

Plant and Machinery Series 781994

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These Guidance Notes are published under five subject headings: Medical, Environmental Hygiene, Chemical Safety, Plant and Machinery and General.

## INTRODUCTION

1 The aim of this Guidance Note is to advise on ways of reducing the risk of accidents at passenger carrying aerial ropeways. It gives advice on the dangers associated with aerial ropeways including design, construction, operation, testing, examination and maintenance.

2 The guidance is based on the experience of HSE and ropeway operators, international recommendations and good engineering practices. It is not exhaustive and should be read along with the manufacturer's advice and other references listed at the back of this guidance. It does not itself have the force of law, though operators and others with responsibility for aerial ropeways have to meet general requirements of health and safety legislation. These requirements are covered in the section on legal duties.

3 The booklet is for those concerned with the specification, design, manufacture, supply, examination and testing, or safe operation of passenger carrying aerial ropeways. Although it is not specifically aimed at ski-tows and installations used solely for the transportation of goods and materials, most of the advice contained here would represent good practice at such installations.

4 Where aerial ropeways addressed in this guidance are used on fairgrounds further advice can be found in HSE'S *Fairgrounds and amusement parks: A code of safe practice*<sup>9</sup> and the *Technics/Annex '0* which accompanies it.

5 A number of technical terms are used in this Guidance Note and they are defined in the Glossary at the back of this publication.

## WHAT DO AERIAL ROPEWAYS INCLUDE?

6 Aerial ropeways include cable cars, sky rides, tramways, chairlifts, gondolas and ski-lifts and are used

to carry people above ground level in cars attached to a rope. The car may be suspended from and hauled by a single rope, or separate haul and suspension or track ropes can be used. Cars can be attached to the haul rope by fixed or detachable grips. The complete installation might have only one station where all boarding and alighting takes place or it can transport passengers between two or more points. The illustration shows the main components of a typical aerial ropeway.

## LEGAL DUTIES

7 Operators and others with responsibility for aerial ropeways have duties under health and safety legislation to ensure the safety of employees, passengers and anyone else who may be affected by the ropeway.

8 The most relevant legislation is listed in the reference section at the back of this guidance. Some of the Regulations, especially those which result from EC Directives<sup>2,3,4</sup> are supported by Approved Codes of Practice (ACOP) or guidance. An ACOP is practical guidance which has been given a special status in law, the positive effect of which is that those who fully comply with an ACOP can be confident that they are also complying with the legal requirements which it explicitly supports.

9 Guidance, whether accompanying legislation, published in an HSE guidance note, or available from any of the other references, does not itself have any comparable legal standing. It is intended to help the reader to understand and control the risks and so meet obligations. Note that HSE'S *Fairgrounds and amusement parks: A code of safe practice*<sup>9</sup> is classed as guidance, not an ACOP.

10 The main duties that are relevant to operators or others connected with aerial ropeways are set out below. The Commission of the European Communities formally proposed a Directive on cableways (94/C70/07) to the Council of Ministers on 1 February 1994. This would cover the essential health and safety requirements to be included in the design, manufacture and installation of cableways, defined as "... capital equipment made up of components, designed, manufactured, assembled and put into service with the object of providing an operational service to carry the general public".

