PART IX

MACHINERY

A. GENERAL

Interpretation in this Part

185. (1) In this Part—

"elevator" means any lift, hoist or other appliance used or intended to be used for the conveyance of persons, material or mineral by means of a car in a hatchway or elevator shaft on guides, where the driving machinery is not normally operated manually from the motor room;

"elevator shaft" means any vertical or inclined way known as a hatchway in which a car, elevator or lift is operated;

"lifting machine" means any crane, excavator, drag-line, winch pulley, windlass, block, chain block, fork-lift or similar equipment for raising or lowering;

"lifting tackle" means any chain sling, rope sling, ring, link hook, shackle, swivel, eye bolt, spreader, shear legs, derrick or similar appliance.

General requirements for all machinery

186. (1) No machinery shall be used at any mine unless it is of good construction, sound material, adequate strength, free from patent defect and maintained in good condition.

(2) Efficient guards shall be provided to such parts of machinery and electrical apparatus as may be a source of danger to persons.

(3) The manager shall ensure that such guards are kept in position and suitably maintained:

Provided that, when such guards are temporarily removed for the purpose of repairs, proper precaution shall be taken for the safety of persons and, on completion of such repairs the guards shall be securely and immediately replaced.

Surface drilling

187. In surface drilling every person in charge of drills shall be responsible for the proper erection and maintenance where

necessary of proper and well-fenced platforms from which workers can attend to waterswivel, change of tools, drill lengths, casings, *et cetera* and for the provisions of ladders thereto.

Belt-driven machinery

188. (1) Belt-driven machinery which it is necessary to stop and start without interferring with the speed of the prime mover shall be permanently fitted with a satisfactory appliance for the purpose.

(2) Driving belts shall not be shipped or unshipped while the machinery is in motion, save for the customary shifting of light belts on the coned pulleys of machine tools for the purpose of alterations in the working speed.

Loose clothing prohibited near moving machinery

189. (1) No person in charge of or in close proximity to moving machinery shall wear loose outer clothing.

(2) The person in immediate charge of moving machinery or supervising other persons working in the neighbourhood of moving machinery shall not allow any person engaged in close proximity to such machinery to wear loose outer clothing.

Repair, et cetera, of moving machinery

190. The repairing, adjusting, cleaning or lubricating of machinery in motion shall only be undertaken by a competent person and then only when it is impracticable to stop such machinery.

Protection of eyes

191. Suitable goggles or effective screens shall be provided to protect the eyes of persons engaged in the dry grinding of metals, in the electrical or oxy-acetylene welding or cutting of metals and in any other process in which injury to the eyes is likely to occur.

Noise control

192. (1) The manager shall take all reasonable measures to ensure that noise levels at any working place do not exceed ninety decibels 90 dB(A) and where the noise exceeds this level, the manager shall provide approved protective ear equipment to persons working at that place.

(2) Any person who is supplied with protective ear equipment in terms of subsection (1) who fails to wear it at the working place shall be guilty of an offence.

(3) The Chief Government Mining Engineer may stipulate in writing to the manager at which working places approved protective ear equipment shall be worn.

Charge of machinery

193. (1) The manager shall ensure that all machinery shall be in the charge of a competent person.

(2) No person having charge of any machinery which is required to be constantly supervised in the interest of safety shall for any reason whatsoever absent himself or cease to have continuous supervision of such machinery during the time for which he is in charge, unless he is replaced by another competent person.

Maximum hours of work for machine supervisors

194. No person in charge of any machinery which, for the safety of life or limb requires continuous supervision shall be caused or permitted to work for more than ten hours during any continuous period of twenty-four hours:

Provided that this limit when ordered by the manager or other person in authority in cases of emergency or when written permission has been granted by an inspector, may be exceeded. Also provided that during the normal change over of his working shift such person may work, within one twenty-four hour period two shifts of not more than eight hours duration each, which shall be seperated by a period of not less than eight hours between the end of the first shift and the start of the second shift.

Safety appliances

195. Every safety appliance at a mine shall be maintained in good working order and properly used.

Machine to be stopped in case of danger and warning before starting a machine

196. (1) The working of every piece of apparatus of any machinery, the using of which appears in any way to have become dangerous, shall immediately be stopped.

(2) No machine shall be started if by so doing any person is likely to be exposed to danger unless adequate warning has been given that such machine is about to be started.

Safety measures during repairs to machinery

197. (1) When any work or repairs are undertaken on any machinery the person in immediate charge of such work or repairs shall ensure that the power supply to such machinery is switched off or disconnected and adequate precautions are taken for the supply to remain switched off or disconnected until the work or repairs have been completed.

(2) No person shall conduct maintenance or repair work, and no person shall cause or permit such work to be done, until all reasonable precautions have been taken to ensure that the work can be done safely.

General requisites for lifting machines

198. No lifting machine or lifting tackle shall be used unless it is—

(a) of good construction, sound material, adequate strength and free from any patent defect; and

(b) so used that the safety of persons is not endangered; and

(c) provided, where practicable, with a brake or other device which automatically prevents the inadvertent downward movement of the load when the raising effort is removed; and

(d) provided, where practicable, with a limiting device which will cut off automatically the power and apply the brakes when the load reaches its highest safe working position.

Provisions concerning ropes and chains

199. (1) Any rope or chain forming part of a lifting machine shall have a factor of safety, calculated on its static load—

(a) in the case of a fibre rope, of at least ten;

(b) in the case of a steel wire rope or a chain, of at least six;

save that when the load is shared equally by two or more ropes or chains, the factor of safety may be calculated on the sum of their breaking forces.

(2) A steel wire rope shall not be used on a lifting machine unless the diameter and construction of such rope are suited to the diameter of the drum, pulley or sheave on which it is used.

