughout working hours;

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- (b) whitewashed;
- (c) provided with gates or other safety equipment to prevent persons or mine cars or other equipment inadvertently falling down the shaft when the cage is not at the landing;
- (d) provided with adequate facilities to enable persons to pass safely from one side of the shaft to the other, where necessary.

5.1.12. Where weather conditions are such that ice may form in shafts, suitable devices should be installed to minimise the risk; where ice does form in a shaft, it should be removed as soon as practicable in a safe manner.

5.1.13. All surface and seepage water should be conducted in such a way as to prevent it from falling freely into the shaft.

5.1.14. Shafts should, as far as possible, be kept clear of accumulations of loose objects, coal and dirt.

5.1.15. Where practicable, a speech communication system should be installed in all man-winding shafts, in addition to the signal appliance required in section 5.14.

5.1.16. All equipment used in the repair and maintenance of shafts should be of suitable material and of sound construction; as far as reasonably practicable, it should be specifically built for this work.

5.1.17. All persons doing repair and maintenance work in shafts should wear and use properly designed safety harness, attached to suitable anchorage points, and designed and made to a suitable national standard.

5.1.18. Work in isolation on shaft repair and maintenance should be prohibited.

5.2. Ladderways

5.2.1. In shafts not exceeding 50 m in depth, ladderways may be provided as an alternative to the requirements of paragraph 15.1.8.

5.2.2. In winding shafts, the ladders should be in a separate compartment, adequately fenced off from the winding compartment.

5.2.3. Ladderways should be –

- (a) so installed as to allow safe travel;
- (b) kept in a safe condition;
- (c) regularly inspected at intervals which should be specified in national laws or regulations.

5.2.4. Every ladder should be of suitable material, adequate strength, properly treated, securely fixed in position, and maintained in good repair.

5.2.5. Ladders should not be sloped at an angle exceeding 80° except in sinking shafts where the ladders are so arranged that continuous support is afforded to the worker's back.

5.2.6. In all ladderways, rest platforms should be installed wherever practicable and not more than 10 m apart.

5.2.7. Ladders should extend at least 1 m above the platforms and the bank; where this is not the case, fixed hand grips should be fitted.

5.2.8. Ladders should be so placed as to cover the manholes of the rest platforms immediately below.

5.2.9. (1) When persons are travelling on ladders, the mine lamps, tools and any other objects they carry should be carefully secured against falling.

(2) Manholes in platforms should have openings of sufficient size to permit the passage of persons wearing rescue apparatus.

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5.3. Winding installations at shafts and unwalkable outlets

General provisions

5.3.1. Competent persons appointed by the manager for this purpose should, at least once in every 24 hours, inspect the state of –

- (a) the external parts of machinery;
- (b) the headgear, ropes, chains, connecting pieces, cages and other similar appliances which are in actual use for the purpose of raising or lowering persons in a mine.

5.3.2. At least once each week, the state of the shafts in which persons are lowered or raised should be examined; for this purpose, properly designed safety harnesses should be worn and used.

5.3.3. The results of the installation specified in paragraph 5.3.1 should be recorded in a register which should be available to all authorised persons.

5.3.4. The environment of the winding-engine house should be controlled in such a way as to prevent sudden changes of atmospheric conditions that might cause condensation to form on the brake path of the engine and thus affect brake efficiency; brake paths should also be kept free from dirt and other contamination.

5.3.5. Devices to detect slack winding rope should be installed, where required, at man-winding installations.

5.3.6. All parts of winding installations, including suspension gear at shafts and unwalkable outlets, should be of sound construction, suitable material, adequate strength, maintained in safe working order by appropriate treatment and inspection, and kept constantly available for use.

5.3.7. All parts of winding installations at shafts and unwalkable outlets should be firmly connected to a rigid foundation.

5.3.8. Where drum clutches are used, every winding engine should be fitted with a suitable interlocking device so that it is impossible –

- (a) to unclutch any drum unless the brakes of such drum are on;
- (b) to release the brakes until the drum clutch is fully engaged and securely locked.

5.3.9. Friction winder (Koepe) pulleys should be –

- (a) of ample diameter, having regard to the size and construction of the rope used;
- (b) kept in such condition that rope-slip is minimised.

Drums

5.3.10. Cast iron drum shafts should be prohibited: national laws or regulations may provide for drum shafts above a stated diameter to be bored longitudinally at the centre.

5.3.11. Drums should be provided with flanges or horns and also, if the drum is conical, with other appliances that effectively prevent the rope from slipping.

5.3.12. Except in the case of friction winder (Koepe) pulleys, the rope end should be properly secured to the drum and there should be not less than two turns of rope on the drum when the cage is at the lowest point of its travel.

Depth indicators

5.3.13. Winding engines should be equipped with a reliable depth indicator and a bell that will automatically ring at the appropriate moment; the indicator should be easily seen and the bell clearly heard by the persons operating the winding engine.

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5.3.14. Markings indicating crucial points in the shaft should also be made on the drums, or, in the case of friction (Koepe) winding, on the rope.

5.3.15. The depth indicators should be tested and, where necessary, adjusted after every adjustment of the cage's travel, and after every capping or rope change.

Speed indicators

5.3.16. National laws or regulations should require that the regular man-winding plant in main shafts used for winding more than a specified number of persons per day be equipped with a speed indicator situated in such a way that the winding speed can at all times be easily read by the engine-driver from his driving seat.

Brakes

5.3.17. Mechanically powered apparatus for raising or lowering persons should be equipped with at least two separate brake systems on the drum or drum shaft, which should bring the cage or cages to rest at not more than a specified rate of retardation when the maximum out-of-balance load is applied in either direction, as appropriate.

5.3.18. Brakes should be arranged to act automatically if the power fails.

5.3.19. In the event of failure of one of the braking systems, at least 50 per cent of the braking effort should still be available for the safe control of the engine.

Overwind preventers and speed controllers

5.3.20. National regulations should specify the speed above which winding engines should be equipped with automatic control.

5.3.21. Every winding engine which is used for man-winding should be equipped with an automatic overwind preventer unless exempted by the competent authority.

5.3.22. During man-winding, the automatic speed controller and overwind preventer should –

- (a) prevent any descending cage from passing the bottom landing place at a speed exceeding 4 m/s where the sump and headgear are in accordance with sections 8.5 and 8.7 and with any further requirements of the competent authority;
- (b) prevent any descending cage from landing on the pit bottom or other permanent landing at a speed exceeding 1.5 m/s;
- (c) cut off the supply of power to the engine and apply the brakes when any cage travels too far above its normal highest position at the top landing place.

5.3.23. (1) Automatic speed controllers and overwind preventers should, unless they are permanently in full and fixed engagement with the winding engine, be fully engaged, either automatically or by the winding engineman, whenever persons are to be raised or lowered.

(2) A proper automatic indicator to show that this has been done should be installed in a position where it can be easily seen by the banksman.

5.3.24. No person should be allowed to enter any cage until the indicator shows that the automatic speed controller and the overwind preventer have been fully engaged.

5.3.25. (1) The automatic speed controller and overwind preventer should be tested in a manner and at intervals prescribed by the competent authority.

(2) The results of the tests should be recorded in a register.

5.3.26. Before the beginning of every period of regular man-winding after a cessation of winding exceeding four hours,

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and notwithstanding the daily inspections required by paragraph 5.3.1, trial winds should be carried out between the points in the shaft in which regular man-winding is to be undertaken.

5.4. Guides

5.4.1. All winding shafts in which cages or skips are used should be provided with guides.

5.4.2. The guides, buntons and fastenings should be of sufficient strength.

5.4.3. The clearance of the cages from each other and also from the shaft sides should be such that the free passage of the cages remains ensured in all circumstances.

5.5. Sumps

5.5.1. (1) Where national laws or regulations require the provision of sumps, a suitable space should be provided under the lowest position of the cage at the bottom landing place.

(2) The depth of this space should be at least equal to the clear height provided at the top of the shaft under paragraph 5.7.1.

5.5.2. Where appropriate, buffers or other devices should be installed to minimise the danger to persons riding in a descending cage.

5.5.3. (1) The sump should be kept sufficiently clear of water to ensure that there can be no danger of persons riding in the cage being submerged if it is lowered too far.

(2) The level of water, if any, in the sump should be kept below any guide weights or attachments which should be kept free for inspection.

5.5.4. The sump should be provided with a ladder leading to the nearest landing, or with other suitable means of egress.

5.6. Keps, safety stops

5.6.1. (1) If keps are used for mineral winding, arrangements should be made to block them securely in the off position.

(2) When keps are blocked in the off position, they should leave the shaft clear for the passage of the cage.

5.7. Headgear and rope pulleys

5.7.1. The competent authorities should specify the clear height to be provided between the pulley and the top of the cage when in its highest position at the top landing place.

5.7.2. (1) Headgear catches or other safety appliances to minimise dangers from overwinding should be fitted.

(2) The correct operation of these devices should be tested once per week.

5.7.3. The headgear should be maintained in sound structural condition, and any accumulation of grease or other flammable material should be promptly removed.

5.7.4. (1) Rope pulleys should be of sound construction having regard to the size and construction of the rope used.

(2) Fenced access platforms should be provided.

5.8. Cages

5.8.1. No person should ride through a shaft or unwalkable outlet otherwise than in a cage which complies with the requirements in paragraphs 5.8.2 to 5.8.9 except –

- (a) for the purpose of sinking operations;
- (b) for the purpose of examining or repairing a shaft or outlet or any machinery or appliances therein;
- (c) for the purpose of accompanying animals or bulky machinery that cannot be raised or lowered in such a cage;

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- (d) in pursuance of an exemption granted by the competent authority;
- (e) for rescue work, where the cages are not adequate for the purpose of rescue.

5.8.2. The cage should be provided with a strong protective roof.

5.8.3. On each deck, bars or hand rails should be provided for the passengers to hold on to.

5.8.4. During man-winding, the cage should be safely enclosed in such a way that nothing can project into the shaft.

5.8.5. The gates should not open outwards, and they should be so set that they cannot be thrown open by jolting or movement of the cage.

5.8.6. The cage should be provided with catches or other suitable contrivances to prevent vehicles falling out.

5.8.7. The manager should specify the maximum number of persons allowed in each cage or on each deck of a cage, subject to such requirements as may be specified by the competent authority.

5.8.8. The bottom of the cage should be so designed as to withstand impacts and stresses produced during normal and emergency landings.

5.8.9. Cages should be high enough for persons to stand upright.

5.9. Detaching gear

5.9.1. Where mechanically operated winding apparatus is normally used for carrying persons through a shaft, appropriate gear should be provided for detaching each ascending cage from the rope and holding it stationary in the event of overwinding.

5.9.2. National laws or regulations should lay down requirements concerning the construction, installation, maintenance, inspection and testing of detaching gear.

5.9.3. In special circumstances, the competent authority may exempt any mine from the requirement to provide detaching gear.

5.9.4. Proper means should be provided to gain access to overwound cages.

5.10. Suspension gear

5.10.1. (1) Capels and connecting pieces between the winding rope and the cage should possess an adequate factor of safety in relation to the maximum static load and with due allowance for dynamic stresses.

(2) National laws or regulations should prescribe the factor of safety and the quality of the materials to be used.

5.10.2. Where emergency chains are used, their length should be such that, if the king bolt breaks, the shock with which the cage is held is as slight as possible.

5.10.3. Ample provision should be made for the safety of the connecting pieces between the tail rope, where used, and the cage.

5.10.4. National laws or regulations should require that the suspension gear between the winding rope and the cage (chains, detaching hooks and other attachments) be examined at specified intervals and by approved techniques.

5.10.5. The responsible engineer should see that defective parts are changed or receive such treatment as is necessary.

5.10.6. All parts of suspension gear should be renewed after a period of service to be specified in national laws or regulations.

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5.10.7. Before a new or renewed set of suspension gear is used, it should be subjected to appropriate non-destructive testing.

5.10.8. The results of the tests and other treatment given should be entered in the register.

5.10.9. If any part of suspension gear between the cage and the main winding rope or the tail rope is broken, all available pieces of the broken part should be kept for inspection –

(a) by the competent person appointed by the manager;

(b) by a person appointed by the competent authority.

5.11. Winding ropes

5.11.1. All winding ropes should be of suitable material and construction and of adequate strength, in accordance with national laws or regulations.

5.11.2. National laws or regulations should prescribe the quality of materials to be used and fix the conditions under which the testing of ropes (and, in respect of wire ropes, of the individual wires) is to be conducted, and the standards to be satisfied.

5.11.3. A certificate from the manufacturers, stating that the rope complies with national laws or regulations, should be furnished for every winding rope and inserted in a register.

5.11.4. Every drum or reel winding rope should at all times possess an ample factor of safety in relation to the maximum static load in material winding, with due allowance for dynamic stresses.

5.11.5. Where any system of winding is in operation which does not permit of periodically cutting off pieces of rope for testing, the safety factor of the rope should be correspondingly increased or the stated life of the rope should take account of this factor.

Means of access and egress

5.11.6. The maximum load in man-winding should not exceed a percentage of the maximum load in mineral winding to be specified in national laws or regulations.

5.11.7. (1) Before its first use for regular man-winding, every winding rope should make at least 20 winds with the ordinary load of mineral and be found free from any visible defect.

(2) This requirement should also apply when the rope capping or the suspension gear has been renewed.

5.11.8. National laws or regulations should specify the life of winding ropes, and no rope should be used beyond this stated period except by permission of the competent authority.

5.11.9. No spliced ropes should be used for man-winding at any shaft or unwalkable outlet.

5.11.10. (1) Every winding rope and counterweight rope should undergo the following daily and monthly examination:

- (a) a daily examination should be carried out by a competent person with the rope passing at a speed not exceeding 1 m/s;
- (b) a monthly examination in appropriate conditions should be undertaken by a competent person, the rope being passed at a speed not exceeding 0.5 m/s after it has been cleaned of encrusted dirt and grease.

(2) In addition, parts of the rope throughout its length, not more than 100 m apart and those particularly liable to deterioration, should be cleaned and examined: the rope circumference should be measured and the surface condition of the rope thoroughly examined including a search for fractured wires.

(3) Electronic or equivalent examination methods may be used in place of those required in subparagraphs 5.11.10 (1) to 5.11.10 (2).

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5.11.11. The results of the above-mentioned examinations should be recorded in a register.

5.11.12. (1) National laws or regulations should state the interval and the procedures to be observed for the recapping of ropes.

(2) These procedures should specify that –

- (a) except in systems which do not so permit, a piece of rope of sufficient length should be cut off, opened and its internal condition examined in a manner specified by the competent authority;
- (b) suitable tests of the rope and of individual wires should be applied as required by national laws or regulations.

5.12. Tail ropes

5.12.1. When tail ropes are used, they should be of suitable material and sound construction.

5.12.2. National laws or regulations should define the working life of the tail rope, the tests to be made and the standards to be satisfied during that working life.

5.12.3. Withdrawn winding ropes should not be used as tail ropes unless they are carefully examined, found to be in good condition and in all respects suitable for use for that purpose.

5.12.4. The free hang at the bottom of the shaft should be such that the upper cage can travel to the highest possible position in the headframe without being hindered by the tail rope.

5.12.5. Devices should be fitted to prevent the tail rope from being distorted.

5.12.6. The shaft sump should be kept clear of water to prevent the tail rope from running in water.

5.12.7. (1) The tail rope should be examined weekly by the competent person appointed under paragraph 5.3.1.

(2) During this examination the rope speed should not exceed 0.5 m/s.

(3) The results of the examination should be entered into a register.

5.13. Duties of winding enginemen at shafts or unwalkable outlets

5.13.1. A winding engineman should not leave the control gear when the engine is in motion or when he has cause to believe that a person is in the cage.

5.13.2. If a winding engineman finds, during the course of duty, a defect likely to affect the proper working of the apparatus, the engine should not be put into motion again until the defect has been reported to the supervisory official and such official has instructed the winding engineman to set the engine in motion.

5.13.3. The engineman should not allow any other person to operate the engine for which he is responsible unless that person is properly authorised.

5.13.4. The engineman should not set the engine in motion in response to any signal transmitted to him which is indistinct or in response to any series of signals which appears to him to be incomplete or inconsistent.

5.13.5. National laws or regulations should specify the minimum age at which a winding engineman may be appointed.

5.13.6. (1) National laws or regulations should specify the hours of employment of winding enginemen.

(2) Winding enginemen should be physically and mentally fit and be qualified in accordance with national laws or regulations.

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5.14. Signalling appliances

5.14.1. Every man-winding plant should have an efficient signalling system for giving both audible and visible signals –

- (a) from each landing to the bank, surface landing or top of shaft and vice versa;
- (b) from the bank to the winding-engine room.

5.14.2. All signals, both visible and audible, transmitted from the landings to the surface should be transmitted to the banksman and winding engineman.

5.14.3. Defects in the signalling system should be immediately reported to a supervisory official who should take action to have the defects remedied.

5.14.4. In shafts with two winding installations, the audible signals should differ distinctly in tone.

5.14.5. Where, in man-winding, two or more decks of a cage are entered and left simultaneously, each floor at the landing or at the bank should be connected by an effective signalling system with the main loading point of the landing or bank, and only the signaller at that point should give the action signal, after all decks are known to be clear and closed.

5.14.6. Electrical signalling systems should be interlocked with other equipment in a manner which prevents inadvertent movement of the cages.

5.14.7. The landings, the bank and the winding engineman should be in telephonic communication.

5.15. Signalling operations

5.15.1. For the purpose of transmitting and receiving signals, an authorised person should be in constant attendance –

- (a) at the top of every shaft by which any persons are about to be lowered;

- (b) so long as any persons are in the mine below ground, at the top of every shaft from which persons may need to be raised;
- (c) unless all persons in the mine are supervisory officials or persons authorised in writing by the manager to give signals, at every shaft from which persons may need to be raised.

5.15.2. At the bank and the landings, only one signalman on each shift should give signals for each winding plant.

5.15.3. Signalmen should be responsible for the clear and safe operation of the signals.

5.15.4. The code of signals should be fixed or approved by the competent authority, and, as far as practicable, should be uniform for all mines in the same district; in any case, the stop signal of one ring should be uniform everywhere.

5.15.5. Wherever signals are given or received, the code should be posted up and observed, and no signals should be given without proper authority.

5.15.6. Before persons enter a cage to be wound, a special signal should be given by the signalman at the landing concerned to the signalman at the bank and an acknowledgement signal received.

5.15.7. The manager should fix the signals and the manner in which they are given –

- (a) at times when no signalman is on duty;
- (b) for shaft inspections or repair work.

5.15.8. Electrical signalling systems should be regularly maintained.

5.15.9. Where national laws or regulations permit automatic man-winding, the requirements of this subsection should not apply, providing other adequate safeguards to minimise hazards with respect to transportation of persons are stipulated.

5.16. Man-winding operations

5.16.1. Material should not be wound in any compartment of the shaft while regular man-winding is in progress.

5.16.2. With the consent of the competent authority, exceptions may be made for a shaft equipped with two winding plants.

5.16.3. Occasional man-winding in conjunction with material should be allowed only in accordance with the requirements of national laws or regulations and under specific conditions.

5.16.4. Whenever the winding engineman has occasion to leave his engine, he should apply the brakes, cut off the power, and take any other steps as may be necessary to ensure that the engine cannot be restarted by an unauthorised person.

5.16.5. The use of skip-winding plant for man-winding should be permitted only where the skips either comply with or provide facilities equivalent to those required for cages under section 5.8.

5.16.6. Engine rooms should be equipped with emergency lighting which is either continuously in operation or is automatically switched on when the main lighting fails.

5.16.7. Where any defect is found in any plant covered by this chapter, man-winding should be discontinued until the defect has been either remedied or other measures taken to enable man-winding to proceed in a safe manner.