- (a) Employers have duties to protect the health and safety of their employees while at work. These include general duties under the Health and Safety at Work etc Act 1974 (HSW Act) and specific duties under Regulations. Employers are required to assess risks to employees and implement appropriate safety measures, provide and maintain a safe workplace (including means of access), provide work equipment which is safe and suitable for the purpose and ensure that it is maintained and used safely;
- (b) Employers have duties towards people other than their employees who may be affected by the employer's work activity. For example, the operator has to ensure that passengers are safe when riding on or getting on or off the ropeway. The operator also has certain duties towards sub-contractors and their employees who are called in to work on the ropeway. Similarly, sub-contractors have duties towards the operator's employees;
- (c) The self-employed have duties towards people who may be affected by their work activities. For example, self-employed maintenance contractors need to ensure that in carrying out their work they do not endanger aerial ropeway passengers or the operator's employees;
- (d) Manufacturers and suppliers of equipment and machinery have a general duty under the HSW Act to ensure that it is designed and constructed so that it will be safe and without risks to health at all times when it is being set, used, cleaned or maintained by a person at work. The Supply of Machinery (Safety) Regulations 1992, which set out specific safety requirements, do not apply to aerial ropeways but may be relevant to certain other machinery used, eg for maintenance purposes;
- (e) Employees have a general duty to take reasonable care of their own safety and that of other people who may be affected by their work. Other people also have certain duties not to interfere with or misuse safety equipment.
- (d) unsafe operation during boarding and alighting at stations, including uncontrolled crowds;
- (e) uncontrolled movement of cars, eg caused by high winds;
- (f) reckless behaviour by passengers, including dropping or throwing objects out of cars;
- (g) passengers being stranded in cars following loss of power or other emergency situations;
- (h) maintenance related activities;
- (i) exposure to the elements, eg hypothermia;
- (j) electrical hazards, eg shock, burns.

12 People may be exposed to risk of injury during normal operation and when maintenance is carried out. This could be made worse by adverse weather conditions, especially high winds. In some cases, especially where ropeways carry more than one person, there is a risk of several people being severely or fatally injured in a single incident. It is therefore advisable to take account of these risks when an aerial ropeway is designed, constructed, operated and maintained and to ensure that the appropriate standards and precautions are applied.

## DESIGN AND CONSTRUCTION

13 The precautions required when aerial ropeways are designed, constructed, relocated or undergoing major alteration or reconstruction are discussed in these paragraphs. Detailed technical guidance can also be found in the documents listed in the reference and further reading section.

14 The complete design and construction ought to be verified by a competent independent body. This work includes the foundations and structures of rope support towers, engine houses, stations, other buildings, ropes, sheaves, drive and rope tension units, brakes, cars and grips. Specific safety measures should be considered. These include emergency stops, electrical circuits and components as well as general guarding. Quality assurance and quality control need to be exercised throughout the design and construction phases.

15 The location and route of an aerial ropeway require careful consideration to ensure that clearances are sufficient and to avoid the risk of impact or entanglement with obstructions or part of the ropeway. It is also advisable to take account of wind and other possible adverse environmental conditions (floods, ice, avalanches, lightning etc) and means of rescue in emergency situations.

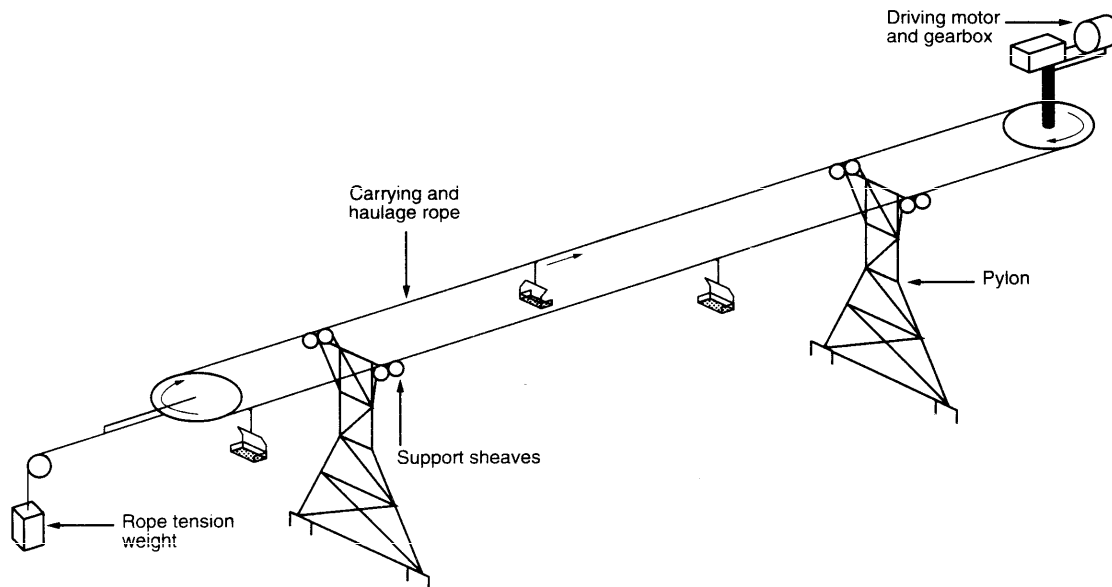
## HAZARDS

11 Aerial ropeways present a number of hazards to the general public, operating and maintenance staff. Particular sources of hazard include:

- (a) the collapse or failure of any part of the installation, eg tower collapse, rope displacement, rope failure, grip displacement;
- (b) impact or entanglement between cars or cars and structures;
- (c) passengers falling from cars or coming into contact with cars, moving parts of machinery or the structure:

## SAFE ACCESS

16 Users of aerial ropeways and employees,



Main components of a typical aerial ropeway

especially those who carry out maintenance and similar work, may be at risk of falling. Users might be unfamiliar with the layout of the ropeway, they might be in a crowd, possibly jostling and, in some cases, they might be carrying ski equipment. Employees, especially if carrying out maintenance work, might need to get to areas where normal access is difficult and be exposed to diving mechanisms or other dangerous parts.

17 Safe and suitable means of access to and from cars is needed for normal operation and in the event of an emergency. Safe access to other parts of the structure is required for inspection, maintenance and operational purposes.

18 In general, walkways, ramps and access routes should have a surface which provides a secure foothold under all foreseeable weather conditions. Secure fencing should be provided wherever possible at any place where a person might fall 2 m or more. Secure fencing should also be provided where someone might fall less than 2 m; and there are factors which increase the likelihood of a fall or the risk of serious injury; eg where a traffic route passes close to an edge, where large numbers of people are present, or where a person might fall onto a sharp or dangerous surface or into the path of a vehicle. If possible, access for maintenance purposes should be via fixed ladders, stairs or walkways but in some cases mobile access equipment might be suitable.

19 The Workplace Health and Safety and Welfare Regulations 1992 and the Construction (Working Places) Regulations 1961 contain requirements for safe access. Guidance Note GS28 gives further advice on this and the guidance in the Code of Safe Practice<sup>9</sup> may be appropriate for passenger access. BS 5304:1988<sup>9</sup> provides guidance on the principles of machinery guarding.

## EMERGENCY PLANT AND COMMUNICATIONS

20 Emergency procedures are discussed in

paragraphs 62 to 65. When designing and constructing the ropeway emergencies such as accidents or prolonged breakdown need to be anticipated and means provided for dealing with these. In particular, it may be necessary to communicate with, and possibly rescue passengers under adverse conditions.

21 Unless the ropeway is so compact that it is possible to speak directly to passengers, there should be appropriate means of communicating with passengers, from one station to another and with the emergency services. Communications systems need to be independent of the main power supply in case of power failure and it is usually necessary to link at least one station to the public telephone system to summon help. Communications cables should be positioned so that they do not unintentionally come into contact with the moving cars or the haul rope.

22 Unless passengers can easily and safely be rescued by other means, an independent auxiliary drive and power source need to be installed to enable cars to be moved to a safe position in case the main drive fails. This drive should be capable of being periodically tested to ensure continued satisfactory operation and may also provide for the failure of any gear box to function properly. An independent power supply will also require sufficient capacity to provide emergency lighting including flood lighting, if necessary.

## ROPES AND DRIVES

23 The failure of a rope or drive could have catastrophic results. It is therefore vital to ensure that ropes and drives are of sound construction, suitable for the purpose intended and well maintained. Ropes should have a minimum factor of safety commensurate with the values specified in the latest European Standards, or in their absence a minimum value of five for running ropes. This is required to take account of any abnormal stresses or fatigue to which a rope may be subjected.

24 Galvanised wire ropes are preferable for suspension and hauling purposes due to their corrosion resistance. If such ropes are not used then alternative means should be used to minimise the effects of corrosion, such as regular dressing with a suitable lubricant.