Windlasses, et cetera

200. (1) On every windlass—

(a) the winding rope shall have at least four turns around the drum of the windlass when the conveyance is at the lowest point of travel; and

(b) the end of the winding rope shall be securely fastened to the drum or the drum shaft.

(2) Every windlass, crab or winder operated by hand shall be fitted with a proper, crank handle for applying torque:

Provided that, where persons are being raised or lowered thereby, two such crank handles shall be provided and at least one person shall manipulate each handle.

Hooks for lifting

201. Every hook used for lifting of loads shall be so designed and proportioned or shall be provided with a device to ensure that no accidental disconnexion of the load can take place.

Attachment of slings, et cetera

202. No person shall attach and no person shall cause or permit the attachment of any sling, or any rope or chain to any load, lifting machine or lifting tackle unless—

(a) it is so attached that no accidental disconnexion can take place; and

(b) the stability of the load and the lifting machine during lifting or transportation is ensured and maintained.

Suspended load not to be left unattended

203. No load shall be left suspended from any lifting machine which is unattended under conditions which may be a danger to any person.

Precautions against spillage

204. Any container used for the raising or lowering of material, mineral or rocks shall be so designed, maintained and operated as to prevent spillage:

Provided that this section shall not apply to a grab, shovel, or similar equipment if adequate precautions are taken to ensure the safety of persons.

Persons not be raised, et cetera, by lifting machines

205. (1) No person shall be raised or lowered by means of any lifting machine other than a windlass, crab or winder used in accordance with the proviso to subsection (2) of section 200:

Provided that a person may be raised or lowered within the safe limits of a lifting machine solely for the purpose of making a working place safe.

(2) No person shall be transported by means of a lifting machine except on the drivers platform thereof.

B. BOILERS

Regulation of erection and use of boilers

206. (1) No person shall commence to erect any boiler on any mine unless such intended erection has been approved by the Chief Government Mining Engineer.

(2) No boiler shall be operated unless a certificate of permission to do so has been issued by the Chief Government Mining Engineer.

(3) In every certificate of permission issued in terms of subsection (2) the Chief Government Mining Engineer shall specify the authorized working pressure of the boiler.

(4) The Chief Government Mining Engineer may from time to time, if it appears to him to be necessary or desirable to do so, approve in writing a new working pressure for any boiler which shall then be regarded as the authorized working pressure of the boiler.

(5) No boiler shall be used at a pressure exceeding the authorized working pressure.

Safety valves

207. (1) Every boiler shall be provided with one or more properly constructed, installed and reliable safety valves.

(2) The loading of safety valves on a boiler shall be such that at least one will lift when the authorized working pressure in such boiler is exceeded.

(3) The loading of safety valves on a boiler and the aggregate area available for the discharge of steam shall be such as to prevent an accumulation of steam pressure in the boiler greater than ten *per centum* above the authorized working pressure.

(4) Each safety valve shall be attached directly to the boiler without the intervention of a stop valve.

Stop valves and non-return valves

208. (1) Every boiler shall be provided with a main steam stop valve as close as practicable to the point of draw-off from the boiler.

(2) Where more than one boiler is connected to the same steam range a non-return valve, which may be of the screw-down type and combined with the main steam stop valve, shall be placed between each boiler and the range.

Pressure gauges

209. (1) Every boiler shall be provided with one or more reliable pressure gauges which shall be—

(a) designed to show the correct internal pressure of the boiler; and

(b) so calibrated as to have a range greater than the authorized working pressure of the boiler by not less than twenty *per centum* and not more than one hundred *per centum*; and

(c) so installed that any gauge may be changed while the boiler is in service.

(2) The authorized working pressure of the boiler shall be marked with a red line on the dial of every pressure gauge.

Water Supply

210. (1) Every boiler shall be provided with two or more reliable and independent means of feed water supply, each of which shall be capable of amply supplying the feed requirements of the boiler under all operating conditions and one of which shall be either a power pump or an injector:

Provided that one reliable means of feed water supply shall suffice for—

(a) any boiler having a total internal capacity of one hundred litres or less; or

(b) any oil, gas or electrically heated boiler where means are provided for automatically isolating the source of heat in the event of deficiency of water.

(2) The feeding apparatuses required by subsection (1) shall be independent of each other except that, when a separate feed discharge stop valve is fitted to each pump or injector, one feed delivery pipe shall be considered to be sufficient.

(3) Where the feed delivery pipe enters a boiler, such pipe shall be provided with a self-acting non-return valve and a stop-valve, the stop-valve to be fitted between the non-return valve and the boiler:

Provided that the two valves may have a common body.

(4) For the purposes of this section, two or more boilers combined for joint working shall be regarded as one boiler.

Water level indicators

211. (1) Every boiler shall be provided with two or more reliable water level indicators, one of which shall be a glass water level gauge with proper blow-through cocks or valves:

Provided that one glass water level shall be sufficient for a boiler with a total internal capacity of one hundred litres or less.

(2) For stationary boilers the lowest working water level shall be at least seventy-five millimetres above the highest parts of the flue passing round or through the boiler.

(3) Every boiler shall be provided with fusible plugs and an automatic device to give warning should the level of the water in the boiler become dangerously low.

Blow-down valves

212. (1) Every boiler shall be provided with at least one blow-down valve placed at the lowest point and connected, either directly by flange or by means of a flanged pipe, and where such flanges are not integral with the pipe or valve, they shall not be fastened by means of screw threads alone.

(2) The discharge from every blow-down valve shall be conducted, by means of a blow-down pipe which shall be graded so that the discharge will flow freely thereto, into an open or suitably vented tank, drain or sump which is so situated and guarded as to prevent danger to any person.

