

Shafts and winding in mines

Approved Code of Practice on the Mines (Shafts and Winding) Regulations 1993 under section 16 of the Health and Safety at Work etc. Act 1974



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The approved code of practice gives practical guidance with respect to the Mines (Shafts and Winding) Regulations 1993 and sets out the aims to be achieved in order to prevent danger from operations within mine shafts which must be complied with.

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This Code has been approved by the Health and Safety Executive, with the consent of the Secretary of State. It gives practical advice on how to comply with the law. If you follow the advice you will be doing enough to comply with the law in respect of those specific matters on which the Code gives advice. You may use alternative methods to those set out in the Code in order to comply with the law.

However, the Code has a special legal status. If you are prosecuted for breach of health and safety law, and it is proved that you did not follow the relevant provisions of the Code, you will need to show that you have complied with the law in some other way or a Court will find you at fault.

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Notice of Approval

By virtue of Section 16(1) of the Health and Safety at Work etc. Act 1974 and with the consent of the Secretary of State for Employment the Health and Safety Commission has on 26 March 1993 approved the Code of Practice entitled *Shafts and Winding in Mines*.

The Code of Practice gives practical guidance with respect to the Mines (Shafts and Winding) Regulations 1993 (SI 1993 No 302) and to Section 2 of the Health and Safety at Work etc Act 1974.

The Code of Practice comes into effect on 1 April 1993 which is the date when the Regulations come into operation.

Signed
Secretary to the Health and Safety Commission

26 March 1993

Introduction

The Regulations

1 The Mines (Shafts and Winding) Regulations 1993 set out the aims to be achieved in order to prevent danger from operations in shafts and must be complied with. They apply to shafts and winding at all mines which are being worked and replace or modify the statutory provisions listed in Schedules 1 and 2 of the Regulations. The date of implementation is 1 April 1993 for all mines except tin mines; and on 1 January 1996 for tin mines. The Regulations are published as a statutory instrument, but for convenience the full legal text is reproduced and interspersed with the Approved Code of Practice (ACOP).

The ACOP

2 Methods of meeting the requirements set out in the Regulations are given in this ACOP. Regulations reproduced in the ACOP are followed by any practical guidance on compliance which the Health and Safety Commission has approved under Section 16 of the Health and Safety at Work etc Act 1974 (HSW Act). Where a paragraph of this ACOP gives guidance on compliance with duties arising under another statutory provision, an appropriate reference is made at the end of the relevant paragraph.

3 The ACOP provides guidance on safety in shafts and winding at mines and deals with the more important safety areas. However, it cannot specify every possible detail or circumstance. Those who have duties under the Regulations should remain alert to developments and hazards that may not be fully dealt with in the ACOP or other guidance material and should use their expertise to assess what further measures are desirable in the light of good working practice and local circumstances.

4 Although failure to observe any provision of this ACOP is not in itself an offence, that failure may be taken by a Court in criminal proceedings as proof that a person has contravened the Regulation or Section of the HSW Act to which the provision relates. In such a case, however, it will be open to that person to satisfy the Court that the Regulation has been complied with in some other way. When proposing to depart from a provision in the ACOP, the manager or other person on whom a duty is placed should consult the Inspector of Mines in charge of the District, inform the owner or owner's representative and keep a record to help in any future revision of the code.

The legal framework

5 The Regulations and ACOP are intended to operate within the framework of the HSW Act. Under mining statute persons employed at a mine are required to obey certain directions and instructions given to them and rules issued by those on whom duties are laid. Section 7 of the HSW Act requires employees to take reasonable care and to cooperate with those on whom duties are laid by these and other regulations. Section 2 of the HSW Act places general duties on employers for the protection of their employees; eg to provide, so far as is reasonably practicable a safe system of work and information, training and supervision necessary to safety. Sections 3 and 4 provide for the protection of non-employees from the effects of work activities while Section 6 of HSW Act puts general duties on those who design, manufacture, import or supply articles for use at work. The general duties complement the more specific duties created by these Regulations and thus must also be fulfilled.

6 The legal status of an ACOP is set down by Section 17 of the HSW Act. Reference in the ACOP to another document does not imply approval by the Health and Safety Commission of that document except to the extent necessary to give effect to this ACOP. Documents which are referred to in the footnotes to the ACOP, such as the Reports of the National Committee for Safety of Manriding in Shafts and Unwalkable Outlets are not covered by the Commission's approval. Appendices 1,2,3,4 and 5 are part of the ACOP.

7 The Health and Safety Executive enforces mining safety legislation through the Inspectors of Mines it appoints. Sections 21 and 22 of the HSW Act give inspectors the power to issue improvement and prohibition notices which can be used to require persons to take action to improve safety standards or to prevent accidents. Such notices are backed by law and persons can be prosecuted for failure to comply.

Code availability

8 The relevant sections of the ACOP should be drawn to the attention of those concerned at the mine. A copy of the ACOP should be posted in the statutory covered accommodation.

Mutual recognition clause

9 Any reference to a standard shall be satisfied by compliance with:

- (i) a relevant standard or code of practice of a national standards body or equivalent body of any Member State of the European Community;
- (ii) any relevant international standard recognised for use as a standard in any Member State of the European Community;
- (iii) a relevant specification acknowledged for use as a standard by a public authority or any Member State of the European Community;
- (iv) traditional procedures of manufacture of a Member State of the European Community where these are the subject of a written technical description sufficiently detailed to permit assessment of the goods or materials for the use specified;
- (v) a specification sufficiently detailed to permit assessment for goods or materials of an innovative nature (or subject to innovative processes of manufacture such that they cannot comply with a recognised standard or specification) and which will fill the purpose of the specified standard,

provided that the proposed standard, code of practice, specification or technical description provides, in use, equivalent levels of safety, suitability and fitness for purpose to those achieved by the standard to which it is expressed to be equivalent.

Citation and commencement

Regulation 1

Regulation

1

These Regulations may be cited as the Mines (Shafts and Winding) Regulations 1993 and shall come into force -

- (a) except as specified in sub-paragraph (b) below, on 1st April 1993, and*
- (b) in so far as they apply to mines of tin or tin ores, on 1st January 1996.*

Interpretation

Regulation 2

Regulation

2

(1) In these Regulations, unless the context otherwise requires -

“Appoint” in relation to a person means appoint in writing with a written statement summarising his responsibilities and authority, and “appointed” shall be construed accordingly;

“Conveyance “ means any carriage, cage, skip or kibble in which persons, mineral or materials are wound through a shaft;

“Counterweight” means a frame containing weights connected into a single conveyance winding system to reduce the out-of-balance static loads within the system;

“Examination “ means a visual examination by a competent person carried out carefully and critically and supplemented by other means (such as measurement and where necessary non-destructive testing) in order to arrive at a reliable conclusion as to the condition and safety of the equipment or installation which if necessary should be dismantled, and “examine” shall be construed accordingly;

“Inspection “ means a visual inspection by a competent person looking carefully and critically for anything which may impair the safe and efficient working of the equipment or installation and “inspect” and “inspected” shall be construed accordingly;

“Keps “ means retractable supports in a shaft on which a conveyance may rest but does not include the doors at the top of the shaft sinking;

“Lift apparatus” means an electrically powered lift and includes equipment used in relation to the lift in the shaft and at shaft entrances;

“Mine “ means an excavation or system of excavations, including all such excavations to which a common system of ventilation is provided, made for the purpose of, or in connection with, the getting, wholly or substantially by means involving the employment of persons below ground, of minerals (whether in their natural state or in solution or suspension) or products of minerals;

Regulation

“Overwind” means unintentional overtravel of a conveyance or counterweight beyond the limits set by a device installed for the purpose of preventing such overtravel;

“Owner” in relation to a mine means the person who is for the time being entitled to work it;

“Shaft” includes a staple-pit, raise, winze or any similar excavation whether sunk or in the course of being sunk and so much of any superstructure provided at the top of a shaft as forms an extension to the shaft shall be deemed to form part of the shaft which is below ground;

“Winding apparatus” means mechanically operated apparatus for lowering and raising loads through a shaft and includes a conveyance or counterweight attached to such apparatus and all ancillary apparatus;

“Winding engineman “ means a person competent to operate the winding apparatus during manual winding.

(2) *A mine shall be treated as being worked at any time when there are persons at work below ground or plant or equipment is in operation at the mine to maintain the safety of that mine or of any other mine or the operation of driving a shaft or outlet is being undertaken at the mine.*

(3) *In these Regulations, unless the context otherwise requires, any reference to-*

(a) *a numbered regulation is a reference to the regulation of these Regulations so numbered;*

(b) *a numbered paragraph is a reference to the paragraph so numbered in the regulation in which that reference appears.*

(4) *In any document issued under these Regulations any word or expression to which meaning is assigned by the Health and Safety at Work etc. Act 1974, the Mines and Quarries Act 1954^(a) or these Regulations shall have the meaning so assigned to it.*

(a) 1954 c.70 extended by the Mines and Quarries (Tips) Act 1969 (c.10) and the Mines Management Act 1971 (C.20); relevant amending instruments are SI 1974/2013 and SI 1976/2063.

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ACOP

10 Appointments should be made by a written statement which summarises the appointee’s duties and authority. Where the appointee makes appointments to similar posts, whether at different mines or within a single mine, the written statement could be in a standard form appropriate to that type of post. If there are any special limitations or conditions peculiar to a particular appointment the standard form, if it is used, should be suitably amended.

11 The definitions in regulation 2 (1) extend to those terms where used in the ACOP. Where appropriate, terms used in the ACOP but not in the Regulations are defined in the glossary (appendix 5).

12 Regulation 2(2) defines when a mine is being worked and includes a mine where plant and equipment are operated intermittently.

2

Application

Regulation 3

Regulation

3

(1) *These Regulations shall apply to all mines which are being worked.*

(2) *Regulation 4 shall also apply to the specification, planning or design of the sinking of a shaft for the purpose of working a mine.*

Shaft sinking

Regulation 4

Regulation

4

(1) *The owner shall ensure, so far as is reasonably practicable, that the sinking of the shaft is so specified, planned and designed as to be safe, and without risk of injury to persons.*

(2) *The manager shall ensure, so far as is reasonably practicable, that the shaft is constructed or sunk safely, and without risk of injury to persons.*

(3) *For the purpose of paragraph (1) or (2), the owner or manager respectively shall take into account risks which (at the time the shaft is specified, planned, designed or, as appropriate, constructed or sunk) it is reasonably foreseeable will arise either while the shaft is being constructed or sunk or during the time it is intended to be used.*

ACOP

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13 Paragraphs 13-40 give guidance specific to the sinking of new shafts, staple shafts, or deepening of existing shafts. Guidance given in other parts of this ACOP should also, where it is relevant, be followed in shaft sinking operations.

14 In the planning, design and construction of a new shaft, staple shaft or deepening of an existing shaft the nature of the strata through which the shaft will be sunk and the eventual duty of the shaft should be taken into account. The shaft should be suitably lined unless the nature of the strata makes it unnecessary.

15 Shaft sinking work should be supervised by persons appointed for the purpose by the manager in the case of statutory appointments and, in the case of non statutory appointments, by the employer (eg a master sinker, foremen sinkers and chargemen). Such persons should be competent to carry out shaft sinking and should be well acquainted with the requirements of the regulations and of paragraphs 16 to 40.

ACOP

Protection against persons falling

16 Scaffolds used in shaft sinkings should be equipped with safety fences and attachment points for safety harnesses. Such scaffolds should not be moved except under the direction of the person appointed to supervise the sinking. When stationary, scaffolds should be wedged or secured to the shaft wall as necessary to prevent danger. Scaffolds and their suspension gear should be inspected at least once in every 24 hours. There are also inspection and maintenance requirements under Regulations 5 and 17. (See also Regulation 7.)

Falls of ground

17 As a precaution against falls of ground care should be taken to ensure that, in accordance with the Manager's Support Rules, a temporary support system is always installed at the earliest opportunity.

Protection against falling objects

18 In addition to the precautions listed in paragraph 55 the following precautions against falling objects should be taken:-

- (a) doors should be provided at the top of the shaft or deepening, except during the initial period of the sinking, which are capable of closing off the shaft. The doors should be kept clear and not opened except when free of debris. A specified area surrounding the shaft top or any entrance and in the case of deepening the top of the deepening should be clearly marked and kept free of any loose materials;
- (b) scaffolds and headgears should be provided with adequate toe boards 150 mm high, and kept clear of unnecessary loose material and debris. Objects which are loose and can fall freely should be secured; and
- (c) walling and tubbings should be inspected at least once in each working shift, ^(a).

Action in the event of an inrush or outburst

19 In the event of an inrush of water or outburst of gas, persons should be evacuated immediately to a safe place. Following such an occurrence persons should not return to the affected area until a procedure for safe re-entry, appropriate to the circumstances, has been established.

Exit

20 Regulation 4 of the Mines (Safety of Exit) Regulations 1988 and paragraphs 9-17 of the ACOP relating to those Regulations apply where appropriate to shaft sinking. Facilities should include ladders so that persons at the bottom of a sinking can when necessary quickly reach a safer position such as the sinking scaffold.

(a) The Report of the National Committee for Safety of Manriding in Shafts and Unwalkable Outlets "Safe Manriding in Mines" (SMIM), Part 2B sections 15, 16 and 23.

ACOP

Winding apparatus used for sinking

21 The owner should comply with the regulations concerning winding apparatus. However due to the nature of sinking operations some deviation from winding practice (see paragraphs 68-120) may be unavoidable. In that event precautions should be taken to ensure that danger does not arise. The following paragraphs set out some of these precautions.