25 Rope splice lengths at new or revised ropeways should comply with manufacturers' recommendations. In most cases this is in accordance with current best practice in European engineering so that the splice length is at least 1200 times the nominal rope diameter (1200 d). This may need increasing to 1500 d if the reeving at the sheave drive or tension stations is complex. For ropes above 42 mm diameter a splice of 1500 d is recommended. Since splices constitute a weakness within a rope, the minimum distance between splices should be 3000 d, ie two splice lengths.

26 The standard of splicing is important and good splicing is a specialised technique. It should therefore be performed by a properly trained person who has sufficient practical knowledge and experience of the types of rope being long spliced to detect any weaknesses or defects.

27 To extend the life of stranded steel wire hauling and carrying-hauling ropes, it is recommended that the diameter of the drive and return sheaves is at least 80 times the nominal rope diameter.

28 Safety devices should be provided to monitor overspeed, over-run, position and, where appropriate, the tension of the haul ropes.

29 To avoid the risk of simultaneous failure due to a common cause, the operating systems for in-service brakes and emergency brakes should be independent from each other wherever practicable. These systems should also be arranged so that 'run-back' of the haul rope can be stopped. Similar devices should be considered to mitigate the effects of a failure in the main tensioning devices,

30 On ropeways where detachable grips are used, all cars need to be stabilised before the automatic attachment/detachment devices come into operation. Safety devices should be fitted to ensure grips are correctly clamped to the rope both before detachment and after attachment. A control device is recommended to be installed so that the correct distance between grips is determined to ensure uniform loading of the ropeway.

## **ROPE SUPPORT TOWERS**

31 The main risk at a rope support tower is the haul rope coming out of the sheaves (known as deropement). If this happens a car can suddenly drop and in some cases may be in danger of hitting the ground.

32 To minimise this risk, rope support towers should be fitted with rope catching devices to support the haul

ropes in case of deropement. Each sheave set should be fitted with a suitable trip switch that will stop the rope traveling if deropement occurs. The trip switch control should have a separate manual re-set which will prevent auto-restart in an unsafe condition. If severe weather or rope running conditions are likely to cause icing, and reduce contact between the rope and one or more of the sheaves, compression sheaves may be needed.

33 Rope support towers require safe access and safe means of working for maintenance staff (see paragraphs 16 to 19). Devices for lifting ropes on and off sheaves for maintenance and replacement purposes should either be permanently available at the point of use or be capable of being fitted easily.

## **CAR DESIGN**

34 Cars should be designed so that passengers are prevented from falling out. On open 'chair-type' cars a lap bar may be used to restrain passengers whereas in enclosed cars, where passengers can stand freely, the door should be kept locked and window openings restricted when not at a boarding or alighting position. If passengers can reach out of a car, the distance between the side of the car and any hazard should be sufficient to prevent entanglement and injury, after allowing for the swing of the car.

35 The static safety factor for car hangers and other critical load bearing parts (such as clamping devices) should be in accordance with the latest European Standards. Where these do not exist or give no guidance a minimum factor of five is recommended to be used.

## **OPERATION**

36 Operating instructions and procedures should be set out in writing and issued to operators and attendants. These instructions and procedures should take account of all the requirements set out by the manufacturer. They need to include safe procedures for the boarding, carriage and alighting of passengers in all foreseeable circumstances. For example, on ropeways used by skiers, the procedures depend on whether the ropeway will be used by passengers with skis-on or skis-off, and whether passengers are likely to want to descend using the ropeway.

37 The operator should have the authority to prohibit the operation of the ropeway in the event of bad weather, operational conditions, or other justifiable reasons. This authority should be explicit in the procedures set down by the controller to avoid confusion. Weather and engineering reports enable the operator to make the judgement so at least one recording instrument for wind speed and direction is needed on the ropeway. It should be located so that it indicates the most severe conditions.

38 The attendants' functions and responsibilities

should be clearly set out. They need proper and suitable training which should be updated and recorded as appropriate. In particular, attendants should be responsible for ensuring that:

- (a) passengers board and alight safely, cars are not overloaded, and the installation is not operated beyond its design capability;
- (b) any objects being carried by passengers do not cause entanglement which can cause injury to themselves or other passengers; and
- (c) the spacing of cars onto the rope is maintained when detachable grip systems are used.