(3) Every boiler shall be blown down continuously or with sufficient frequency so as to ensure that no dangerous amount of sludge or dissolved salts is allowed to accumulate.

General safety provisions for boilers

213. (1) Every boiler shall be properly and adequately equipped with all other necessary fittings and auxiliaries or suitable material to ensure safe operations.

(2) A high grade of metal piping shall be used for conveying steam and for all the boiler fittings connected therewith and cast iron pipes or fittings shall not be used.

(3) Every boiler safety valve, pressure gauge, water gauge, fittings and auxiliaries shall be inspected and maintained in proper working order to ensure their safety.

Attachment for pressure test

214. (1) Every boiler shall be provided with a suitable attachment to enable an inspector to affix a pressure gauge for the purpose of carrying out pressure tests.

(2) The attachment referred to in subsection (1) shall be so placed as to enable the inspector's test gauge and the boiler's pressure gauge to be read from one place.

Periodical examination by inspector

215. Every boiler in service or on standby for emergency generation shall, at intervals not exceeding two years, be thoroughly examined internally and externally as far as is practicable, by an

inspector and before being put back into service shall be hydraulically tested in the presence of and to the satisfaction of such inspector:

Provided that in certain circumstances the above examination may be conducted by a competent person with the approval of an inspector and the result of the examination and test shall be recorded in ink in a book provided by the manager in terms of section 218.

Hydraulic testing

216. (1) Any boiler having an authorized working pressure of less than five hundred kilopascals shall be hydraulically tested to double such pressure.

(2) Any boiler having an authorized working pressure of five hundred kilopascals or more shall be hydraulically tested to not more than one comma two times such pressure plus four hundred kilopascals.

(3) No masonry or casing of any boiler may be replaced before the prescribed examination and test by hydraulic pressure has been carried out except with the permission of an inspector.

Precautions during entry to one of battery of boilers

217. When any boiler of a battery or boilers is entered for cleaning, repairing, examination or any other purpose the person in charge shall ensure that it is safe to do so and that all valves are closed and locked or securely lashed during the period that such work is being carried on.

Boiler Record Book

218. (1) A Boiler Record Book provided for the purpose by the manager shall be kept of the working of each separate boiler used for generating steam on a mine in which shall be entered in ink the date on which the boiler is cleaned or examined and the condition of the boiler at such examination and a full report of any alterations or repairs to the boiler. The results of any hydraulic test shall also be recorded in ink.

(2) Each entry in the Boiler Record Book shall be initialled by the manager or some duly qualified person appointed by him.

C. COMPRESSORS AND PRESSURE VESSELS

Construction and maintenance of pressure vessels

219. Every air receiver, cylinder or other pressure vessel shall be—

(a) constructed to the approval and satisfaction of the Chief Government Mining Engineer; and

(b) kept clean and free from—

(i) carbonized oil or other inflammable material which may ignite under working conditions; and

(ii) material which may cause corrosion; and

(iii) materials which is liable to chemical reaction which may cause an uncontrolled rise in pressure; and

(c) maintained in safe working condition at all times.

Information to be marked on pressure vessels

220. (1) Every pressure vessel shall have marked upon it so as to be clearly visible the year of manufacture and the serial number, if known, and the authorized working pressure.

(2) The authorized working pressure of a pressure vessel shall be the designed safe working pressure or such other pressure as may be fixed from time to time by an inspector.

Examination and test of pressure vessels

221. (1) Every pressure vessel shall be—

(a) so far as is practicable, provided with a suitable manhole, handhold or other means which will allow the interior to be thoroughly cleaned and inspected;

(b) at intervals not exceeding six months, examined internally by a competent person appointed by the manager who shall ensure compliance with paragraph (b) of section 219:

Provided that, if it is so constructed that the internal surfaces cannot be thoroughly examined, a pressure vessel shall instead be tested by hydraulic pressure to the satisfaction of an inspector to a pressure one comma five times the authorized working pressure;

(c) at intervals not exceeding two years, tested by hydraulic pressure to the satisfaction of an inspector to a pressure one comma five times the authorized working pressure.

(2) The results of any examination or test required by subsection (1) shall be suitably recorded in ink and the record signed by the competent person carrying out such cleaning, examination, repair and tests.

Air compressors

222. (1) The supply of air for air compressors shall be drawn from the purest and coolest source available.

(2) Every air compressor in which compression takes place in the presence of lubricating oil shall, where possible, be filled with a fusible plug as close as practicable to the outlet valve or discharge port of every stage.

(3) Every air compressor having a rating exceeding one comma five cubic metres of free air per second shall be fitted with a thermometer or pyrometer as close as practicable to the outlet valve or discharge port of every stage and the maximum design temperature shall be indicated by a red mark on the scale of each thermometer or pyrometer.

Pressure gauges

223. (1) All cylinders, receivers or other vessels which are subjected to a higher pressure than atmosphere, other than working cylinders or chambers of heat engine, air engines or portable gas cylinders, shall be fitted with a reliable pressure guage at all times showing the internal pressure.

(2) The dial of every pressure gauge shall be so calibrated as to have a range greater than the authorized working pressure of such pressure vessel by not less than twenty *per centum* and not more than one hundred *per centum*.

Safety and other valves

224. (1) Every pressure vessel shall have at least one reliable safety valve which shall be so loaded that it will lift when the authorized working pressure is exceeded and the area available for discharge of gas shall be such as to prevent accumulation of pressure greater than ten *per centum* above the authorized working pressure.

(2) Adequate precautions shall be taken to ensure that the load setting of every safety valve on a pressure vessel cannot be altered by any unauthorized person.