5.17. Shaft sinking or deepening: general

5.17.1. In addition to other examinations of the shaft required by this section, the master sinker, or a competent person appointed by him or by the manager, should at least once in every 24 hours thoroughly examine the state of the shaft

and the state of all gear by which cradles, platforms or pumps are slung in the shaft.

5.17.2. Every cradle or platform used in the shaft should, when necessary, be constructed with a grid or other suitable contrivance to secure the efficient ventilation of the whole of the shaft.

5.17.3. Each cradle or platform should have its maximum load posted on it, and it should be the duty of supervisory officials to verify that the maximum load is not exceeded.

5.17.4. (1) National laws or regulations should specify the precautions to be taken while persons are working on any cradle or platform in the shaft, and particularly to prevent falls of persons.

(2) Where two or more parts of the cradle or platform are hinged together, those parts should be securely bolted together whenever work thereon is in progress.

5.17.5. If sinking is done from the surface, and the work is carried on during the night, the surface of the shaft top should be adequately illuminated.

5.17.6. A supervisory official should, during his shift, have entire charge of the operations at the shaft bottom, subject to the directions of the manager or any person appointed for this purpose by the manager.

5.17.7. Immediately before the descent of a shift, or if work is carried on without an interval by a succession of shifts, the supervisory official should carry out a general safety examination during his shift and satisfy himself that the shaft is in a safe condition for persons to work at the bottom or on any walling or tubbing operation.

5.17.8. The supervisory official should be the last man to ride at the end of the shift, and if this shift is succeeded immediately by another shift, he should not leave the bottom of

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the shaft until the descent of the supervisory official of the next shift.

5.17.9. No person should be allowed to descend after any cessation of work in the shaft, caused by the withdrawal of the workmen for shotfiring or other purposes, until the supervisory official has examined the shaft and found it to be safe in all respects.

5.17.10. If firedamp has been found or is likely to be found in the shaft, the examination should be made with an approved flame safety lamp or an approved firedamp detector serving the same purpose.

5.17.11. The banksman should keep the shaft top and landing edge free from loose material at all times.

5.17.12. (1) When a shaft is being sunk through water-bearing strata, adequate means of escape from the bottom of the shaft should be provided, and the work conducted in accordance with a specially prepared scheme by the manager.

(2) The scheme should be submitted to the competent authority who should require any amendment thought to be necessary in the interests of the safety of the persons employed in the shaft.

5.18. Winding or hoisting of persons and materials at sinking shafts

5.18.1. All winding or hoisting equipment, including winches, guides, ropes, chains, connecting pieces, buckets, platforms and their associated equipment and similar appliances should be –

- (a) of suitable material, good construction, adequate strength and free from patent defect;
- (b) inspected in accordance with the general rules laid down in this section;
- (c) maintained in safe working condition;

5.18.2. Where multi-rope suspension is used for a cradle or platform, individual rope loads should be measured to ensure that no one rope is overloaded.

5.19. Sinking shafts

5.19.1. An appropriate clear height should be provided between the pulley and the top of the bucket when resting at the surface.

5.19.2. As soon as the shaft, or the newly deepened part of a shaft, reaches a depth specified in national laws or regulations, rope guides for the bucket should be installed.

5.19.3. A shaft should be closed at the shaft top by flaps or trap doors which should be opened only when required for the passage of the bucket or of material.

5.19.4. The shaft bottom should be adequately illuminated throughout working hours.

5.20. Winding engines or winches at sinking shafts

5.20.1. Before a winch is installed at a sinking shaft site, it should be the duty of the manager to establish that it is properly designed for that installation and fully capable of meeting any demands likely to be made on it.

5.20.2. The winch should be provided with a reliable depth indicator and with such other means as may be necessary to indicate to the engineman when the bucket or the counterweight is approaching the shaft top.

5.20.3. The winch should be provided with brakes satisfying the requirements of paragraphs 5.3.17 to 5.3.19, and equipped with a properly designed clutch/brake interlocking arrangement.

5.21. Suspension gear at sinking shafts

5.21.1. (1) National laws or regulations should specify the requirements to be satisfied by suspension gear which should be of a standard at least equal to that required by the relevant parts of this section.

(2) Particular attention should be given to breaking strength, capels and the device for the prevention of bucket rotation.

5.22. Signalling appliances at sinking shafts

5.22.1. Efficient signalling appliances should be provided for signalling between the working places in the shaft, the shaft top and the winchman.

5.22.2. Signalling appliances should be operated only by the chageman or the signallers appointed for the purpose.

5.22.3. It should, however, be possible for any person to operate the signalling appliances from the bucket at any point in its course.

5.22.4. Signalling appliances should be examined daily.

5.23. Winding operations at sinking shafts

5.23.1. National laws or regulations should fix the maximum man-winding speed.

5.23.2. When lowering the bucket, the person operating the winding apparatus should stop it 6 m above the point to which it is being lowered, and should not lower it further until he has received another signal to do so.

5.23.3. (1) When raising the bucket, the person operating the winding apparatus should stop it 1-2 m above the point from which it is being raised to enable it to be steadied and cleaned.

(2) It should not be raised further until another signal to do so has been given.

5.23.4. The supervisory official or the persons authorised to transmit signals at the bottom of the shaft should ensure that the bucket is properly loaded, and in particular that –

- (a) no mineral projects above the rim;
- (b) tools, equipment or other materials are not loaded together with mineral;
- (c) when objects projecting above the rim are carried, they are securely fastened to the bow or chains supporting the bucket;
- (d) nothing capable of causing injury is adhering to the outside of the bucket;
- (e) when the bucket is being raised, it is in line with the pulleys and carefully steadied.

5.23.5. When anything is to be lowered, otherwise than in a bucket, it should be the duty of the banksman, or other person authorised to transmit signals, to ensure that it is safely slung.

5.23.6. No person should be wound or hoisted without a light except in an emergency.

5.23.7. No person should enter or leave a bucket at the top of the shaft or at any working platform before the flaps or trap doors or protective canopy at the top of the shaft or at the working platform have been closed.

5.23.8. No person should be carried on the edge of the bucket except for the purposes of shaft inspection.

5.23.9. Any inspecting person should be protected from falling by wearing and using a properly designed safety harness.

5.23.10. No person should be carried in a partly or fully loaded bucket.

5.23.11. Where two buckets are used, neither bucket should be used for material winding while man-winding is in progress.

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5.23.12. While any person is at work on a cradle or platform, it should be secured to the side of the shaft by means of steady-jacks or other devices to prevent it swinging.

5.24. Shotfiring at sinking shafts

5.24.1. Subject to the provision of the following requirements, shotfiring during shaft sinking should comply with the requirements stated in Chapter 17.

5.24.2. Shotfiring should be carried out only by competent and properly authorised persons.

5.24.3. The primers should be prepared only in a special place designated by the manager.

5.24.4. The explosives should be brought to the bottom in closed containers and only when they are immediately required for use.

5.24.5. Special containers should be provided for detonators.

5.24.6. No shotfirer should couple a shotfiring cable to a detonator in a shaft provided with winding apparatus unless –

- (a) the bucket is conveniently placed for persons in the shaft to enter it;
- (b) he has satisfied himself that the person operating the winding apparatus is ready to raise.

5.24.7. While the leads are being joined and the connection made to the firing line, only those persons needed for the operation, in addition to the shotfirer, should be present.

5.24.8. All shots should be fired electrically.

5.24.9. The cable should not be coupled to the firing apparatus until all persons are in a place of safety.

5.24.10. The shotfirer should be the last to leave the bottom.

6. Roads

6.1. Safety of roads

6.1.1. It should be the duty of the manager of every mine to take, with respect to every road in the mine, such steps to control movement of the strata in the mine and support the roof and sides of every road as may be necessary to keep every road secure.

6.2. Height and width of travelling roads

6.2.1. Every length of road in a mine which is used at the beginning or end of a shift by the number of persons, which should be specified in national laws or regulations, for the purpose of walking to or from their working places in the mine, should be not less in height and width than that which should be specified in national laws or regulations.

6.2.2. Roadways should be constructed of such height and width as to be travelling with reasonable convenience.

6.3. Fencing or sealing of unfit parts of mine roadways

6.3.1. Every entrance from a road in a mine to a part of the mine which for the time being is not maintained in a state fit for persons to work in or pass through should be provided with an efficient enclosure or barrier which should prevent any person from accidentally entering that part of the mine.

6.3.2. Every enclosure or barrier should be properly maintained, and an appropriate notice prohibiting entry, except to authorised persons, should be posted where it can be seen easily by all concerned.

6.3.3. Where, due to atmospheric or other conditions, emissions of dangerous concentrations of noxious or flammable

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gas occur from such unfit parts of the mine, the entrance to every such part should be effectively sealed and suitable arrangements made, where necessary, to discharge the emissions in a safe manner.

6.4. Inclined roadways and workplaces

6.4.1. On inclines with a slope exceeding 45°, repairs should be undertaken only from platforms or when using adequate safety harnesses.

6.4.2. Bunkers, chutes and the delivery end of conveyors should be so arranged that no person is endangered by falling coal or other objects.

6.4.3. Persons who are required to enter bunkers or chutes should wear and use safety harnesses, take other precautions as are necessary and should have a second competent person present.

6.4.4. Stairs, platforms or steep walks in a mine should be provided with rails, fences or gates as may be necessary for the protection and safety of persons.

6.4.5. Persons working in steep roadways or steep seams should be protected, as far as is practicable, against falling pieces of coal or other objects.

7. Haulage and transport

7.1. Transport Rules

7.1.1. (1) It should be the duty of the manager of every mine to formulate Transport Rules with respect to every road in the mine used for the transport of persons and material.

(2) Such Transport Rules should include and specify –

- (a) the standard height and width with respect to each length of road in which vehicles are run or conveyors operated;
- (b) the minimum clearances between loads and the roof and sides of the roads along which such loads are transported;
- (c) that conveyor belts and the loads they carry should not be allowed to rub against the roof or sides of roadways;
- (d) the maximum loads to be transported in terms of number of vehicles, weight, dimensions or other criteria;
- (e) the maximum speed at which vehicles may run;
- (f) the standard of track and haulage appliances to be used;
- (g) the special procedures which must be observed at specified points on the haulage system.

7.1.2. A clearly understandable copy of the Transport Rules should be posted at both ends of the roadway to which the rules apply.

7.2. Haulage plant inspection and maintenance scheme

7.2.1. It should be the duty of the manager of every mine to formulate a scheme for the systematic and regular inspection and maintenance of all haulage plant in the mine.

7.2.2. The manager should appoint sufficient competent persons to ensure that the requirements of the scheme are fulfilled.

7.3. Haulage: general provisions

7.3.1. Every haulage road should be as regular in gradient and cross-section, and as straight, as is reasonably practicable.

7.3.2. All tracks, vehicles, mechanical and electrical gear, ropes and appliances should be –

- (a) of proper design, good construction, suitable material, adequate strength and free from patent defect;
- (b) regularly inspected;
- (c) maintained in an efficient and safe condition.

7.3.3. (1) The code of signals for mechanical haulage operations should be specified by the mine manager unless a uniform code for all mines in the same district has been specified by the competent authority.

(2) The code to be used along each haulage system should be posted at the ends of each system, at all connecting roadways and at all engine houses.

7.3.4. At all places where vehicles are coupled or uncoupled, there should be at least 60 cm clear space –

- (a) between the vehicles and the side of the road;
- (b) where there are two or more parallel lines or rails between the vehicles.

7.3.5. (1) Where haulage and travelling may occur simultaneously, there should be separate travelling ways or regularly spaced places of refuge.

(2) If the gradient of the travelling way exceeds 1:12, haulage and travelling should take place simultaneously only where there is no danger from rolling vehicles or material.

(3) Refuges should be –

- (a) of dimensions which should be specified by national laws or regulations;
- (b) made readily visible by whitewashing or other means;
- (c) kept clean and unobstructed.

7.3.6. (1) Except where national laws or regulations otherwise permit, suitable and sufficient general lighting should be provided at –

- (a) all sidings, landings, passbyes and junctions;
- (b) all places where vehicles are being coupled or uncoupled except within 100 m of the working face.

(2) All such places should be effectively whitewashed.

7.3.7. Every haulage road should be kept clear as far as possible of pieces of coal and other obstructions.

7.3.8. Riding on vehicles or their attachments without the authorisation of a supervisory official should be prohibited.

7.3.9. Where practicable, places where vehicles are coupled or uncoupled should not be on a gradient.

7.3.10. (1) As far as is practicable, vehicles should be provided with parking brakes.

(2) Sufficient and suitable sprags, lockers or drags or other devices should be provided by the management and should be used for the purpose of controlling vehicles in motion and holding vehicles while they are being coupled or uncoupled.

7.3.11. Where practicable, vehicles should be equipped with buffers that project beyond the ends to a distance of at least 10 cm.

7.3.12. Arrangements should be made so that vehicles can be coupled or uncoupled with safety.

7.3.13. Except at landings and loading places and during shunting, vehicles that are moved together should be coupled.

7.3.14. (1) On all haulage roads, adequate precautions should be taken to prevent vehicles running away.

(2) As far as is practicable, all runaway protection devices should be designed to assume automatically the position in which they are operative.

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7.3.15. (1) In mechanical haulage roads, rerailing devices should be provided where practicable.

(2) Derailed vehicles should not be rerailed by hand until the haulage engine or the rope has been stopped.

(3) Where rerailing takes place on inclines, proper provision should be made to prevent vehicles running away.

7.4. Hand and animal haulage

7.4.1. (1) The manager of every mine should specify the rules for the safe conduct of operations on all hand or animal haulage roads.

(2) These rules should, in particular, specify that –

- (a) no person, when moving a vehicle by hand down an incline (the gradient of which is to be stated in the rules), should go down in front of the vehicle;
- (b) when a person cannot by his own strength control a vehicle from behind, a contrivance should be provided to enable him to maintain control from behind the vehicle;
- (c) when workers have to push vehicles in low places, suitable protective hand grips should be provided on the vehicles;
- (d) hand haulage of vehicles in close succession is prohibited.

(3) These rules should also specify –

- (a) the conditions in which riding on vehicles is authorised;
- (b) the means by which supplies should be transported from the end of the haulage track to the working face or place.

7.4.2. In horse haulage, derailed vehicles should not be rerailed until the horse has been unhitched.

7.5. Mechanical haulage: general provisions

7.5.1. National laws or regulations should specify the conditions under which haulage by locomotive is permitted.

7.5.2. Every locomotive used in a mine should be provided with –

- (a) brakes which can be applied by the driver by direct mechanical action, whether or not any other device for applying them is fitted;
- (b) means for applying sand to the rails;
- (c) means for giving adequate audible warnings;
- (d) a suitable portable fire extinguisher;
- (e) a seat for the driver.
- (f) controls so placed that the driver can simultaneously operate them and see ahead without leaning out of the locomotive;
- (g) a portable lamp;
- (h) a suitable dead-man control switch.

7.5.3. Every locomotive used in a coal mine should be provided with a combined speed and distance indicator unless it is of a size which is exempt by national laws or regulations.

7.5.4. Every locomotive should be provided with a headlight with an effective range of at least 60 m.

7.5.5. Locomotive-hauled sets should carry a conspicuous red warning light at the rear of the last vehicle.

7.5.6. Petrol locomotives should not be permitted underground.

7.5.7. If diesel locomotives are used in mines, they should be of a type approved by the competent authority.

7.5.8. (1) National laws or regulations should control the use of electric locomotive haulage.

(2) Electric locomotives should be of types approved by the competent authority.

7.5.9. No locomotive should be taken into use or kept in use if any serious defect of any kind is noticed.

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7.5.10. Every locomotive and each of its accessories should, so far as is practicable, be constructed of non-flammable material, and any flammable material included therein should be shrouded with a substantial metallic covering, except where exempted by the competent authority.

7.5.11. In the case of haulage with a rope and stationary engine, proper means should be provided for signalling to the engineman from a sufficient number of points in the road.

7.5.12. Tracks should be constructed of rails of adequate section and be properly laid as specified in the manager's Transport Rules.

7.5.13. (1) The frames of pulleys, sheaves and rollers on rope haulages should be made of non-flammable material.

(2) All pulleys, sheaves and rollers should be securely fixed.

(3) Pulleys, sheaves and rollers that alter the direction of the rope should be securely fenced and otherwise rendered safe.

7.5.14. On main and tail rope haulages, the coupling and uncoupling of vehicles in motion should be prohibited.

7.5.15. (1) No person should operate any locomotive or trackless vehicle unless appointed to do so by the manager of the mine.

(2) Such appointed drivers should have been trained in the use of the type of vehicle in question and, in particular, in such emergency procedures as skid control.

(3) Each appointed driver should be provided with a copy of the Transport Rules and be thoroughly familiar with their contents and in particular the routes to which he is assigned.

7.6. Trolley locomotive haulage

7.6.1. National laws or regulations should state the maximum percentage of firedamp in the general body of air

which is permitted in roads along which trolley locomotives are used.

7.6.2. Trolley wires and trolley feeder wires should be provided with cut-out switches at appropriate intervals and near the beginning of all branch lines.

7.6.3. Trolley wires and trolley feeder wires should be provided with overcurrent protection.

7.6.4. Trolley wires and trolley feeder wires should be located only in intake ventilation.

7.6.5. Trolley wires, trolley feeder wires and bare signal wires should be adequately insulated where they pass through doors and where they cross other power wires and cables.

7.6.6. Trolley wires and trolley feeder wires lower than 2 m in height should be adequately guarded –

- (a) at all points where persons are required to work or pass regularly under the wires;
- (b) on both sides of all doors;
- (c) at stations where persons board or leave man-riding trains;
- (d) by temporary guards where any persons are required to work in the vicinity of the trolley or trolley feeder wires.

7.6.7. National laws or regulations should specify –

- (a) the maximum voltage, the character of the current and the electrotechnical details of the installation;
- (b) the minimum height of the trolley wire above the top of the rails.

7.6.8. Conspicuous light signals should be placed at shunting places, crossings and approaches to show when the trolley wire is live.

7.6.9. For the whole length of the trolley wire, the roadway should be adequately supported to prevent falls or deformation

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that might result in a reduction of the height of the trolley wire above the top of the rails exceeding 10 per cent of the normal height.

7.7. Storage-battery locomotives

7.7.1. National laws or regulations should contain provisions relating to the safe construction, ventilation and use of batteries for storage-battery locomotives.

7.7.2. Batteries should not be charged or changed below ground except at a charging station arranged in relation to the ventilation in such a way that –

- (a) the charging apparatus is on the intake side of the battery racks;
- (b) the air passes from the battery racks directly into an airway and does not subsequently ventilate a working face;
- (c) airway entries of restricted size are positioned close to roof level.

7.7.3. Each charging station should be –

- (a) constructed of non-flammable material;
- (b) provided with suitable and sufficient apparatus for combating outbreaks of fire;
- (c) so equipped that the spilling of water or electrolyte is minimised.

7.7.4. Any person spilling water or electrolyte on a battery in a charging station should forthwith remove it or cause it to be removed.

7.7.5. No lamp or light other than one which is approved by the competent authority should be used within 10 m of any charging station.

7.7.6. A notice containing the requirements of paragraphs 7.7.3, 7.7.4, and 7.7.5 should be kept posted in a readily visible manner at each charging station.

7.8. Diesel vehicles, including locomotives and trackless vehicles

7.8.1. (1) National laws or regulations should specify –

- (a) the maximum percentage concentration of carbon monoxide and oxides of nitrogen, particularly nitrogen dioxide, permitted in exhaust gases emitted by diesel vehicles;
- (b) the maximum percentage concentration of firedamp, carbon monoxide and oxides of nitrogen permitted in the general body of air in the roadways where diesel vehicles operate;
- (c) the frequency and methods of sampling to ensure compliance with subparagraphs 7.8.1 (1) (a) and 7.8.1 (1) (b).

(2) The results of such sampling should be entered in a register.

