BS ISO 17842-2:2015

BSI Standards Publication

Safety of amusement rides and amusement devices

Part 2: Operation and use

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National foreword

This British Standard is the UK implementation of ISO 17842-2:2015.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

ISO 17842-2

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Safety of amusement rides and amusement devices —

Part 2: Operation and use

Sécurité des manèges et des dispositifs de divertissement —

Partie 2: Fonctionnement et utilisation

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 254, *Safety of amusement rides and amusement devices*.

ISO 17842 consists of the following parts, under the general title *Safety of amusement rides and amusement devices*:

— *Part 1: Design and manufacture*

— *Part 2: Operation and use*

— *Part 3: Requirements for inspection during design, manufacture, operation and use*

INTERNATIONAL STANDARD **ISO 17842-2:2015(E)**

Safety of amusement rides and amusement devices —

Part 2: Operation and use

1 Scope

This part of ISO 17842 specifies the minimum requirements necessary to ensure the safe maintenance, operation, inspection and testing of the following: mobile, temporary or permanently installed machinery and structures, e.g. roundabouts, swings, boats, Ferris wheels, roller coasters, chutes, grandstands, membrane or textile structures, booths, stages, side shows, and structures for artistic aerial displays. The above items, hereafter called *devices*, are intended to be installed both repeatedly without degradation or loss of integrity, and temporarily or permanently in fairgrounds and amusement parks or any other locations. Fixed grandstands, construction site installations, scaffolding, removable agricultural structures and simple coin operated children's amusement devices, carrying not more than three children, are not covered by this document.

Existing national rules on workers' safety are not concerned by this document.

ISO 17842-3 contains inspection requirements during design, manufacture, operation and use.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2307, *Fibre ropes — Determination of certain physical and mechanical properties*

ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 9554, *Fibre ropes — General specifications*

ISO 7001, *Graphical symbols — Public information symbols*

ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 7165, *Fire fighting — Portable fire extinguishers — Performance and construction*

ISO 13857, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO/IEC 17020, *Conformity assessment — Requirements for the operation of various types of bodies performing inspection*

ISO 17842-1, *Safety of amusement rides and amusement devices — Design and manufacture*

ISO 17842-3, *Safety of amusement rides and amusement devices — Requirements for inspection during design, manufacture, operation and use*

ISO/TS 17929, *Biomechanical effects on amusement ride passengers*

IEC 60947-3, *Low-voltage switchgear and controlgear — Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

EN 12385, *Steel wire ropes — Safety*

EEC 2006/7/EC, *DIRECTIVE 2006/7/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17842-1, ISO 17842-2, ISO/IEC 17020 and ISO/TS 17929, and the following apply.

NOTE Any symbols connected with the respective terms or units are explained in the clauses concerned.

3.1
amusement device
arrangement of equipment that produces the desired effect of amusement or entertainment when the guest moves through it or on it primarily by his or her own action, or any other system that is not covered by the term *amusement ride* (3.2)

Note 1 to entry: In this document, the word *device* is used to refer to an amusement device or *amusement ride* (3.2).

3.2
amusement ride
equipment that is designed to entertain the *passenger*s (3.22) during motion, including the biomechanical effects

Note 1 to entry: In this document, the word *device* is used to refer to an *amusement device* (3.1) or amusement ride.

Note 2 to entry: See ISO/TS 17929 for the definition of biomechanical effect.

3.3
attendant
person appointed to work under the supervision of an operator, to assist in the operation of an device available for use by the public

3.4
competent person
person who has acquired through training, qualifications or experience, or a combination of these, the knowledge and skills enabling that person to perform a specified task

3.5
controller
<ride> person or organization having overall control of an amusement device

Note 1 to entry: This may be either an individual or corporate body owning an amusement device, or the concessionaire or lessee who has been granted control of the device by the owner for a specified period.

3.6
designer
engineer
person or body responsible for the design of a device (or modifications thereof), including, but not limited to establishing and describing the configuration of the amusement ride or device, conducting appropriate risk assessment(s), establishing strength (including fatigue strength), designing and specifying electrical/electronic control systems, defining inspection criteria and including the provision of the necessary documentation

3.7
design review
document detailing the review of all the applicable design documents, to determine the suitability for use of a device

3.8
design risk assessment
DRA
document produced by the designer to ensure a safe design within the agreed scope of supply

3.9
device log
book or file containing all the necessary information about the use and history of any device

3.10
fence
structure designed to restrict or prevent movement across a boundary

3.11
gate
section of fencing that may be opened to provide access

3.12
guest
person who interacts with a device

Note 1 to entry: While both are guests, a *passenger* (3.22) is active and a *spectator* (3.33) passive.