39 A sufficient number of attendants is needed at each boarding and alighting station. If boarding and alighting are in the same area, a single attendant may only be used if it is safe to do so.

40 On shutdown, proper procedures need to be followed to ensure that passengers are not left stranded. Before resuming operation after any prolonged shutdown (eg overnight or after prolonged closure due to excessive wind speeds) an inspection and proper start-up procedure should be followed. This should include running the rope through at least one full cycle.

#### **INFORMATION TO BE DISPLAYED**

41 Enough suitable signs should be posted in prominent places to help instruct the public. These signs are not an alternative to safe systems, but supplement them.

42 Where appropriate, notices should state the maximum number of people (with any age limitations) to be allowed in a car, emergency evacuation procedures and crowd control information. The information may need to be in other languages of the ropeway users, eg French and German; this applies especially to emergency evacuation instructions.

#### **SAFETY OF EMPLOYEES**

43 Operating procedures should ensure the safety of staff involved in operation, inspection, examination, testing, maintenance and repair work and in emergency procedures. Safe access should be provided as discussed in paragraphs 16 to 19. Permit-to-work schemes and power isolators which can be locked in the off position should be provided when necessary. Staff need to be fully conversant with permit-to-work schemes or other similar systems.

44 Operations involving the construction, structural alteration, demolition or repair of the structure of a ropeway may be subject to the Construction Regulations.

#### **TESTING, INSPECTION AND THOROUGH EXAMINATION**

45 Before a new or relocated ropeway is opened to the public, or if it has undergone major repair or refurbishment, it will need thorough examination and testing by a person competent to do so, preferably an independent third party. All tests should be in accordance with the designer's instructions, if available, and take into account the foreseeable stresses which may be met in service. Additional tests or examinations may be required by the competent person.

46 Following successful completion of thorough examination and testing, the ropeway can be issued with a certificate by the competent person as being fit for the purpose for which it was designed.

#### **DAILY CHECKS**

47 The ropeway should only be opened to the public when the operator is satisfied it is safe to do so. In practice this means carrying out routine checks and a trial run of at least one full cycle of operation on each day before the ropeway is made available for public use. Daily checks are recommended which take into account any instructions provided by the manufacturer and form part of a written inspection procedure with records kept in a daily log. Daily checks, where appropriate, can include:

- (a) operation of the main drive and all braking systems;
- (b) correct functioning of safety circuits and electrical control systems;
- (c) communications systems;
- (d) correct location of running ropes on sheaves;
- (e) general visual observation of the condition of ropes, fittings, anchorages, rope grips, cars and hangers and any other component whose failure could result in risk to passengers;
- (f) all public access paths, stairways, ramps etc for safe access.

#### **ROUTINE INSPECTIONS FOR MAINTENANCE**

48 Routine inspections form part of the overall maintenance schedule for a ropeway installation and can only be carried out by people sufficiently trained or experienced in the inspection techniques required. As with daily checks, routine inspections need to be recorded in a suitable format enabling a maintenance history to be built up.

49 The frequency and depth of inspection should be determined by someone competent to make such

judgments together with the ropeway operator. The judgments need to take into account any instructions provided by the manufacturers of the ropeway components, level of usage, loading and environmental conditions.

**50** Routine inspections, where appropriate, include:

- (a) operational condition and state of repair of the main and auxiliary drives and all braking systems;
- (b) condition and operation of safety circuits and electrical control systems;
- (c) condition and operation of communications systems;
- (d) free movement of counterweights and rope tension carriages or oil level and pressure in hydraulic tension systems;
- (e) condition of the complete lengths of haul rope and splices;
- (f) condition of all other ropes, fittings and anchorages;
- (g) condition of rope grips, cars and hangers;
- (h) all public access paths, stairways, ramps etc for safe access;
- (i) condition of any other component whose failure could result in risk to passengers.

**51** It should be noted that routine inspections duplicate some areas covered by daily checks but in much greater depth. Daily checks indicate to the operator that components are functioning correctly but not their actual condition, which can be established only by proper inspection.