Scaffold winches

22 Scaffold winches should be equipped with interlocks to ensure that any clutch cannot be withdrawn until the associated brake is fully applied. Similarly it should not be possible to release that brake unless the associated clutch is fully engaged. When any clutch is withdrawn in order to level the scaffold, only upward movement of the ropes should be possible.

23 Scaffold winch braking systems should be designed to the same strength criteria as winding engine brakes.

Scaffold ropes

24 The maximum life for a scaffold rope should be 3½ years from the first day of use unless the owner is satisfied that it is safe to extend the rope life and has confirmed this in writing to the manager. To establish that such an extension is safe, the owner should arrange, approximately two months before the rope life ends for a 1 m sample, indicative of the condition of the rope, to be cut and submitted for testing at a suitable rope testing laboratory.

25 The laboratory examination should assess the standard of lubrication, the effect of wear, corrosion and fatigue and establish the aggregate strength. This should be augmented by an examination of the rope throughout its length. The examination should include cleaning and measuring at places particularly liable to deterioration and at other places not normally covered by regular inspection. Non-destructive testing (NDT) may assist in determining whether the rope may continue in service beyond its normal life. NDT is particularly useful for this purpose if it has been carried out at intervals throughout the life of the rope because the extent and rate of deterioration can then be assessed. The results of any tests and examinations should be kept at the mine and should clearly indicate the life extension which is appropriate. This should not exceed 12 months. If any further extension is proposed the procedure described in paragraph 24 and this paragraph should be repeated.

26 The factor of safety of any scaffold rope should not be less than 5. Scaffold ropes should be recapped every 12 months in accordance with the procedure for winding ropes described in paragraph 195. The main load-carrying members of the scaffold structure should have a factor of safety of at least seven.

Guide ropes

27 Guide ropes should be installed as early as possible. Where this is not practical the winding rope used should be of a non-rotating type.

28 During excavation the maximum depth of shaft permitted below the sinking scaffold should be such that the scaffold is as close to the bottom of the sinking as is consistent with safety. This is in order to minimise the distance the conveyance has to travel without guides.

ACOP

Overwind protection

29 The movement of the conveyance should be controlled so as to minimise the risk of collision with the sinking scaffold. The automatic contrivance should be regularly adjusted to ensure that the speed of the conveyance cannot exceed 2m/s when it is at or below the level of the scaffold.

30 Where detaching hooks are not used, a penultimate overwind switch and an ultimate overwind switch connected into different control circuits, each of which is arranged to cut off the motive power to the winding engine and apply the brakes, should be provided in the headframe for each conveyance. These switches should be connected to tensioned trip wires or similar devices operated by the rider. The overwind clearance above the ultimate overwind switch should be sufficient to allow the conveyance to be brought safely to rest with 50% of the normal mechanical braking force applied from the maximum controlled speed with the most onerous out of balance load when persons are being carried. Crash doors should be situated immediately below each conveyance when it is in the ultimate overwind switch position. They should close automatically without damaging the winding ropes whenever any conveyance reaches that position.

Written instructions on transmitting signals

31 The manager should give any person appointed under Regulation 16(1) to transmit signals under Regulation 14, and any person authorised to transmit signals from the shaft floor to the onsetter positioned on the sinking scaffold, written instructions to ensure that:

- (a) the conveyance is correctly attached to the winding rope;
- (b) the conveyance is properly loaded;
- (c) no minerals project above the rim;
- (d) tools, equipment and other materials for use in the mine are not carried together with minerals and are secured if they project above the rim of the conveyance;
- (e) nothing capable of causing injury is adhering to the outside of the conveyance; and
- (f) when the conveyance is to be raised it is first allowed to hang free and then steadied.

A person competent for the purpose should ensure that anything raised or lowered other than in a conveyance is safely slung.

32 When anything is being lowered through a shaft sinking, the competent person operating the winding apparatus should stop the load about 6m above the scaffold and not lower it further unless a signal has been received that it is safe to continue winding. Where necessary the same procedure should be followed above the bottom of the shaft sinking. Similarly when raising anything through the shaft the person should stop it about 1.5m above the bottom of the shaft sinking and should not raise it further until the appropriate signal has been received to continue winding.

ACOP

Interlocking

33 Interlocking with the winding engine control system should be provided so that:

- (a) when winding is taking place, tipping chutes are clear of the path of the conveyance;
- (b) during an ascending wind, the shaft top doors are open whenever a conveyance is in a zone extending from a safe stopping distance below the doors until it is above the doors;
- (c) before discharging conveyances into the tipping chutes, all shaft top doors are closed; and
- (d) where there are two winding systems in the same shaft they should be interlocked so that whenever either system is selected for manwinding, the other cannot be used in any alternative mode.

34 The banksman should not allow persons to enter or leave a conveyance or to load materials into or unload them from a conveyance unless the shaft top doors have been closed and the conveyance lowered onto them. The interlock system should allow the conveyance to be raised off the doors and the doors opened before the conveyance is wound down the shaft.

Cranes used in foreshafts

35 The excavation of a foreshaft should be carried out using a suitably tested winding system, eg temporary winders or in exceptional cases cranes.

36 Cranes should not be used for winding longer than is necessary to allow the normal winding apparatus to be installed; and in any event they should not be used to wind from depths exceeding 90 m. Their stability should be maintained at all times and they should be secured on a level foundation adjacent to the shaft. Hoist ropes should comply with the relevant requirements for drum winding ropes in paragraphs 124-134 of this ACOP. The crane driver should have sufficient visibility to control the operation safely. Cranes should be fitted with an automatic safe load indicator (ASLI) and a display table indicating the maximum permitted load at varying inclinations of the jib or radii of the load. The maximum permitted load should be specified at not more than 80% of the normal rating of the crane. The ASLI^(a) should give an audible and visual warning when the load being raised or lowered approaches the safe working load. The indicator should be fitted with a device to cut off the power to the motors to prevent further lifting and to apply the hoist drum brakes if the safe working load is exceeded by 10%. The device should be designed, as far as practicable to fail safe.

37 Every crane should be fitted with brakes which can stop and hold the load stationary at any point in the shaft. Preferably such brakes should act directly on the hoist and derricking drums. Brakes should be capable of exerting a braking torque at least 25% greater than the torque applied to the drum by the maximum safe working load. Crane brakes should be automatically applied when the appropriate control lever or switch is not held in the operating position and whenever the motive power is cut off.

(a) BS 7262: 1990 for ASLIs

ACOP

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38 Cranes should be provided with suitable devices which automatically cut off the motive power and apply the brakes when:

- (a) the speed of the crane hoist exceeds the maximum speed specified by the manager by more than 15%;
- (b) the jib moves beyond the normal limits of the derrick motion; or
- (c) any overwind device is operated.

39 Cranes should be provided with effective means to prevent the jib moving whenever a load is being raised or lowered through the shaft.

40 Scotch Derrick cranes fitted with a single motor for both hoisting and derricking motions and containing cast iron components, the failure of which could cause uncontrolled movement, should not be used.

Equipment of shaft and inspection, examination and maintenance of shaft and fixtures

Regulation 5

Regulation

5

(1) *The owner shall ensure that each shaft is so equipped that, so far as is reasonably practicable, it is safe to use.*

(2) *So far as is reasonably practicable, the owner shall provide suitable winding apparatus in any shaft through which a person travels.*

(3) *The manager shall ensure that each shaft is so maintained that, so far as is reasonably practicable, it is safe to use.*

- (a) *In order to maintain the shaft and its fixtures in a safe condition the manager shall appoint sufficient competent persons to inspect and to examine each shaft and its fixtures at suitable intervals of time, and to carry out such maintenance as is necessary;*
- (b) *the written statement summarising the responsibilities and authority of any competent person mentioned in sub-paragraph (a) of this paragraph shall-*
 - (i) *include details of the frequency of the inspections or examinations and of the nature of the examinations, maintenance or examinations and maintenance which that competent person shall carry out, and*
 - (ii) *be revised when necessary to ensure that those details are correct and up to date;*
- (c) *every competent person mentioned in this regulation shall record the result of any inspection or examination he makes setting out any defects he finds.*

ACOP

41 Shaft sumps and extensions of the shaft above the surface landing should be provided with adequate ventilation and suitable means of access to enable apparatus and fixtures in them to be inspected or examined. Suitable means should be provided where necessary for the removal of spillage and control of water.

42 Pipes and cables should be securely installed with adequate clearances from moving conveyances and counterweights and positioned to avoid danger. For new installations methane drainage pipes should not be located adjacent to electric cables, or opposite the open ends of conveyances or where practicable in a downcast shaft. Where necessary, pipe ranges should be earthed to prevent the build-up of static electricity^(a).

Ladderways and stairways

43 Every shaft through which persons travel should be provided with winding apparatus suitable for manwinding (see Regulation 10). Where this is not practicable, the requirements of the Regulation must be met by other means. For example in very shallow shafts (normally those less than 50 m deep) or in shafts which are only used as an emergency means of egress, ladders or preferably stairways may be provided.

44 Any ladderway should be properly constructed and maintained to provide safe means of egress. All ladders should be securely fastened and provided with platforms at intervals which, in the case of installations carried out after the commencement date of the Mines Safety of Exit Regulations 1988, should not exceed 5 m. These platforms should be securely fenced and constructed so as to form a safe place of rest and allow reasonably convenient access for carriage of an injured person on a stretcher. Unless secure handholds are provided, ladders should project at least 1m above any platform. Ladderways should be provided with suitable fencing which will prevent persons falling further than the distance between adjacent platforms and offer protection from falling objects. At new installations, if space permits, ladders should be suitably inclined. (See also Regulation 6(b) of the Mines Safety of Exit Regulations 1988.)

45 Stairways should offer the same standard of protection as that recommended for ladderways in paragraph 44.

Appointment of competent persons

46 The manager's appointments for the purposes of Regulation 5 (4) (A) should be technicians skilled in the maintenance of shaft linings and fittings. These persons should be trained in shaft work and associated safety procedures and will normally report to the mine engineer. From time to time, other qualified persons will need to make inspections (eg civil and electrical engineers) and the manager should provide for this.

(a) See BS 5958: Code of Practice for control of undesirable static electricity.

ACOP

Inspection, examination and maintenance of shafts

47 The manager's written instructions to competent persons should detail arrangements for the inspection of the lining^(a) of the shaft and of the foundations and structures associated with the shaft and any pipes or cables installed in it.

48 Routine inspections of the lining and fixtures of a shaft through which persons are carried (including any part of the sump containing fixtures provided to meet the requirements of Regulation 5(1)) should be made at intervals not exceeding 7 days. Such inspections should determine the state of the shaft lining, the state of the water garlands and detect loose material that may fall. Any part of such a shaft through which persons are not normally carried may be inspected at longer intervals provided that it is inspected before persons other than persons making the' inspection travel through it. The intervals between inspections of parts of a shaft through which persons are not carried will depend on the condition of the shaft and its fittings and the rate at which deterioration is likely to occur but in any event should not exceed six months. However where winding apparatus extends through such a part of a shaft the apparatus should be inspected in accordance with paragraph 188. Where a substantial plug or partition is keyed into the surrounding strata and provides adequate support for the upper part of the shaft, no inspections of the lower part of the shaft are required if the manager is satisfied that no danger will arise as a result. Ceramic or other monitoring devices should be installed to detect movement of the shaft lining above such isolating plugs. Where a shaft is provided solely for pumping or ventilation purposes and is not used for the transportation of men, materials or minerals, the foregoing requirements do not apply. However the manager should make arrangements to ensure that such a shaft is kept secure. In some cases this may be achieved by an inspection from the top of the shaft and any accessible inset but where distances are too great to permit this, the use of TV cameras should be considered as an alternative to access by temporary winding apparatus. Where it is necessary to enter such a shaft the precautions listed in paragraphs 57 to 60 of this ACOP should be adopted. The more detailed examination of equipment should be included in the manager's scheme for the mine. The responsibility of the appointed person will include carrying out the examination of that part of the scheme relating to shafts.

Reports of inspections or examinations

49 After any inspection or examination required under these Regulations, the person carrying it out should make a written report identifying any defects requiring remedial work. Defects likely to affect the safety of the shaft should be brought immediately to the attention of the manager or to the person for the time being in charge of the mine. These reports should be compared with previous reports by a competent person to assess if there has been any deterioration likely to affect safety.

Use of shaft or its fixtures

Regulation 6

Regulation 6

The manager shall ensure, so far as is reasonably practicable, that when a shaft or fixtures in a shaft are used, they are used safely.

ACOP

Transport of materials and minerals

50 The manager should make arrangements to ensure that persons do not enter the shaft when materials or minerals are being transported except in the following circumstances:

- (a) in an adequately protected ladderway (see paragraph 44);
- (b) during shaft sinking;
- (c) during installation or maintenance work in the shaft when it may be necessary for persons to take maintenance equipment and materials with them;
- (d) when transporting bulky materials which cannot be raised or lowered inside a conveyance - in such circumstances the load may project above the top of the conveyance or be slung beneath it and it may be necessary for someone to travel on the conveyance to ensure that the load does not foul the shaft or its fixtures. In this case it will be appropriate to travel at reduced speed;
- (e) when fluids, minerals or materials are being transported through a pipeline in the shaft;
- (f) when gravity operated winding apparatus is being used;
- (g) when a special compartment is provided in a lift apparatus to separate the materials from the manwinding deck and the lift apparatus is equipped with solid doors and load monitoring equipment;

51 Persons travelling through a shaft in a conveyance may take with them such items as portable technical equipment or personal tool kits which are necessary for their work provided it is safe to do so.