7.8.2. Every diesel vehicle should be so constructed that –

- (a) no air enters the engine without first being cleaned;
- (b) no exhaust gases are expelled from the vehicle without first being cooled and diluted;
- (c) no flames or sparks are emitted from the vehicle.

7.8.3. (1) The manager of every mine should formulate a scheme of systematic maintenance of diesel vehicles.

(2) This scheme should stipulate that –

- (a) a competent person should examine the principal parts of the locomotive or vehicle, in particular flame traps and baffle plates, every day and should, where necessary, clean, change or repair those parts;
- (b) every diesel vehicle should be thoroughly examined and tested at intervals not exceeding seven days.

7.8.4. Diesel vehicles, when not in use, should be kept in places which –

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- (a) are provided with not less than two means of egress;
- (b) are ventilated by a current of air sufficient to dilute and render harmless all exhaust gases emitted by any engine running therein, with the return air passing directly into a return airway;
- (c) are constructed of non-flammable material;
- (d) have a floor of smooth concrete provided with suitable drainage to contain oil spillage;
- (e) have an inspection pit or other suitable means for making inspections from below the vehicle;
- (f) are provided with suitable and sufficient apparatus for combating outbreaks of fire.

7.8.5. (1) No person should replenish any diesel vehicle with fuel oil in any mine except at a place appointed as a filling station.

(2) Every filling station should be –

- (a) provided with not less than two means of egress;
- (b) ventilated by a current of air sufficient to dilute and render harmless all gases emitted therein, with the return air from the station passing directly into a return airway;
- (c) constructed of non-flammable material;
- (d) provided with a floor of smooth concrete surrounded by a sill;
- (e) provided with suitable and sufficient apparatus for combating outbreaks of fire;
- (f) equipped so as to minimise oil spillage.

7.8.6. Any person spilling oil in a filling station should –

- (a) forthwith wipe it up, or cause it to be wiped up, with a non-flammable absorbent;
- (b) forthwith deposit that absorbent, or cause it to be deposited, in a fireproof receptacle;

(c) as soon as practicable take the absorbent, or cause it to be taken, to the surface.

7.8.7. No person should take any oil from any container in a filling station while any internal combustion engine in the filling station is running.

7.8.8. The transfer of oil to a reserve tank or to a diesel vehicle should be done only by means of apparatus specially provided for that purpose and in accordance with instructions issued by the manager.

7.8.9. The fuel oil should comply with a standard approved by the competent authority.

7.8.10. (1) The fuel oil should be taken into the mine in sealed metal drums or in tank cars.

(2) The quantity of oil stocked in the mine should not exceed 24 hours consumption.

7.8.11. Empty containers should be removed from the mine as soon as possible.

7.8.12. In the event of any irregularity in the running or sound of the engine and, in particular, any excessive emission of smoke, any open sparking, any stoppage in the circulation of water, or any leakage of fuel, the diesel vehicle should immediately be stopped, taken out of service and examined.

7.8.13. Any defects found to affect the safe use of a diesel vehicle should be remedied before the vehicle is put to further use.

7.8.14. The results of inspections and any irregularities in running should be recorded in a register.

7.9. Compressed-air locomotives

7.9.1. Every day before being taken into use, every compressed-air locomotive should be examined by the driver.

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7.9.2. Once every week, the locomotive should be thoroughly examined by a competent person who should enter the results of the examination in a register.

7.9.3. (1) Compressed-air locomotives should be properly maintained in accordance with a scheme formulated by the manager of the mine.

(2) This scheme should specify the parts to be examined or tested, the manner of the examination or tests and the intervals at which such examinations or tests should be carried out.

(3) Where deemed necessary in the interests of safety, the competent authority should state the changes which it requires to be made in the scheme.

7.9.4. The results of the examination and tests required by paragraph 7.9.3 should be entered in a register.

7.10. Conveyors

7.10.1. No conveyor should be installed in a road which does not have the clearances stipulated in the manager's Transport Rules.

7.10.2. A travelling road, free from obstruction and not less than 60 cm wide, should be provided between the conveyor and one side.

7.10.3. No flammable material should be used for support or other purposes within a distance of 10 m from the driving unit and associated loop take-up of the conveyor.

7.10.4. The conveyor structure should be supported by non-flammable blocks, and kept clean and, as far as is practicable, free from spillage.

7.10.5. (1) All conveyor belts used in coal mines should be of the fire-resistant type.

(2) Where such belts are not already in use, national laws or regulations should specify the date from which they should be used.

7.10.6. (1) The hydraulic fluid used in the conveyor driving unit, transmission and associated appliances should be of the fire-resistant type.

(2) Where such hydraulic fluid is not already in use, national laws or regulations should specify the date from which it should be used.

7.10.7. (1) Suitable and adequate means of extinguishing outbreaks of fire should be provided along conveyor roads and at the driving unit of every conveyor.

(2) As far as is practicable, an automatically operated fire extinguishing system should be installed at the drive unit and associated loop take-up.

7.10.8. Conveyors should be provided with effective means to stop them from any point along their length.

7.10.9. There should be adequate patrolling of all roadway conveyors while they are at work.

7.10.10. Dangerous parts of belt conveyors, in particular the driving unit and return end, should be safely fenced.

7.10.11. Where practicable, the driving unit and return end of conveyors should be self-cleaning; otherwise, arrangements should be made for them to be cleaned only when the belt is stopped.

7.10.12. A lock-out system should be incorporated and used when cleaning the drive and return end.

7.10.13. Where the inclination of any conveyor gives rise to danger from sliding objects, devices should be installed to afford adequate protection against such danger.

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7.10.14. Suitable precautions should be taken to prevent danger from over-run and run-back during maintenance operations.

7.10.15. Proper arrangements should be made for the anchoring of the return end of all conveyors, which should be independent of face or roof supports.

7.11. Haulage on inclines

7.11.1. No person should be employed as signaller, brakesman or haulage engineman unless he is duly authorised and competent for the work.

7.11.2. Braking appliances and haulage engines should be properly constructed, maintained and operated, and properly fixed in position.

7.11.3. Stop blocks or other similar contrivances should be provided and maintained –

- (a) at the top of every incline on which vehicles are moved by gravity;
- (b) at every entrance to such an incline by which vehicles are brought to it.

7.11.4. Where there is a risk of a person falling into an incline, adequate protection should be provided.

7.11.5. A system should be provided for communicating distinct and definite signals between all landings and the ends of the incline.

7.11.6. During interruptions in haulage, and at the end of the shift, the haulage engineman should cut off the power from the engine, apply the brake and secure it against unauthorised use.

7.11.7. (1) When a vehicle is derailed or is stopped by an accident, the necessary steps should be taken by the brakesman or engineman and the incline attendants so that the vehicle cannot run away.

(2) The haulage should not be restarted until all the persons employed in the rerailing and handling of the vehicle are in safety.

7.12. Face haulage

7.12.1. The manager's Transport Rules (see section 7.1) should contain provisions to control the conveyance of minerals and materials along the line of the coal face.

7.12.2. For longwall faces equipped with armoured conveyors and power loaders, these Rules should specify –

- (a) the method by which supplies are to be transported on the armoured conveyor;
- (b) the method by which supplies are to be placed on and removed from the armoured conveyor;
- (c) the method by which parts for replacement such as conveyor sections, powered-support sections, power-loader sections, cables and hoses, should be transported in safety.

7.12.3. The Rules should also specify the method by which the armoured conveyor, power loader, supports and other equipment should be installed at or withdrawn from the coal face, and state that –

- (a) the winch used for face haulage should be fitted with a load limitation device;
- (b) all ropes, chains, cappings, linkages and other attachments should be properly designed and maintained for the purposes for which they are used;
- (c) where appropriate, a properly designed track should be laid along the line of face for the purposes of installing or withdrawing face equipment;
- (d) a separate system of signalling should be provided from any point between the point of installation/withdrawal and the face winch operator.

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7.13. Travel and transportation of persons on roads and inclines: general provisions

7.13.1. 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, or along portions of roadways, the mine operator should arrange for such transportation to be carried out.

7.13.2. As far as is practicable, roads or inclines separate from the haulage roads or inclines should be provided for the passage of persons.

7.13.3. Where the provision of travelling roads separate from haulage roads is not practicable, the haulage operations should be stopped while persons are travelling to and from their work unless special arrangements have been made to ensure the safety of the persons travelling.

7.13.4. The haulage equipment in roads and inclines normally used for mineral haulage should not be used for riding, save in so far as is allowed by national laws or regulations or otherwise by the authority of the manager.

7.13.5. It should be the duty of each engineman, brakesman and signalman to enforce the requirements of paragraphs 7.13.3 and 7.13.4 in so far as their jurisdiction extends.

7.13.6. National laws or regulations should specify the intervals at which travelling roads, inclines or compartments should be inspected.

7.13.7. Travelling roads, inclines or compartments should be maintained in a safe condition.

7.13.8. Notices should be posted indicating the route to the travelling roads and to the shafts or outlets.

7.14. Travel on foot

Travel on level or slightly inclined roads

7.14.1. For the purposes of this section “level or slightly inclined roads” means roads with a gradient not exceeding 3° or 1:20.

7.14.2. On mechanical haulage roads ordinarily used for travel, a footpath of at least 60 cm width, free of all obstructions, and of sufficient height, should be provided along the whole length of one side.

7.14.3. Section 7.14.2 should not apply to gate roads in which the haulage speed does not exceed 1.5 m/s but on these roads it should always be possible to travel and pass vehicles safely.

7.14.4. In ropeways where the footpath may be in the middle of the road, persons travelling should be protected against swinging ropes.

Travel on inclines

7.14.5. On haulage inclines with a slope exceeding 3° but not exceeding 25° the haulage road may be used for travel, subject to rules which should be specified by the competent authority.

7.14.6. Inclines used for haulage and having a gradient of over 25° should have a safe, separated travelling way for persons unless –

- (a) a special travel incline is available; or
- (b) other effective arrangements have been made to ensure safe travel.

7.14.7. The travelling way should have sufficient dimension to allow the passage of persons wearing breathing apparatus.

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7.14.8. In travel inclines and other travelling ways with a gradient of from 25° to 45° either –

- (a) steps should be cut or ladders provided; or
- (b) a rope or a fixed bar should be provided to serve as a hand rail.

7.14.9. Where the slope exceeds 45°, ladders should be provided.

7.14.10. If the slope exceeds 70°, rest landings should be provided not more than 10 m apart.

7.14.11. Haulage inclines should be entered only when the operations require, and the haulage is stopped.

7.14.12. Reliable means of communication should be provided so that persons wishing to enter the incline can make their intention known to others concerned.

7.15. Mechanical passenger haulage (man-riding)

7.15.1. (1) The manager's Transport Rules should contain provisions relating to roads used for man-riding.

(2) Such rules should specify –

- (a) the speed of the man-riding train along specified lengths of road;
- (b) the posting of clear signs at places where speed changes are required because of gradient changes or any other cause, to show the speed required;
- (c) the number of passengers per vehicle and the number of vehicles per journey;
- (d) the standard of track;
- (e) the procedures to be observed at boarding or alighting stations;
- (f) the importance of strict discipline and the need to obey the instructions of the train guard who should be easily identified;

- (g) the clearance between vehicles or their passengers and the roof and sides;
- (h) the need to adequately protect passengers in vehicles drawn by locomotives powered by trolley wire systems from contact with live conductors;
- (i) the need to switch off the electricity supply to the trolley wires of vehicles powered by trolley wire systems at all boarding or alighting stations while persons are entering or leaving, and to provide a special light signal to indicate that the trolley wire is dead;
- (j) the posting of copies of the Transport Rules where they can be read easily at the entrance to the road to which they apply, and of relevant extracts inside each passenger vehicle;
- (k) provisions for the enforcement of discipline at all boarding and alighting stations.

7.15.2. Each boarding or alighting station should be adequately illuminated.

7.15.3. No person should enter or leave a moving train.

7.15.4. Bulky tools or materials should not be carried in man-riding vehicles where they may endanger passengers.

7.15.5. (1) The certification and authorisation of a locomotive driver should be specifically related to the types of locomotives on which that person has been trained.

(2) Such certification and authorisation should not be granted until the driver has been trained to be proficient in all conditions at the mine, including both man-riding and materials haulage.

7.15.6. (1) All man-riding trains should be provided with effective means of signalling between the conductor and the driver.

(2) The means provided should preferably be of the fail-safe type.

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7.15.7. Each carriage of a locomotive-hauled man-riding train should be provided with brakes for both normal service and emergency operation.

7.15.8. There should be readily accessible means of applying the brakes manually, and the method of operation should be marked on each carriage.

7.15.9. The emergency brakes should operate automatically in the event of overspeed.

7.15.10. Where such trains operate on gradients steeper than 1:30, the emergency system should comprise fail-safe track brakes.

7.15.11. Where the requirements of paragraphs 7.15.7 to 7.15.10 are not already applied, national laws or regulations should state a date by which they should be fully observed.

7.15.12. (1) Locomotive brakes should be tested on a clearly identified and marked selected length of track with the locomotive coupled to a trailing load which is equivalent to that of the most onerous braking condition.

(2) An additional test of each complete man-riding train should be made to verify the operation of the carriage brakes.

7.15.13. New man-riding carriages should be designed to give maximum protection to the passengers.

7.15.14. Where practicable, retractable energy-absorbing arrestors should be installed.

7.15.15. (1) Locomotive haulage systems should be designed to ensure that suitable pass-by arrangements are provided to permit trains to be hauled from in front.

(2) Terminal man-riding stations should be established on relatively level terrain.

7.15.16. In so far as they are practicable, the provisions of paragraphs 7.15.6 to 7.15.14 should also apply to rope-hauled man-riding trains.

7.16. Man-riding on conveyors

7.16.1. The manager's Transport Rules should lay down provisions for each length of roadway where riding is permitted.

7.16.2. Such Transport Rules should specify –

- (a) the maximum gradient along which riding is permitted;
- (b) the speed of the conveyor belt, having regard to the gradient;
- (c) the specific conditions under which persons may travel while minerals or materials are being conveyed;
- (d) the minimum clearances between the belt conveyor and the roof, and between the belt conveyor and the nearest side of the road;
- (e) the spacing of persons along the belt when man-riding is in progress;
- (f) the construction of boarding and alighting stations to ensure the safety of the persons using the system;
- (g) the provision of an efficient system enabling the conveyor to be stopped at any point along its length;
- (h) the provision of adequate general lighting at all boarding and alighting stations and, where practicable, along the whole length of the conveyor where persons ride;
- (i) the provision of illuminated notices which warn persons of their approach to the alighting stations and of any other possible hazards which may be present on the length of road along which persons ride;
- (j) the provision of a safety device which stops the conveyor automatically when persons fail to dismount from the conveyor at an alighting station;
- (k) the halting of any other mechanical haulage equipment located in the same roadway where man-riding on conveyors is taking place, except in circumstances which should be specified by the competent authority.

8. Support

8.1. Duty to secure safety of each working place

8.1.1. It should be the duty of the manager of every mine to take such steps to control movement of the strata in the mine and support the roof and sides as may be necessary to keep each working place secure.

8.1.2. It should be the duty of the manager of every mine to ensure that he is at all times in possession of all information necessary for him to keep each working place secure.

8.2. Support Rules

8.2.1. It should be the duty of the manager of every mine to formulate Support Rules which should specify, for each working place, the maximum intervals between:

- (a) supports on roadways;
- (b) each row of props, roof bolts or other supports at the face;
- (c) adjacent props, roof bolts or other supports in the same row;
- (d) the last row of supports and the face;
- (e) powered supports;
- (f) holing props or sprags;
- (g) chocks;
- (h) packs.

8.2.2. The Support Rules should clearly state that the specified intervals are maximum distance and that, where additional supports appear to be needed, it should be the duty of those engaged in that place to set them or, if such persons are not competent to do this, to report to the supervisory official.

8.2.3. At every place where machinery is used for cutting, conveying or loading, the system of support should require cross supports (bars) to be set above every prop that the Support Rules require to be set.

8.2.4. (1) Where armoured conveyors are used on the coal face, the props, bars and powered supports should be of an approved type.

(2) The competent authority should determine the approval standards for these supports.

8.2.5. (1) Support Rules for each mine should include such plans, sections and diagrams as to make them readily understood by those required to carry them out.

(2) Copies of the Support Rules relative to each working place should be posted where they can be easily seen at the entrances to the district to which they apply.

8.2.6. (1) Where withdrawal of support is required, it should be done in accordance with the method which should be specified in the Support Rules.

(2) The procedure should cover the use of the appropriate tools and safety contrivances, the setting of extra supports to control the collapse of roof from which supports are being withdrawn, and the safe positioning of those persons engaged in the operation.

(3) Such persons should be competent in this type of work.

8.2.7. In thick or steeply inclined seams, holing props or sprags should not be removed except in accordance with the requirements of the Support Rules.

8.3. Setting of supports

8.3.1. It should be the duty of each mine operator and mine manager to provide supports of suitable material,

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adequate strength and in sufficient quantity where they are readily available for use.

8.3.2. (1) Every prop set to support the roof or sides of working faces or roadways should be set securely and on a proper foundation.

(2) Whenever such props become broken or otherwise unstable, they should be replaced forthwith.

(3) If this cannot be done, it should be immediately reported to the supervisory official.

8.3.3. All chocks forming part of a system of support should be built on a proper foundation and made tight to the roof.

8.3.4. All packs forming part of a system of support should, so far as is practicable, be made tight to the roof over their whole area.

8.3.5. (1) All roadway supports should be securely set so as to maintain maximum stability.

(2) Where practicable they should be fixed by ties or struts to the neighbouring support.

(3) Cavities above the supports should be filled in so far as is practicable.

8.3.6. The supervisory staff and the workers concerned should examine and test the roof, sides and supports as often as is necessary to ensure their safety and particularly before work is resumed after an interruption.

8.3.7. (1) In inclined seams, the supporting props or chocks should be set to ensure maximum support having regard to the inclination of the seam or road and probable strata movement.

(2) Where necessary, such supports should be reinforced to prevent displacement.

8.3.8. (1) Overhanging coal or sides should be taken down.

(2) Where this is not practicable, suitable sprags or other means of support should be set.

8.3.9. A person using roof bolts to form part of a system of support in a mine should ensure that the roof bolts are securely fixed in place.

8.4. Powered supports: general provisions

8.4.1. No powered support should be used below ground unless it has been certified as being constructed to an appropriate standard.

8.4.2. (1) It should be the duty of the competent authority to specify the tests and examinations to which supports should be subjected before they are certified.

(2) Where the competent authority of an importing country does not have the necessary facilities to carry out the specified tests and examinations, it should be the responsibility of the exporting manufacturers to provide the documentation certifying that the supports and equipment are in compliance with the importing country's requirements.

(3) Such tests and examinations should cover –

- (a) the mechanical strength of individual structures to ensure that they will withstand, without damage, the forces imposed on them;
- (b) the expected life of individual components as simulated by cyclic testing;
- (c) the performance of the complete support;
- (d) the reliability of the valve gear and the extent to which it can be operated from a safe place;
- (e) the ability of hose lines and connectors to meet the demands made on them with a specified factor of safety;

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- (f) the ratio of soluble oil to water in the hydraulic fluid to ensure that the mix does not contain less than 5 per cent soluble oil and also to ensure that mineral oil is not used as hydraulic fluid;
- (g) the specification of the hydraulic fluid tank to check that the tank is equipped with devices to ensure its safe operation;
- (h) the specification of the pump to ensure that the pump is suitable for the system;
- (i) acquisition of the information required to determine the maximum interval between supports.

8.4.3. Where, by reason of any irregularity in the roof, floor or sides, the powered supports are ineffective in ensuring safety, and, notwithstanding section 8.2, the Support Rules should make provision for the use of conventional supports until such time as the conditions allow normal use of the powered supports.

8.4.4. (1) Any person whose duties include the setting of powered supports should ensure that they are set securely.

(2) When it appears that a powered support is defective, it should be reported forthwith to the supervisory official.