## INSPECTION OF SAFETY RELATED COMPONENTS

**52** Where the failure of a component will directly result in serious risk to passengers, such components should be given particular consideration when drawing up maintenance and inspection schedules. Such components include wire ropes, fixed and detachable rope groups, pylon structures etc.

## THOROUGH EXAMINATION

**53** In addition to the inspections detailed in paragraphs 48 to 51, thorough examination of the ropeway by a competent person, preferably an independent third party, is recommended on an annual basis. For ropeways used seasonally the thorough examination is best undertaken just before the start of the season. The examination should be based on a scheme prepared by the competent person along with the ropeway controller and/or operator and take into

account manufacturers' advice, past experience and all relevant standards and guidance material. Examinations cover all components and systems specified in paragraph 50 and inspection of all structures and foundations for signs of movement or failure. All significant defects need to be reported immediately to the operator and a decision made on what action to take with a full written report provided within a reasonable time.

**54** Static ropes need examination particularly where they may be subject to bending stresses, at rope terminations and where environmental conditions could cause deterioration (eg corrosion in a marine environment). Haul ropes need examination for wear, lubrication, broken wires, corrosion and localised damage. BS 6570:1986 Code of practice for the *selection, care and maintenance of steel wire rope* gives further advice on this.

**55** Monitoring the internal condition of the haul and suspension ropes is a specialist area and requires trained and competent people. Non-destructive (NDT) methods, such as magnetic induction, should be used if possible. In addition the competent person might consider it necessary to carry out an internal examination on some occasions. To monitor any deterioration in the rope and determine examination intervals, records of all examinations need to be kept. All ropes likely to be examined by NDT methods in service should be examined at the start of their service life to provide a datum for subsequent comparisons.

**56** It is not possible to have all safety related components examined each year, so a sampling strategy needs to be used so that all components are thoroughly examined over a set period which is determined by the competent person. The set period is recommended to be no greater than five years. Components examined in this way include:

- (a) clamping devices (including fixed and detachable grips) dismantled into their separate parts;
- (b) load bearing parts associated with chairs or cars;
- (c) bolts and other fasteners from the critical components such as anchor bolts and shear frame pins found on support towers;
- (d) foundations and structures concerning the ropeway.

**57** It is unlikely that one individual will be competent to carry out thorough examinations on all parts of the installation. For example, the examination of ropes is a specialised skill. It is up to the controller to establish that the competent person has the necessary skills and facilities to carry out the thorough examinations for which they are employed. It should be noted that thorough examination by a competent person is not a substitute for regular planned maintenance. Testing, inspection and thorough examination only form part of a maintenance scheme, which is covered in the next section.

## MAINTENANCE

58 Manufacturers or suppliers normally provide a maintenance schedule to the ropeway controller as part of the operating documentation. If one is not available (eg existing installations) the ropeway controller is responsible for ensuring one is provided. It is important that maintenance schedules recommended by the manufacturer are followed, with records of all maintenance related activities kept to build up a maintenance profile of the ropeway.

59 Good maintenance schedules contain frequencies of inspections and examinations as detailed in paragraph 56 together with more detailed maintenance requirements for certain components. These requirements cover at least the following:

- (a) all wire ropes - including lubrication, tensioning and discard criteria;
- (b) static ropes - the position of static ropes should be moved periodically lengthways in the same direction each time by a sufficient length to ensure a different portion of rope is sitting on a pulley. This improves the fatigue life of the rope by altering the position of maximum stress where ropes bend over a sheave;
- (c) fixed grips - these can be moved along the haul rope a uniform distance on a regular basis, ensuring stresses on the rope are evened out and the rope life increased. This may be done, for example, by moving a set number of grips each day. All fixed grips are recommended to be moved at least once during the season or a minimum of once each year;
- (d) fixed and detachable rope grips - these should be dismantled, cleaned, checked for wear, lubricated and re-set within defined tolerances on a regular basis. Detachable grips can be given slip tests or grip force tests. On fixed grips the provision of torque figures is recommended to avoid the danger of overtightening which damages the grips.