52 Where minerals are transported through a shaft by a pipeline means of halting the flow of minerals should be provided. These means should be readily accessible at suitable positions at the shaft side.

53 Where minerals are carried in a skip measures should be taken to prevent:

- (a) overloading the skip;
- (b) loading unless an empty skip is in line; and
- (c) a skip from being unloaded unless there is sufficient capacity in the receiving hopper for its full load.

These should be achieved by the provision of appropriate interlocks. Where this is not practicable there should be personal supervision.

54 Where winding apparatus comprises a conveyance and counterweight it is sometimes necessary for shaftsmen to travel on the counterweight for the purpose of inspecting the shaft. To ensure safety the counterweight should be provided with a suitable platform with handrails.

ACOP

Protection from falling objects

- 55 The manager should make arrangements that require:
- (a) banksmen and onsetters, or other persons appointed for the purpose, to keep landings and insets clear of loose materials and minerals;
 - (b) where appropriate, working platforms to be provided with toeboards 150 mm high to prevent tools etc from falling off them; and
 - (c) canopies and covered walkways to be provided at landings or insets where persons may be at risk.

Egress from overwound conveyances

56 Platforms and stairways or ladders should be provided to allow persons in an overwound conveyance which has been detached from the rope or held by the catches referred to in paragraph 97 to reach a place of safety. Suitable exit provisions should also be made where necessary in shaft sumps.

Access to shafts not equipped with winding apparatus

57 Where safe travel is required only for limited purposes or when it is proposed to enter disused shafts, (ie a shaft not normally used by persons in the course of their work) procedures should, where possible, be drawn up to ensure that the process of entering such a shaft is carried out safely. In an emergency, time may not permit these procedures to be drawn up in a formal manner but on such occasions a competent person should supervise the operation.

58 Oxygen deficiency and toxic or flammable atmospheres are dangers which should be avoided by the use of sampling, preferably from a remote position, and provision of adequate ventilation.

59 Safety harnesses should be used in accordance with paragraph 62.

60 Falls of ground or falling objects are possible and precautions should be taken to safeguard against these hazards as exploration and restoration of the shaft proceed.^(a)

Abandoned mines

61 Shafts at abandoned mines where there is no work of any sort in progress are covered by Section 151 of the Mines and Quarries Act 1954 and are outside the scope of these Regulations.

(a) There is further information on disused shafts in the British Coal publication "The Treatment of Disused Mine Shafts and Adits".

Safety harnesses

Regulation 7

Regulation

7

(1) *So far as is necessary to ensure safety, a person in a shaft shall wear and use a suitable safety harness.*

(2) *The manager shall ensure that sufficient suitable safety harnesses in good condition are available and that there are sufficient suitable anchorages to ensure safety.*

ACOP

7

62 Where there is a danger that persons may fall from a height in a shaft they should wear a safety harness at all times. They should ensure that the harness is secured to a suitable anchorage and should only detach it to move to a new working position. A full body harness^(a) should be used. The use of simple safety belts in shafts is not acceptable.

63 The manager should ensure safety harnesses are in good condition by making arrangements for their issue, storage, inspection and maintenance. They should fit properly and should therefore be available in a range of sizes or fully adjustable.

64 All conveyances, counterweights and working platforms should have sufficient anchorage points available to enable persons to reach any part of the shaft on which they need to work whilst making use of their safety harness.

(a) Type D harness in BS 1397: 1979 Specification for industrial safety belts, harnesses and lanyards.

Space at bottom of shaft

Regulation 8

Regulation

8

The manager shall ensure, so far as is reasonably practicable, that no person enters or remains in any uncovered space at the bottom of a shaft unless -

(a) *the entry is-*

- (i) *for the purpose of working there, or*
- (ii) *during shaft sinking operations; and*

(b) *suitable safety precautions are taken.*

ACOP

8

65 No person should work in any uncovered space at the bottom of a shaft when the winding apparatus is in motion, or when anything is suspended from the winding apparatus (eg during slinging operations), except for the purpose of maintenance operations or the handling of bulky equipment or material.

Barriers

Regulation 9

Regulation
9

The manager shall ensure that at each entrance to a shaft there is a barrier suitable to ensure safety.

ACOP

Protection against injury from falls and moving equipment

66 Shaftside barriers and gates should be designed, constructed and maintained so as to prevent persons and objects from falling into the shaft or coming into contact with working parts of the winding apparatus^(a). Shaft gates should be kept closed unless loading or unloading is in progress. If any part of a shaftside barrier is removable the banksman or onsetter should ensure that it is kept in place at all times except as necessary for the use of the shaft or for inspection or maintenance.

67 Areas around the top of or entrance to a shaft should be kept clear of loose material- see paragraph 18(a).

(a) BS 5304: 1988 BS Code of Practice for safety of machinery and SMIM, Part 2A paragraphs 144 and 148.

9

Suitability of winding apparatus

Regulation 10

Regulation

The owner shall ensure that winding apparatus is suitable for the purpose for which it is used, and has effective and suitable:-

- (a) *brakes;*
- (b) *except in the case of lift apparatus, brake locking devices and brake interlocking devices;*
- (c) *means of controlling power to the winding engine;*
- (d) *means of preventing an overwind;*
- (e) *means of preventing a conveyance or counterweight travelling at an excessive speed;*
- (f) *means of safely stopping and holding a conveyance or counterweight in the event of an overwind; and*
- (g) *means of monitoring the movement of every conveyance in the shaft.*

10

ACOP

Design and construction of winding apparatus

68 Winding apparatus should be designed and constructed to include:

(a) *winding engines* which should:

- be firmly anchored to secure foundations;
- be separately housed except at a shaft sinking or where two winding engines serve the same shaft;
- have local manual controls independently located in such a manner that a person operating one winding engine is not distracted by movement or signals associated with the other engine;
- avoid the use of single line components wherever practicable. Where their use is unavoidable they should be designed so as to avoid danger: for example they may be designed to fail safe (see paragraphs 73 and 86);

(b) *controls*: where more than one means of control are provided, interlocking should ensure that the winding engine will only respond to the controls which have been selected. This requirement does not apply to the stop switch referred to in paragraph 85, or the emergency stop facility referred to in paragraph 137; and

(c) *facilities to enable routine maintenance*: facilities should be incorporated into the winding apparatus to enable routine maintenance and tests to be carried out safely and effectively.

Hydraulic system protection

69 Brake system pumps should be prevented from starting when the brake lever is not in the fully applied position except in the case of the automatic operation of pumps in an accumulator system. Where brakes are operated by hydrostatic power, fluid thermal and level protection systems should be fitted. Where liquid controllers are operated by a hydraulic servo unit, this unit should be fitted with fluid thermal protection. The protective devices should:

- (a) give an alarm to the person controlling the winding engine when a predetermined limit above normal operating temperature is exceeded;
- (b) in the case of unattended winding apparatus after completion of the wind, prevent further winding and stop the hydraulic pumps if a predetermined unsafe limit is attained.

Mechanical brakes

70 Each winding engine should be fitted with mechanical brakes which act directly on the drum or sheave and which are capable of bringing the winding apparatus safely to rest. The mechanical brake should be automatically applied when the power supply is cut off. Where the mechanical brakes are applied wholly or partially by hydraulic, steam or air pressure, they should be provided with a means of automatic application independent of such pressure. Such brake systems should be fitted with pressure gauges to enable the braking force to be checked.

ACOP

71 The performance of winding engine mechanical brakes should be adequate for both service and emergency duties and meet the following requirements:

- (a) *drum winding apparatus with two conveyances or a conveyance and counterweight* - the brakes should be capable of holding the drum stationary when the loads are balanced and the normal maximum torque is applied in either direction by the winding engine;
- (b) *drum winding apparatus with one conveyance* - the brakes should be capable of holding the drum stationary when the fully loaded conveyance is halfway down the shaft and the normal maximum downwards torque is applied by the engine;
- (c) *clutched drum winding apparatus* - when the drum(s) are clutched the brakes should be capable of holding the drum(s) stationary when the loads are balanced and the normal maximum torque is applied in either direction by the winding engine. In the declutched condition the brakes should be capable of exerting a suitable braking torque(a). If manwinding is to take place with a drum declutched other than in an emergency, the driven drum should be used for manwinding and should be provided with two brakes or one disc with two independent braking calliper units which, when the other drum is declutched, are capable of exerting a braking torque not less than that defined in (b) above for a drum winder with one conveyance (see paragraph 179(g));
- (d) *friction winding apparatus manually applied brakes* - the brakes should be capable of holding the driving drum/sheave stationary when a torque is applied to it of 2.5 times the maximum static torque which will occur during the winding of persons, materials or minerals. The winding engineman should be able to vary the braking torque up to the maximum required;
- (e) *friction winding apparatus emergency or automatically applied brakes* - the brakes should be capable of producing a braking torque which will reduce the speed of the ropes on the winding drum/sheave at a rate of at least:
 - (i) 1 m/s² when persons are being carried; or
 - (ii) 0.5 m/s² when materials or minerals are being carried.

The maximum permissible retardation under emergency trip conditions should not exceed that produced by the greatest torque which will not cause slip between the winding ropes and the drum/sheave. This should be calculated on the basis of a coefficient of friction between them of 0.2. The maximum retardation which should not cause the winding rope to slip should be determined from the formula in appendix 3. Emergency brakes should produce a braking torque, when the drum/sheave has been brought to rest, of not less than that required to produce the retardations specified in sub-paragraph (i) and (ii) above.

72 In drum winding systems, to minimise the risk of injury to persons when the brake is applied following an emergency trip excessive retardation of the conveyance should be avoided. To achieve this the maximum retardation of the drum should not exceed 5m/s² but should preferably be less than 3.5 m/s².

(a) SMIM, Part 1B section 32, paragraph 20.

ACOP

73 The mechanical braking system should be able to bring the winding apparatus safely to rest and apply at least 50% of the normal braking force in the event of failure or malfunction of any one component of the system. The brakes should be automatically applied following any significant reduction of operating fluid pressure in the system. Newly manufactured brakes should not contain any single line components. Existing mechanical brakes should wherever practical be modified to eliminate single line components. If this cannot be achieved any such components should be designed and manufactured for infinite fatigue life, and their operational life should be specified. All safety critical braking components should be designed to have a suitable margin of reserve strength taking into account fatigue effects, stress raisers and impulse loading.

74 Steps should be taken to prevent contamination of brake paths or linings, eg by moisture or oil^(a) since this may lead to serious reduction of braking torque. These steps should include the adequate heating of winding engine houses. Where this is impractical local heating to prevent condensation on braking surfaces should be considered. Monitoring devices should be provided to give warning of conditions likely to lead to condensation problems.

Electrical braking

75 Electrical braking should be provided for all electrical winding apparatus where it is practicable to do so. However some existing backshaft winding apparatus used for manwinding may not include such facilities in view of their low speed and infrequent use. Where electrical braking is provided the facility to apply it either automatically or by the winding engineman should remain available at all times after the initiation of an emergency trip or until the mechanical brakes have been proved to be on (eg by pressure/limit switches) and preferably substantially effective.

76 Push button winding apparatus and new winding apparatus used for manwinding should have electrical braking designed so that in the event of an emergency trip it is retained and applied automatically to compensate for any loss in the effectiveness of the mechanical brakes and to ensure that the winder is brought safely to rest at a predetermined retardation.

77 The simultaneous application of electrical and mechanical brakes should where practicable avoid retardations likely to cause injury or, in the case of friction winding apparatus, cause slip.

78 Power retained for electrical braking on d.c. winding apparatus is also available for driving; consequently the design of the control system should prevent the application of driving torque following an emergency trip.

Steam and compressed air winding engines

79 With most steam and compressed air winding engines, the reversal of steam or compressed air may be used to replace or augment the mechanical brake during service braking. However it is not practical to retain steam or air for automatic application of reverse power following an emergency trip. In the event of an emergency trip the steam or air supply should be cut off and the throttle control linkage automatically disconnected. Special release valves should be provided to exhaust the steam or compressed air between the throttle valve and cylinders to ensure complete removal of power.

(a) SMIM, Part 1B, Section 29, paragraph 10 and Part 2A, paragraph 215.

ACOP

Brake locking

80 All winding apparatus should be provided with an effective means of locking the mechanical brakes in position when they are fully engaged. This device should be set to operate automatically and should be designed to operate in the event of the loss of power.

81 The brake locking device should comprise:

- (a) a locking mechanism on the control linkage of the mechanical brake which is engaged when that brake is fully applied and prevents release of the brake; or
- (b) a valve, which when operated, exhausts fluid supply pressure and, when the brake is fully applied, prevents its release.

82 At each manwinding level there should be automatic indicators clearly visible to persons transmitting signals therefrom which show that the brakes are fully engaged and locked in that position. This does not apply at underground levels during shaft sinking.

83 Each winding level should be provided with a brake lock actuating device which enables persons working on a conveyance or counterweight to ensure that it cannot be moved inadvertently. This does not apply to lift apparatus, or at underground levels during shaft sinking.

84 During normal manwinding the brake locking device should be interlocked with the shaftside equipment to prevent the winding apparatus from being set in motion if:

- (a) any shaftside barrier or gate is not fully closed;
- (b) any platforms or shaftside equipment protrude into the path of a conveyance (see paragraph 123); or
- (c) any emergency stop button has not been reset after an emergency stop signal.

This does not apply to lift apparatus.

Stop switch

85 All electrically driven winding apparatus should be provided with a switch which will:

- (a) cut off the supply of electricity to the engine other than for the purpose of braking it; and
- (b) automatically apply the mechanical brakes.

The switch should be placed within easy reach of the person operating the winding engine.