3.13
inspection
procedures and investigations necessary for the *inspection body* (3.14) to decide whether the device can continue to be operated safely, or whether it requires any improvements and/or defects to be remedied immediately or within a specified time

3.14
inspection body
any organization operating in accordance with ISO/IEC 17020 carrying out approval, examination and tests of devices

3.15
initial approval
design and calculation review, verification, examinations and tests executed by the inspecting body before a device is first made available for public use

3.16
latching
<restraint> means of being held secure against opening except by intentional action of the *passenger* (3.22), operator or other means

Note 1 to entry: This can include *restraints* (e.g. drop bars) held in place by gravity, detents or other means.

3.17
locking
Note 1 to entry: means by which a locked *restraint* (3.27) is held secure against opening except by intentional action of the operator or other means not accessible by the *passenger* (3.22)

3.18
manufacturer
any natural or legal person who is responsible for designing and manufacturing a product with the view to placing it on the market under his own name

Note 1 to entry: Any commercial operator that either places a product on the market under his own name or trademark or modifies a product in such a way that compliance with applicable requirements may be affected should be considered the manufacturer and should assume the obligations of the manufacturer.

3.19
major modification
safety-related alteration to the hardware or software of a device, including the introduction of a new safety-related component or the substitution of a safety-related component, which results in a deviation from the design specification

3.20
operator
person appointed by the controller to be in charge of the operation of a device at all times when it is intended to be available for the public

3.21
operation and use risk assessment
OURA
document, produced by the controller, that details all of the considered risks inherent during all modes of device operation at the particular location and the means taken to mitigate them

3.22
passenger
patron
any person using a device

3.23
passenger containment
components (e.g. seating, foot wells, handrails, passenger restraints) designed to prevent *passengers* (3.22) from moving outside a predetermined area on a ride either as a result of biomechanical effects, the ride forces or the behaviour of the passenger

3.24
passenger safety envelope
safety envelope
motion safety envelope
passenger clearance envelope
theoretical or actual physical space that may be encroached upon by any part of a passenger (3.22) of an amusement ride during the ride cycle

3.25
passenger unit
PU
part or parts of a device in or on which the passengers (3.22) are intended to ride

3.26
platform
horizontal or slightly inclined surface raised above the level of an adjacent area

3.27
restraint
system, device, or characteristic that is intended to inhibit or restrict the body movement and/or maintain the body position to tolerate accelerations of the patron(s) while on the amusement ride or device

3.28
reach envelope
patron reach envelope
passenger reach envelope
physical space where a passenger (3.22) could reach during a ride cycle while properly positioned, as defined by the ride analysis, in the amusement ride or device and limited only by the vehicle, seat geometry, and restraint system

3.29
repair
restoration of components or assemblies to the requirements set out in the manual

3.30
reasonably foreseeable misuse
<human error> use of a machine in a way not intended by the designer, but which can result from readily predictable human behaviour

[SOURCE: ISO 12100:2010, 3.24]

3.31
safety-related component
component of a device on which the safety of the *passengers* (3.22) is dependent

3.32
service
replacement or replenishment of components, including fluids which are designated to be replaced or replenished at specified intervals

3.33
spectator
person in the vicinity of a device, typically watching the operation of the device or waiting to gain access to the use the device

3.34
trial run
proving run of a device during which no passengers (3.22) are carried

4 Operation, maintenance and use of amusement rides and amusement devices

4.1 Introduction

This part of ISO 17842 is concerned with the installing, assembly and disassembly, operating, dismantling, handling, maintaining, repairing, modifying and inspecting of devices, and is addressed to controllers, operators, attendants and inspection bodies.

4.2 Standard documentation

The documents, which shall accompany devices, are

— manuals (see ISO 17842-1),

— device log (see ISO 17842-1), and

— operation and use risk assessment (OURA), incorporating the residual risks resulting from the design risk assessment (DRA).