**Note:** Bench tests upon fixed grips should not be accepted as an indication of their effectiveness when installed;

- (e) drive and brake units - these should be kept secure, alignment and clearances kept within tolerable limits, and parts properly lubricated;
- (f) all moving parts, bearing, linkages etc - these should be kept properly lubricated and significant worn or damaged parts replaced;
- (g) emergency equipment;
- (h) all controls and switches including positioning devices;
- (i) communication systems;

- (0) safety equipment including auxiliary equipment (see paragraph 52).

## MODIFICATION AND REPAIR

60 If any modifications or repairs are proposed which may affect the integrity of a ropeway they should be devised in accordance with the manufacturers' and designers' instructions, or with a plan and specification drawn up by a competent person. Once these instructions have been drawn up they should be submitted to either the manufacturer or an independent consulting engineering to establish that the design concept is sound and that the calculations are correct, before any changes are made.

61 Ropeway controllers should take care to ensure that their employees and others who may be involved with the maintenance, modification and repair of the ropeway make a distinction between routine maintenance work and work involving modification and repair. Controllers should give clear instructions on this distinction so that adequate additional precautions can be made. This is because they may require examination and test by a competent person.

## EMERGENCY PROCEDURES

62 Emergencies, whether due to an accident, prolonged breakdown or other malfunction of the ropeway, can put passengers at risk. As well as normal hazards, there is a danger that passengers may panic and try to get off the ropeway in an unsafe manner, and if they are stranded in cold weather there is a danger of hypothermia.

63 It is therefore necessary to consider all potential emergencies and decide on the appropriate procedures for dealing with them before the ropeway is taken into use. Procedures should be sufficient to cope with the worst possible cases - for example, if the ropeway fails and strands passengers in a car above an inaccessible ravine. They should be validated, ie checked to ensure that they work in practice, not just in theory, and reviewed at regular intervals. If the procedures rely on the emergency services for their effectiveness then the responsible officers from the emergency services need to be aware of this and involved not only when the procedures are drawn up but also when they are put into practice.

64 Staff should be familiar with emergency procedures, which are normally set out in writing. It may be necessary to ensure that a suitable and sufficient team of people is properly trained and practised in emergency evacuation procedures and is available during operating periods. Team members should regularly practise their skills in emergency evacuation; it may be appropriate to do this on a 12 monthly basis.

65 Procedures should not rely on the physical well-being of passengers and need to take into account the

possibility of several casualties. Where ropeways are likely to be used in bad weather rescue times should be short enough to prevent danger to stranded passengers.

## RECORDS

66 The controller should keep a record for each ropeway showing the following information:

- (a) the specified operating limits - include the maximum wind speeds and directions, the maximum number of passengers and rope speeds;
- (b) at least these details of the rope and its attachments:
  - (i) information to identify the rope clearly;
  - (ii) the specification of the rope and its splice;
  - (iii) copies of certificates for the rope, its terminals, grips and other attachments;
  - (iv) date of installation;
  - (v) records of inspections and examinations (other than the daily inspections);
  - (vi) maintenance records;
  - (vii) defects and repairs.
- (c) details of all other tests, examinations and inspections carried out on the ropeway installation;
- (d) details of maintenance-related activities which should include details of replacement parts and expendable items;
- (e) details of modifications to original installation.

67 The operator for each ropeway should also complete a daily log with the following minimum information:

- (a) ropeway identification;
- (b) date and time of the daily inspection;
- (c) result of inspection including description of defects noted and any action taken;
- (d) operating times;
- (e) weather conditions (wind, temperature, ice, snow etc);
- (f) accidents, incidents, and defects identified during use;
- (g) signature of the person making entry.