ACOP

Safety circuits

86 Safety circuits should not be dependent upon single line components for functions essential to safety and should be protected against electrical faults^(a).

Prevention of overwinding and overspeed

87 All winding apparatus should have a device which prevents the conveyance or counterweight from travelling at excessive speed and beyond a predetermined position above the highest landing in the shaft. Winding apparatus with a designed normal winding speed in excess of 1.5 m/s should be fitted with a permanently operative automatic contrivance which when set for manwinding causes the mechanical brake to be applied to:

- (a) prevent a conveyance from landing at the bottom of the shaft or at its lowest entrance at a speed greater than:-
 - (i) 1.5 m/s for drumwinding engines; or
 - (ii) 4 m/s for friction winding engines or such a lower speed as is necessary to prevent the conveyances or counterweight engaging the arresting devices; and
- (b) limit the speed of an ascending conveyance so as to avoid danger to any person travelling therein.

88 Winding engines with clutched drums should have a separate drive from each drum to the appropriate part of the automatic contrivance or an automatic contrivance for each drum. Simple overspeed devices which trip at a single speed are only suitable for engines with a designed nominal winding speed of not more than 1.5 m/s; in these cases the overspeed switch should be set as close to this speed as possible without causing unnecessary trips.

89 All winding apparatus should be fitted with suitable ultimate overwind switches in the headgear to safeguard against failure of the primary overwind protection. When operated by the conveyance or counterweight these should remove power from the winding engine and apply the mechanical brake^(b).

Design of automatic contrivances and their back-up apparatus

90 Traditionally automatic contrivances have been of the mechanical type^(c). Other types of automatic contrivance (eg electronic) may be used if they provide an equivalent level of safety. The automatic contrivance may be constructed to eliminate all single line components (including software programmes) which would cause failure to an unsafe mode. If not it should be monitored to detect failure and should also be backed-up by a separate 'supervisory device' with an independent drive arranged to bring the winder safely to rest in the event of overspeed or overwind. If the supervisory device fails, or its overspeed/overwind trip circuits are brought into operation, then further winding should be prevented until either the cause of failure has been remedied or the automatic contrivance has been checked and proved effective.

(a) SMIM, Part 1A, paragraphs 43-47 and Part 1B, Section 17-20.
Part 2A, paragraphs 42-43 and Part 2B, Section 6.

(b) SMIM, Part 1A, paragraphs 62-65 and Part 1B, Section 23.

(c) SMIM, Part 1A, paragraphs 36-41, Part 1B, Section 13-16, Part 2B, paragraphs 31-37 and Part 2B, Sections 3 and 4.

ACOP

91 If the automatic contrivance has separate modes for manwinding and mineral winding it should be set to the manwinding mode before persons are allowed to enter a conveyance. This should be displayed on indicators at every landing which are clearly visible to persons transmitting signals from such landings. The requirement for visual indicators does not apply to underground levels in a shaft sinking. (See also Regulations 14 and 15(3).)

Overwind protection for drum winding apparatus

92 When manwinding, an effective device should be provided for detaching the conveyance from the winding rope to prevent it from being drawn against the headgear structure in the event of an overwind. This does not necessarily apply when shaft sinking or when using a temporary conveyance in an emergency or for the purpose of examining or repairing a shaft or equipment installed in it (see paragraph 30).

93 Danger to persons in a descending conveyance following an overwind should be prevented by providing suitable arresting devices below the lowest winding level. Alternatively, the automatic protection should be set so that there is an adequate clear braking distance available below the conveyance after a safety trip and the lowest landing will not be passed at excessive speed. For this purpose braking distance and landing speed should be based on the brake force remaining after failure of any one component in the braking system during the most onerous out of balance manwinding condition.

94 Arresting devices should be capable of safely arresting a fully manloaded descending conveyance, with an empty ascending conveyance, at an impact speed of not less than 1.6 m/s or the maximum speed resulting from an overspeed trip with reduced brake force consistent with failure of anyone component, whichever is the greater. The peak retardation should not exceed 2.5g; but transient peaks of less than 0.04 seconds duration should be ignored.

Overwind protection for friction winding apparatus

95 Friction winding apparatus should be provided with a combination of arresting devices and bumping beams both in the headgear and the sump. Arresting devices should be designed to retard the conveyance safely under the most onerous out of balance manwinding conditions at an average retardation not exceeding 1 g.

96 In new or modified installations with two conveyances sump bumping beams should be located so that they are struck after those in the head gear. Where a conveyance and counterweight system is operated, the bumping beams for a descending counterweight should be in advance of those in the headgear.

Headgear catches

97 All winding apparatus, except in shaft sinkings, should be provided with catches or equivalent devices in the headgear to prevent an overwound or detached conveyance or counterweight from falling back to an extent likely to cause danger.

ACOP

Slack rope protection

98 Where drum winding apparatus is in use and persons are being wound, devices should be provided to detect the formation of slack rope at the surface. If they detect slack rope the devices should cause the safety circuit to be tripped and audible and visual warning to be given to the winding engineman. Where slack rope protection can be provided throughout the wind by systems of proven reliability they should be used for this purpose.^(a)
Balance rope loop protection

99 To avoid risk of damage to the balance rope or shaft fittings, where applicable, a monitoring device should be installed to detect when the loop lifts above its highest normal running position.^(b)

Conveyance monitoring devices

100 All winding apparatus should be provided with the following devices located so that they are visible to a winding engineman in the winding engine house:

- (a) a rope speed indicator marked with the normal maximum speed and the maximum speed permissible for manwinding; and
- (b) an indicator showing the position of each conveyance.

A mark on the rope or drum is not by itself an effective means of monitoring the position of the conveyance. Where conveyance position monitoring can be provided throughout the wind by systems of proven reliability they should be considered for this purpose.

Guides and rubbing ropes

101 Shafts should be fitted with guides for the conveyances and counterweights^(a), (See also Regulations 5 and 15(1).)

102 When new, such ropes should have a factor of safety of at least five. Weight rods when new should have a minimum factor of safety of 10, and threaded portions under tension, 15. Ropes and weight rods should not be used for longer than 20 years unless examination indicates that they are suitable for a further specified period.

103 Unless conditions are particularly corrosive fixed guides should be formed from steel sections each of which is positively located at the ends and anchored to the shaft side at appropriate intervals to ensure stability.

(a) SMIM, Part 1A, paragraphs 74-82 and Part 1B, Section 26.

(b) SMIM, Part 2A, paragraphs 133-137.

(c) SMIM, Part 2A, paragraphs 108-124. Useful guidance is also to be found in the British Coal publication 'Ropeman's Handbook'.

ACOP

Protection of unattended winding engines

104 Where the winding engineman is allowed to leave the winding engine room in accordance with rules made by the manager (see paragraphs 153 and 155) the following additional protective and monitoring equipment should be provided and, where appropriate, warning given at the place where the operations are being supervised:

- (a) thermal protection of all main bearings, winding engine brake paths and winder motor windings (and motor/generator sets where applicable);
- (b) effective means of detecting moisture on the winding engine brake paths and, in accordance with paragraph 74, protection of brake paths and linings against contamination;
- (c) means of giving adequate warning of the outbreak of fire in the winding engine room.

Lift apparatus used in mine shafts

105 Lift apparatus should be designed, constructed and installed to a suitable standard^(a).

106 Switches should be provided which will, when manually operated, cut off the supply of power to the lift apparatus driving motor and cause the brakes to be applied. They should be located at the following positions:

- (a) in the conveyance adjacent to the controls;
- (b) on top of the conveyance adjacent to the controls;
- (c) at each entrance to the shaft;
- (d) in the well of the lift shaft; and
- (e) in the motor house adjacent to the lift driving mechanism. Rack and pinion hoists used in mine shafts

Rack and pinion hoists used in mine shafts

107 Rack and pinion hoists should be suitable and comply with the provisions of this ACOP^(b) where appropriate.

108 The maximum designed speed of the hoist should be plainly marked inside the conveyance.

109 Every hoist should be provided with suitable and effective safety gear. The safety gear should be in full and fixed engagement with the rack and be designed to cut off the supply power to the driving motors if the conveyance speed exceeds 1 m/s. It should be so constructed as to:

- (a) be independent of any driving system or any other braking systems; and
- (b) automatically apply the safety gear brakes and bring the conveyance to rest safely.

(a) See BS 5655: Part 1: 1986 safety rules for the construction and installation of electric lifts.

(b) Useful guidance for rack and pinion hoist may be found in BS 4465: 1989 "specification for design and construction of electric hoists for both passengers and materials". The scope of this Standard refers to temporary installations at the surface but it would also be applicable to hoists used in shafts.

ACOP

110 The safety gear should be designed to minimise the effect of extraneous matter or atmospheric conditions. A notice should be clearly displayed inside the conveyance setting out adequate instructions to be followed in the event of the safety gear being operated. The instructions should include a warning that, in such an event, no attempt should be made to move the conveyance until effective action has been taken to prevent further uncontrolled movement of the conveyance.

111 Every hoist conveyance should have at least two independent driving machines. Each should be fitted with a braking system which will be automatically applied if the power supply to the driving motors is cut off or if there is a loss of supply to the control circuits.

112 Each conveyance should be provided with effective means of releasing the braking system mentioned in paragraph 111 in the event of its automatic application. In addition to the independent governor and safety gear required by paragraph 109, effective means of automatically controlling a descending conveyance should be provided to prevent its speed exceeding 0.8 m/s.

113 A device should be provided at the bottom of the shaft which will automatically over-ride the release mechanism provided to satisfy paragraph 112 to cause the driving machine brakes to be re-applied and prevent the conveyance overwinding.

114 At the top of the shaft the rack supporting structure and guides should continue beyond the end of the rack for a length at least equal to 1.5 times the distance between the top of the conveyance and the lowest point at the rack drive pinions.

115 A switch should be provided which will cut off the supply of power to the driving motors and cause the brakes to be applied. It should be placed within easy reach of the operator.

Conveyances

116 Every main suspension member of a conveyance and counterweight should have a breaking strength of not less than seven times the maximum static load which is normally carried by that member.

117 Conveyances, other than kipples (see paragraph 119), which are intended to carry persons through a shaft should be completely covered in at the top, closed at the sides and provided with an adequate floor of sufficient strength to withstand any load likely to be imposed on it. They should be provided with gates or doors which cannot project beyond the side or end of the conveyance and provided with a secure handhold easily reached by all occupants. Where practicable, additional means of egress through the roof and upper floor or side of each manwinding deck of the conveyance should be provided. If the exits from a conveyance are likely to be obstructed following an overwind an alternative means of egress should be provided^(a).

(a) SMIM, Part 2A, paragraphs 92-100.

ACOP

118 Conveyances used to transport vehicles should be provided with suitable means to retain the vehicles and loads in place. In push button installations it is recommended that the security of vehicles is proved in such a way that the apparatus cannot be set in motion from the entrance or a landing unless the vehicles are correctly located and secured in place. In other winding installations similar arrangements should be used wherever practicable.

119 Kibbles designed to be self tipping on the release of a locking mechanism should not be used for manwinding. Any kibble used for manwinding should be sufficiently strong and guarded to prevent persons falling out.

Fire precautions

120 Winding apparatus should be constructed to minimise the risk of fire. The manager should ensure that adequate precautions are taken to prevent fire and that suitable and sufficient means of extinguishing fire are provided.

10

Installation and modification of winding apparatus

Regulation 11

Regulation

(1) *When winding apparatus is installed, the owner shall appoint sufficient competent persons who shall examine all aspects of the installation of the apparatus and make a written report.*

(2) *When winding apparatus is modified in a way which could affect its safe operation, the manager shall appoint sufficient competent persons who shall examine all aspects of the modification of the apparatus and make a written report.*

(3) *For the purposes of this regulation any modification made to winding apparatus with a view to rectifying a defect mentioned in a report made under paragraph (1) or (2) shall be treated as a modification which could affect the safe operation of the winding apparatus.*

(4) *The manager shall ensure that winding apparatus is not used after being installed or after being modified as mentioned in paragraph (2) unless the report made under paragraph (1) or, as the case may be, paragraph (2) (and construed in each case together with any further report made by virtue of paragraph (3)) states that the winding apparatus is safe to use.*

11

ACOP

Commissioning

121 When a winding system is first installed it must be properly commissioned to ensure that it complies with all the requirements necessary for its safe operation. A number of specialists may be used for this work on different parts of the system. The work should be supervised by competent persons appointed by the owner. Such persons need not be part of the mine organisation but they should be competent to assess the overall safety of the system to which each part contributes. A full report of the commissioning procedures and the results of any tests and examinations carried out should be made and signed by the appointed persons. A copy of the report should be kept at the mine and be readily available for reference so that any subsequent tests can be compared with the performance at the time of commissioning.

Modifications

122 If any modifications are subsequently made which are likely to affect the safety of the system or the way in which it is operated they should be thoroughly tested to ensure that the winding system fully meets the requirements necessary for its safe operation. A modification to one part of the system may affect other aspects of its performance and it may be necessary to retest the system, not just that part which has been modified. The manager should appoint a competent person to supervise any tests and examinations necessary and make a full written report to confirm that the winding system is safe for further use. This report should be kept with the commissioning report. Any changes made to the winding system which would be likely to affect its operation should be notified to the winding engineman and any other person appointed to supervise or control its safe operation.