(3) When a safety valve on a pressure vessel is directly loaded by springs, the compression nuts shall abut against metal stops or washers at the working load compression or be positively locked in position.

(4) No stop valve on a pressure vessel shall be placed between any safety valve and any receiver which it serves.

(5) When a safety valve on a pressure vessel is loaded by a weight or spring acting on a lever, the load shall act only at the extreme end of such lever.

(6) Every safety valve on a pressure vessel shall be so constructed that it shall be free to rotate on its seat.

(7) Every air compressor, except one which discharges into an air receiver and cannot be closed off therefrom, shall be provided with a pressure relief valve or other automatic device capable of preventing an accumulation of pressure greater than—

(a) the pressure for which such air compressor was designed; or

(b) ten *per centum* above the pressure for which the system into which the air compressor discharges was designed;

whichever is the lesser.

Drain for liquid

225. Every pressure vessel in which liquid may collect shall be provided with a suitable drain at the lowest part of the vessel the discharge from which shall be controlled by a cock or valve and shall be led to a safe place.

D. ELEVATORS

Use of elevator to be authorized by Chief Government Mining Engineer

226. (1) No elevator installation shall be used until such use has been approved by the Chief Government Mining Engineer.

(2) In approving the use of an elevator installation, the Chief Government Mining Engineer shall specify the maximum working load of the installation and he may from time to time fix a new maximum working load.

(3) The maximum working load of an elevator installation shall not be exceeded.

Requisites for elevators

227. Every elevator installation and every part thereof shall be of good construction, suitable material, adequate strength, free from patent defect and shall be properly maintained.

Periodical inspection and Elevator Record Book

228. (1) A competent person appointed by the manager shall examine carefully—

(a) at least once in each week at intervals not exceeding ten days, the motor or engine, elevator shaft, guides and drums, ropes and connexions, sheaves and all safety appliances of each elevator; and

(b) at least once in each month at intervals not exceeding forty-five days, the entire elevator installation and all fittings in connexion therewith.

(2) The competent person appointed in terms of subsection (1) shall make a report on the result of any test, examination, repairs or inspection carried out on an elevator which shall, as soon as as is practicable, be entered in ink in a book to be termed the Elevator Record Book which shall be provided by the manager and kept in a suitable place.

(3) Each entry in the Elevator Record Book shall be signed in ink by the competent person responsible for the entry.

(4) The Elevator Record Book shall at all times be available for inspection by an inspector.

Protection of elevator shafts

229. Every elevator shaft shall be effectively protected by gates so as to prevent when such gates are closed, any person falling down such elevator shaft or coming into contact with any moving part in such elevator shaft.

Prevention of overruns

230. In very elevator installation efficient automatic devices shall be provided and maintained which shall ensure that the platform or conveyance does not overrun the highest or lowest point to which it is for the time being constructed to travel.

Protection against failure of ropes, et cetera

231. In every elevator installation efficient devices shall be provided and maintained which will support the conveyance, together with its maximum working load, in the event of failure of the ropes or any other part of such installation.

Requisites for conveyance carrying persons

232. Every elevator installation used for carrying persons shall be provided with a conveyance which is so constructed as to prevent any person carried from falling out or being trapped between any part of such conveyance and any fixed structure or other moving part of such elevator or being struck by articles or materials falling down the elevator shaft.

Ropes

233. (1) No rope shall be used for supporting an elevator conveyance or counterpoise unless it is of good quality and manufacture and of adequate strength and free from any defect.

(2) Any rope referred to in subsection (1) shall be made of wire and the diameter of the wires used in the construction thereof shall be suited to the diameter of the sheaves and drum.

(3) No rope shall be used for supporting an elevator conveyance or counterpoise when the breaking force at any point therein has become reduced to less than five times the maximum working load, the supporting effect of the other rope, if any, being ingnored:

Provided that, in the case of any elevator in which the conveyance or counterpoise is suspended by more than two ropes fitted with appliances for equally distributing the load, a minimum factor of safety of ten on the aggregate strength of all the ropes shall be sufficient, as long as no single rope has a factor of safety lower than three, with respect to the maximum working load.

(4) In the case of any elevator where no part of the rope is rigidly fixed to the drum, the construction shall be such that there shall be no dangerous slipping of the ropes on the drum under any possible working condition, the safety of the apparatus to be judged by an inspector.

(5) When the lifting and counterpoise ropes are rigidly fixed to the drum, there shall be at least three full turns of rope on the drum when they run the limit.

Brakes

234. In every elevator installation, the drum, engine or motor shall be provided with an adequate brake which shall be kept in proper working order.

Clear spaces at top and bottom of elevator shaft

235. A clear space of not less than one metre shall be provided—

(a) between the bottom of the elevator shaft or any equipment at the bottom of the elevator shaft and the lowest point of the underside of the elevator car when the car is at its lowest landing; and

(b) between the top of the elevator car and the underside of the overhead grating or floor when the car is at its top landing; and

(c) between the top of the counterpoise and the underside of the sheave or beams when the elevator car is at its lowest landing:

Provided that, in the case of elevators which run at a speed greater than one hundred metres per minute, the clear space at the top or bottom shall not be less than one comma five metres.