8.4.5. It should be the duty of a supervisory official, who becomes aware of a defective powered support, to have it repaired as soon as possible and to ensure that the roof at that place is effectively supported.

8.4.6. The provisions of the Support Rules relative to powered-support faces should specify the intervals between adjacent supports and should require that supports be advanced as soon as practicable after a web of coal of stated thickness has been taken by the power loader, so as to ensure that the area of unsupported newly exposed roof is kept to a minimum.

8.4.7. (1) Persons should not normally work on the face side of an armoured face conveyor.

(2) However, provisions should be included in the manager's Support Rules for the support of roof and sides during any period it becomes necessary for persons to work on the face side of an armoured face conveyor for whatever reason.

8.4.8. The system of work should be so organised and the equipment provided so designed and used that the need for persons to cross to the face side of the armoured conveyor is minimised.

8.5. Installation and withdrawal of powered supports

8.5.1. (1) In every mine where powered supports are used, it should be the duty of the manager to draw up a scheme for the installation of powered supports and a scheme for their withdrawal and transport.

(2) The scheme for the installation of powered supports should cover –

- (a) the method of transportation of the powered supports from the surface to the coal face where they are to be used, with special emphasis on the correct use of the safe-handling and lifting points;
- (b) the provision of suitable vehicles, purpose-built where necessary, for the transport of supports;
- (c) the provision of a suitable winch equipped with load-limitation facilities for hauling the powered supports along the face line;
- (d) the provision of haulage equipment of ample size, strength and design;
- (e) the method of supporting the face line during the installation of the powered supports.

(3) The scheme for the withdrawal and transportation of powered supports should cover –

- (a) the method of support of the face line during the withdrawal operation;

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- (b) the method of transportation of the powered supports from the face line to their new site;
- (c) further provisions similar to those of subparagraphs 8.5.1 (1) (b) to 8.5.1 (1) (d).

8.6. Provision of roof canopies or cabs

8.6.1. Where practicable, diesel-, battery- or mains-powered self-propelling machinery, including shuttle cars, used at or in the vicinity of the coal face, should be provided with roof canopies or cabs which give adequate protection against falls of ground from the roof or sides.

8.7. Precautions where falls of roof or side have occurred

8.7.1. (1) Where any fall of roof or side breaks or otherwise renders ineffective any support at any place where any person has to pass or work, it should be the duty of the supervisory official to ensure that any roof or side exposed or adjacent thereto is, if necessary, dressed and secured by supports.

(2) Such work should be done before any work of clearing debris is begun, except such work as is necessary for the setting of supports.

8.7.2. Where the above provisions cannot be observed, no persons should pass or work be done at that place except under the supervision of a supervisory official.

9. Ventilation and firedamp control

9.1. General provisions

9.1.1. All accessible parts of the mine should be constantly ventilated in a manner adequate to keep those parts in a fit state for persons to work in or pass through.

9.1.2. A place should not be considered to be in a fit state to work in or pass through if the air contains either less than 19 per cent of oxygen or more than the percentages of carbon dioxide and firedamp as specified in national laws or regulations.

9.1.3. National laws or regulations should also specify the maximum and minimum temperatures and other environmental conditions, as appropriate, under which work is allowed to proceed in any part of the mine.

9.1.4. Where there is evidence that the ventilation of any part of a mine needs to be improved, the competent authority should request the manager to effect such improvement.

9.1.5. (1) All airways should be of adequate dimensions for the quantity of air they are designed to pass.

(2) They should be systematically inspected and maintained in good condition.

9.1.6. (1) It should be the duty of the manager to ensure that in every mine there is a ventilation plan, kept up to date, which specifies –

- (a) the direction and distribution of the air current;
- (b) the position of the main doors, any booster and auxiliary fans, all air-measuring stations and air crossings;
- (c) any other information as may be required by the competent authority.

(2) It is also his duty to ensure that there is a ventilation development plan for each development district, showing –

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- (a) in the case of longwall working, the priority that must be given to the establishment of through ventilation before the main coal production operation is allowed to start;
- (b) in the case of bord and pillar workings, the maximum length of heading allowed to be driven before cross-cuts are made which provide through ventilation.

9.1.7. (1) Under the responsibility of the mine manager, a single authorised person should be appointed to take charge of the ventilation of a mine.

(2) In cases where the ventilation circuits of two or more mines are joined, one authorised person should be designated as being responsible, in so far as the joint circuits may be concerned.

9.1.8. (1) No change should be made in the general ventilation system except by order of the manager.

(2) This rule should not apply in a case of emergency, when the responsible supervisory official may take the necessary immediate action, and then report to the manager or other senior official.

9.1.9. (1) When major changes in the ventilation system are decided upon, it should be the duty of the manager to ensure that a ventilation plan is established which clearly shows the various stages of the change.

(2) The manager should take the necessary steps to ensure that all persons responsible for effecting the change thoroughly understand their duties in this respect.

9.1.10. (1) Unless, in all parts of the mine required to be constantly ventilated, there is provided, by natural means, ventilation to the standard required by this section, there should be provided and maintained at the surface of the mine a ventilating fan driven by mechanical power.

(2) Depending on the size of the mine, the competent authority should determine the need for a reserve ventilating fan available for immediate use.

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9.1.11. Whenever practicable the surface ventilating fan should be provided with –

- (a) an alternative source of power;
- (b) a water gauge;
- (c) either an automatic fan-speed indicator or an automatic ventilation-pressure indicator;
- (d) an efficient air lock;
- (e) a fan drift and fan housing, both of which are fireproof;
- (f) fireproof ducts and pressure-relief devices;
- (g) devices which enable the current of air to be reversed should this be necessary; such devices should be regularly tested as specified by the competent authority;
- (h) such other safety devices as may be prescribed by the competent authority.

9.1.12. (1) The surface ventilating fan should be in the charge of the engineer specified in paragraph 2.2.4, who should be responsible for its maintenance and examination at intervals which should be specified in national laws or regulations.

(2) A record should be kept of such examinations.

9.1.13. Where practicable, surface ventilating fans should be permanently fitted with such monitoring devices as will give an early warning of defective operation.

9.1.14. (1) Every unplanned stoppage of the surface ventilating fans should be reported immediately to the manager or his deputy who should take steps to ensure the safety of the persons below ground, including the return of persons into districts which had been evacuated.

(2) Unplanned stoppages in excess of 30 minutes should be reported to the competent authority.

9.1.15. Ventilation furnaces should be prohibited.

9.1.16. (1) Seals erected in cross-cuts between main intake and main return airways should be constructed in such a way

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that they will not be readily destroyed in the event of an explosion or fire.

(2) This rule should also apply to all main air crossings.

9.1.17. (1) Unless national laws or regulations allow otherwise, every road which connects a main intake to a main return or which, as regards any working face, connects the intake and return airways, should be provided with at least two suitable and properly maintained doors to minimise the leakage of air.

(2) Where this is not practicable, other suitable means of minimising air leakage should be provided.

9.1.18. (1) In any other road where it is necessary to prevent the short circuiting of the air current, there should be provided, and properly maintained, at least two doors.

(2) Where this is not practicable, at least one door and one or more sheets should be provided.

9.1.19. (1) Doors and sheets provided in compliance with the preceding rule should be so spaced that when one door or sheet is open the other can remain closed.

(2) Where this is not practicable, other measures to minimise the leakage of air through them should be taken.

9.1.20. Doors should be self-closing.

9.1.21. Any person who opens a door or sheet should ensure that such door or sheet is closed as soon as possible.

9.1.22. All ventilating sheets should be of fire-resistant material.

9.1.23. The use of open lights should be prohibited in all underground coal mines.

9.1.24. The use of open flames or arcs for welding, steel cutting or any other purpose should be permitted only under conditions which should be defined by the competent authority.

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9.1.25. (1) Where any workings are proceeding towards old workings which may contain accumulations of firedamp, the approach to the old workings should be done in accordance with a scheme prepared by the manager.

(2) A copy of the scheme should be sent to the competent authority, which should require amendments as necessary. (See also Chapter 14.)

9.2. Booster fan control

9.2.1. No fan should be installed below ground unless the manager is satisfied that it is necessary for the proper ventilation of the mine and that such a fan can be installed without detriment to the safety and health of the persons employed in that mine.

9.2.2. (1) No fan other than an auxiliary fan should be installed below ground unless a ventilation survey of every part of the mine likely to be affected by the booster fan installation has been carried out by a suitably qualified person.

(2) The aforementioned person should prepare a report which recommends the appropriate type, size and location of the proposed fan.

(3) A copy of the report, which should be up to date in relation to the commissioning of the fan, should be sent to the competent authority which may require amendments to the proposals.

9.2.3. The fitting of monitoring equipment is strongly recommended in the interests of safety and the efficient operation of the installation.

9.2.4. (1) It should be the duty of the manager of any mine where a booster fan is installed to formulate rules, known as Booster Fan Rules, which should control the fan's operation.

(2) Such rules should be prominently posted and should cover –

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- (a) the fireproof construction of the fan housing and of specified lengths of roadway on the intake and return sides of the fan;
- (b) the frequency of any examination and the arrangements for reporting any unusual circumstances or occurrence associated with the operation of the fan;
- (c) the arrangements for reporting any significant increase in the firedamp content of the air passing through the fan, and the action to be taken should the concentration rise to the limit specified by the manager;
- (d) a description of the monitoring equipment used on the installation;
- (e) the times when the booster fan may be stopped for the purposes of inspection or maintenance, and the action to be taken before, during and upon the restart of the fan;
- (f) the action to be taken in the event of an unplanned stoppage of the fan, including the effect on other booster or auxiliary fans installed in the mine;
- (g) where the mine is interconnected to another mine, the arrangements for notifying the management of that mine;
- (h) the names of persons authorised to stop, start or otherwise control the booster fan installation, except that, in an emergency, it should be the duty of any person to take appropriate action in the interests of the safety of the mine.

9.3. Auxiliary fan control

9.3.1. Only authorised persons should stop, start or otherwise control the operation of auxiliary fans installed below ground.

9.3.2. (1) Before an auxiliary fan is installed below ground, the manager of the mine must be satisfied that a

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sufficient quantity of air is reaching the fan to prevent recirculation of air.

(2) He must also be satisfied that this air is not unduly polluted by dust, smoke or noxious or flammable gases.

9.3.3. (1) Any auxiliary forcing fan should be installed on the intake side and any exhausting fan should be installed on the return side of the place to be ventilated so as to avoid recirculation of air.

(2) Every auxiliary fan should be connected with earth to prevent the accumulation of an electrostatic charge.

9.3.4. Each auxiliary fan should be equipped with an air duct which should be maintained in good condition and be capable of delivering the specified minimum quantity of air to the face of the working place.

9.3.5. (1) The manager of the mine should specify the minimum quantity of air to be delivered or exhausted at the end of the duct.

(2) He should also specify the intervals at which the air quantity should be measured.

9.3.6. A record should be kept of the aforementioned air-quantity measurements, and it should be the duty of the person making the measurements to comment in writing on any significant trend in the recorded data.

9.3.7. (1) Before two or more auxiliary fans are installed in any section of the mine, the manager should have prepared a plan showing the system of ventilation and the air quantities reaching each auxiliary fan installation.

(2) A copy of the plan should be sent in advance to the competent authority which may require amendments.

9.3.8. Where a place is provided with an auxiliary fan, no person should stay in that place when the fan is stopped, unless authorised to do so by a supervisory official.

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9.3.9. (1) It should be the duty of the manager of any mine where an auxiliary fan is installed to formulate rules, known as Auxiliary Fan Rules, which should control the operation of the auxiliary fan installation to which they refer.

(2) Such rules should be prominently posted and should specify –

- (a) the auxiliary ventilation system to be used when persons are at work in the heading and when the heading is unoccupied;
- (b) the ventilating equipment to be used;
- (c) the minimum quantity of air to be delivered to the face of the heading when persons are at work and when it is unoccupied;
- (d) the preparation, and posting at the entrance to the heading where it can be explained to the workers engaged in the heading, of a plan showing the changes, if any, which will occur in the system as the work progresses;
- (e) the continuous operation of the fan, except in the case of a planned stoppage for maintenance or inspection;
- (f) the arrangements, and the procedure to be carried out, when an unplanned stoppage of the fan occurs or any unusual circumstances arise concerning the operation of the system;
- (g) the method and type of fencing to be used when the auxiliary ventilation system fails, and it becomes necessary to temporarily close off the heading;
- (h) the method of recommissioning the system when there has been a stoppage, including the procedure to be adopted for the safe removal of gas which may have accumulated in dangerous quantity in the heading;
- (i) the specific intervals at which the system must be inspected by a competent person, and any monitoring equipment which may be used in the system.

9.3.10. For the purpose of dust control, or other purposes which are in the interests of safety and health, the competent authority may allow controlled recirculation of air under specified conditions.

9.4. Air measurements and firedamp determinations

9.4.1. (1) National laws or regulations should specify the intervals, places and manner in which air measurements and firedamp determinations should be taken.

(2) The locations at which sample and measurement taking is specified should include –

- (a) every main intake airway as near as practicable to the entrance to a shaft or outlet;
- (b) at every split where air leaves the main air current, as near as practicable to the junction;
- (c) where the split serves a working district, at a point –
 - (i) 50 m from the first working place at which the air enters;
 - (ii) 50 m from the last working place at which the air leaves the district;
- (d) in the district return airway as near as practicable to the junction with the main return airway;
- (e) such other points as may be required by the competent authority.

(3) Notwithstanding national laws or regulations, where the firedamp content of the mine air exceeds 1 per cent at any measuring place, air samples and air measurements should be taken daily at that place.

(4) In all other places, measurements and determinations should be made at intervals of not more than one month.

9.4.2. When changes are made in the direction, distribution or division of the air current, which substantially

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affect the air quantity entering or leaving a district, air measurements and firedamp determinations should be made as soon as practicable after the changes have taken effect.

9.4.3. (1) The results of the aforementioned air measurements and firedamp determinations should be entered in a book specially kept for this purpose by the competent person making the measurements and determinations.

(2) This person should comment upon and draw attention to any significant trends in the recorded data.

9.4.4. When firedamp concentrations are found to exceed those specified, national laws or regulations should state which levels are reportable to the competent authority and indicate the details that should be submitted.

9.4.5. (1) All detection and ventilation measures should be carried out by persons who have been trained and certified as competent.

(2) They should pay particular attention to those especially vulnerable places in a mine where the gas hazard tends to be greatest.

9.5. Withdrawal of persons from a mine or part of a mine endangered by firedamp

9.5.1. Except in the performance of work essential for the safety of the mine, or in the case of the rescue of persons in imminent danger, it should be prohibited to work, travel or remain in any part of a mine where, in the general body of the air, firedamp is detected at a concentration exceeding a figure to be specified in the national laws or regulations; this figure should not exceed 2.5 per cent.

9.5.2. If, in the case of rescue, imminent danger or essential work for dealing with the danger, it is necessary to work in places where there exists a dangerous accumulation of firedamp, the work should be done only –

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- (a) under the direct supervision of the manager or his deputy;
- (b) by specially trained miners;
- (c) under the supervision and in the continuous presence of a specially appointed supervisory official.

9.5.3. When circumstances arise as stated in this section, it should be the duty of the manager or other senior official of the mine to notify the competent authority which should take action appropriate to the circumstances.

9.5.4. (1) Places which have been evacuated on account of firedamp should be effectively fenced.

(2) Temporary idle workings also should be fenced.

9.5.5. No person should enter a fenced area except in the continuous presence of a specially appointed supervisory official.

9.5.6. Where persons have been withdrawn, general work should not be resumed except in accordance with procedures specified by the manager, which should be in accordance with any directives laid down by the competent authority.

9.6. Sudden outbursts of coal, firedamp or other harmful gases

9.6.1. (1) Where the danger of sudden outbursts of firedamp or other harmful gases exists, a properly designed scheme should be commissioned and carried out in conformity with requirements laid down by the competent authority.

(2) These requirements should stipulate, among other things, that –

- (a) the workings should be so planned that the return air from each working place flows direct into the return airway;
- (b) notwithstanding the requirements of subparagraph 19.4.3 (2), sufficient and suitable self-contained breathing apparatus should be immediately available at each working

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place for the use of each person to enable him to escape to a place of safety when an outburst of gas or coal occurs;

- (c) automatic warning systems and other means of communication should be installed, which will enable warning messages to be sent to other working places which may be endangered by an outburst of gas in a given area;
- (d) where practicable, gas monitoring equipment should be installed in each working place and should sound alarms when the percentage of firedamp or other noxious gas reaches a predetermined level;
- (e) it should be the duty of the manager of the mine to take the necessary measures to train all persons in the procedures to be adopted and in the use of the equipment available in places liable to sudden outbursts of gas;
- (f) adequate steps should be taken at the surface to prevent any firedamp issuing from the mine from igniting;
- (g) accumulations of firedamp, large or small, should not be dispersed by blowing compressed air.

9.7. Firedamp detectors

9.7.1. National laws or regulations should specify the number of firedamp detectors to be provided in each working district of a mine.

9.7.2. Firedamp detectors of a type approved by the competent authority should be used.

9.7.3. The approved firedamp detectors should be adjusted, maintained and tested in a manner specified in the relevant approval.

9.7.4. (1) Arrangements should be made to train sufficient persons to be competent in the correct use of the firedamp detectors.

(2) Where the firedamp detector is a flame safety lamp, the competence of the appointed person to recognise actual gas caps as they appear on the lowered flame of the lamp should be tested and certified in a register.

9.8. Firedamp drainage

9.8.1. Arrangements should be made to ensure that, before the drilling of any borehole required for the purpose of tapping firedamp and draining it through any firedamp drainage system, there is available a pipe range in which any firedamp which may be tapped can be collected and conveyed to a point where it may be discharged safely.

9.8.2. No person should drill any borehole unless, as soon as the depth of the borehole permits, the borehole is drilled through a device with which the borehole may be sealed in the event of a sudden flow of firedamp from it.

9.8.3. Before any person commences to bore any hole in stone, he should ensure that water is flowing through the drill rods and, after commencing to drill any such borehole and for as long as the rods continue to rotate, he should ensure that water continues to flow through the drill rods and is flowing out of the mouth of the borehole.

9.8.4. Arrangements should be made at each borehole to permit the measurement of the rate of gas flow together with the percentage of firedamp in that gas flow.

9.8.5. Each stand-pipe forming part of the firedamp drainage system should be so inserted and sealed in the borehole from which it leads that leakage of firedamp or air around the pipe is minimised.

9.8.6. No stand-pipe should be joined to a pipe range by other than a flexible connection.

9.8.7. Every firedamp range installed in a mine should be –

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- (a) so designed and constructed as to permit, at suitable places along its length, samples to be taken of firedamp flowing through it, and water to be drained from it;
- (b) adequately supported;
- (c) so painted that there is a yellow band (the international colour code for methane) near to every joint in the range and that the valves used in the range are also painted yellow.

9.8.8. When a pipe is to be connected to a firedamp drainage range, it should be done in such a way as to minimise the amount of air entering the range.

9.8.9. No exhaustor should be installed in a firedamp drainage system, unless –

- (a) it is of a type approved by the competent authority;
- (b) it is so constructed and installed that when the exhaustor is not working firedamp will not be able to flow through it in a reverse direction;
- (c) it and the system are so arranged that, when the exhaustor is not working, the firedamp may be caused to by-pass the exhaustor and allowed to flow freely through the system;
- (d) it is connected to earth in such a manner as will ensure immediate electrical discharge without danger.

9.8.10. Only suitably constructed buildings should be used to house surface exhaustors, and they should not be utilised for any other purpose.

9.8.11. All electrical apparatus used in conjunction with the exhaustor should be certified either as intrinsically safe or flameproof.

9.8.12. (1) Except where the calorimeter employed for monitoring firedamp uses a naked flame, no other lamp or light should be used in the exhaustor house unless it is a permitted light.