11

Keps

Regulation 12

Regulation

(1) *The owner shall ensure that no person installs keps in or in connection with any winding apparatus.*

(2) *The manager shall ensure that keps are not used when winding apparatus is used for carrying persons.*

12

ACOP

123 Where, for the time being, keps are retained for mineral/materials winding or clutching operations, they must not be used during manwinding and should be locked in the fully retracted position before the winding engine brakes can be released. The interlocking arrangements described in paragraph 84 should also be provided. Automatic 'keps locked clear' indicators should be provided to show that the keps are locked in the clear position. They should be clearly visible to persons giving signals. (See also Regulation 10.)

12

Ropes and associated equipment

Regulation 13

Regulation

(1) *The owner shall specify the type of rope intended for use in any winding apparatus and any attachment or connection intended for use with such a rope and shall ensure that any such rope, attachment or connection is suitable for the use for which it is intended.*

(2) *Before any winding rope is put into service in a shaft, the owner shall specify in writing the maximum life expected for any winding rope in that shaft, taking into account the conditions under which the winding rope will be used.*

(3) *If there is any change in the conditions under which a winding rope is used in a shaft, the owner shall review the life specified under paragraph (2) and reduce it if necessary.*

(4) *The owner shall ensure that the specification made under paragraph (2), as amended under paragraph (3) where appropriate, is kept at the office of the mine while any rope is in use as a winding rope in the shaft to which the specification relates and for 6 months thereafter.*

(5) *The manager shall ensure that no rope is used for winding after the expiry of the life specified under paragraph (2), as reduced under paragraph (3) where appropriate, except in accordance with directions which may be given by an inspector appointed under section 19 of the Health and Safety of Work etc Act 1974.*

13

ACOP

124 In determining the suitability of any rope, account should be taken of the maximum load to be carried and the ratio of the diameter of the drum or pulley to that of the rope to ensure that operational stresses are kept within safe limits^(a). On no account should spliced ropes be used. Ropes which have been used as balance ropes should not be used as winding ropes. Suspension ropes in lift apparatus should be suitably treated to prevent corrosion.

125 The winding ropes on drum winding engines should be properly anchored. To minimise the loading on the anchorage, at least 3.5 laps of rope should normally remain on the drum when the conveyance is at the deepest part of the shaft to which it may travel. Spare rope stored in or on the drum should not be considered as reducing the load on the anchorage.

Factors of safety

126 In determining the loads which winding and balance ropes should be capable of withstanding a factor of safety should be allowed to take account of any abnormal stresses or fatigue to which the rope may be subjected. For winding and balance ropes that load should be:

- (a) for balance ropes on drum and friction winders, at least 6 times the maximum suspended weight of the rope;
- (b) for winding ropes on drum winders, at least 6½ times the maximum static load carried in normal service or 5½ times the maximum static load where the Blair twin rope system is used;

13

(a) Further guidance is in the British Coal publication 'Ropeman's Handbook'.

ACOP

- (c) for winding ropes in lift apparatus, at least 12 times the maximum static load; and
- (d) for winding ropes on friction winding apparatus:
 - (i) F_1 times the maximum static load they may be required to withstand when carrying persons; or
 - (ii) F_2 times the maximum static load they may be required to withstand when carrying the materials or minerals which are most frequently carried; whichever is the greater. (F_1 and F_2 are calculated by means of the formulae in appendix 4)

127 Cappings of ropes should be able to withstand at least seven times the maximum static load they will carry in service, except for lift rope capping. Lift rope capping should be able to withstand at least 12 times the maximum static load they will carry in service.

Rope life

128 Ropes used in winding apparatus must be inspected and examined in accordance with Regulation 17 and paragraphs 193 to 203 to assess their condition. Any rope showing signs of significant deterioration should be taken out of service.

129 Unless other directions have been given by an inspector the rope life specified under Regulation 13(2) should not exceed:

- (a) 3½ years as winding ropes on drum winders, except for Blair twin rope systems where the life should not exceed 2½ years;
- (b) two years as winding ropes on friction winders;
- (c) five years as winding ropes on lift apparatus;
- (d) five years as balance ropes on drum winders, including any period during which it was used for any other purpose; or
- (e) three years as balance ropes on friction winders, including any period during which it was used for any other purpose.

130 Where favourable circumstances permit, an extension to the specified rope life may be considered. Where an extension to the life of any rope is proposed the owner should arrange for a sample, indicative of the condition of the rope, to be cut and submitted for testing at a suitable rope testing laboratory. This should be done approximately two months before the rope life expires. The laboratory examination should assess the standard of lubrication, the effect of wear, corrosion and fatigue and establish the aggregate strength. This should be augmented by an examination of the rope throughout its length. Such an examination includes cleaning and measuring the rope at places particularly liable to deterioration and at other places not normally covered by the regular 30 day examination carried out in accordance with paragraph 193. Non-destructive testing (NDT) should be used to assist in determining whether the rope may continue in service beyond its specified life. NDT is particularly useful for this purpose if it has been carried out at intervals throughout the life of the rope so that the extent and rate of progression of any deterioration can be assessed. Before the life of any rope is extended beyond that specified in accordance with Regulation 13 the owner should notify an inspector of the proposal and make available the results of any examination and tests. An extension of the rope life may be agreed with the inspector for a specified period. If any further extension is proposed the procedure should be repeated.

ACOP

Control of balance rope loops

131 Where balance ropes are used the loop should be controlled^(a), It should also be monitored in accordance with paragraph 99.

Conveyance and counterweight suspension gear

132 The apparatus used to attach a winding or balance rope to a conveyance or counterweight should have a minimum factor of safety of 10:1. This should be based on its ultimate breaking load when new and the maximum static load which will normally be carried. The apparatus should have been shown by test to be capable of withstanding, without any permanent deformation, a proof load equal to 2½ times that maximum load. The use of screwed components in tension should be avoided wherever practical: but where they are utilised they should have a minimum factor of safety of 15:1. Suitable steels should be used (See appendix 1).

133 Where not less than three sets of suspension gear are provided and used in rotation in a shaft in which there are two sets in use at any time, or where not less than two sets of suspension gear are provided and used in rotation in a shaft in which there is a single set in use at any time, the maximum life for that apparatus or parts thereof should be 20 years from the time of first use: but it should be designed for a minimum definitive life of 20 years and subjected to suitable NDT at 12 month intervals. Where favourable circumstances exist the life of suspension gear may be extended by agreement with an inspector.

134 Steels used for suspension gear should have the mechanical properties specified in table 1 of appendix 1. The recommended chemical composition for suitable steels is also given in appendix 1. Alternative steel having the mechanical properties appropriate to its group may be used but any proposal to use such material should be discussed with an inspector to enable its suitability and definitive life to be assessed. Suspension gear already in service and made from steel complying with earlier specifications approved by HSE may continue in service for the completion of its definitive life. Any component made from steel which is not in a fully hardened and tempered condition may remain in service subject to the need for reheat-treatment at intervals depending on the conditions of use - see paragraph 189. These may include certain components in the normalised condition which cannot be hardened and tempered.

(a) SMIM, PArt 2B, section 11.

Regulation

Signalling and communication

Regulation 14

(1) *The owner shall ensure that there is provided in any shaft where there is winding apparatus suitable means -*

- (a) *to give audible and visual signals to;*
- (b) *to receive audible and visual signals from;*
- (c) *to communicate by speech with;*

any place where any such means of signalling and communication are necessary to enable the winding apparatus to be used safely.

(2) *The means referred to in paragraph (1) shall be so placed that they are safe to use and the winding apparatus can be operated safely.*

(3) *The manager shall ensure that the means referred to in paragraph (1) are so used as to enable the winding apparatus to be used winding apparatus to be used safely.*

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ACOP

Shaft signalling equipment

135 Where there are means of signalling and speech communications they should be positioned and located so that they can be safely operated and winding operations can be safely controlled.

136 Effective means of signalling should be provided from all normal entrances to the shaft, and in the case of shaft sinking, from the sinking scaffold, to the place from which the winding engine is controlled. It should also be provided between entrances to the shaft. Provision should be made for shaftsmen to transmit signals effectively between the conveyance and the surface from any position in the shaft; and, where applicable, persons involved in headgear and shaft sump maintenance should be able to transmit signals to the place where the winding engine is controlled. During shaft sinking or deepening persons should be able, where appropriate, to transmit signals from the shaft floor to the onsetter on the sinking scaffold.

137 The means of signalling referred to in paragraph 136 should include an emergency stop signal facility comprising circuitry which is, as far as practicable, independent of the normal signalling circuit. It should not be possible to cancel an emergency stop signal from any position other than that at which it was initiated nor to override it by the transmission of other signals.

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ACOP

138 Signalling systems should give both audible and visual signals which should be heard and displayed simultaneously at the shaft surface entrance, the winding engine room, those underground entrances being used for winding and, in case of shaft sinking, on the sinking scaffold. The visual signals should be so positioned that they can be easily seen by the banksman, winding engineman and onsetter respectively. Signals relating to a particular winding sequence should be automatically cancelled after the commencement of the sequence by means of suitable devices driven from the winding engine. Where such devices depend on movement of the winding apparatus they should be capable of distinguishing between stationary and creep speed winding operations^(a).

Automatic shaft signalling systems

139 In addition to the requirements of paragraphs 135 and 136, systems designed to transmit signals automatically on completion of the mineral loading and unloading processes should incorporate automatic indicators clearly visible to the person operating the winding engine and at:

- (a) the banksman's position which show when the unloading process has been completed at the surface landing; and
- (b) the onsetter's position which show when the loading process has been completed at the underground entrance.

Provision of speech communication

140 Every shaft fitted with winding apparatus (controlled other than from within the conveyance) should be provided with a means of speech communication between the winding engineman, banksman, onsetter, all other underground entrances and, in the case of shaft sinking, any sinking scaffold.

141 Means of speech communication should where possible be provided between persons riding on top of a conveyance or counterweight, or involved in maintenance of headgear or shaft sump equipment, and the person controlling the winding engine. Similar facilities should be provided between the banksman and persons on any deck of a conveyance.

142 Speech communication should not be used to require movement of a winding engine except where the communicating parties have agreed that the signalling system is defective. In that case speech communication should only be used to complete the wind. Speech communication should not be routed through the mine telephone switchboard. Precautions should be taken to minimise the risk of both the speech and signal systems becoming defective at the same time.

(a) SMIM, Part 1A, paragraph 85-94, Part 1B, Sections 27 and 28, Part 2A, paragraphs 157-160 and Part 2B, Section 13

ACOP

143 Unless other arrangements have been made in accordance with Regulation 15(4), winding apparatus controlled from within the conveyance^(a) should be provided with a means of speech communication between the conveyance, every landing and a place at the surface of the mine which is continuously manned while persons are underground. Where no banksman is present a separate alarm facility should be provided to enable a person on such a conveyance to indicate at the continuously manned point that persons are in a conveyance stopped between places where they would normally alight.

Code of signals

144 Subject to paragraphs 135 and 146 the code of signals for winding apparatus, except in lift apparatus and rack and pinion hoists, should be specified by the manager who should ensure that all persons required to use the code of signals are fully acquainted with it. A copy of the code should be posted at every entrance to a shaft and in every winding engine house.

145 At all mines the signal given before any persons are carried should be “3”.

146 At coal mines the following code of signals should be specified in manager’s rules, and used both for manwinding and mineral winding:

To raise up	1
To lower down	2
To raise steadily	4
To lower steadily	5
To stop when in motion	1

Additional signals may be used for other purposes so long as they are specified in the rules.

147 Because of differences in winding operations between individual mines there will be variations in signals other than those required by paragraphs 145 and 146 and the manager should specify in writing any additional signals necessary. Where there is more than one underground entrance in use these will include the signals to indicate to which entrance a conveyance is to be sent.

Carriage of persons

148 When persons are to be carried through a shaft, signals to the person controlling the winding engine should be transmitted by the banksman and onsetter or other competent person authorised to send signals. The banksman or onsetter should not allow any person to enter the conveyance unless:

- (a) the manwinding signal 3 has been transmitted to the person controlling the winding engine and onsetter (or banksman as the case may be); and
- (b) the manwinding signal 3 has been received in return; and
- (c) except at underground levels in a shaft sinking, it has been confirmed that the indicators show that the apparatus is operating in the manwinding mode and the brakes are fully engaged and locked in that position.

(a) Such winding apparatus controlled from within the conveyance is confined to lift and rack and pinion installations.

149. Special provisions should be made for ‘first person in’ and ‘last person out’ manwinding.

Use of winding apparatus

Regulation 15

Regulation

(1) *The manager shall ensure, so far as is reasonably practicable, that winding apparatus is used safely.*

(2) *The manager shall make suitable rules to provide for the safe use of any winding apparatus. The rules shall specify the manner in which and the conditions under which each set of winding apparatus is to be used.*

(3) *The manager shall ensure that persons are not carried by winding apparatus while it is operating automatically.*

(4) *No person shall control winding apparatus by radio except with suitable equipment and in a suitable manner.*

(5) *In this regulation “radio” includes any transmission of electromagnetic radiation.*

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ACOP

Shaftside equipment

150 Shaftside equipment should be interlocked to avoid its incorrect operation endangering persons^(a) (see also paragraph 84).

Automatic/push button winding

151 The means of changing control of the winding apparatus from manual to automatic/push button operation should be situated at the winding engine manual control position and should be secured to ensure safety by means of selector switches which can be locked in the appropriate mode, eg key operated at the engine house manual control position and, for push button only, at the surface entrance.

152 Only a person competent for the purpose and appointed by the manager should switch the apparatus from manual to automatic/push button control or vice versa. The competent person may be a winding engineman. (See also Regulation 16(1).)

153 A person trained as a winding engineman should be readily available when persons are underground or in the shaft. When the apparatus is set to either push button or automatic control it should not be possible to operate it by any other means.