## REFERENCES

### Legislation

- 1 *Health and Safety at Work etc Act 1974, Chapter 37* HMSO ISBN 0105437743
- 2 *Workplace (Health, Safety and Welfare) Regulations 1992: Approved Code of Practice* HSE Books 1992 ISBN O 717604136
- 3 *Provision and Use of Work Equipment Regulations 1992: Guidance on Regulations* HSE Books 1992 ISBN O 717604144
- 4 *Management of Health and Safety at Work Regulations 1992: Approved Code of Practice* HSE Books 1992 ISBN O 717604128
- 5 *Construction (General Provision) Regulations 1961 S1 1961/1580* HMSO ISBN 0111001439
- 6 *Construction (Lifting Operations) Regulations 1961 S1 1961/1581* HMSO ISBN 011 100151 X
- 7 *The Construction (Working Places) Regulations 1966 S1 1966/94* HMSO ISBN 011 1002648
- 8 *The Construction (Health and Welfare) Regulations 1966 S1 1966/95* HMSO ISBN 011100120 X

### Guidance and further reading

- 9 *HSE Fairgrounds and amusement parks: a code of safe practice* (revised) HS(G)81 HSE Books 1992 ISBN 011 886307X
- 10 *HSE A code of safe practice at fairs: technical annex* HSE Books 1988 ISBN 011 8859169
- 11 *HSE Safe erection of structures: Part 3: Working p/aces and access* GS28 HSE Books 1986 ISBN 0118835300
- 12 International Organisation for Transportation by Rope *Technical recommendations for the construction of continuous movement monocable ropeways intended for the transportation of passengers: Part I Installations with fixed grips. Part II Installations with detachable grips.* Second edition Rome 1968 (Cahier No 2) available from International Organisation for Transportation by Rope Secretariat office at Uff Trasporti Funiviari Via C Battisti 231-39100 Bolzano Italy
- 13 International Organisation for Transportation by Rope *International recommendations for the design and operation of cable transport systems for public use: Part 8 Operation* (Complement to Cahier 2) available from address above
- 14 *BS EN 292 Parts 1 and 2: Safety of machinery; basic concepts, general principles for design*



15 BSI CP3: *Chapter V: Part 2:1972- Code of basic data for the design of buildings - wind loads*

16 BS 6651:1990 *Code of Practice for protection of structures against lightning*

17 BS 8100: Part 1:1986 *Lattice towers and masts. Code of practice for loading*

18 BS 8100: Part 2:1986 *Lattice towers and masts. Guide to the background and use of Part 1 Code of practice for loading*

19 BS 5304:1988 *Code of practice for safety of machinery*

20 BS 6570:1986 *Code of practice for the selection, care and maintenance of steel wire ropes*

## GLOSSARY

**Attendant:** anyone appointed to work under the control and direction of a ropeway operator to assist in the operation of a ropeway.

**Car:** any closed or unenclosed passenger carrying unit such as a chair or gondola in or on which people travel.

**Competent person:** a competent individual person (other than an employee) or a competent body corporate or unincorporated who has enough knowledge and practical experience of the machinery and plant which they need to examine to detect the defects and weaknesses which the examination is intended to discover. They should also be able to assess the importance of the defects and weaknesses in relation to the strength and function of the particular plant. The Fairground Code refers to such people as 'appointed persons'.

**Controller:** the person or organisation having the overall control of a ropeway. This may be the individual or a corporate body owning the ropeway or the concessionaire or lessee having been granted control of the ropeway by the owner for a specified period. The controller is also responsible for ensuring that proper records are kept.

**Detachable grip:** a device which secures the car to the haul rope, and enables the car to be removed from the haul rope at stations during normal operation.

**Examination:** a careful and critical assessment of the ropeway carried out by a competent person. This should include, where necessary, a visual assessment supplemented by other means such as measurement and non-destructive testing. Some parts may need to be dismantled so that this can be done.

**Fixed grip:** a device which secures the car to the haul rope, and remains on the haul rope throughout normal operation.

**Inspection:** a careful and critical assessment of the ropeway carried out without dismantling.

**Operator:** the person appointed by the controller to be in charge of the immediate operation of the ropeway whenever it is intended to be available for public use and when operation is required for other duties such as maintenance, inspection and examination.

**Ropeway:** a general term used to describe the complete passenger carrying aerial ropeway installation.

**Safety factor:** the minimum breaking load of a component divided by the maximum applied load taking into account the most adverse conditions.

## Guidance Notes: Plant and Machinery series

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