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(2) In addition each naked-light calorimeter should be installed in an enclosure which is ventilated separately from the calorimeter room.

9.8.13. The aforementioned enclosure should not be opened except by an authorised person who should satisfy himself that it is safe to do so.

9.8.14. (1) So far as is practicable, every place where firedamp is discharged should be kept free from anything likely to ignite firedamp.

(2) This should not apply to places where the firedamp is utilised.

9.8.15. Where firedamp is discharged into the atmosphere on the surface, such discharge points should be fitted with suitable flame traps to prevent flames entering the system.

9.8.16. National laws or regulations should fix the minimum percentage of firedamp by volume which should be fed into a utilisation plant.

9.8.17. (1) Where firedamp is discharged from a system below ground, this point should be surrounded by a fence of sufficient size to ensure that the percentage of firedamp in the air at the outside of the fence does not exceed the figure which should be fixed by national laws or regulations.

(2) This figure should not exceed 2.5 per cent.

9.8.18. Firedamp should not be discharged from any system into an intake airway.

9.8.19. Abandoned workings in which firedamp may accumulate should be dealt with in an appropriate manner to contain or eliminate any hazardous accumulation.

9.8.20. It should be the duty of the manager of every mine where a firedamp drainage system is installed to arrange for the training of a sufficient number of competent persons to be in charge of the system.

10. Precautions against flammable coal dust

10.1. General provisions

10.1.1. It should be the duty of the manager of every mine to ensure that all practicable measures are taken in the getting, transportation and preparation of minerals to minimise emission of flammable dust.

10.1.2. Where such dust is emitted into the mine atmosphere either below ground or on the surface, measures should be taken to ensure that the dust is trapped as near as possible to the point of origin.

10.1.3. Accumulations of flammable dust should be cleaned up and transported out of the mine or rendered harmless without delay.

10.1.4. (1) No plant for screening or sorting coal should be placed within 80 m of a downcast shaft, drift or adit unless national laws or regulations allow otherwise.

(2) In any event, the necessary measures should be taken to minimise the possibility of dust entering the downcast air stream.

10.1.5. Vehicles used for the transport of minerals should be maintained in good condition so as to minimise spillage.

10.1.6. Conveyor equipment should be so constructed that the risk of dust deposition is minimised.

10.2. Maintenance of safe, incombustible-dust conditions along mine roadways

10.2.1. National laws or regulations should state the minimum percentages of incombustible matter to be maintained on mine roadways.

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10.2.2. (1) National laws or regulations should specify the method and intervals at which the dust in mine roadways should be tested for incombustibility and fineness.

(2) A dust register should be used to record details of these tests, including the place and date of sampling, the amount of incombustible matter in the samples and the date of treatment of different sections of the roadways.

10.2.3. The maintenance of the specified standards of incombustible dust along roadways should be achieved by the spreading of stone dust or by any other means authorised by national laws or regulations or by the competent authority.

10.2.4. (1) The stone dust used for this purpose should be harmless to health.

(2) It should also possess the properties, degree of fineness and the dispersibility which should be specified in national laws or regulations.

(3) The intervals at which the stone dust must be tested for compliance with these requirements should also be specified.

10.2.5. Where deemed necessary, stone-dusting may be supplemented by the use of dust-consolidation materials which can be applied to the roadway to prevent dust rising into the ventilation current.

10.3. Means of arresting explosions

10.3.1. (1) National laws or regulations should specify the measures to be taken to arrest any explosion which may occur in a mine.

(2) Included in these measures should be the installation of stone-dust or water barriers.

10.3.2. (1) National laws or regulations should specify the places in a mine where barriers should be placed for the purpose of arresting and minimising the effect of an explosion.

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(2) For these purposes, national laws or regulations should specify maximum and minimum distances, from the first working place in any ventilating district, at which barriers should be maintained.

10.3.3. National laws or regulations should approve and specify the types of stone-dust or water barrier to be installed below ground.

10.3.4. (1) The manager of every mine should prepare an explosion-barrier scheme for the mine, which complies with national laws and regulations regarding barriers.

(2) This scheme should include the installation of barriers in roadways where coal is transported and in any other roadways where the manager may determine that flame is likely to extend.

10.3.5. The position of all barriers should be shown on the ventilation and rescue plans.

10.3.6. Barriers should be maintained with a sufficient quantity of suitable dust or water, and with enough clearance between the roof and sides of the roadway to allow them to operate efficiently.

10.3.7. Nothing in this Code should prevent the use of triggered barriers in conditions to be agreed among management, workers and the competent authority.

10.3.8. Relevant information regarding the movement and maintenance of barriers should be kept in the dust register required by subparagraph 10.2.2 (2).

11. Precautions against respirable dust

11.1. Prevention and suppression of respirable dust

11.1.1. (1) It should be the duty of the manager of every mine to establish a scheme which provides apparatus and other equipment to minimise emissions of dust and to suppress dust which enters the mine air.

(2) Every such scheme should cover –

- (a) the apparatus and equipment to be provided;
- (b) the systematic examination and testing of the apparatus and equipment so as to ensure its correct maintenance and efficient operation;
- (c) the appointment of a properly trained and competent person to be in charge of the scheme.

11.1.2. No person should use any machinery or equipment unless it is equipped with the dust prevention and suppression devices as specified in subparagraph 11.1.1 (1).

11.1.3. No person should tamper with, remove or otherwise interfere with any dust prevention or suppression devices unless authorised to do so by the manager of the mine.

11.2. Sampling of respirable dust

11.2.1. (1) It should be the duty of the manager of every mine to establish a scheme for the sampling of the air in relation to the mining operations.

(2) Each sample taken should be representative of the general body of air in the vicinity of the mining operation being sampled or may, where applicable, be made by a method of personal sampling.

(3) The sample should also be taken throughout the shift during which the operation is in progress.

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(4) The intervals at which samples are taken should be related to the method of coalgetting but should not exceed three months.

(5) Dust determination should be carried out at a properly equipped laboratory, approved by the competent authority, as soon as practicable after receipt of the sample.

(6) The scheme must also cover –

- (a) the sampling equipment to be provided, which should be of a type approved by the competent authority;
- (b) the positions and frequency at which the samples must be taken in relation to the method of coalgetting;
- (c) the arrangements for determining the respirable-dust and quartz content of the sample;
- (d) the arrangements for the systematic examination and testing of the sampling equipment so as to ensure its efficient maintenance and operation;
- (e) the training and appointment of sufficient competent persons to operate the scheme efficiently.

11.3. Allowable maximum respirable dust concentrations

11.3.1. (1) National laws or regulations should specify the allowable maximum dust concentration in a working place.

(2) Such concentrations should be specified after taking into account modern technology and scientific and medical research.

(3) The specified standards should be kept under review in consultation with representatives of employers' and workers' organisations.

11.3.2. In any mining operation where it is established through sampling that the dust concentrations exceed the allowable maximum concentrations, measures should be instituted to ensure that the required limits are complied with.

11.4. Provision of dust respirators

11.4.1. (1) There should be provided, as a secondary means of protection at every mine, sufficient dust respirators of a type approved by the competent authority for the use of persons engaged in the mining operations.

(2) Such protection should be provided at no cost to the persons employed.

11.4.2. These dust respirators should be kept clean and maintained in efficient working order.

11.4.3. Proper fitting of respirators and thorough training in the use of respirators should be provided for each employee requiring the use of respirators.

11.5. Medical supervision

11.5.1. (1) It should be the duty of the operator of the mine to prepare a scheme for the adequate medical supervision of the persons employed at the mine.

(2) The scheme should also provide for a period of recuperation and convalescence, where necessary.

(3) In particular, the scheme should specify the arrangements for chest radiography.

(4) In the evaluation of chest radiographs, reference should be made to the standard films of the International Classification of Radiographs of the Pneumoconioses of the ILO, and the ILO guide-lines for their use.

11.5.2. Such medical supervision and recuperation should be provided at no cost to the persons employed.

11.6. Provision for small mines

11.6.1. (1) Where individual small mines are unable to provide the dust sampling equipment and laboratory facilities

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recommended by this code, they may make arrangements with a large mine, or may pool resources with other small mines in order to comply with these requirements.

(2) Alternatively, such facilities may be provided by the competent authority.

12. Miners' lamps, flame safety lamps and general lighting

12.1. Miners' lamps

12.1.1. Only safety lamps approved by the competent authority and provided by the mine operator should be used.

12.1.2. In all mines, all lamps should be numbered.

12.1.3. In all mines, all lamps should be maintained constantly in good condition by authorised, competent persons.

12.1.4. Every person who receives a lamp should –

- (a) as far as is practicable, satisfy himself that it is complete and in good order;
- (b) refuse any lamp that does not fulfil these conditions;
- (c) handle the lamp carefully;
- (d) report any damage to the lamp to the person in charge of the lamp room, who should keep a record of all damaged lamps;
- (e) report the circumstances if he returns to the lamp room a lamp other than the one he took out;
- (f) not attempt to open a safety lamp whilst below ground;
- (g) not attempt to relight a flame safety lamp provided with an internal relighter if there is any uncertainty as to the presence of firedamp or the safe condition of the lamp;
- (h) not place a flame safety lamp in a ventilation duct.

12.1.5. The relighting of flame safety lamps should be done only in conformity with the provisions laid down in national laws or regulations or by the competent authority.

12.1.6. All lamps should be serviced in a special “lamp room”.

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12.1.7. Lamps should be cleaned, fitted and refilled in a room separated from the place where the fuel is stored.

12.1.8. (1) Stoves, open lights and smoking should be prohibited in a lamp room where flame safety lamps are being handled.

(2) This prohibition should be posted at the entrance to the lamp room.

12.1.9. No unauthorised person should enter the lamp room.

12.1.10. The lamp room should be equipped with an adequate number of fire extinguishers.

12.1.11. It should be the duty of the authorised competent persons in charge of the lamp room to keep a record of –

(a) the name of every person who has gone into the mine;

(b) the number of the lamp handed to that person.

12.2. Maintenance of lighting performance

12.2.1. National laws or regulations should specify the minimum lighting performance of all lamps used below ground and the manner in which the lamps should be tested to ensure that they comply with the prescribed standards.

12.2.2. It should be the duty of the manager of every mine to take such measures as are necessary to ensure that the specified minimum lighting performance is achieved and that all lamps are maintained in good condition.

12.3. Provision of general lighting

12.3.1. (1) National laws or regulations should specify the places below ground at which suitable and sufficient general lighting should be provided.

(2) These specified places should include –

- (a) the entrance to each shaft or outlet, together with the sidings associated therewith;
- (b) every siding, pass-by and junction, every place where vehicles are regularly coupled or uncoupled or regularly attached or detached from a haulage system, and every place where vehicles are filled mechanically;
- (c) every room or place which houses any machine or motor;
- (d) any other place specified by the competent authority.

12.3.2. The requirements specified in paragraph 12.3.1 are in addition to those stated in paragraph 7.3.6.

12.3.3. The lighting provided should be so installed as to minimise glare or eye strain.

12.4. Provision of coal-face mains lighting

12.4.1. National laws or regulations should specify the conditions under which coal face mains lighting may be provided by means of approved equipment.

12.5. Places which should be whitewashed

12.5.1. (1) National laws or regulations should specify the places below ground which should be whitewashed.

(2) These places should include –

- (a) the entrances to each shaft or outlet, and the associated sidings which are regularly used;
- (b) every siding, pass-by and junction, every place where vehicles are regularly coupled or uncoupled or regularly attached or detached from a haulage system, and every place where vehicles are regularly filled mechanically;
- (c) every room or place which houses any machine, motor, electrical transformer or switchgear.

13. Mine fires ¹

13.1. General provisions

13.1.1. It should be the duty of the mine operator and of the mine manager to plan, equip and work the mine so as to minimise the risk of fire.

13.1.2. (1) The mine operator should provide a self-rescuer of an approved type for all persons permitted to be below ground at the mine.

(2) The manager should ensure that there is in force a scheme for using such devices and maintaining them in suitable condition.

13.1.3. As far as is practicable, in all new mines there should be provided two main intake airways so separated that, if one becomes contaminated with the products of a fire, the other is clear for a safe means of escape from the mine for the persons below ground.

13.1.4. In all mines where two main intake airways are not provided, the one main intake should, as far as is practicable, be so constructed and equipped that it is free from the risk of fire.

13.1.5. All conveyor belting, sheeting and brattice should be of a fire-resistant type and approved by the competent authority.

13.1.6. Unless exempt by virtue of national laws or regulations on the grounds of natural conditions or size, every mine should be equipped with a water mains circuit capable of delivering to all working places an adequate quantity of water at sufficient flow pressure for the purpose of efficient fire fighting.

13.1.7. The manager of every mine should draw up a plan and should enforce rules for the organisation and conduct of fire-fighting work and of fire drills.

13.1.8. As far as is practicable, the hydraulic fluid used in machinery should be fire-resistant.

13.2. Fireproof construction

13.2.1. All shaft linings in new installations should be made fireproof as far as reasonably practicable.

13.2.2. The head frame and pit-head buildings should not be made of wood.

13.2.3. (1) Haulage rooms, engine rooms and workshops underground, together with their equipment, should be constructed in a fireproof manner.

(2) Such places should be provided with a second exit to minimise the risk of being trapped by fire.

13.3. Fire-fighting equipment

13.3.1. (1) In addition to the water mains required by paragraph 13.1.6, special places of risk specified by the manager should be provided with suitable fire extinguishers, sand or stone dust.

(2) These specified places should include –

- (a) all parts of the mine where flammable material is stored;
- (b) all driving units of roadway conveyors;
- (c) all electrical gear;
- (d) all coalgetting machines, heading machines and tunnelling machines;
- (e) all diesel maintenance workshops and filling stations.

13.3.2. Where the risk of frictional ignition is high, coalgetting machines, heading machines and tunnelling machines should, where practicable, be provided with automatically operated fire extinguishers.

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13.3.3. (1) Fire extinguishers should be examined, and discharged and refilled as often as may be necessary to ensure that they are kept in good working order.

(2) A record should be kept of each refilling.

13.3.4. Fire extinguishers which are liable to give off poisonous or noxious fumes or gases, or give rise to an oxygen deficiency, should not be provided or used underground.

13.3.5. (1) At least once a month, or at shorter intervals if specified by national laws or regulations, all the equipment and material provided for fire fighting should be examined by a competent person, appointed by the manager.

(2) A report of each examination should be made by the competent person and any deficiencies remedied.

13.3.6. Stations with a suitable supply of fire-fighting equipment should be established at convenient points both on the surface and underground.

13.4. Storage of flammable materials

13.4.1. Stocks of combustible or flammable material should not be stored in the vicinity of any shaft or outlet.

13.4.2. No oil, grease, canvas or other highly flammable material should be stored underground except in a fireproof receptacle or chamber, and only in limited quantities.

13.4.3. In underground workshops, engine rooms, motor rooms or transformer houses, greasy or oily waste should be placed in closed metal receptacles and regularly removed from the mine.

13.4.4. At all places where combustible material may accumulate, the ventilation should be so arranged that, as far as practicable, the products of combustion from any fire which may occur will be coursed directly into the return airway.

13.5. Precautions against spontaneous combustion of coal

13.5.1. (1) In mines subject to spontaneous combustion, the manager should draw up a scheme of precautions to be taken at the mines in order to minimise the risk of spontaneous combustion of coal.

(2) The scheme should include –

- (a) the methods of working the coal seam, bearing in mind the need for the minimum number of entries to a district so as to facilitate its effective sealing;
- (b) the position of adequate supplies of suitable materials for seals;
- (c) the position of all fire-fighting equipment;
- (d) site preparations for establishing seals or stoppings underground;
- (e) the manner in which seals – where practicable, of the pressure-control type – or stoppings should be built to avoid the risk of leakage of atmosphere into or out of the sealed area.

13.5.2. Special inspections should be carried out regularly, especially following idle days, before work is resumed.

13.5.3. (1) Where practicable, continuous monitoring of the mine atmosphere should be done at strategic places.

(2) The information should be communicated to a control room on the surface of the mine.

(3) The person in charge of the control room at the time should notify the management of any significant change in the content of the mine atmosphere being monitored.

13.6. Procedure in case of fire

13.6.1. Each mine should draw up an emergency procedure to be adopted in case of outbreak of fire.

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13.6.2. Where any smoke or other sign is noticed which indicates that a fire may have broken out below ground, the person who notices it should warn the nearest supervisory official as soon as possible.

13.6.3. (1) When any fire occurs below ground, the person who notices it should, if possible, try to extinguish it and warn the nearest supervisory official as soon as possible.

(2) The competent authority should be notified without delay.

13.6.4. Suitable precautions should be taken to prevent danger to persons from any noxious, asphyxiating or flammable gases or smoke emanating from any fire.

13.6.5. (1) All persons, except those directed by the manager or other supervisory official of the mine to stay for the purpose of dealing with the emergency, should be withdrawn without delay from all workings likely to be affected by fire or smoke.

(2) Thereafter only specially authorised persons should enter the mine.

13.6.6. Where reasonably practicable, all accessible parts of the mine contiguous to the fire should be treated with stone dust or in some other way designed to prevent the spread of fire.

13.6.7. (1) When sealing operations become necessary, all parts of the mine should be deemed to be affected.

(2) Only persons engaged in the sealing operations should be permitted below ground until the mine has been declared safe.

13.6.8. (1) Where seals are erected to contain the fire, provision should be made for sampling the atmosphere from behind them.

(2) Where practicable, provision should also be made for use of the pressure-control technique as stated in subparagraph 13.5.1 (2) (e).

13.7. Procedure for reopening districts which have been sealed

13.7.1. Before any seals are reopened, the competent authority should be notified and the plan for reopening agreed.

13.7.2. The reopening of districts which have been sealed should be permitted only when it has been established, by means of samples and other relevant data, that the fire has been extinguished and that the temperatures behind the seals are not likely to cause a resurgence of the fire when the seals are opened.

¹ Appendix B contains a list of publications on the prevention and control of mine fires that may be consulted to supplement the provisions of Chapter 13, "Mine fires".

14. Precautions against intrushes of water, gas or other material which flows when wet

14.1. General provisions

14.1.1. (1) It should be the duty of every mine operator and mine manager to acquire and record on the mine plans all useful information concerning the position, extent and depth of:

- (a) old workings whether mine workings or not;
- (b) water-bearing strata;
- (c) any peat, moss, sand, gravel, silt or other material which flows when wet and which may exist in or near their mines.

(2) The mine operator and mine manager should inform each other of all available and relevant findings made and the actions each has taken in this respect.

14.1.2. When the existence of the aforementioned features near to the mine workings has been established, it should be the duty of the manager to prepare a scheme of working designed to prevent an intrush of water, other material or gas.

14.1.3. (1) A copy of the scheme should be sent to the competent authority before the scheme is put into operation.

(2) A copy should also be posted in accordance with section 4.2.

14.1.4. The period of advance notice of the scheme should be specified by the competent authority which should have the duty of examining it and requiring any amendments which appear to it to be necessary in the interests of safety.

Precautions against intrushes of material which flows when wet

14.2. Working under the sea or other body of water

14.2.1. Where mine workings are being carried out, or proposed to be carried out, in the vicinity of the sea, a lake, river or other body of water, each mine operator and each mine manager should have the duty to ascertain –

- (a) the total thickness of strata between the mine workings and the surface water;
- (b) the nature of such strata with respect to their strength, water bearing characteristics, the presence or absence of geological faults and any other feature which may be relevant to prevent an intrush of water or other material which flows when wet.

14.2.2. The mine operator and the mine manager should each inform the other of all findings made and all actions taken in this respect.

14.2.3. (1) The mine manager should prepare a scheme to prevent an intrush of water or other material into the mine.

(2) A copy of the scheme should be sent to the competent authority in advance of its being put into operation.