154 A change from manual control should only be made when a conveyance (but not a counterweight) is at the highest landing to which it is normally raised. Where two winding engines operate in the same shaft and the control system is such that they operate in sequence then for the purpose of this requirement but not for the purpose of paragraph 68 they should be considered as one winder.

(a) SMIM, Part 2A, paragraphs 139-156.

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ACOP

155. During operations the competent person may not need to be in the winding engineroom at all times provided that the equipment specified in paragraph 104 is installed. However the competent person should only leave the engineroom in accordance with the manager's rules which, amongst other matters, should specify that:

- (a) the competent person inspects the winding engine at appropriate intervals, taking into account the frequency of use, operating conditions, etc;
- (b) the operation of an alarm system provided to give warning of a malfunction of the winding apparatus is immediately communicated to the competent person wherever located who should immediately investigate the cause of the alarm.

156 If, during the operation, the conveyance comes to an unscheduled stop anywhere except at:

- (a) a place within three metres of the highest landing to which a conveyance is normally raised; or
- (b) any other landing or entrance to the shaft

the wind should be completed under the supervision of the competent person (paragraph 152) at a suitable reduced speed and in the case of push button manwinding under manual control at a speed not exceeding 2 m/s.

Automatic winding

157 The initiation of an automatic winding sequence should only be possible by means of manually operated controls. An effective means for preventing the winding apparatus from being set in motion or to stop it when it is in motion should be provided at these controls and readily accessible. The controls should be situated so that the person operating them can observe directly, or remotely by means of visual aids the operation of the winding apparatus or the loading or unloading of a conveyance at the surface entrance or landing.

158 When a period of manwinding follows a period of automatic winding the winding engineman should manually control the apparatus to complete one wind in each direction before manwinding is allowed to take place.

Push button winding

159 Push button operation of winding apparatus should only be carried out by persons competent for the purpose appointed by the manager in accordance with Regulation 16(1).

160 When the apparatus has been changed to push button control that person should complete one wind in each direction to check that it is in order before manwinding commences.

161 Each entrance to the shaft should be provided with a device capable of bringing the apparatus to a halt without danger. This does not apply in the case of lift apparatus. Effective means for preventing the winding apparatus from being set in motion and to stop it when it is in motion should be provided in such a position as to be readily available to a person operating any push button provided.

ACOP

162 Where winding of persons is carried out the controls should be so arranged that push button operation can only be initiated from a control station located at the shaft surface entrance or by means of the inching control.

163 Push button winding systems should be used either with:

- (a) a means for the onsetter to signal to the banksman that the onsetter is ready to wind. This should be interlocked so as to prevent the winding apparatus from being set in motion unless the signal has been given; (where there is more than one underground landing in use “ready to wind” signals should be received from all onsetters to or from whose landing the conveyance will travel before the apparatus can move); or
- (b) a conventional shaft signalling system (see guidance on Regulations 14 and 16) with signals given in the normal way by both banksman and onsetter before the banksman sets the apparatus in motion. In this case the signalling equipment should be constructed so as to minimise the risk of false signals and should be interlocked so as to prevent the apparatus being set in motion unless a correct sequence of signals is transmitted.

164 Inching may be carried out either from the banksman’s or onsetter’s positions and the controls should be located so that the person operating them can observe the movement of the conveyance or counterweight. The controls should be designed so that inching cannot be initiated from either landing unless the banksman or onsetter has received acceptance from the other by means of a switch set to the station from which inching is to be carried out.

Use of radio for control of winding apparatus

165 The control of winding apparatus by radio is a variation of push button winding in which the control station is mobile (on top of, or inside the conveyance instead of fixed at the surface shaft side) and the winding apparatus is controlled directly without the intervention of a winding engineman or banksman. As such it should be used only on those types of winding apparatus designed for push button winding and operated according to the requirements of paragraphs 152 to 156 of this ACOP. Guidance given in other parts of this ACOP, particularly in the case of signalling, may not be appropriate for radio control (see for example paragraph 136) but should be followed where it is relevant. Detailed consideration should also be given to the following features:-

- (a) The design and the conditions of use of the winding apparatus change-over switches used to select the manual, pushbutton or radio mode of control (see paragraphs 151 and 152) and the procedures adopted for their use.
- (b) The provision of an emergency stop device on the conveyance arranged to stop the winding apparatus and which, so far as is practicable, operates independently of the radio “raise”, “lower” and “stop” control push-buttons.
- (c) A means of repeating the signals referred to in paragraph 146 of this ACOP to the operator on the conveyance, as confirmation of his command and to warn of impending movement of the conveyance.

ACOP

166 Whenever control of the winding apparatus is by radio, the manager's rules, prepared in accordance with Regulation 15(2), should include the following additional requirements:-

- (a) the provision of speech communication from the radio control station to a place on the surface of the mine which is manned while the winding apparatus is under such control;
- (b) where the radio control device and speech communication device utilises a common transmitter, the provision of a second independent means of communicating (which may be a speech transmitting device, signalling device, hammer and gong, etc) capable of attracting the attention of a suitably trained person, appointed and located at the mine surface for the purpose of organising the recovery of persons from the shaft should the radio/speech transmission fail while the conveyance is mid-shaft;
- (c) that the shaft be conspicuously marked from top to bottom at suitable intervals to indicate to persons on the conveyance their position in the shaft relative to the surface.

Manager's rules for safe winding

167 The manager's rules should lay down the procedures and duties to be followed for each winding installation to ensure safe winding and should, among other matters, specify:

- (a) that any person engaged in loading or unloading conveyances or waiting to travel through the shaft should follow the instructions of the banksman, onsetter or travelling onsetter as the case may be;
- (b) the maximum winding speed of persons, materials and minerals;
- (c) that persons riding in a kibble should stand inside and not sit on the edge; and
- (d) the maximum load of minerals or materials which may ordinarily be carried.

168 Before the rules required by Regulation 15(2) are modified in any way which could affect the safe operation of the winding apparatus the manager should appoint persons competent for the purpose to review all aspects of the operation to ascertain whether the operation of the apparatus is likely to cause injury to persons. These persons should make a written report of the review. The manager should ensure that the report is satisfactory before a change to the rules is implemented.

Transport of abnormal loads

169 The arrangements for transporting abnormal loads should include the supervision of the winding operation by a person competent for the purpose, counterbalancing the load where necessary and informing the winding engineman of the abnormality and of any restrictions on winding speed.

Carriage of persons

170 Persons being conveyed through a shaft, except those engaged in inspection, examination, maintenance or installation, should normally travel in a conveyance designed and built for that purpose. Extra precautions should be taken to ensure the safety of such persons or of persons accompanying bulky materials that cannot be carried inside a conveyance.

ACOP

171 Persons should not enter a conveyance unless authorised by a banksman or onsetter. This does not apply to persons authorised in writing by the manager to transmit signals below ground at an underground entrance not manned by an onsetter. No person should attempt to leave the conveyance until it is stationary at a landing. No persons other than banksmen, onsetters or persons authorised by the manager should open the gates or doors of, or interfere with, the conveyance.

Lift apparatus in mine shafts

172 The manager should appoint persons to operate the lift apparatus and no one except an appointed person should set the lift apparatus in motion.

173 The winding of materials should only be carried out under the supervision of a person competent for the purpose appointed by the manager.

174 During manwinding the lift apparatus should be operated from controls inside the conveyance. If the lift apparatus has not been used for 8 hours or more persons should not be allowed to travel in it until a person competent for the purpose and appointed by the manager has run the conveyance, using external controls, between the top of the shaft and the lowest entrance to check that the apparatus is in order.

15

Competent persons and winding enginemen

Regulation 16

Regulation

(1) *When persons are below ground in a mine where winding apparatus is used, the manager shall -*

- (a) *ensure that sufficient competent persons (including winding enginemen) appointed by him are available at the mine to ensure the safe operation of the winding apparatus.*
- (b) *give each such competent person suitable written instructions as to his duties.*

(2) *The manager shall specify in writing the maximum hours of work of winding enginemen and these shall be posted in the winding engine room.*

(3) *Each winding engineman shall record the hours he works.*

16

ACOP

175 Appointments should include winding enginemen, banksmen and onsetters. A banksman should be in attendance to receive and transmit signals at the landing in use at the top of the shaft whenever any person is about to be lowered through that shaft and whenever any person who is to be raised through that shaft is below ground. An onsetter is not required when all the persons below ground who are to be raised through that shaft are people appointed by the manager to exercise statutory supervision and inspection duties or persons authorised in writing by the manager to give signals.

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ACOP

Duties of banksmen and onsetters

176 The responsibilities of banksmen and onsetters should include transmitting and acting on signals and overseeing activities at the position where they are stationed. They should exercise reasonable care that:

- (a) whenever persons are to be raised in a conveyance with more than one deck involving decking operations, the top deck is loaded first;
- (b) the number of persons entering a conveyance or any deck of a conveyance does not exceed the maximum specified by the manager (see paragraph 180);
- (c) during manwinding, any automatic indicators required by paragraphs 82, 91 and 123 are correctly displayed;
- (d) during manwinding all gates are properly closed before signalling to start winding; and
- (e) no gate is opened until the conveyance is stationary at the landing.

177 The banksman and onsetter should not allow any person to enter or leave a conveyance unless the indicators show that the brakes are fully engaged and locked in that position. This does not apply at underground levels during a shaft sinking.

Duties of winding enginemen^(a)

178 Winding apparatus should not be set in motion other than by a person appointed as a winding engineman or a trainee winding engineman working under the direct supervision of a winding engineman responsible for that person's training. The winding engineman should not set the apparatus into motion if any signal is incomplete or indistinct. Different arrangements apply for pushbutton/automatic winding or lift apparatus (see paragraphs 151-156 and 172-174).

179 The specified duties of winding enginemen should require amongst other matters that:

- (a) the winding engineman must inspect the external parts of the apparatus within the winding engine house at least once in every shift and keep it cleaned and lubricated unless suitable alternative arrangements have been made by the manager;
- (b) after any cessation of winding exceeding two hours the winding engineman should, before persons are carried through the shaft, test the apparatus by running each conveyance at least once between the surface of the shaft and the lowest entrance or the top deck of the scaffold in the case of a shaft being sunk;
- (c) when maintenance work has been carried out on the winding apparatus or ancillary apparatus which may affect its safe operation, the winding engineman should operate the apparatus manually for at least one wind in each direction to ensure that it is functioning properly before normal winding recommences;
- (d) if the winding engineman discovers any defect likely to affect the safe working of the winding system the apparatus should not be set in motion again until the winding engineman has reported the defect to the manager or other person designated by the manager and the manager or designated person has determined that it is safe to continue winding;

(a) Guidance on the training of winding engineman is given in SMIM, Part 1A, paragraphs 127-130; and Part 1B, section 33.

ACOP

- (e) except during automatic or pushbutton winding (see paragraph 155) the winding engineman should not leave the controls when the apparatus is in motion or when there is any cause to believe that anyone is in a conveyance, other than to close the main circuit breakers following an emergency trip;
- (f) except during push button winding or in the case of lift apparatus, any person operating any winding apparatus should ensure that, whenever any person is being or is about to be carried through the shaft, the brake is fully engaged immediately after the conveyance stops at any landing or entrance and is kept so engaged until the appropriate signal to raise or lower that conveyance has been transmitted;
- (g) when changing levels on a clutched drum winding engine the empty conveyance attached to the loose drum should normally be held at the surface by the loose drum brake while the fixed drum is turned to raise or lower the other empty conveyance; and
- (h) unless the automatic contrivance and the fixed drum brake have been commissioned and tested for winding a single conveyance declutched operation should be solely for the purpose of changing levels. Manwinding should not be carried out in the declutched condition, except in an emergency.

General duties

180 The manager should ensure that persons engaged in winding operations receive a copy of any part of the rules relevant to their duties. He should also post notices at each entrance to the shaft showing the maximum number of persons or load of materials/minerals which may be carried and another notice in the winding engine house showing the maximum winding speed when persons are being carried and the maximum winding speed for materials/minerals. (See also Regulation 15 (2).)

181 During manually controlled manwinding, except in the cases referred to in paragraphs 149 and 184, the winding engineman should not set the apparatus in motion unless he has received from the onsetter the signal to raise up (or to raise steadily) and from the banksman of the signal to lower down (or to lower steadily). The banksman should not transmit the signal to lower until the signal has been received to raise from the onsetter. Where winding is to take place between insets the onsetter at the upper inset may be regarded as being the banksman.

Hours of employment of winding enginemen

182 The hours of work of winding enginemen should not normally exceed eight hours in any 24. For the purpose of changing between rostered shifts, the hours of work per 24 hours period may be extended to not more than 16 on two such periods per week, but the average number of hours worked per 24 hour period by any winding engineman should not exceed eight over any period of three weeks. In an emergency, a winding engineman may be employed beyond normal hours of work.

183 Sufficient trained winding enginemen should be available to cover absences due to illness and holidays. However, in exceptional circumstances a winding engineman may be employed on a system of 12 hour shifts with intervals of 12 hours between shifts for up to six weeks in any 12 week period.

ACOP

16

Travelling onsetters

184 Where only one conveyance is in use the manager may appoint a travelling onsetter who travels in that conveyance to give signals instead of a banksman and onsetter. In this case only one set of signals will be given to the winding engineman. Apparatus should be provided at all landings to ensure that the onsetter is able to operate the gates, transmit signals and communicate with the person controlling the winding engine safely from inside the stationary conveyance. (See also Regulation 14.)