Elevator not to be used during repairs in elevator shaft

236. No elevator shall be used whilst repairs are being effected in the elevator shaft.

Part X

ELECTRICAL APPARATUS, WIRING AND LIGHTING

Interpretation in this Part

237. (1) In this Part—

"circuit" means an electrical circuit forming a system or branch of a system;

"conductor" means an electrical conductor so arranged as to be electrically connected to a system;

"covered with insulating material" means adequately covered with insulating material of such quality and thickness that there is no likelihood of leakage;

"competent person", in relation to any duty or function, means a person who has had adequate training and experience to enable him to perform that duty or discharge that function without avoidable danger to himself or any other person;

"danger" means danger to health, life or limb through shock, burn or other injury to the person or from fire attendant upon the generation, transformation, distribution or use of electrical energy;

"dead" means at or about zero potential and disconnected from any live system;

"earthed" means connected to the general mass of earth in such manner as will ensure at all times an immediate discharge of electrical energy without danger;

"electrical apparatus" includes all electrical cables and conductors and any part of any machinery, apparatus or appliance in which conductors are used or of which they form a part;

"earth leakage protection" means protection based on the principle of sensing current flowing from the live parts of an installation to earth. The sensitivity and time response characteristics of the protection shall be consistent with the object of minimising danger;

"flexible cable" means any cable which is designed to be movable while in use and has its conductors stranded to conform with accepted practice for such cable;

"live" means electrically charged;

"metallic covering", in relation to any electrical cable or conductor, means any metallic covering, armouring, sheath or pipe through which any conductor passes;

"portable apparatus" means any electrically-operated apparatus which is designed to be held in the hands while being operated;

"qualified electrician" means a person who either holds a recognized certificate of competency as an electrician issued by a registered industrial council or has served a recognized apprenticeship;

"substation" means a building or designated area containing electrical apparatus for the control of an electrical power system or circuit;

"system" means an electrical system in which all the conductors and apparatus are electrically connected to a common source of electromotive force;

"transportable apparatus" means any electrically-operated apparatus which is capable of being moved, whilst working from place to place under its own power or by means of any other mechanical power;

"voltage" means the difference of electrical potential between any two live conductors or, if there be only one live conductor, between that conductor and earth;

"extra-low-voltage" means a voltage normally not exceeding thirty volts root-mean-square alternating current or fifty volts direct current;

"low voltage" means a voltage normally exceeding extra-low voltage, but not exceeding two hundred and fifty volts;

"medium voltage" means a voltage normally exceeding two hundred and fifty volts, but not exceeding six hundred and fifty volts;

"high voltage" means a voltage normally exceeding six hundred and fifty volts.

(2) In this Part any reference to a specific voltage shall be construed as including a reference to any voltage falling within a permissible variation therefrom presribed by the Standard Association of Zimbabwe Safety Code CCI of 1964.

Application of Standard Association of Zimbabwe Safety Code for Electrical Wiring of Premises

238. (1) Without derogation from the provisions of this Part, the installation of any electrical cable switchgear, transformer and electrical apparatus of any kind at any mine shall generally conform to the Standard Association of Zimbabwe Safety Code for the Electrical Wiring of Premises S.A.Z.S. No. CC1 of 1964, where it is applicable.

(2) In the event of any inconsistency in the provisions of these regulations and the code referred to in subsection (1) the provisions of these regulations shall prevail.

General provisions regarding electrical apparatus

239. (1) All electrical apparatus and conductors shall be—

(a) of suitable design and of sufficient rating or capacity to avoid dangerous overloading; and

(b) so installed, worked and protected as to prevent any danger arising out of normal use; and

(c) properly maintained in a safe condition.

(2) All distribution systems operating at a voltage exceeding low voltage shall be adequately equipped with main switches which shall have over-current protection and earth leakage protection.

(3) Except in offices and domestic premises, low-voltage circuits or sub-circuits installed for supplying electric power by means of flexible cables to portable or transportable apparatus shall be provided with suitable and effective earth leakage protection.

(4) each individual item of transportable apparatus operating at a voltage exceeding low voltage which uses flexible cables shall be provided with suitable and effective earth leakage protection.

(5) Electrical apparatus shall be kept clear of obstruction and, unless specifically constructed for operation under wet or dirty conditions, shall be kept dry and clean.

Diagrams of general electrical arrangement on mine

240. At any mine at which there is installed electrical apparatus operating at a voltage in excess of medium voltage there shall be kept at the surface of the mine plans or distribution diagrams showing the general electrical arrangement for all such apparatus as far as reasonably possible.

Cutting-off at surface of supply to apparatus underground

241. (1) There shall be provided at the surface at very mine in which there is installed below ground electrical apparatus, other than telephone and signalling apparatus, suitable switchgear for cutting off the supply of electricity to such apparatus.

(2) Efficient arrangements shall be maintained whereby a competent person is in attendance at the mine or readily available on call for the purpose of operating such switchgear whenever any cable below ground is live and any person is at work below ground.

(3) An effective means of communication shall be provided between the place at which such switchgear is situated and—

(a) each established shaft main station; and

(b) a place at or near each main substation immediately controlled by such switchgear.

Cutting-off of supply to circuits, motors, et cetera

242. (1) There shall be provided, in relation to every electrical circuit at every mine, whether at the surface or below ground, such effective means suitably placed for cutting off supply of electricity to that circuit as may be necessary to prevent danger and, without prejudice to the generality of the foregoing such means shall be provided for cutting off supply to any flexible cable at the apparatus by which such flexible cable is connected to a fixed cable.

(2) There shall be provided, in relation to every electrical circuit at every mine, whether at the surface or below ground, such effective means of cutting off automatically the supply of electricity to such circuit in the event of any fault or overload occurring in any part of such circuit as may be necessary to prevent danger.

(3) There shall be provided such effective means of preventing the automatic making live of any electrical circuit or electric apparatus as may be necessary to prevent danger; this shall not preclude the use of autoreclosers on overhead lines.

(4) There shall be provided, in relation to every electric motor at every mine, switchgear which will enable the supply of electricity to be entirely cut off from the motor, such switchgear being placed so that it may be readily operated by the person operating the motor and, wherever the motor is remotely controlled and the switchgear cannot be locked in the "OFF" position, an additional isolater shall be provided which shall be mounted on or adjacent to the motor.