(3) The period of advance notice of the scheme should be specified by the competent authority which should have the duty of examining the scheme and specifying any amendments which appear to be necessary in the interests of safety.

14.3. Precautions where salt deposits are present

14.3.1. Boreholes from the surface in areas underlain by coal measures situated at workable depths, even if they have not reached the coal measures, should be so filled before abandonment that no water can penetrate through them into the coal measures.

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14.3.2. In areas where salt deposits overlie coal measures situated at workable depths, the salt should not be worked by solution from boreholes.

14.3.3. Where, in any mine, water encountered has been observed to give off hydrogen sulphide (H_2S), special precautions should be taken against poisonous gases when draining or otherwise dealing with such water.

15. Electricity

15.1. General provisions

15.1.1. Electrical equipment should be installed in any mine or part of a mine only in so far as is allowed under the regulations in force at the time and in the conditions laid down therein.

15.1.2. Where electricity is used at a mine, the mine operator should have the responsibility of –

- (a) appointing an electrical engineer as defined in paragraph 2.2.4;
- (b) providing an adequate number of competent electricians to fulfil the requirements of this chapter;
- (c) making financial provision for training an adequate number of persons properly to fulfil the requirements of this chapter;
- (d) providing adequate training facilities for the persons engaged in fulfilling the requirements of this chapter.

15.1.3. (1) Small mines (as defined by national laws or regulations) which do not, as individual mines, have sufficient resources to fulfil the requirements of this chapter should pool their resources with other mines, or make such appropriate arrangements as to be able to comply with the relevant requirements.

(2) Notwithstanding the requirements of subparagraph 15.1.3 (1), any mine using electricity should employ a competent electrician, regardless of the horsepower installed in the mine.

15.1.4. (1) It should be the duty of the manager of every mine to ensure that the engineer appointed under paragraph 2.2.4 prepares and implements a scheme with respect to the installation, re-installation and use of the electrical apparatus at the mine.

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(2) This scheme should cover:

- (a) the examination and testing of all electrical equipment before it is energised after installation or re-installation, as the case may be;
- (b) the systematic examination and testing of all electrical apparatus at the mine to ensure proper maintenance thereof;
- (c) the intervals, which may differ for parts of apparatus, within which all electrical apparatus must be examined and tested;
- (d) the nature of the examination and testing to be carried out;
- (e) a system to ensure the safety of persons working on electrical apparatus or systems;
- (f) the registration of installations and the recording of the results of examinations and tests.

15.1.5. National laws or regulations should specify the qualifications and experience required of electrical workers.

15.1.6. Properly constructed switchgear for cutting off the entire supply of current to the mine should be provided at the surface of the mine and should be connected directly with the main substation below ground.

15.1.7. During the time any conductor is live, a person authorised to operate the said switchgear should be available within reach thereof.

15.1.8. Efficient means, suitably placed, should be provided for cutting off all current from every electrical circuit in the mine as may be necessary to prevent danger.

15.1.9. No person, except a qualified engineer/electrician or a competent person acting under his supervision, should undertake any electrical work where technical knowledge or experience is required.

15.1.10. Only appropriately marked, approved or permitted electrical apparatus suitable for the purpose should be used.

15.1.11. (1) A schematic diagram showing the position of all equipment at the mine should be kept at the office.

(2) This plan should be kept up to date at all times.

15.1.12. At places where electrical apparatus is installed, the following notices should be kept posted where they can be easily seen and read:

- (a) a notice prohibiting any unauthorised person from handling or interfering with apparatus;
- (b) a notice containing directions as to the procedure in case of fire;
- (c) a notice containing instructions on how to communicate with the person appointed to cut off the electric power on the surface of the mine;
- (d) a notice containing directions as to the rescue and first aid of persons suffering from electric shock or burns.

15.2. Electrical systems

15.2.1. National laws and regulations should specify the voltages at which electrical power is to be transmitted and used.

Insulation

15.2.2. All insulating material should be suitable for the purpose for which it is to be used.

15.2.3. All parts of underground electrical systems should normally be kept efficiently insulated from earth.

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Earthing systems

15.2.4. Where any point of an underground system is earthed it should be earthed by connection to an earthing system at the surface of the mine, unless national laws or regulations permit another equivalent earthing system.

15.2.5. All earthing conductors should be electrically continuous throughout, and in efficient electrical connection with earth and with the apparatus that they are intended to earth.

Overload and short-circuit protection

15.2.6. 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.

Transformers

15.2.7. The places where transformers are installed should be adequately ventilated so that the heat generated by them is efficiently dissipated.

15.2.8. (1) When oil-filled transformers are in use, they should be installed in fireproof places and be equipped with suitable fire protection devices.

(2) Oil-filled transformers should be phased out of use as soon as may be practicable.

Switchgear

15.2.9. Switchgear should be designed so that it cannot be closed accidentally by gravity, impact or any other cause.

15.2.10. Switchgear should be provided with no-volt or under-volt protection to avoid inadvertent or uncontrolled restarting of machines.

15.2.11. All high-voltage switchgear containing oil or polychlorinated biphenyls (PCB) should be phased out as soon as may be practicable.

15.2.12. Where switchgear can be electrically charged from duplicate sources of supply, means should be provided to isolate the switches from both sources.

Conductors

15.2.13. The types of conductors that may be used and the conditions in which they may be used should be specified in national laws or regulations.

15.2.14. Flexible cables used with hand-held, portable or transportable apparatus should be of the multi-core type and should comprise an earthing conductor of adequate cross-sectional area and conductance.

15.2.15. At every point where any flexible cable is joined to main cables, a switch should be provided to cut off the current from the flexible cable.

15.2.16. Cables to be installed in shafts should be of the appropriate type.

15.2.17. Shaft and slope cables, the conductors or coverings of which are not capable of sustaining their own weight, should be secured at suitable intervals by adequate supports.

15.3. Additional precautions against firedamp or coal-dust explosions

15.3.1. If the firedamp content of the general body of the air in any place or area exceeds a percentage to be determined by national laws or regulations, the current –

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- (a) should be immediately cut off from all conductors and apparatus affected, except that which may be monitoring the mine atmosphere and is intrinsically safe;
- (b) should not be switched on again so long as the said percentage remains;
- (c) should be reintroduced only under the direction of the official in charge of that part of the mine, after he has deemed it safe to do so.

15.3.2. Flameproof apparatus should not be altered or changed in any way that would impair its efficiency and safety.

15.4. Operating regulations

15.4.1. The current should always be cut off from all conductors and apparatus which are not in use.

15.4.2. No unauthorised person should enter a substation or transformer room or interfere with the working of any apparatus connected therein.

15.4.3. No work should be done on any live conductor or live part of apparatus.

15.4.4. When work is being done on apparatus or conductors, special care should be taken in accordance with national laws and regulations to ensure that they remain de-energised.

15.5. Additional measures

15.5.1. The competent authority may require other additional measures in the interests of safety.

16. Machinery and plant

16.1. General provisions

16.1.1. All machinery and plant used in connection with the working of the mine should be of good design, sound construction, suitable material, adequate strength, free from patent defect and properly maintained.

16.1.2. The mine operator should have the duty of –

- (a) making financial provision for the training of an adequate number of persons to fulfil properly the requirements of this chapter;
- (b) providing adequate training facilities for the persons engaged in fulfilling the requirements of this chapter.

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

6.1.4. (1) It should be the duty of the manager of every mine to ensure that the engineer appointed under paragraph 2.3.5 prepares and implements a scheme with respect to the mechanical apparatus at a mine.

(2) This scheme should cover –

- (a) the systematic examination and testing of all mechanical apparatus at the mine to ensure proper maintenance thereof;
- (b) the intervals, which may differ from part to part of apparatus, at which all mechanical apparatus should be examined and tested;
- (c) the nature of the examination and testing which should be carried out;

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- (d) the examination and testing which should be carried out consequent upon the re-erection of all mechanical apparatus;
- (e) the method and manner by which mechanical apparatus should be dismantled;
- (f) a system to ensure the safety of persons working on mechanical apparatus;
- (g) the manner in which the records of examination and testing should be kept.

(3) 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 mechanical apparatus.

16.1.5. The mechanical apparatus at every mine should be in the charge of a qualified mechanical engineer appointed under the terms of paragraph 2.2.4.

16.1.6. National laws or regulations should specify the qualifications and experience required of the mechanical engineer in charge and of the staff who operate under his direction.

16.1.7. No person except a qualified engineer/mechanic, or a competent person acting under his supervision, should undertake any work on machinery and plants where technical knowledge or experience is required.

16.1.8. A sufficient number of qualified persons for the proper performance of the duties required by this chapter should be appointed by the manager.

16.2. Fencing of machinery

16.2.1. All flywheels, gears, belts and other moving parts of machinery and plant at a mine, which are liable to cause injury should be kept securely fenced.

16.2.2. It should be the duty of supervisory officials and other authorised persons to keep all fences properly maintained, in good condition and in the correct position.

16.2.3. If persons passing or handling machinery at points distant from the driving engine or motor can be endangered thereby, effective signals or other 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.

16.3. Internal combustion engines

16.3.1. (1) All internal combustion engines used underground should be of a type approved by the competent authority.

(2) The provisions of section 7.8 should be taken into account in this context.

16.4. Boiler and steam plant

16.4.1. No steam boiler or other steam-raising plant should be installed underground.

16.4.2. Paragraph 16.4.1 should not apply to approved devices for vulcanising or other purposes, approved by the competent authority.

16.4.3. Every boiler installed on the surface of the mine, whether separate or part of a range, should be provided with –

- (a) a suitable safety valve;
- (b) a suitable steam gauge and a suitable water gauge to show respectively the pressure of steam and the height of the water in that boiler;
- (c) an effective guard or other protection for the gauges provided on each boiler.

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

16.4.5. Each boiler attendant should receive adequate instruction and training for the duties he has to perform.

16.4.6. The cleaning and maintenance of every steam boiler should be specified in the scheme required by paragraph 16.1.4.

16.5. Compressed-air equipment

16.5.1. Any compressor that compresses air, used underground in the mine, should be so designed, constructed, operated and maintained that:

- (a) air entering the compressor is as dry, clean and cool as practicable;
- (b) the maximum temperature of the air in the compressor is at least 30° C below the flash-point of the compressor lubricating oil;
- (c) 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;
- (d) the compressed air flowing in the pipe range to the top of the shaft is as dry and cool as practicable.

16.5.2. Only high-quality mineral oil or suitable synthetic oil, having a flash point to be specified by the competent authority, should be used for lubricating the compressor.

16.5.3. Unless the lubricating oil is certified by the manufacturer, to ensure that the requirements of paragraph 16.5.2 are met, tests should be made of the flash point of –

- (a) all fresh supplies of oil;
- (b) the oil in the compressor, as often as is necessary.

16.5.4. The manager's scheme of maintenance required by paragraph 16.1.4 should cover all aspects of compressed-air equipment.

16.5.5. (1) All receivers containing compressed air for use underground should comply with the requirements of the competent authority.

(2) They should be kept clean and free from carbonised oil or other material liable to ignition.

(3) They should be opened and examined at intervals not exceeding three months.

16.6. Cranes and lifting gear

16.6.1. Every crane, crab and winch used at a mine should have the safe working load or loads clearly marked on it.

16.6.2. Where a jib crane is so constructed that the safe working load may be varied by raising or lowering the jib, the crane should be fitted with an automatic load indicator showing the safe working load.

16.6.3. (1) No person should load any crane, crab or winch in excess of the safe working load except for the purpose of a test.

(2) This test should be carried out by an authorised person in an approved manner.

16.6.4. (1) Only equipment capable of supporting the effective load should be used.

(2) It should be the duty of the mine operator to ensure that equipment made available is appropriately and clearly marked.

17. Explosives and shotfiring

17.1. General provisions for explosives

17.1.1. On the surface of a mine, all explosives and detonators should be stored in a magazine constructed and situated in such a way as to ensure their security and safety in accordance with national laws or regulations.

17.1.2. Only explosives and detonators approved by the competent authority and provided by the mine operator should be taken into or used in a mine.

17.1.3. The delivery, conveyance, storage, issue and return of explosives should be effected by specially trained persons authorised by the manager.

17.1.4. Possession and use of explosives and detonators by persons other than those authorised by the manager should be prohibited.

17.1.5. (1) Frozen or deteriorated explosives should not be taken into the mine.

(2) If found underground, such explosives should be brought to the surface.

(3) On the surface, frozen explosives should be thawed with due precautions, and deteriorated explosives should be destroyed under the supervision of a competent person.

17.1.6. The competent authority should issue rules regarding –

- (a) classification of explosives for safety purposes;
- (b) rules to be complied with by explosives manufacturers as regards cartridging;
- (c) particulars to be marked on cartridges;
- (d) substances and appliances designed to produce a similar effect to that of explosives.

17.2. Conveyance of explosives and detonators to the magazine

17.2.1. When delivered to the mine, explosives and detonators should be immediately conveyed in a safe manner to an explosive store under the supervision of an authorised person.

17.2.2. Detonators should not be conveyed together with other explosives in the same container.

17.2.3. (1) In any mine where large quantities of explosives are transported and stored below ground, it should be the duty of the manager of the mine to prepare a scheme which deals with the handling, transport and storage of such explosives.

(2) This scheme should include provisions concerning –

- (a) the location, construction, ventilation and marking of each underground reserve station, and the names of the persons who have custody of the keys thereof;
- (b) the design and construction of the special carriage for the explosives;
- (c) the supervision of and the precautions to be taken during the transit of the carriage;
- (d) the supervision of the explosives held in the underground reserve station;
- (e) the manner in which large quantities of explosives are taken to any working face;
- (f) the maximum quantity of explosives to be stored in the underground reserve station at one time;
- (g) the control of the issue of explosives from the underground reserve station, and the return of such explosives;
- (h) the duties of the persons in charge of the underground reserve station in ensuring security and safety;
- (i) the precautions to be taken in case of fire or explosion.

17.3. Issue, return and recording of explosives and detonators

17.3.1. Explosives and detonators should be issued in the place and in the manner designated by the manager.

17.3.2. Each type of explosive should, as far as possible, be issued in the same chronological order in which it was delivered to the mine.

17.3.3. Explosives should be issued only to persons authorised to receive them, and detonators should be issued only to persons authorised to fire shots.

17.3.4. Except where permitted under 17.4.3, all such authorised persons should, at the end of the shift, return all unused explosive to the place of issue and, except where an automatic receiving device is in operation at the place of issue, personally hand the explosives over to the person responsible for collecting them.

17.3.5. Admittance to explosives stores of any person not authorised by the manager should be prohibited.

17.3.6. National laws or regulations should –

- (a) limit the quantity of explosive issued to any one person;
- (b) limit the total quantity issued to the requirements of the shift.

17.3.7. For sinking shafts and for driving surface or other drifts, and except where national laws or regulations or the competent authority permit otherwise –

- (a) the explosives issued should be carried only by authorised persons and only in adequate, closed canisters provided by the mine operator;
- (b) the maximum quantity of explosive to be placed in any one canister should be specified by national laws or regulations;

- (c) explosives canisters should be equipped with locks, and each canister containing explosives should be kept locked until the explosive is required for use or for checking;
- (d) detonator cases should be equipped with a lock and constructed of substantial, non-conducting material in such a way that, when they are closed, it should be impossible for any detonator or the leads of any detonator contained in the case to touch any metal part exposed outside the case;
- (e) delay detonators should be kept in a separate detonator case, and should not be placed in a case containing an instantaneous detonator;
- (f) each delay detonator placed in a case should be clearly marked by a number which indicates the period of delay; national laws or regulations should specify the maximum period of delay for detonators of that type.

17.3.8. The competent authority should issue rules covering the conveyance of explosives in trolley locomotive haulages.

17.3.9. Each person to whom a detonator case has been issued should:

- (a) retain the key of the case in his possession during the time of the shift;
- (b) ensure that only detonators and a check sheet are kept in the case;
- (c) keep the detonator case separate from any canister containing explosive;
- (d) keep the case on his person or, if this is not practicable, keep the case in a securely locked receptacle which does not contain any explosives.

17.3.10. Except where permitted for sinking shafts, or driving surface or other drifts, no shotfirer should remove a detonator from the case unless it is required immediately for charging a shothole.

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17.3.11. (1) A register of a type specified by the competent authority should be kept for each explosives store, and should contain particulars, including the names or the identification numbers of the persons concerned, of the delivery, issue and return of explosives.

(2) The delivery, issue and return of explosives should be immediately entered in the register.

(3) The return of any unused explosive deposited in the automatic devices referred to in paragraph 17.3.4 should be recorded before the next distribution begins.

(4) The register should be balanced daily, compared with stock, and signed by the responsible person in charge of the magazine.

17.3.12. If any explosive is missing, the manager should be immediately informed.

17.3.13. No person should take away any explosive from a mine.

17.3.14. The requirements of paragraphs 17.3.11 to 17.3.13 should also apply to detonators.

17.4. Keeping of explosives during the shift

17.4.1. Shotfirers who are appointed for a number of workplaces, and who carry their own explosives, should keep the reserve of explosives in a special chest that should be kept securely locked.

17.4.2. Tools should not be placed in the aforementioned special chest.

17.4.3. Where permitted by the competent authority, explosives in the care of a shotfirer at the end of a shift may be handed over to an authorised shotfirer on the oncoming shift, together with the key to the explosives chest, providing the

exchange of explosives is noted in detail in the register required by virtue of paragraph 17.3.11.

17.5. General provisions for shotfiring

17.5.1. National laws or regulations should specify the restrictions governing shotfiring in coal mines.

17.5.2. (1) National laws or regulations should specify the training, qualifications and experience of shotfirers in coal mines.

(2) None but such persons should be authorised by the manager of a mine to fire shots, except trainee shotfirers under instruction.

17.5.3. (1) Each shotfirer should keep a register of the shots fired.

(2) The register should be balanced and signed by the shotfirer at the end of each shift.

17.6. Equipment of a shotfirer

17.6.1. (1) It should be the duty of the mine operator to provide shotfirers with all the equipment they require for the proper execution of their duties.

(2) Each shotfirer should be provided with –

- (a) a tool made entirely of wood for charging and stemming shotholes;
- (b) a scraper suitable for cleaning shotholes;
- (c) an approved shotfiring cable suitable for single or multi-shotfiring as the case may be;
- (d) an approved shotfiring apparatus for single or multi-shots as the case may be;
- (e) the removable handle of the shotfiring apparatus, which should be kept in the possession of the shotfirer throughout the shift of duty.

17.7. Charging, tamping and firing

17.7.1. No person should begin to charge a shothole unless it has been thoroughly cleaned.

17.7.2. No person should charge a shot until the shotfirer is satisfied that the shothole is properly drilled, placed and safe for firing.

17.7.3. Any person charging a shothole should, to the best of his judgement, ensure that it is neither undercharged nor overcharged, having considered the task to be performed.

17.7.4. No shothole should be charged with a weight of explosive which exceeds the maximum which should be specified by the competent authority.

17.7.5. Tamping should consist of suitable non-flammable material.

17.7.6. Except where the infusion method is used, each shothole should be stemmed with sufficient material to prevent a blown-out shot, and to ensure efficient results.

17.7.7. Supervisory officials should see that supplies of tamping material are available near the workplace where firing is being done.

17.7.8. The charging and tamping should be done by the shotfirer or under his personal supervision.

17.7.9. Explosive cartridges should be used only in the form in which they are delivered.

17.7.10. Explosive cartridges should not be forced into a shothole.

17.7.11. Shotholes should not be charged until immediately before firing.

17.7.12. Explosive cartridges should not be fitted with detonators or fuses until immediately before use, except where otherwise permitted in section 5.24 for sinking shafts or for surface drifts or other cross-measure drifts.

17.7.13. When more than four shots are to be fired simultaneously in any one place, they should be fired electrically.

17.7.14. The shotfirer himself should connect the shots together to the shotfiring lines and fire them.

17.7.15. Holes drilled in rock should be drilled wet, or dust-collecting apparatus approved by the competent authority should be used.