Examination, inspection, maintenance and testing of winding apparatus

Regulation 17

Regulation

17

(1) *So far as is necessary to ensure compliance with these regulations the manager shall ensure that winding apparatus is regularly and adequately examined, inspected, tested and maintained in accordance with a suitable written scheme.*

(2) *The manager shall appoint sufficient competent persons to regularly and adequately examine, inspect, test and maintain the winding apparatus.*

(3) *Each person appointed under paragraph (2) shall write a report of the examinations, inspections, tests or maintenance which he carries out setting out any defects he finds.*

ACOP

17

185 Without prejudice to general requirements the manager should draw up schedules detailing the inspections, examinations, tests or maintenance and their frequency in relation to individual items and ensure that they are kept up to date^(a). Special provision should be made for any necessary testing of winding apparatus before it is brought back into service after a period out of use.

186 The manager should institute and maintain a formal system to ensure that the inspections, examinations, tests and maintenance are safely carried out on each piece of apparatus as specified in the schedules.

187 Any person carrying out tests, maintenance, inspections or examinations should, before leaving the mine, make a written report of the work carried out, any defects found and remedial action taken. Where a defect is found which is likely to affect safe working remedial action should be taken before winding recommences.

(a) SMIM, Part 1A, paragraphs 100-126; Part 1B, sections 29-31, Part 2A paragraphs 181-205 and Part 2B, sections 15-29.

ACOP

Routine inspection, examination and maintenance of winding apparatus

188 All external parts of winding apparatus used for carrying persons should be inspected at least once in every 24 hours in which the apparatus is in use to ascertain its condition and safety. Where apparatus is not in regular use, such as emergency winding apparatus, these inspections may be carried out at longer intervals not exceeding 13 weeks; but it should be inspected immediately before it is brought into use and thereafter at least once every 24 hours.

189 All apparatus used for attaching a conveyance to the winding rope should be examined and a report made at the following intervals:

- (a) for drum winding apparatus, 26 weeks;
- (b) for friction winding apparatus, 12 months; and immediately after an overwind when detaching gear is operated on a drum winding system or the conveyance has engaged the arresting devices on friction winding apparatus. All suspension gear, except on lift apparatus, should be non-destructively tested following each period of 12 months' use (see paragraph 132). Except for items listed in appendix 2, if the material of construction is not in the hardened and tempered condition it may require heat treatment at intervals depending on the condition of use. Guidance should be sought from the manufacturers if there is any doubt as to the metallurgical condition of the material and where appropriate the need for periodic heat treatment and its frequency should be agreed with an inspector. Suitable materials are listed at appendix 1.

190 Where the intervals between rope cappings have been extended in accordance with paragraph 194(b) the intervals between regular examination and NDT of suspension gear may be amended by agreement with an inspector.

191 Detaching gear on drum winding systems should be dismantled, cleaned and refitted at intervals not exceeding 26 weeks. Whenever a detaching hook is replaced checks should be made to ensure that the dimensions of the replacement hook are compatible with those of the detaching plate or bell.

192 Main suspension members of every conveyance and counterweight should be examined at regular intervals depending on the condition in which they are used. The examination should include suitable NDT at positions where fatigue failure is most likely to occur, particularly where welding has been used.

Maintenance of winding ropes^(a)

193 Winding ropes should be inspected at least once in every 24 hours in which they are in use. In addition, examinations should be made at intervals not exceeding 30 days in the course of which a rope should be cleaned at all places particularly liable to deterioration and at other places not more than 90m apart throughout its length. After cleaning, the surface condition of the rope should be examined, the diameter measured and a check made for any fractures of the wires. A written report of the inspection or examination should be made. Dead laps and spare laps of rope in or on the drum should be inspected as circumstances permit but the anchorage of the rope to the drum should be thoroughly examined for any signs of movement.

(a) Useful additional guidance is to be found in the British Coal publication 'Ropeman's Handbook'.

ACOP

194 Correct capping of winding ropes is essential and provision should be made for them to be re-capped at regular intervals after they have been taken into use. The appropriate intervals for different types of winding system are specified below:

- (a) winding ropes used with drum winding apparatus should be recapped at intervals not exceeding 26 weeks;
- (b) winding ropes on friction winding apparatus should normally be recapped at intervals not exceeding 26 weeks but the intervals between cappings may be extended by arrangement with an inspector;
- (c) emergency mobile winding ropes should be recapped at intervals not exceeding 12 months except when their aggregate or continuous duty reaches 26 weeks in any 12 month period, in which case they should be recapped immediately; and
- (d) ropes on lift apparatus in mine shafts should be recapped at intervals not exceeding five years.

195 The capping and recapping of winding ropes should be carried out by, or under the supervision of, a competent person appointed by the manager. Before any rope on drum winding apparatus is recapped a length of rope including the capping should be cut off and a section opened up immediately for internal inspection and a written report made. This report should refer to the general external and internal condition of the length of the rope cut off making particular reference to any broken wires, wear and corrosion and the state of lubrication. As soon as practicable an examination and test should be conducted and a report made available at the mine showing;

- (a) the number and position of any fractures or cracks in wires;
- (b) the extent and position of any wear of wires;
- (c) the extent and position of any corrosion of wires;
- (d) the state of any galvanised coating on wires;
- (e) the state of lubrication of wires;
- (f) the condition of any fibre core; and
- (g) the results of any tensile, torsion and bend tests of wires.

The overall strength of the rope derived from the tests on individual wires should be determined and compared with the previous value and when the rope was first put into use.

196 In the case of drum winders the length of rope which should be cut off will vary with the period which has elapsed since the last recapping but should not be less than the following:

- (a) if the rope was recapped within the previous three months - 1 m;
- (b) if the rope was recapped within the previous four months - 1.2 m;
- (c) if the rope was recapped within the previous five months - 1.5 m; or
- (d) if the rope was recapped more than five months previously - 2 m.

197 In the case of friction winding systems each capping should be moved a distance of not less than 150 mm along the rope.

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Capping of ropes

198 The preparation of the rope end for capping should be carried out in accordance with suitable standards^(a). Only sockets which are suitable for the particular type of rope should be used.

199 Where white metal^(b) is used as the capping medium, it should have a melting point of not more than 300°C. Only new ingots should be used for this purpose. When pouring the metal into the socket the person in charge of the operation should ensure that the temperature:

- (a) of the white metal is between 335°C and 365°C; and
- (b) inside the socket of the capping is between 150°C and 205°C before the white metal is poured in.

200 Where resin^(c) is used as the capping medium the suppliers instructions should be strictly followed. Only resin systems which have been found by testing to be suitable for the purpose should be used. The wires of the brush should be distributed as evenly as practicable within the cone termination and this is particularly important with large section wires (eg guide ropes) to prevent stress cracking of the resin. With large section wires a space of approximately one wire diameter should be maintained between the bore of the socket and any wire at the large end of the capping. Care should be taken to prevent any leakage of the resin from the small end of the socket because this can result in voids and lack of support of the wires in this region. Where capping is to be carried out in low ambient temperatures (below 8°C) the advice of the resin system supplier should be sought.

Maintenance of balance ropes and their fittings

201 Apparatus used to attach a balance rope to a conveyance or counterweight should be designed, manufactured and tested when new to the same requirements as that of suspension gear (see paragraph 132). In addition to the regular inspections required by paragraph 188 balance rope attachments should be examined by NDT methods at intervals corresponding with the lives of the ropes (see paragraph 129). Regular lubrication of balance rope swivels may be necessary at intervals depending on the conditions in which they are used. Balance ropes should be kept well lubricated and should be regularly inspected throughout their length paying particular attention to that portion of the rope lying at the bottom of the loop at the end of wind positions.

Maintenance of guides and rubbing ropes

202 At suitable intervals depending on the conditions in which they are used guide and rubbing ropes and their fittings should be examined. At positions most liable to deterioration the ropes should be cleaned at regular intervals, their surfaces inspected for corrosion and uneven wear, the diameter measured and a check made for any fractures of the wires.

(a) Useful guidance is to be found in the British Coal publication 'Ropeman's Handbook'.

(b) White metal cappings should comply with BS 463: 1970 (1987) specification for white metal ingots for capping steel wire ropes.

(c) Useful guidance is to be found in the British Coal Notes of Guidance for the resin capping of wire ropes.

ACOP

203 Guide and rubbing ropes may deteriorate due to fatigue at the headgear termination. At suitable intervals depending on the conditions in which they are used the terminations should be remade and the ropes lifted by an amount not less than 1.5 times the length of the termination. Guide and rubbing ropes should be discarded when the outer wires have lost more than one third of their depth. The effect of uneven wear may be reduced by regular turning of the rope. When ropes are lifted they should be rotated by a quarter turn. If this is carried out at five yearly intervals surface wear will be evened out over a 20 year lifespan.

Testing of winding engine brakes and automatic contrivances

204 Arrangements should be made for regular testing of brakes and automatic contrivances to ensure that they are effective as follows:-

- (a) *every shift* - a static brake holding test should be carried out before winding starts;
- (b) *weekly* - the device provided to prevent an overwind (see paragraph 87) should be tested by raising each conveyance and counterweight to pass above the point at which the device comes into operation to stop the winding apparatus at the top of the shaft.

(See also Regulation 10.)

205 At suitable intervals tests should be carried out by attempting to land the descending conveyance at an excessive speed. These tests should be carried out at least every 26 weeks for electrically driven winding systems fitted with a supervisory device in addition to an automatic contrivance. Other installations should be tested at least every 13 weeks(a). Tests to confirm the correct operation of the supervisory device should be carried out as part of the series of tests on the automatic contrivance.

206 In lift apparatus the speed control system should be tested at intervals not exceeding 26 weeks and other control and supervisory systems at intervals not exceeding 12 months.

207 During the tests required by paragraphs 204(b) and 209 a person competent for the purpose should record the distance travelled by the conveyance or counterweight past the landing at which the device or control system respectively operates comes into operation at the top of the shaft.

Safety audit

208 The manager should make arrangements for the winding engine maintenance to be verified by persons competent for the purpose independent of the regular maintenance staff (ie undertake a safety audit) at intervals not exceeding three years, to check that specified maintenance procedures are being properly carried out and recorded. The persons carrying out the audit shall be independent of persons involved in maintenance and should report their findings to the engineers responsible for electrical and mechanical engineering at the mine.

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Safety gear for rack and pinion hoists

209 Safety gear should be tested and the results recorded at intervals not exceeding 13 weeks or such period as is recommended by the manufacturer, whichever is the shorter period, to ensure that it satisfies the requirements of paragraph 109(b).

210 The manager should ensure that the overspeed governor and safety gear is overhauled at intervals not exceeding 4 years or replaced to a suitable contemporary standard.

17

Records and reports

Regulation 18

Regulation

(1) Subject to paragraph (3), the manager shall keep the reports and, where appropriate, records made under regulations 5(4) (c), 11(1) to (3), 16(3) and 17(3) at the office of the mine for three years from the date the report or record is made.

(2) The owner shall ensure that any report made under regulation 11 (1) is given to the manager.

(3) Records and reports kept by virtue of paragraph (1) shall be kept at the office of the mine where the winding apparatus to which they relate is.

18

General duty of mine manager

Regulation 19

Regulation

It shall be the duty of the manager to ensure, so far as is reasonably practicable, that any requirement or prohibition imposed upon any other person by or by virtue of these Regulations is duly complied with by the person concerned.

19

Exemptions

Regulation 20

Regulation

20

(1) *Subject to paragraph (2) the Health and Safety Executive may, by a certificate in writing, exempt any mine, or part of a mine or class of mines from any requirement or prohibition imposed by these Regulations, and any such exemption may be granted subject to conditions and to a limit of time and may be revoked at any time by a certificate in writing.*

(2) *The Health and Safety Executive shall not grant any such exemptions, unless having regard to the circumstances of the case and in particular to -*

- (a) *the conditions if any which it proposes to attach to the exemption; and*
- (b) *any other requirements imposed by or under any enactment which apply to the case, it is satisfied that the Health and Safety of persons who are likely to be affected by the exemption will not be prejudiced in consequence of it.*

Disapplication of Section 157 of the Mines and Quarries Act 1954

Regulation 21

Regulation

21

Section 157 of the Mines and Quarries Act 1954 (which provides a defence in legal proceedings in certain circumstances) shall not apply in relation to any prosecutions or other legal proceedings based on an allegation of a contravention of a requirement or prohibition imposed by or under these regulations.

Repeals and modifications of the Mines and Quarries Act 1954

Regulation 22

Regulation

22

(1) *The provisions of the Mines and Quarries Act 1954 specified in column 1 of Schedule 1 to these Regulations are hereby repealed to the extent set out opposite thereto in column 2 of that schedule.*

(2) *Sections 30(1) and 42 of the Mines and Quarries Act 1954 shall cease to have effect in relation to shafts.*

Revocation of regulations

Regulation 23

Regulation

23

(1) *The Regulations specified in column 1 of Part I of Schedule 2 to these Regulations are hereby revoked to the extent set out opposite thereto in column 2 of that Part.*

(2) *The Regulations specified in Part II of Schedule 2 to these Regulations shall cease to have effect in relation to shafts.*

(3) *The Regulations specified in Part III of Schedule 2 to these Regulations (being regulations which apply to particular mines) are hereby revoked.*

Appendix 1 Steel to be used for conveyance suspension gear

(Paragraph 132)

Types of steel

The following types of steel are suitable for making any apparatus (including a detaching hook) provided for attaching any conveyance to a rope:

Steels to BS 2772: Part 2: 1989 Specification for wrought steel having the mechanical properties specified in table 1.

Chemical composition

Steels having the chemical composition and heat treatments specified in BS 2772: Part 2: 1989 Appendix C have been found capable of meeting the mechanical properties described in table 1.