(5) Where a standby generating plant is installed to provide a source of electric power as an alternative to the normal source of supply, a change over switch of the design approved by an inspector or other arrangement approved by an inspector or the electricity supply authority, shall be installed which shall render it impossible for the standby plant to become electrically interconnected with the normal source of supply.

Restrictions on voltages

243. (1) Electricity at a voltage exceeding medium voltage shall not be applied to—

(a) any transportable apparatus:

Provided that higher voltages may be applied to such apparatus with the prior approval in writing of the Chief Government Mining Engineer; or

(b) any motor rated at less than fifteen kilowatts; or

(c) the rotating parts of any apparatus:

Provided that the provisions of paragraphs (b) and (c) shall not apply to slip ring motors or armatures of direct current generators and motors or any other apparatus where the prior approval in writing has been obtained from the Chief Government Mining Engineer.

(2) Electricity at a voltage exceeding low voltage shall not be applied to any portable apparatus.

Inspection, examination and testing of electrical apparatus

244. The manager shall ensure that there is in force a scheme for the systematic inspection, examination and testing of all electrical apparatus in order to ensure as far as is practicable the safety of persons.

Maintenance and protection of electrical apparatus

245. (1) All electrical apparatus shall be so installed as to minimize the danger of fire arising therefrom and shall be kept dry.

(2) No inflammable or explosive material shall be stored in any room or compartment containing operating electrical apparatus or in dangerous proximity to any such electrical apparatus.

(3) Every electricity-generating plant and all main substation transforming and switching equipment shall be adequately fenced off or enclosed and notices prohibiting unauthorized persons from entering shall be placed at all designed places of ingress and, when such plant or equipment is unattended by an authorized person all designed places of ingress shall be kept closed and locked to prevent unauthorized access.

Access to electrical apparatus

246. (1) All parts of electrical apparatus that require attention and all handles for the operation of electrical apparatus shall be so placed that there is face means of access thereto and adequate working space thereat.

(2) All handles referred to in subsection (1) shall be kept free of obstruction and be conveniently placed for operation.

(3) Wherever it is necessary to prevent danger, electrical apparatus shall be identified by a suitably placed label at the point of control.

Prohibition of damage to or interference with electrical apparatus

247. (1) Every person doing any work which may result in such damage to any electrical apparatus that the apparatus might be a source of danger to persons employed thereat shall take adequate precautions to protect it from such damage.

(2) No person on a mine shall wilfully damage any electrical apparatus or, without proper authority, operate, interfere with, remove or render useless any electrical apparatus but in an emergency any person may operate electrical apparatus in order to cut off the supply.

Insulation

248. (1) All material used in any mine for the purpose of insulating any conductor shall be suitable, having regard to—

(a) the degree of installation and mechanical strength required; and

(b) the conditions of temperature and moisture to which it is likely to be subjected; and

(c) any means provided for its protection.

(2) Every conductor forming part of any electrical system shall be kept efficiently insulated from earth:

Provided that—

(i) in the case of any system with polyphase supply, all neutral points in that supply shall be connected to an earth continuity system which shall be earthed at the surface of the mine; and

(ii) in the case of any system with singled phase or direct currenct supply, the mid-voltage point or one pole in that supply shall be connected to an earth continuity systems which shall be earthed at the surface of the mine.

(3) In relation to every electrical system efficient means shall be provided to ensure that, as far as is practicable, wherever any dangerous defect arises in the insulation of the system the supply of electricity to the fault is automatically cut off.

Earthing

249. (1) There shall be connected to earth at the surface of the mine in such manner as will ensure immediate electrical discharge without danger—

(a) every metallic covering of any cable; and

(b) the outer conductor of every concentric cable; and

(c) every metallic of any covering or container of or mounting for any other electrical apparatus; and

(d) every metallic handle for the operation of any electrical apparatus:

Provided that this subsection shall not apply to any electrical apparatus having approved double insulations.

(2) Any earthing conductor installed for the purpose of subsection (1) shall have a conductivity throughout, including any joint, not less than nought comma five that of the conductor or having the greatest current carrying capacity in relation to which it is provided, save, that the equivalent copper cross-section area shall however not be less than two comma five square millimetres and need not exceed seventy square millimetres.

(3) Subject to compliance with the provisions of subsections (1) and (2) and to the provisions of sections 250, the metallic covering of any cable may be used as an additional earthing conductor.

(4) No switch, fuse or circuit breaker shall be placed in any earthing conductor:

Provided that this subsection shall not preclude the use of an isolator in the neutral earthing connexions of alternators or transformers.

Cables

250. (1) This section shall apply to all electric cables at a mine, other than—

(a) flexible cables for portable and transportable apparatus; and

(b) telephone and signalling cables; and

(c) blasting cables; and

(d) at the surface, other cables so placed or otherwise safeguarded as to prevent danger.

(2) Every conductor in any cable to which this section applies other than an earthed outer conductor of a concentric cable and a metallic covering of a cable used as an earthing conductor in accordance with subsection (3) of section 249 shall be covered with insulating material.

(3) Every such cable shall be efficiently protected from mechanical damage and supported at such intervals and in such manner as to prevent damage or danger thereto.

(4) Every such cable which is used for transmitting electricity at a voltage exceeding low voltage and which is situated in any underground excavation in which vehicles are moved otherwise than by hand or in which conveyors are used or at a place where there may be danger or igniting inflammable material, shall be protected by a metallic covering containing all the conductors forming part of the electrical system at that place.