4.3 Duties of the controller

4.3.1 General

The controller or nominated delegate(s) shall

— ensure that the required documentation accompanies the device when being bought, sold or otherwise transferred or supplied,

— select and train operators and attendants,

— assemble, and disassemble safely,

— ensure safe operation in full compliance with: manual(s), all laws, prescriptions and regulations issued by local and national authorities,

— service, maintain, repair and modify safely,

— where required, ensure that only devices which have valid operational documentation and are examined and tested by appropriate inspection bodies, are operated,

— maintain, keep available and update as required the operating manual and device log, as well as creating necessary reports,

— ensure that where operators do not have a clear view of all loading or unloading points, devise a clear system of signals for checking with attendants that it is safe to start, ensure every person using the system is instructed in how to use it and display a copy of the signal code in appropriate positions,

— ensure that emergency procedures are established, well documented and regularly practiced, and

— provide full instructions on the control or communications system.

The ride controller can delegate any part of his duties, but remains responsible.

4.3.2 Selection and training of staff

Obtaining suitable and competent staff involves selection, training, testing of knowledge and understanding, monitoring, auditing and keeping records. The controller shall select people able to put the safety of the public first, likely to follow procedures conscientiously and having the maturity and authority to give confidence to the public.

Adequate training shall be provided to all employees and training records kept. Training shall be appropriate to the risks and given in a way that those being trained can understand.

The operator and attendants of devices shall demonstrate competency in the operation of devices according to the manual(s).

No operators or attendants of the device shall be younger than required by national standards or law in the country of use.

Operators and attendants, depending on their duties, shall be provided with suitable and sufficient information and training in the working of their devices, covering the following:

— systems of work for safe operation, including speed limits and any other specific safety measures;

— procedures for reporting breakdown, defects or unusual occurrences;

— loading and unloading procedures;

— passenger restrictions as detailed in the manual such as height and weight limits, medical conditions, disabilities (see *guest behaviour* in ISO 17842-1);

— control of waiting and viewing areas;

— use and operation of passenger containment and passenger restraint systems including the checking of restraint closure;

— controlled/emergency stop procedures;

— emergency procedures, including passenger evacuation.

4.3.3 Assembly and disassembly

4.3.3.1 Siting of Devices

4.3.3.1.1 General

Devices shall be sited and assembled in accordance with manufacturer's instruction and applicable national requirements.

4.3.3.1.2 Standard conditions for the siting of devices

The ride controller or his representative shall ensure that a device is only sited on ground which is suitable for this purpose in accordance with the manual(s). For example ensure that the ground

— can safely bear the load of the device. For existing structures, e.g. buildings or piers, a detailed inspection and calculation shall be carried out in order to establish permissible loads,

— is sufficiently flat, even and stable for the attraction to be assembled and used on safely, in accordance with the device log and manual.

The ground shall be checked at regular intervals after assembly, to confirm that there is no deterioration in its load bearing capacity, especially during adverse weather conditions. Drainage shall be considered.

The controller shall establish the position of underground services or overhead lines which may present hazards during the assembly or operation of the device, taking advice as necessary from the appropriate authority. Where these could be a source of danger to persons employed or to members of the public, all reasonably practicable precautions shall be taken to prevent such danger, either by the provision of adequate and suitably placed barriers or otherwise.

Care shall be taken to ensure that underground services are not struck when poles or pegs are placed in the ground or when excavation is undertaken. Service location techniques shall be employed before any such work is commenced, unless it has been confirmed beforehand that there are no services present.

When positioning devices, controllers shall apply the following principles.

a) The proximity to other fixed or mobile structures or services shall be in accordance with ISO 17842-1.

b) There shall be sufficient clearance between adjacent devices, buildings or other occupied areas to minimize the risk of fire spread.

c) Consideration shall be given to any possibility of uplift caused by wind.

d) They shall be arranged so that the public have safe access to each device at entrance, and safe egress at exit points, so that there are no bottle necks which could cause overcrowding in an emergency.

e) Sufficient clearance shall be provided between and above devices on main access routes, so as to provide access for emergency service vehicles, and provide access to fixed fire hydrants even when the public may be being evacuated.

f) Where rides cross over or pass through each other, as a minimum the clearance envelopes for each ride (see ISO 17842-1 and/or ISO/TS 17929) shall apply. The controllers shall ensure that safety envelopes for both passengers and spectators are not compromised.

g) The OURA will need to consider whether protection is required to prevent falling objects hitting passengers or spectators.