These include:

1.5% manganese steel

Group 1 - 150 M12

Group 2 - 150 M19 (higher tensile)

Nickel Chrome Molybdenum Steel

Group 3 - 806 M20

Group 4 - 806 M22 (higher tensile)

Group 5 - 826 M31 (" " " ")

Table 1 Mechanical properties

Group	Product form	Limiting ruling section* mm	Minimum values of mechanical properties			
			Tensile strength <i>R_m</i> N/mm ²	Yield strength <i>R_e</i> N/mm ²	Elongation on 5.65/50 <i>A</i> %	Minimum charpy V-notch impact test values at -20% J
1	Plate	Up to and including 100	490	340	24	80
	All other forms	Up to and including 100	540	340	24	80
	All forms	Over 100 up to and including 150	490	310	23	60
	All forms	Greater than 150	430	280	22	55
2	All forms	Up to and including 150	540	340	24	68
	All forms	Over 150 up to and including 250	540	340	20	55
3	All forms	Up to and including 150	620	435	19	47
	All forms	Over 150 up to and including 250	620	435	19	37
4	All forms	Up to and including 63	770	540	17	40
5	All forms	Over 63 up to and including 250	850	680	15	55
	All forms	Over 150 up to and including 250	850	650	15	50

* For the meaning of the term 'Limiting Ruling Section' reference should be made to BS 2772: Part 2: 1989. Specification for Wrought Steel.

Appendix 2 Components of conveyance suspension gear which do not require periodic heat treatment

(paragraph 189)

- (a) Wedges and safety blocks of wedge type capels.
- (b) Fine adjustment blocks of multi-rope suspension gear.
Outer plates, drop pin and bottom pins of Barker Davies 2 and 2A detaching hooks.
Outer plates, spacer blocks and rivets and the drop pin of the Barker Davies 4 catch detaching hook.

Appendix 3 Formula to determine the maximum retardation which should not cause slip in friction winding apparatus

(paragraph 71)

$$r = \frac{e^{\mu\theta} T_a - T_d}{e^{\mu\theta} (T_a + G_a) + (T_d + G_d)} \times g$$

- Where
- r is the retardation in m/s^2 resulting from the greatest torque which would not cause any winding rope to slip.
 - e is the Napierian base taken as 2.7183
 - μ is the coefficient of friction between the winding ropes on the winding sheave = 0.2
 - θ is the angle of lap in Radians of the winding ropes on the winding sheave.
 - T_a is the static tension in the ascending winding ropes at the level of the winding sheave.
 - T_d is the static tension in the descending winding ropes at the level of the winding sheave.

G_a is the sum of the following:

- (i) the equivalent mass of the deflecting sheaves associated with the ascending winding ropes, referred to the winding rope centre line,
- (ii) the mass of the ascending winding ropes in the rope plane between the winding sheave and the deflecting sheaves where the friction winding apparatus is of the ground mounted type,
- (iii) the mass of the vertical ascending winding ropes in the headgear between the deflecting sheaves and a point level with the winding sheave, where the friction winding apparatus is of the ground mounted type.

G_d is the sum of the following:

- (i) the equivalent mass of the deflecting sheaves associated with the descending winding ropes, referred to the winding rope centre line,
- (ii) the mass of the descending winding ropes in the rope plane between the winding sheave and the deflecting sheaves where the friction winding apparatus is of the ground mounted type,
- (iii) the mass of the vertical descending winding ropes in the headgear between the deflecting sheaves and a point level with the winding sheave where the friction winding apparatus is of the ground mounted type.

g is the acceleration due to gravity, ie 9.81 m/s^2

Note: Tensions are expressed in newtons or kilonewtons when masses are expressed in kilogrammes or tonnes, respectively.

Appendix 4 Formulae for calculation of safety factors of winding ropes

(paragraph 126)

$$F_1 = 1.0 + \frac{4.5 (R+C)}{R(1 + 0.0051 \sqrt{M}) - 13.5}$$

$$F_2 = \frac{4.5 (R+C)}{R(1 + 0.0051 \sqrt{M}) - 13.5}$$

Where

R = the ratio of the diameter of the winding sheave to the diameter of the winding ropes;

C = 35 where there is not a nearby deflecting sheave, or 43 where there is a nearby deflecting sheave; and

M = the vertical distance in metres between the level of the top of the highest winding sheave and the level at which the winding ropes meet the suspension gear of the conveyance when at its lowest position in the shaft.

Appendix 5 Glossary

Terms defined in regulation 2(1) are not repeated in this glossary. Regulation 2(4) makes it clear that definitions in the regulations apply also to documents issued under the regulations.

Abnormal load

Any load of a greater mass than the maximum normally permitted for the system or any load which by virtue of its dimensions requires special handling.

Ancillary apparatus

See winding apparatus and winding system.

Arresting devices

Devices provided in the headgear and the sump to retard and arrest an overwound conveyance or counterweight, particularly in friction winding systems.

Automatic contrivance

The apparatus, provided to prevent overwinding or overspeed of a manwinding conveyance or counterweight and which is designed:

- (a) to prevent the descending conveyance from being landed at the lowest entrance or at the bottom of the shaft at an excessive speed; and
- (b) to control movement of the ascending conveyance to prevent danger to persons therein; and
- (c) to prevent travel of a conveyance or counterweight beyond predetermined end of wind limits.

Automatic shaft signalling systems

A signalling system in which the transmission of signals is initiated by completion of the loading and unloading processes.

Automatic winding

The operation of a winding engine between predetermined levels in a shaft which is initiated by starting switches or by automatic shaft signals interlocked with and thereafter controlled and operated by the loading and unloading equipment.

Backshaft winding engines

Backshaft winding engines are defined as simple systems operating at 4m per second or less, used only once or twice each shift or less frequently and carrying small loads as with shaft pumping duties and shaft inspections.

Balance rope or chain

A rope suspended from and linking the underside of the conveyances, or conveyance and counterweight, to reduce the out-of-balance static loads within the system.

Banksman

The person in charge of signalling and of loading and unloading conveyances at the shaft top.

Bumping beams

In friction winding, beams fitted in the headgear and the shaft sump, at the extreme limits of travel, to stop an overwound conveyance or counterweight.

Capping

The complete attachment fitted at the end of a steel wire rope by means of which the rope is coupled to any conveyance, counterweight or apparatus.

Clutched drum winding engine

A winding engine having two drums either or both of which may be de-clutched for the purpose of adjusting the depth of winding.

Conveyance safety gear

Automatic safety gear fitted to a lift car which in the event of the failure of the winding ropes or suspension gear or if the lift car exceeds a predetermined downward speed will stop and hold the car when carrying the maximum load.

Crash doors

Doors fitted within the head frame of a shaft sinking which are capable of preventing a fully loaded conveyance from falling back down the shaft.

Creep speed

A low winding speed normally employed just prior to stopping or for rope or shaft examination.

Detaching bell or plate

The apparatus in the headgear which operates the detaching hook in the event of an overwind, and from which the detached conveyance or counterweight is thereafter suspended.

Detaching hook

A device in drumwinding installations located between the capping and the conveyance or counterweight so that, in the event of a severe overwind, an ascending drum wound conveyance or counterweight is detached from the rope and is suspended from the detaching bell or plate.

Drum winding apparatus

Winding apparatus in which the rope for a conveyance or counterweight is fastened at one end to the drum of a winding engine so that it is wound on or off as the drum is rotated.

Dynamic braking

A means of obtaining controlled electrical braking by utilising an a.c. winding engine as a generator by replacing the a.c. supply to its stator with a d.c supply and using the rotor resistance controller to control the braking and dissipate energy.

Electrical braking

The conversion of kinetic energy in the winding system to electrical energy in a winding engine motor to be utilised for the purpose of decelerating the winding engine.

Emergency trip

The automatic opening of the safety circuit resulting in the removal of the motive power and the application of the brakes following the detection of an abnormal condition.

External parts of winding apparatus

Those parts which can be visually examined without dismantling.

Factor of safety

The ratio between the ultimate braking strength of a component in the particular manner of likely failure and the maximum static loading to which it may be subjected in service.

Fail to safety (fail safe)

The automatic assumption of a safe condition in the event of a fault or failure of a component or system.

First person in

The first person to be wound to an unattended landing.

Foreshaft

The initial excavation necessary to provide accommodation for the installation of equipment to facilitate the main shaft sinking in accordance with these regulations.

Friction winding apparatus

Winding apparatus in which a rope or ropes are attached to a conveyance or counterweight at each end and in which uncontrolled movement of the conveyance or counterweight is prevented by friction between the rope or ropes and the treads of a driven sheave of a winding engine.

Governor rope

A steel wire rope provided in a lift installation to drive a governor which monitors the speed of the lift car and operates the safety gear in the event of a downward overspeed.

Gravity operated winding apparatus

Winding apparatus moved solely by the action of gravity on a part of it in which a load is carried.

Guides

An arrangement of girders, rails, timbers, or ropes, in a shaft to restrict lateral movement of conveyances or counterweights.

Headgear

The structure at the top of a shaft on which the winding pulleys or sheaves are mounted.

Inching control

A push button which operates the winding engine at low speed only while it is being pressed.

Infinite fatigue life

A component is said to be designed for infinite fatigue life when the calculated stress conditions are such that failure from fatigue of the component under specified service conditions should theoretically never occur i.e. the number of duty cycles that can be withstood may be regarded as infinite.

Inset

An underground opening or entry from a shaft.

Kibble

A large steel bucket used to transport persons, materials or debris in a shaft sinking or deepening.

Landing

Any shaft entrance normally used by persons to enter or leave a conveyance.

Last person out

The last person to be wound from a landing, leaving it unattended.

Manual winding

Winding in which the functions of the winding apparatus (eg acceleration, deceleration and braking) are manually controlled and initiated by the winding engineman.

Maximum static torque

The torque resulting from the maximum static load in the conveyance during manwinding, or materials/mineral winding.

Maximum torque

The torque resulting from the maximum power permitted by the torque limiting device to be applied by the prime mover. Where no torque limiting device is provided, the maximum torque shall be taken as 1.1 times the maximum torque required in service for normal duties taking into account any permissible variation in loading conditions.

Mechanical brake

Members which transmit force from springs, fluid or weight(s) to braking surfaces of the drum or sheave of a winding engine, to bring the drum or sheave to rest and to hold the drum or sheave at rest by action of brake friction linings on brake paths.

Onsetter

The person in charge of signalling and of loading and unloading conveyances at a shaft inset or in shaft sinking at the sinking scaffold.

Overspeed device

A device which detects when a conveyance is travelling at excessive speed and causes the winding apparatus to be brought to rest.

Overwind safety catch

Catch or equivalent device provided in the headgear to prevent a conveyance from falling back an excessive distance after a severe overwind, independent of the suspension gear.

Practical

Non-legal term used occasionally in the Code to indicate that the Health and Safety Executive is aware that, although the method outlined in the ACOP is in general desirable, it may not be practical in all circumstances. No precise assessment of the costs and benefits is required.

Push button winding

Winding in which each wind is initiated manually from the shaft side and in which the wind is completed without further manual intervention.

Rider

A framework for steadying a kibble between two guide ropes in a shaft sinking or deepening.

Rubbing rope

Rope hung in a shaft between the paths of the conveyances or counterweights to prevent collision when they meet.

Safety circuit

A circuit which detects abnormal conditions and causes the winding apparatus to be brought to rest, prevents its being moved and in some cases indicates the nature of the abnormal condition.

Scaffold rope

A steel wire rope used for suspending sinking scaffolds which may be used to restrict lateral movement of conveyances.

Scaffold winch

A powered winch on which the ropes supporting a sinking scaffold are wound.

Shaft fixtures

Pipes, cables and their supports within a shaft, also the supporting structure for rigid guides; ladders, stairways, working platforms, barriers, fences and anchorages etc.

Shaft lining

A brick, concrete or metal lining installed for the purpose of supporting the strata at the sides of a shaft sinking.

Shaft sinking/sinking shaft

A shaft in the process of being excavated.

Shaftsman

A person employed in the inspection, examination, maintenance and repair of shafts.

Shaft sump

The extension of the shaft below the lowest inset.

Signal

Audible and visual intimation conveyed over a distance, used in accordance with a code, to control the movement of winding apparatus.

Single line component

A critical component the failure of which to function as designed renders a system totally inoperative.

Sinking scaffold/sinking stage

A working platform suspended in a shaft sinking.

Skip

A shaft conveyance designed primarily for the bulk handling of minerals.

Slip

Abnormal relative movement between the winding rope(s) and friction treads of a friction winding engine.

Staple pit

A shaft connecting excavations at two or more levels below ground and having no surface outlet.

Supervisory device

A monitoring device operating in association with the automatic contrivance providing a back up for the main protective features.

Suspension gear

Apparatus including any detaching hook for attaching to the winding rope a conveyance or counterweight.

Tipping chute

A retractable chute for conveying debris from a kibble tipped at the top of a sinking shaft to a storage hopper or stockpile.

Travelling onsetter

A person travelling in a conveyance who is in charge of signalling and loading and unloading in place of the banksman and onsetter in some single conveyance systems during manwinding.

Ultimate limit switch/ultimate overwind switch

A switch positioned in a head frame above the highest terminal decking level, and operated by a conveyance, counterweight or rider in the event of an overwind beyond the point at which an overwind switch on the automatic contrivance is operated.

Winding rope

A steel wire rope used for suspending and moving conveyances in a shaft utilising a winding engine.

Winding system

The winding apparatus and its system of use make up the winding system concerned.

Further information

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