(5) Where such cable is protected by a metallic covering, such covering shall be—

(a) electrically continuous throughout; and

(b) where necessary having regard to its position, protected against corrosion; and

(c) at any place at which there may be a danger of igniting inflammable material, so constructed as to minimize the risk of ignition of that material in the event of any fault in or leakage of current from a live conductor in that cable.

Flexible cables

251. (1) Every flexible cable at any mine shall be adequately protected against mechanical damage and shall be of an approved specification.

(2) No single core flexible cable shall be used at any time for supplying portable or transportable apparatus other than welding electrode holders or trolley-wire locomotives.

(3) Each conductor in a flexible cable shall be covered with insulating material and the conductor and insulating material shall be efficiently protected from damage.

(4) No flexible cable shall be connected to any other electrical apparatus except by means of a properly constructed connector.

(5) A metallic covering provided to protect a flexible cable from damage shall not be used as the sole earthing conductor in respect of such cable or any apparatus connected thereto.

(6) Every flexible cable in use shall be examined by a competent person at least once in each week and every such cable used with portable apparatus shall be examined immediately before use by the person authorized to use the apparatus and, if any such cable is found to be damaged or defective, it shall be repaired forthwith or taken out of service and not used further until it has been effectively repaired.

Switchgear and connexions

252. (1) All parts of switchgear and of electrical connexions at every mine shall be of sufficient mechanical strength and current carrying capacity to prevent danger, in particular from rough usage.

(2) All live parts of such switchgear and connexions shall be so enclosed or otherwise protected as to prevent—

(a) the risk of persons accidentally coming into contact therewith; and

(b) the deposition of dust or other injurious matter thereon; and

(c) the entry of moisture.

(3) Whenever any such switchgear or connexion is at any place at which there may be risk of igniting any inflammable material, all live parts thereof shall be so protected as to prevent such ignition.

(4) Any material insulating any conductor in any cable shall be efficiently protected and sealed at any point at which that conductor is connected to other apparatus and where the insulating property of the material might be diminished by moisture or otherwise.

(5) Whenever any cable protected by a metallic covering is connected to other apparatus, such metallic covering shall be securely and safety attached, both mechanically and electrically, to such apparatus.

Blasting cables

253. (1) Every blasting cable shall be readily identifiable by some specific colour or colouring.

(2) Blasting cables shall not be used for any other purpose than blasting.

(3) Current from telephone, signalling or lighting circuit or from any other source other than a blasting box, or other blasting device approved for blasting shall not be used in a blasting circuit.

(4) Adequate precautions shall be taken to prevent cables or conductors used in blasting circuits from coming into contact with other cables or electrical apparatus other than an approved blasting box, or other device approved for blasting.

Transformers

254. In any transformer at a mine suitable provisions shall be made to guard against danger arising from the charging of lower voltage components by contact with or leakage from higher voltage components.

Telephone and signalling systems

255. (1) Adequate precautions shall be taken to prevent any telephone wire or signalling conductor coming into contact with any cable or electrical apparatus connected to a higher voltage systems.

(2) Contact makers in telephone or signalling apparatus shall be so constructed as to prevent the accidental closing of the circuit.

(3) In any electrical signalling system where failure or disconnexion would be likely to cause a dangerous situation due to loss of signalling facilities a means of verbal communication or alternative signalling shall be provided.

Posting of notices

256. It shall be the duty of the manager at every mine to ensure that the under-mentioned notices are kept posted within all generating stations, winding engine rooms, main substations and pump stations and elsewhere, as may be necessary to minimise danger, in such characters as to be easily seen and read—

(a) a notice prohibiting unauthorized person from interferring with electrical apparatus; and

(b) a notice containing directions for precedure in case of fire; and

(c) a notice containing directions for treatment of persons suffering from electric shock.

Persons working on or operating electrical apparatus

257. (1) Any person doing any work with or on any electrical apparatus which may make such apparatus a source of danger to persons, shall take adequate precautions to ensure the safety of such persons.

(2) Any person neglecting to maintain or inspect or carry out work on electrical apparatus as instructed by a competent person shall be guilty of an offence.

(3) No person shall be instructed to carry out any duty on any electrical apparatus, for which technical knowledge and experience are necessary to avoid danger, exept under such a degree of supervision as may be appropriate having regard to the nature of the work and the knowledge and experience of the person concerned.

(4) No person shall commence any work upon conductor, or in proximity to any exposed conductor, being in either case a conductor in a circuit in which the voltage exceeds extra low voltage, until he has ensured that such conductor has been made dead, and has taken steps, by earthing or other adequate means, to ensure that it will remain dead until he is satisfied that it is safe to restore the current:

Provided that this subsection shall not apply to any work on electrical apparatus which due to the location of such apparatus cannot be made dead in which case such work is done by or under the constant supervision of a qualified electrician authorized in writing by the manager to carry out duties incidental to the generation, transmission, distribution or use of electrical energy.

(5) No person whose duties include the operation of any transportable or portable apparatus supplied with electricity by means of a flexible cable shall at any time either leave that apparatus while it is working or leave the working place, except for the purpose of cutting off the supply of electricity to the cable, without ensuring that the cable has been made dead, unless his instructions expressly authorize him to do so.

(6) A person whose duties include the operation during his shift of any electrical apparatus supplied with electricity by means of a flexible cable shall ensure, before using that cable during that shift, that so much of it as is accessible is examined and that any further parts which subsequently become accessible are also then examined, and he shall not use any cable which is found to be damaged or defective.

(7) For the purposes of this section "qualified electrician" means a person who either holds a recognized certificate of competency as an electrician issued by a registered industrial council or has served a recognized apprenticeship.