17.8. Water-infusion shotfiring

17.8.1. No shot should be fired by the water infusion method unless the explosives and detonators are approved for this purpose by the competent authority.

17.8.2. The shotfirer should satisfy himself immediately before he fires the shot that the shothole is filled with water.

17.8.3. The infusion apparatus should be so constructed that it holds secure in the shothole and is not ejected by the shot.

17.9. Protection against flying fragments

17.9.1. (1) Before the shotfirer connects the firing line to the exploder, he should determine the zone of danger and post guards.

(2) Where such guards are not available, fences marked with suitable notices giving warning of danger should be erected.

17.9.2. (1) The shotfirer should, before firing the shot, ensure that all persons in the vicinity have taken adequate cover.

(2) The shotfirer should be the last person to leave the workplace, and should himself take proper shelter.

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17.9.3. If guards have been posted or fences erected, they should not be withdrawn or removed until the shotfirer has authorised access to the workplace.

17.9.4. If two workings approach each other and one of them is likely to be broken into by a shot fired in the other, the supervisory official should stop work in the latter working, withdraw the persons engaged therein in good time before the shot is fired, and fence it off.

17.9.5. Where the workings offer insufficient protection against flying fragments, adequate shelter or other protection should be provided.

17.10. Procedure after shotfiring

17.10.1. The shotfirer should –

- (a) not allow the workplace to be re-entered after firing until the fumes have sufficiently dispersed;
- (b) ascertain by a personal examination that it is safe for normal work to be resumed;
- (c) where he finds the place is not safe, take the necessary action to make it safe before normal working is resumed.

17.10.2. (1) Where a round of shots has been fired the shotfirer should –

- (a) wait until all fumes and noxious gases have been dispersed before making the examination;
- (b) examine for sockets in the face and for any remnant explosive in such sockets.

(2) If he suspects that there may be a misfire or a charge not fully exploded, he should carefully inspect the material brought down by the shot and, if he does not recover the explosive and the detonator, the material should be loaded and transported separately for further examination.

17.10.3. It should be prohibited to scrape out or drill out shots wholly or partly, or to drill further into sockets.

17.11. Misfired shots

17.11.1. (1) It should be the duty of the manager of every mine where shotfiring takes place to draw up a scheme which instructs all shotfirers in the detailed procedure to be followed in the event of a misfired shot.

(2) The procedures should cover single shotfiring and shotfiring in rounds where this is practised.

17.12. Miscellaneous provisions for shotfiring

17.12.1. (1) Electrical shotfiring apparatus should be regularly inspected, cleaned and overhauled at intervals which should be specified by national laws or regulations.

(2) Such apparatus should be maintained in good condition.

17.12.2. Electrical shotfiring apparatus should be used only by an authorised shotfirer.

17.12.3. The shotfirer should couple the machine to the shotfiring lines only at the moment of firing the shot.

17.12.4. No more shots should be charged than can safely be fired simultaneously by the shotfiring apparatus used.

17.12.5. (1) For shotfiring lines, only insulated conductors should be used.

(2) Their minimum length should be specified and related to the duty to be performed.

17.12.6. Precautions should be taken to prevent shotfiring lines from coming into contact with other electrical conductors.

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17.12.7. Where firing from the mains is permitted by national laws or regulations –

- (a) the connection of the firing line to the power line should be effected only through a switch that is under lock and key, and cuts off the current on all poles;
- (b) a second disconnecting device, also under lock and key, should be inserted between the switch and the firing line;
- (c) shotfiring cable should not be laid in the same conduits as wires for cables for other purposes.

17.12.8. When several shots have to be fired at the same time –

- (a) care should be taken that all connections are properly made;
- (b) all shots to be fired should, unless otherwise directed for mines liable to sudden outbursts of gas, be connected in series;
- (c) the main conductor to the machine or the mains should be connected last and should be of sufficient length.

17.13. Special provisions for shotfiring in stone drifts

17.13.1. It should be lawful for a shotfirer engaged in a cross-measure drift, to prime the cartridges to be used in that round at a place at least 45 m from the face, provided that:

- (a) the place in question has been selected by the manager;
- (b) the shotfirer has been appointed by the manager to prime cartridges at that place;
- (c) immediately he has removed a detonator from its case to prime a cartridge, the shotfirer short-circuits the detonator leads;
- (d) the shotfirer is provided with a specially constructed box divided into separate compartments for primed cartridges;

- (e) immediately each cartridge has been primed, the shotfirer places it in the specially constructed box which is kept securely locked;
- (f) only primed cartridges are placed in or taken out of the box;
- (g) detonators of different delay are not placed in the same compartment of the box.

17.13.2. Priming of cartridges should not begin until the shotfirer has established that the shotholes can be charged immediately he has completed priming.

17.14. Additional precautions during shotfiring

17.14.1. (1) It should be the duty of the manager of the mine to fix the maximum number of shots to be fired per hour and shift by each shotfirer.

(2) This information should be sent to the competent authority which may direct amendments to be made in the interests of safety.

17.14.2. At any place where firedamp is indicated by the lowered flame of the safety lamp, or where an approved firedamp detector shows a percentage in excess of that which should be specified by national laws or regulations, shotfiring should be prohibited.

17.14.3. The aforementioned prohibition should not be lifted until the senior official on duty at the mine has examined the place and satisfied himself that it is safe to resume shotfiring.

17.14.4. Where delay action detonators are used in coal, national laws or regulations should specify the maximum period of delay between the firing of the first and last shot in the round.

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17.14.5. (1) National laws or regulations should also specify the conditions under which delay detonators are used in stone drifts approaching a coal seam or waste area.

(2) Shotfiring with delay detonators should be carried out according to a specific plan endorsed by the manager.

17.14.6. (1) Immediately before charging each shot and before firing, the shotfirer should test the air for firedamp within a radius to be specified in national laws or regulations.

(2) In particular, the air in cavities, breaks and other accessible places where firedamp might migrate within the radius should be tested.

(3) For the purpose of this paragraph, firedamp is considered to be present when it is indicated on the lowered flame of the safety lamp or when approved firedamp detectors show a percentage in excess of that which should be specified by national laws or regulations.

17.14.7. The hole should not be charged if –

- (a) any break is found in the hole;
- (b) firedamp is found to be issuing from it;
- (c) firedamp is found in the general body of the air.

17.14.8. If, after charging, firedamp is found within the described radius, the charge should not be fired until the firedamp has been cleared.

17.14.9. Before rounds of shots are fired the shotfirer should –

- (a) carry out an examination for general safety, and test for the presence of flammable gas over the whole area to be covered by shotfiring;
- (b) immediately before the first shothole of any round is charged, test for gas –
 - (i) in every accessible place within 10 m of each of the two shotholes which are furthest apart in the round;

- (ii) at the mouth of each shothole in the round;
- (iii) along the edge of any waste in the vicinity;
- (c) immediately before firing the round, test for gas in the vicinity of each shothole and along the edge of any waste opposite.

17.14.10. When firing in coal seams liable to produce dangerous dust, before charging the shots, the firing area should be adequately protected by stone-dusting or watering.

17.14.11. In mines liable to sudden outbursts of gas, shotfiring should be subject to special regulations issued by the competent authority.

18. First aid

18.1. Surface organisation

18.1.1. At every mine where the total number of persons employed on one shift exceeds a figure specified by national laws or regulations, there should be provided and maintained in good order a suitable first-aid centre.

18.1.2. The first-aid centre should be –

- (a) a place of easy approach, and of easy entrance to persons carrying a stretcher;
- (b) separated from accommodation used for other purposes;
- (c) used only for first aid, medical examinations or ambulance work.

18.1.3. (1) The first-aid centre should be situated on the surface conveniently near the main entrance to the mine.

(2) It should be adequately heated, lighted, kept clean and consist of treatment, rest, storage and waiting rooms.

(3) The treatment room should –

- (a) have an easy-clean, non-slip floor, easily washed walls, built-in storage cupboards, easy-clean working tops, and sinks with running water;
- (b) be equipped with a desk, chair, glass-topped treatment trolley with drawers, adjustable treatment chair, adjustable magnifying lamp, adjustable couch, and screen.

(4) The rest room should have –

- (a) a floor and walls as for the treatment room;
- (b) a door leading from the treatment room and wide doors leading to outside to facilitate movement of stretchers;
- (c) a sink with running water, an adjustable couch and a rest chair.

(5) The store room should be accessible from the treatment room and provided with lockable units and a locked door.

(6) The waiting room or area should be accessible from the treatment room and provided with benches and chairs.

18.1.4. National laws or regulations should specify the minimum equipment to be kept in the first-aid centre.

18.1.5. The first-aid centre should be in the overall charge of first-aid officers who should have access to the services of a physician.

18.1.6. No person other than a qualified nurse or a person who has undergone an approved course of first-aid training should be appointed by the manager to be in charge of the first-aid centre.

18.1.7. The first-aid officer(s) in charge of the first-aid centre should always be immediately available if he or they are not in continuous attendance while persons are at work in or about the mine.

18.1.8. (1) At small mines, where the total number of persons employed on any shift does not exceed the figure specified by national laws or regulations in accordance with paragraph 18.1.1, a first-aid room should be provided and kept constantly available for use.

(2) The room should have adequate means of heating and lighting, hot and cold water and interior surfaces which are easily cleaned.

18.1.9. National laws or regulations should specify the minimum equipment to be kept in the first-aid room.

18.1.10. (1) These arrangements should be in the charge of a person or persons qualified in first-aid and life-saving techniques.

(2) One such person should always be readily available during working hours.

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18.1.11. Where the resources of any mine are insufficient to fulfil the requirements of this chapter, two or more mines may pool their resources to meet these requirements, providing such facilities are readily accessible from each mine, and the competent authority agrees with the arrangements.

18.2. Underground organisation

18.2.1. (1) A sufficient number of persons employed underground should hold approved first-aid certificates or possess equivalent qualifications.

(2) As far as practicable, each of these qualified persons should regularly work with the same group of persons working below ground.

18.2.2. (1) First-aid personnel should each carry a first-aid outfit which they should bring to the surface daily for inspection, and for replacement of the contents as necessary.

(2) Each first-aid outfit should contain at least the following items:

- (a) two triangular bandages;
- (b) small, medium and large sterile-packed dressings with integral bandage;
- (c) assorted adhesive plasters.

18.2.3. (1) The manager of the mine should make arrangements for first-aid stations to be provided at the following places in the mine:

- (a) at appropriate points in each deputy's district;
- (b) in the area of the shaft bottom or the bottom of a surface drift;
- (c) at other places where persons regularly work or pass.

(2) Each first-aid station should contain –

- (a) at least one stretcher with two clean, dry blankets per stretcher;

- (b) wooden (or other approved type) splints (one set per stretcher);
- (c) a separate, robust container holding at least eight triangular bandages per stretcher and small, medium and large sterile-packed dressings;
- (d) analgesic apparatus suitably protected so that only authorised persons can gain access to it when necessary;
- (e) where reasonably practicable, a telephone so that the mine surface can be informed without delay of any accident which may need the attention of a doctor or nurse.

18.2.4. It should be the duty of all supervisory officials underground and all first-aid persons to keep first-aid equipment in good order and replenished when necessary.

18.2.5. A list of all first-aid persons employed below ground should be kept posted in the first-aid centre and at places where it can easily be read by persons employed at the mine.

18.3. Transport of cases of accident or sickness

18.3.1. The manager should make suitable arrangements to effect the swift and comfortable transport of injured and sick persons to the surface of the mine.

18.3.2. The mine operator should make such arrangements as are necessary for the transport of sick and injured workers to hospital or to their homes.

18.3.3. At every shaft or staple in which injured persons are raised and where the cage is not large enough to permit a stretcher to be laid flat, at every shaft or staple where persons can only be raised otherwise than in a cage, and at every sinking pit, there should be provided and used a suitable jacket or contrivances to prevent aggravation of an injury.

18.4. Inspection

18.4.1. National laws or regulations should specify the intervals at which all first-aid equipment and the ambulance organisation should be inspected by a competent person appointed by the manager.

18.4.2. All defects and shortcomings should be remedied without delay.

18.5. Training and retraining

18.5.1. (1) As far as practicable, every new entrant to the coalmining industry should be given training and instruction in vital life-saving techniques.

(2) Refresher courses should be held as necessary to keep such persons up to date with new techniques.

18.5.2. Holders of approved first-aid certificates should be re-examined as required by the competent authority.

18.5.3. The persons employed in the first-aid centre should, in addition to obtaining other qualifications, receive such instruction and training as will enable them to undertake –

- (a) resuscitation;
- (b) assessment and evaluation of wounds;
- (c) dressings;
- (d) assessment and evaluation of medical and surgical conditions;
- (e) emergency treatment and referral;
- (f) simple record keeping;
- (g) management of multiple casualties;
- (h) use of all emergency equipment;
- (i) stores management.

18.6. Reporting of injuries

18.6.1. (1) Every person who suffers an injury, however slight, should report for examination or treatment at the first-aid centre before leaving the mine, even if the injury has been treated underground.

(2) A record of reported injuries should be kept in the first-aid centre.

19. Mines rescue

19.1. General organisation

19.1.1. The mine operators should provide and maintain, jointly or separately at convenient centres, adequate central rescue stations fully equipped for rescue work and for the training of rescue workers, unless stations rendering equally effective service are maintained by the individual mines and approved by the competent authority.

19.1.2. The radius of operation of a station should be determined by the competent authority.

19.1.3. (1) Every rescue station should be placed under the immediate control of a competent superintendent who has been fully trained in rescue work and has had a sufficient period of practical experience underground in a mine, as decided by the competent authority.

(2) He should also possess such other qualifications as national laws or regulations specify.

- 19.1.4. Unless exempted by the competent authority –
- (a) the operator or manager of every mine should affiliate the mine to a central rescue station, if one exists in the mining district, in such a manner as to acquire the right of calling for and obtaining the full services of the station at any time;
 - (b) every mine should be connected by telephone to its central rescue station, if one exists, or, if not, to other nearby mines maintaining their own rescue stations.

19.1.5. (1) Rescue workers in sufficient numbers should be prescribed by national laws or regulations.

- (2) They should be maintained and organised either –
- (a) by the provision of a permanent rescue corps at the central rescue station, and of trained rescue workers at the mine;
- or

(b) by the provision of rescue brigades at the mine.

19.1.6. Subject to any exemption which may be granted by the competent authority, a sufficient number of members of a permanent rescue corps should be continuously employed at the station, and in constant residence there.

19.1.7. Effective arrangements should be made at every mine for summoning other rescue workers as soon as their services are required.

19.2. Selection of rescue workers

19.2.1. The persons to be trained in mine rescue work should be carefully selected on the grounds of their physical fitness, coolness, powers of endurance and general suitability for the work and, in the case of miners to be trained to co-operate with the permanent rescue corps, also on the ground of their knowledge of the layout of the mine.

19.2.2. Rescue workers should have had at least two years' working experience underground in a coal mine and hold an approved first-aid certificate.

19.2.3. Every rescue worker should be medically re-examined every 12 months and should not continue to act as such unless he is certified as fit.

19.3. Instruction and practice

19.3.1. At every central rescue station, or other stations as required by the competent authority, there should be a sufficient number of competent instructors to train rescue workers.

19.3.2. Every person selected for training in rescue work should undergo courses of instruction and practices prescribed by the competent authority.

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19.3.3. Rescue workers who have been certified as efficient should periodically undergo further practices and instruction as prescribed or approved by the competent authority.

19.4. Rescue apparatus and equipment

19.4.1. At every central rescue station, and at all other stations approved by the competent authority, there should be provided and maintained in good order, and permanently ready for immediate use, such adequate and suitable rescue equipment as is specified by the competent authority.

19.4.2. Any accidents or dangerous occurrences from the use of breathing apparatus, smoke helmets or the like should be reported to the competent authority.

19.4.3. (1) At every mine there should be provided and maintained a room or other suitable accommodation for rescue workers and equipment in accordance with national laws or regulations.

(2) Rescue equipment, except that required to be kept below ground by subparagraph 9.6.1 (2) (b), should be stored in such a room or accommodation and not underground in the mine.

19.4.4. National laws or regulations should state the intervals at which inspections are to be made of accommodation, apparatus and equipment provided for rescue work, training and practice.

19.4.5. (1) At every mine there should be kept, in a form suitable for use by rescue workers and for the training purposes, a sufficient number of clear and legible tracings of the general ventilation system.

(2) The tracings should show all doors, stoppings, air crossings, regulators and telephone stations.

(3) The tracings should show the intake airways in a colour different from that of the return airways.

19.4.6. The code of signals for use in rescue work and training in each country should be uniform for all mines and approved by the competent authority.

19.5. Conduct of mine rescue work

19.5.1. (1) It should be the duty of the manager of every mine to make rules for the conduct of rescue work at that mine.

(2) These rules should specify –

- (a) the duties to be performed by certain persons when rescue work is to be carried out;
- (b) the duties of the person (nominated by the manager or some other competent person) who is in charge on the surface of the mine;
- (c) that only duly authorised persons may enter the affected part of the mine;
- (d) that the name of every person who enters the mine be recorded.

19.5.2. A competent person appointed by the manager should ensure that sufficient rescue teams are organised and that the sets of breathing apparatus are tested in accordance with the requirements of the competent authority.

19.5.3. (1) As soon as is practicable, a fresh-air base or bases should be established as near as is safe to the, possibly irrespirable, atmosphere.

(2) As far as is practicable, there should be provided at each fresh-air base:

- (a) two persons, one of whom is competent to maintain self-contained breathing apparatus, and the other competent in first aid;

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- (b) a rescue brigade equipped with breathing apparatus and ready for service in an irrespirable atmosphere;
- (c) resuscitation apparatus and such other equipment as prescribed in national laws or regulations;
- (d) telephonic communication between the fresh-air base and the surface of the mine.

19.5.4. (1) No rescue brigade should go beyond a fresh air base unless it has received clear instructions as to where it should go and what it should attempt.

(2) When the brigade is not familiar with the route to be taken, the plan supplied should clearly show that route.

(3) Wherever possible, a guide from the mine concerned, equipped with breathing apparatus, should accompany the rescue brigade.

19.5.5. (1) The captain of each rescue brigade should at all times give first priority to the safety of his brigade.

(2) Immediately before the brigade enters irrespirable atmosphere, he should ensure that each set of breathing apparatus is working satisfactorily.

(3) Whilst in irrespirable atmosphere he should regularly check the condition of each brigade member and of the apparatus.

20. Surface buildings, structures and means of access

20.1. Safety of buildings

20.1.1. All buildings and structures on the surface of the mine should be kept in safe condition, and, wherever possible, they should be constructed of fire resistant material.

20.2. Safe means of access

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

20.2.2. (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.

(2) Where these provisions are not practicable, properly designed safety harnesses should be used.

21. Tips, dams and lagoons

21.1. Tips

21.1.1. (1) It should be the duty of the manager of every mine, where it is proposed to tip mine refuse, to establish that the proposed site is suitable and safe in all respects.

(2) In assessing safety and suitability, consideration should be given to safeguarding the safety of the civilian population during normal tipping operations and also in the event of a tip-slide.

21.1.2. (1) Plans and sections of the proposed tipping operations should be prepared by a qualified and competent civil engineer.

(2) A geological map of the area should also be provided.

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

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

21.1.4. 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.

21.1.5. It should be the duty of the manager to prepare Tipping Rules which should include:

- (a) provisions for a system of drainage for the tip;
- (b) the maintenance in proper order of the drainage system;
- (c) the manner in which tipping operations are to be carried out in order to avoid any dangerous occurrence and prevent danger to persons;
- (d) the nature and frequency of tip inspections and the reporting thereon;

- (e) the action to be taken in the event of a defect or other dangerous condition.