Permissible voltages for lighting

258. (1) Subject to subsection (2), the maximum permissible voltage for lighting underground shall be—

(a) one hundred and thirty volts alternating current between line and earth; or

(b) two hundred and twenty-five volts between phases (line voltage) in a three phase alternating system if the neutral point is earthed or two hundred and fifty volts in a single phase system if the centre point is earthed; or

(c) one hundred and thirty volts direct current.

(2) Subsection (1) shall not apply to electric discharge lamps but the conductors, lamps and all equipment associated with such lighting shall be contained in an adequate earthed protective enclosure.

(3) The maximum permissible voltage for lighting on the surface shall be two hundred and twenty-five volts alternating or direct current to earth:

Provided that this shall not apply to the starting and operating voltage of electric discharge lamps.

Overhead lines

259. (1) Where bare overhead wires are used for the transmission or distribution of electrical energy on the surface, glazed porcelain or glass insulators of the correct type and voltage rating shall be used.

(2) Except in the case of electric trolley wires and service lines, the minimum height of any such bare wires or other overhead line conductor above ground or any gantry, dump or similar artificial surface shall be four comma nine metres for voltages not exceeding medium voltage and five comma five metres for high voltage systems.

(3) The height of the earth wire in the system of any voltage shall not be less than four comma six metres above ground.

(4) The minimum height above road or rail surface of any line conductor or earth wire shall be five comma eight metres whenever an overhead line crosses over a road or railway line normally open to traffic.

(5) In order to prevent danger arising from a broken line conductor or leakage from a line conductor, stay wires, supporting framework and metal poles shall be bonded to an earthed conductor carried continuously from pole to pole throughout the length of any overhead powerline.

(6) In the case of an electric trolley line system to be used on the surface or underground, the height of the overhead trolley conductor and the voltage at which such system operates shall be subject to the approval in writing of the Chief Government Mining Engineer.

Lines close to buildings

260. (1) Live conductor used on service lines in the terminal span of a connexion between an overhead line and a building or in a span between one building and another building shall be insulated conductors.

(2) The point of attachment of a service line shall—

(a) where connected to an overhead line, be at a support;

(b) where connected to a building be at a terminating device securely fixed to the building.

(3) A conductor, other than an earth conductor, leading to or from a transformer or other apparatus at a pole-mounted substation shall, at all points below a height of three comma five metres from the ground, be insulated and, in the case of a high voltage conductor, shall have earthed metal sheathing or earthed screening.

(4) Whenever any portion of any overhead line passes any building and thereby might be inadvertently touched by any person or be in such a position to be adversely affected by conditions of heat or moisture, that portion shall be insulated.

(5) The height above ground of any low or medium voltage insulated line conductors used in a service line in the terminal span of a connexion between an overhead line and a building shall, at any point up to and including the point of attachment to the building, be not less than three comma one metres:

Provided that the provisions of this subsection shall not apply to an overhead cable consisting of insulated conductors enclosed in earthed metal sheathing or armouring.

Protection of supports

261. Every support which carries overhead conductors or other electrical apparatus shall be adequately protected to prevent any unauthorized persons from coming into dangerous proximity to the conductors by climbing such support.

Trolley lines and electrically-propelled vehicles

262. (1) Unless otherwise authorized in writing by the Chief Government Mining Engineer, a trolley line conductor system shall be effectively protected throughout its length against the danger of persons making inadvertent contact with the current-carrying parts.

(2) Effective means shall be provided for cutting off the supply of electricity to the trolley line conductor system of any section on the same level and any such section so controlled shall not exceed an installed length of one thousand metres.

(3) Effective means shall be provided, by bonding or otherwise, to ensure that—

(a) the track system overrun by locomotives operating from trolley line conductors is continuous throughout its length; and

(b) the resistance of any joint does not exceed the resistance of ten metres of the track rail; and

(c) the resistance of the whole track system is not greator than four times the resistance of the overhead trolley conductor.

(4) Reasonable precautions shall be taken to ensure—

(a) that no metallic structure or articles in the vicinity of a trolley line conductor shall attain a potential above that of earth; and

(b) the safety at all times of any person working or walking in close proximity to trolley line conductors.

(5) The supply of electricity shall be cut off from any trolley line system which is not in regular daily use.

(6) There shall be provided on any locomotive exceeding eight tonnes mass and on any other electrically-propelled vehicle, whether supplied with electricity from trolley line conductors or storage batteries a device activated by the driver the release of which in an emergency will automatically disconnect the supply of electricity to the driving motors.

(7) Control levers of eletrically-propelled vehicles shall be so arranged that such levers cannot accidentally be removed whilst there is a supply of electricity to the driving motors.

Charging batteries

263. (1) No person shall charge or change any battery of any storage-battery locomotive or storage-battery vehicle at any mine except at a place recognized for the purpose which, for the purpose of this section, shall be called a "charging station":

Provided that this subsetion shall not apply to any combined battery and trolley line locomotive which is designed for battery charging while in use.

(2) Every charging station shall be—

(a) constructed of non-flammable material; and

(b) provided with suitable and sufficient apparatus for fighting outbreaks of fire; and

(c) under the control of a competent person; and

(d) adequately lighted; and

(e) provided with a clean water supply.

(3) Every charging station and all battery chargers shall be so arranged that the gases evolved in charging are adequately dispersed.

(4) Any person spilling any water or electrolyte on any battery or any electrolyte on the floor of any charging station shall forthwith remove it or cause it to be removed.

(5) No unauthorized person shall interfere with any battery charging equipment at any charging station.

(6) No person shall smoke or use any light, other than an adequately protected electric lamp, in or within ten metres of any charging station, and a suitable notice to this effect shall be conspicuously displayed.

(7) Every charging station shall be provided with suitable first aid equipment.

(8) No material other than that required for charging operations shall be stored in a charging station.