21.2. Dams and lagoons

21.2.1. The provisions of paragraphs 21.1.1 and 21.1.2 should apply to dams and lagoons in the same way as they apply to tips, with the substitution of references to dams and lagoons for references to tips.

21.2.2. The manager of the mine should appoint a qualified and competent civil engineer to be responsible for the maintenance and security of each dam and lagoon as required by paragraph 2.3.2.

21.3. Reporting of dangerous occurrences

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

21.3.2. Such dangerous occurrences should be reported forthwith to the competent authority who should take appropriate action.

22. Surface railway sidings and other vehicular traffic

22.1. Railway sidings

22.1.1. (1) National laws or regulations should specify the manner in which danger to persons is to be avoided in the operation of railway sidings located on the surface of the mine premises.

(2) These laws or regulations should include items covering –

- (a) the transport of persons;
- (b) the control of points and signal wires;
- (c) the provision of equipment and safety devices;
- (d) the movement of vehicles;
- (e) restrictions of the passage of persons on foot;
- (f) the provision of specific crossing points;
- (g) the minimum age of locomotive drivers.

22.2. Other vehicular traffic

22.2.1. It should be the duty of the manager of a mine to make and post in a prominent place Transport Rules which control the flow and movement of vehicular traffic on the surface of the mine, so as to secure the safety of all the persons employed there.

22.2.2. As far as possible, the signs used in the control of traffic should be the same as those used on public roads.

23. Training

23.1. General requirement

23.1.1. No person should be employed on any work at a coal mine unless that person has received the necessary instruction and training so as to be able to do the work competently and in safety.

23.2. Specific training requirements

23.2.1. National laws or regulations should specify –

- (a) the period of induction training for adults who are new entrants to the industry;
- (b) the period of training required for persons moved to new work;
- (c) the period of training and employment of young persons on surface work before they proceed to work underground;
- (d) the period of attendance by young persons at approved courses of training at a mining school or other approved place – and, where practicable, the inclusion in the curriculum of training in first-aid techniques vital to safe life;
- (e) the period of training for adults during which they should come under close personal supervision when starting work underground;
- (f) the requirement that each manager is to prepare a scheme for coal face training which covers all operations and specifies the period of training in each operation, including training required when new systems of work are introduced;
- (g) the requirement that each person employed at a mine should undergo refresher training at intervals to be specified;

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- (h) the requirement that records of the training of each person be kept by a training officer appointed by the manager;
- (i) the duty of the training officer to supervise the training of persons who work at the mine and to report, in writing, on training matters as required by the manager.

24. Miscellaneous

24.1. General duties and conduct

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

- (a) take immediate steps to remove the danger;
- (b) where this is not possible, immediately warn persons in danger, advise them to withdraw, withdraw himself and notify the nearest available supervisory official.

24.1.2. Persons should be immediately withdrawn from any place in which they are found to be in imminent and serious danger.

24.1.3. All underground employees should be acquainted with those means of egress to the surface which they may have to use.

24.1.4. Supervisory officials on an outgoing shift should inform the supervisory officials of the next oncoming shift of any dangers that require attention in the workings under their respective supervision.

24.1.5. All cases where persons are withdrawn from parts of a mine because of imminent danger, and certain other exceptional circumstances to be defined in national laws or regulations, should be notified forthwith to the competent authority.

24.1.6. (1) Persons with infirmities should be employed only on work at which they cannot endanger themselves or others.

(2) They should receive adequate instruction and training to permit them to work without danger.

24.1.7. Every person employed at a mine should obey any instruction given to him by an official of the mine who has

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responsibility for such instructions in the matter of safety, health or welfare.

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

24.1.9. Every person employed at a mine should behave in an orderly manner on the surface and underground, at all times.

24.1.10. No person should be at a mine in a state of intoxication.

24.1.11. No person should take any alcoholic beverage or dangerous drug into a mine.

24.1.12. No person should sleep below ground or on the surface whilst on duty.

24.1.13. (1) Suitable protective helmets provided by the mine operator should be worn by all persons who work below ground and on designated sites on the mine surface.

(2) The mine operator should also provide other protective equipment where necessary to protect the health and safety of the miners.

24.2. Carrying of matches, smokers' materials and lighters, and search for contraband

24.2.1. In all coal mines –

- (a) it should be prohibited to smoke or to bring in pipes, tobacco for smoking, cigarette papers, matches, or any other device or material capable of producing a flame, or any tool capable of being used for improperly opening a flame safety lamp;
- (b) the manager should cause either all persons who enter a mine, or such of them as may be selected on a system approved by the competent authority, to be searched to see

whether they are carrying any object prohibited by subparagraph 24.2.1 (a);

- (c) any person who refuses to allow himself to be searched should be refused entry to the mine.

24.3. Medical examinations

General requirements

24.3.1. (1) Every young person and adult should be medically examined before commencing work at a mine.

(2) The examination should normally include a chest X-ray.

24.3.2. Every young person and adult should be certified as medically fit before commencing work at a mine.

24.3.3. (1) Should the examining medical officer deem that a follow-up medical examination is required, he should, in conjunction with the manager of the mine, have the duty of arranging this.

(2) In any event, medical re-examinations for young persons should continue until the age of 21 years is attained.

24.3.4. Records of all medical examinations and the action taken thereon should be kept at the medical centre.

24.3.5. No young person should be employed on heavy work, whether underground or on the surface, that is likely to cause physical injury or is manifestly in excess of his strength.

24.3.6. Re-examinations of all employees should be carried out at intervals to be fixed by the competent authority.

Obligation of mine operator

24.3.7. The mine operator should provide, free of charge, to both young persons and adults all medical examinations required by this section.

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24.4. Welfare facilities

24.4.1. National laws or regulations should specify the requirements for the changing, storing and drying of clothes, and for canteen, washing and toilet and laundry facilities to be provided at mines.

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

- (a) adequate facilities for the changing, storage and drying of clothes;
- (b) adequate shower facilities;
- (c) adequate toilet facilities above and below ground, for both men and women as is necessary.

24.5. Noise and vibration

General provision

24.5.1. National laws or regulations should specify the noise levels to be permitted on the surface and below ground in coal mines.

Scheme of noise control

24.5.2. It should be the duty of the manager of every mine to prepare a scheme of noise control relative to the mine, in consultation with a noise control specialist.

Vibration

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

24.6. Safety and health committees

24.6.1. A safety and health committee consisting of representatives of workers and management should be set up in each coal mine, and this committee should meet regularly.

24.6.2. A tripartite safety and health committee consisting of representatives of the mine operators, workers and the competent authority should be set up for each coalmining industry.

24.6.3. (1) Each mine manager should cause a record of accidents to be kept in a manner to be prescribed by the competent authority.

(2) This record should allow particular types of accidents to be readily identified together with their location.

24.6.4. (1) The manager of every mine should have the accident data analysed so that he may take appropriate action to deal with –

- (a) underground districts that need increased supervision;
- (b) particular sources of danger that call for changes in methods;
- (c) particular defects that need to be remedied.

(2) For these purposes, the manager should consult with representatives of the workers and officials of the mine.

24.6.5. (1) The tripartite committee should meet regularly to discuss all aspects of coal mine safety and health matters.

(2) It should also note national trends, and research and development at national and international levels.

(3) It should call for action in any case which gives it cause for concern either at district or at national level.

24.6.6. It should be the duty of the competent authority to supply the tripartite committee with the necessary information to enable it to fulfil the duties set out in paragraph 24.6.5.

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24.7. Other matters

Appeals

24.7.1. (1) National laws or regulations should provide for an appeal procedure wherever the competent authority requires amendment or other change in any scheme, rule or other instruction issued by a mine operator or mine manager.

(2) Appeals should be based on the required amendments being impracticable or against the best interests of safety and health.

Exemptions

24.7.2. In accordance with the requirements of subparagraph 2.1.2 (3), the competent authority should be empowered to grant exemption from any regulation or part of a regulation, as the case may be, providing that it is satisfied that the standards of safety and health are maintained and that the granting of the exemption causes no danger to persons.

24.7.3. Where necessary, the competent authority should impose, in writing, other conditions which at least maintain existing standards.

Employment of workers speaking different languages, and illiterate workers

24.7.4. For districts where considerable numbers of workers speaking different languages, or illiterate workers, are employed, national laws or regulations should prescribe the measures to be taken to ensure that such workers are enabled to understand such regulations, instructions and orders as concern the safe performance of their duties with minimum risk to the safety and health of both themselves and others.

Telephonic or other means of speech communication

24.7.5. Notwithstanding the requirements regarding telephonic installations elsewhere in this code, in every mine employing a minimum number of persons, and having workings extending beyond a minimum distance from the entrance to the mine (both to be specified in national laws or regulations), a speech communication system should be installed at a sufficient number of suitable points underground to allow communication between the different parts of the mine and also between the underground workings and the surface.

24.7.6. If there is a central exchange below ground, it should be situated at the intake shaft, in a room or recess appropriately protected against damage and screened from noise and interference.

Prohibition of persons working alone

24.7.7. It should be prohibited for a person to work alone in a remote place where, if an accident occurred, he would not soon be discovered and assisted.

Admission of outside persons

24.7.8. Any person not employed at a mine should not be allowed to enter the mine, unless permitted by the manager to do so and accompanied by a responsible person.

24.7.9. Every person who enters a mine, for whatever purpose, should comply with the provisions of national laws or regulations and with any instructions given by the manager, supervisory officials or the accompanying responsible person with a view to ensuring his or her safety and the safety of the workers and of the mine.

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Safety signs

24.7.10. (1) As far as is practicable, all mines should use the same system of signs and safety colours.

(2) These should be explained to all new entrants to the industry, and should be kept posted where all persons employed at the mine can easily see them, as required by section 4.2.

25. Regulations relating to opencast coal mines

25.1.1. (1) The undermentioned chapters of this code should be applied to opencast coal mines as appropriate, subject to adaptation of the content to suit the particular conditions obtained in opencast coal mines.

(2) Notwithstanding the following provisions, it should be the duty of the operator to ensure that the operations be so designed, planned and undertaken that the safety of the personnel and the workings are assured.

Chapter 1 *Definitions*

Chapter 2 *General duties*

2.1 Duties of governments where coal is mined

2.2 Duties of mine operators

2.3 Duties of mine managers and supervisory officials

2.4 Duties of workers

Chapter 3 *Surveyors and plans*

3.1 Appointment of duly qualified surveyor

3.2 Duties of mine surveyor

3.3 Plans: general

3.4 Faulty plans

3.5 Abandonment plans

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Chapter 4 *Commencement and cessation of mining operations; posting of notices; records and notification of accidents, dangerous occurrences and notifiable diseases*

4.1 Commencement and cessation of mining operations

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- 4.2 Posting of notices
- 4.3 Records and returns
- 4.4 Notification of accidents, dangerous occurrences and notifiable diseases
- Chapter 9 *Ventilation and firedamp control*
 - 9.7 Firedamp detectors
- Chapter 11 *Precautions against respirable dust*
 - 11.1 Prevention and suppression of respirable dust
 - 11.2 Sampling of respirable dust
 - 11.3 Allowable maximum respirable dust concentrations
 - 11.4 Provision of dust respirators
 - 11.5 Medical supervision
 - 11.6 Provision for small mines
- Chapter 12 *Miners' lamps, flame safety lamps and general lighting*
 - 12.2 Maintenance of lighting performance
 - 12.3 Provision of general lighting
- Chapter 13 *Mine fires*
 - 13.1 General provisions
 - 13.3 Fire-fighting equipment
 - 13.4 Storage of flammable materials
 - 13.5 Precautions against spontaneous combustion of coal
- Chapter 16 *Machinery and plant*
 - 16.1 General provisions
 - 16.2 Fencing of machinery
 - 16.4 Boiler and steam plant
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 - 16.6 Cranes and lifting gear

Regulations relating to opencast coal mines

- Chapter 17 *Explosives and shotfiring*
 - 17.1 General provisions for explosives
 - 17.2 Conveyance of explosives and detonators to the magazine
 - 17.3 Issue, return and recording of explosives and detonators
 - 17.4 Keeping of explosives and detonators to the magazine
 - 17.5 General provisions for shotfiring
 - 17.6 Equipment of a shotfirer
 - 17.7 Charging, tamping and firing
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 - 17.10 Procedure after shotfiring
 - 17.11 Misfired shots
 - 17.12 Miscellaneous provisions for shotfiring
- Chapter 18 *First aid*
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 - 18.3 Transport of cases of accident or sickness
 - 18.4 Inspection
 - 18.5 Training and retraining
 - 18.6 Reporting of injuries
- Chapter 19 *Mines rescue*
 - 19.1 General organisation
 - 19.2 Selection of rescue workers
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 - 19.4 Rescue apparatus and equipment
 - 19.5 Conduct of mine rescue work
- Chapter 20 *Surface buildings, structures and means of access*
 - 20.1 Safety of buildings
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- Chapter 21 *Tips, dams and lagoons*
 - 21.1 Tips
 - 21.2 Dams and lagoons
 - 21.3 Reporting of dangerous occurrences
- Chapter 22 *Surface railway sidings and other vehicular traffic*
 - 22.1 Railway sidings
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- Chapter 23 *Training*
 - 23.1 General requirement
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- Chapter 24 *Miscellaneous*
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 - 24.2 Carrying of matches, smokers' materials and lighters, and search for contraband
 - 24.3 Medical examinations
 - 24.4 Welfare facilities
 - 24.5 Noise and vibration
 - 24.6 Safety and health committees
 - 24.7 Other matters
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 - Employment of workers speaking different languages, and illiterate workers
 - Telephonic and other means of speech communication
 - Admission of outside persons
 - Safety signs

Appendices

A. ILO Conventions, Recommendations, codes of practice and guides

Listed below are various Conventions, Recommendations, codes of practice and guides produced by the ILO, which may assist the reader seeking further information about occupational safety and health in the coal mine industry.

Although this list is current as of the date of publication of this code of practice, the ILO is constantly publishing new material and the reader is advised to contact the ILO directly or its national correspondent of the Occupational Safety and Health Information Centre (CIS) for the most up-to-date information.

I. Conventions

Number	Short title	Year
31	Hours of Work (Coal Mines) (Revised)	1935
31	Hours of Work (Coal Mines) (Revised)	1935
45	Underground Work (Women)	1935
81	Labour Inspection	1947
115	Radiation Protection	1960
119	Guarding of Machinery	1963
123	Minimum Age (Underground Work)	1965
124	Medical Examination of Young Persons (Underground Work)	1965
144	Tripartite Consultation (International Labour Standards)	1976
148	Working Environment (Air Pollution, Noise and Vibration)	1977
155	Occupational Safety and Health	1981
161	Occupational Health Services	1985

II. Recommendations

Number	Short title	Year
69	Medical Care	1944
79	Medical Examination of Young Persons	1946
82	Labour Inspection (Mining and Transport)	1947

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96	Minimum Age (Coal Mines)	1953
97	Protection of Workers' Health	1953
112	Occupational Health Services (Revised)	1985
114	Radiation Protection	1960
118	Guarding of Machinery	1963
124	Minimum Age (Underground Work)	1965
125	Conditions of Employment of Young Persons (Underground Work)	1965
156	Working Environment (Air Pollution, Noise and Vibration)	1977
158	Labour Administration	1978
164	Occupational Safety and Health	1981

III. Codes of practice and guides

Prevention of accidents due to electricity underground in coal mines (Geneva, 1959, 54 pp.)

Prevention of accidents due to fire underground in coal mines (Geneva, 1959, 48 pp.)

Guide to the prevention and suppression of dust in mining, tunnelling and quarrying (Geneva, 1965, 421 pp.)

Prevention of accidents due to explosions underground in coal mines (Geneva, 1974, 37 pp.)

Protection of workers against noise and vibration in the working environment (Geneva, 1977, 74 pp.)

Occupational exposure to airborne substances harmful to health (Geneva, 1980, 44 pp.)

Occupational safety and health in the iron and steel industry (Geneva, 1983, 342 pp.)

Safety in the use of asbestos (Geneva, 1984, 116 pp.)

IV. Manuals

Manual of industrial radiation protection, in six parts (Geneva, 1959-68)

The role of medical inspection of labour (Geneva, 1968, 122 pp.)

Accident prevention. A workers' education manual (Geneva, 1983, 175 pp.)

Labour inspection, purposes and practice (Geneva, 1985, 234 pp.)

V. Occupational safety and health series

- No. 48 *Sixth international report on the prevention and suppression of dust in mining, tunnelling and quarrying* (Geneva, 1982, 160 pp.)
- No. 49 *Dermatoses and professions* (Geneva, 1983, 95 pp.)
- No. 52 *Success with occupational safety programmes* (Geneva, 1984, 148 pp.)
- No. 53 *Occupational hazards from non-ionising electromagnetic radiations* (Geneva, 1985, 133 pp.)
- No. 54 *The cost of occupational accidents and diseases* (Geneva, 1985, 161 pp.)

VI. Reports of ILO industrial committees and similar meetings

A. Coal Mines Committee

- Safety and health in coal mines*. Report III, Tenth Session (Geneva, 1976, 128 pp.)
- Employment and training with reference to health and safety at coal mines*. Report III, Eleventh Session (Geneva, 1982, 75 pp.)

B. Tripartite technical meeting on mines other than coal mines

- Workers' health in mines other than coal mines with special reference to the effects of the working environment and technological changes*. Report III, Fourth meeting (Geneva, 1984, 61 pp.)

VII. Other publications

- Encyclopaedia of occupational health and safety*, Vols. 1 and 2 (Geneva, 3rd (revised) ed., 1983, 2,538 pp.)

B. List of publications on the prevention and control of mine fires supplementing the provision of Chapter 13, "Mine fires"

- Hauptstelle für das Grubenrettungswesen: *Merkblatt Einsatz von Prozessrechnern zur Früherkennung von Grubenbränden* (Guide-

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lines for the use of process control computers for the early recognition of mine fires), (Essen, 1979).

- : *Merkblatt für den Einsatz von CO-Messeinrichtungen* (Guide-lines on the use of carbon monoxide measuring devices), (Essen, 1975).
- : *Merkblatt für Inertisierung mit Stickstoff bei der Grubenbrandbekämpfung* (Essen, 1976).
- : *Plan für Inertisierungsmassnahmen mit Stickstoff* (Plan for inerting measures with nitrogen), (Essen, 1980).

Institution of Mining Engineers: "Sealing off fires underground", in *Mining Engineer* (London), August 1962, No. 23.

Oyarzun, S.: *Organización para casos de emergencias en la Empresa Nacional del Carbón - ENACAR S.A.* (Organisation for emergency cases in the national coal factory - ENCAR S.A.), (Santiago).

- : *Prevención y control de incendios en interior minas - ENACAR S.A.* (Prevention and control of fire in underground mines), (Santiago).
- : *Reglamento sobre tronaduras en interior minas - ENACAR S.A.* (Regulations on explosives in underground mines), (Santiago).
- : *Rescate en minas subterráneas de carbón* (Rescue in underground coal mines), (Santiago).

Steinkohlenbergbauverein: *Beurteilung der Analysenergebnisse von Grubenbrandgasproben* (Results of analysis of mine fire gas tests), (Essen, Verlag Glückauf, 1981).

- : *Hinweise zum Verhüten und Bekämpfen von Gasbränden in Streckenvortrieben mit Teilschnittmaschinen*, Circular No. MZ 18 (Notes on prevention and suppression of gas fires in haulage with undercutting machines), (Essen, 1983).
- : *Hinweise zur Selbstrettungs-, Rettungs- und Brandschutztechnik bei der Auffahrung von Sonderbewetterten*, Circular No. MZ 22 (Notes on self-rescue, rescue and fire prevention techniques when driving roadways in poorly ventilated areas with full face cutting machines), (Essen, 1982).
- : *Merkblatt für die Inertisierung mit Stickstoff bei der Grubenbrandbekämpfung* (Guide-lines for inerting measures with nitrogen in mine fire-fighting), (Essen, 3rd supplement, 1983).

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