NOTE Local regulations can exist that define the minimum distance between amusement rides and devices and other structures, objects, services, etc.

4.3.3.2 Transportation, assembly and disassembly

4.3.3.2.1 Supervision and personnel

When devices are transported, assembled or disassembled on site they shall be under the direct supervision of the controller and/or competent delegate(s).

4.3.3.3 Ground packing, stability and anchors

All necessary measures shall be taken during assembly to ensure that the device will be stable when in use.

No device shall be assembled on sloping or uneven ground, unless suitable packing has been incorporated which allows the device to be used safely.

The device shall be level where necessary and have its load adequately distributed and firmly supported. Its stability shall be checked frequently.

The number of packing pieces used shall be kept to a minimum. The height of the packing material shall be kept to a minimum and the packing itself shall be stable.

All packing materials incorporated shall be sound and suitable for the purpose, chosen and located in accordance with the manual(s), so as to prevent slipping and sinking, or dislodgement.

Packing shall be placed directly beneath the load points of the device. If this cannot be achieved a suitable supporting structure shall be formed which effectively transmits the load of the device safely through the packing to the ground. Dynamic loads can lead to the loosening of packing and anchorage; consequently, repeated checks of the packing and anchors are essential.

If an attraction is equipped with props to support the structure, these props shall be used in accordance with the manufacturer's instructions.

Hydraulic jacks shall not be used to support a ride during operation, unless they are designed and approved for the purpose.

4.3.3.3.1 Public safety

Members of the public shall not be admitted into areas where a device is being assembled or disassembled.

The controller and/or competent persons shall, where necessary, provide means to prevent members of the public entering work areas e.g. with fences and/or warnings.

4.3.3.3.2 Working method

A safe system of work, which as a minimum takes into account the manufacturer's manual(s) shall be followed during these operations. Controllers shall make themselves familiar with, and follow the official requirements of local and national authorities.

Devices shall be moved so as to minimize the risk of damage to safety-related components and all loads shall be properly secured during transit.

Where there is any temporary state of instability or overstress in the device during assembly or dismantling, the precautions specified by the designer, manufacturer, and/or supplier, shall be followed. This may require, e.g. the use of temporary guys, stays, supports and fixings to prevent danger through collapse of any part of the device.

Temporary provisions for access and working during assembly and disassembly operations shall be safe including sufficient and suitable lighting to allow work to be conducted in a safe and proper manner.

Unauthorised access shall be prevented through openings in platforms and through any gaps within the device, which are only intended for access when the device is not in motion or use. Such openings or gaps

shall be provided with covers, be securely fixed in position or equipped with barriers and access doors, which are securely fastened.

Before reassembly, all components as specified in the manual(s) shall be cleaned, carefully examined for signs of wear, deformation or other damage, confirming fitness for purpose or otherwise repaired or replaced. They shall be properly lubricated in accordance with the manual(s). Replacements and repairs of safety related components shall be noted in the device log.

Fastening and securing components shall be used in accordance with manufacturer's instructions and correctly adjusted, or replaced if necessary.

Upon completion of assembly, all components that are important to the safety of the device, shall be checked to ensure that they have been properly installed in accordance with the manufacturer's manual(s).

All structural members needed to ensure the stability and safety of a device shall be used and correctly fitted. Where it is a design requirement, the whole assembly shall be securely anchored to ensure that it is stable.

Where rail tracks form part of the device, they shall be properly laid and aligned, according to the manual(s).

4.3.4 Care of equipment

All equipment shall be maintained in accordance with manufacturer's manual(s) and/or general engineering practices.

4.3.4.1 Mechanical equipment

At the intervals as stated in the manual(s), safety related components shall be checked to ensure that they are within the limits stated in the manual. Parts requiring replacement shall be consistent with the design specification.

Controllers shall have procedures to ensure that safety-related components are

— individually identifiable according to design and quality,

— traceable as per the location(s) on the device,

— not interchangeable such that parts cannot be used in incorrect positions — for example, two pins may look identical but have different material properties,

— stored so as to prevent deterioration and contamination,

— cleaned and lubricated as required by the manual before being incorporated into the device, and

— carefully assembled so that they are not damaged, in particular as follows:

1) assembled using fastenings and fixings correctly used and adjusted, in accordance with the manual(s);

2) all pins shall be provided with their secondary retention system (such as safety locknuts and washers, split pins or castellated nuts with split pins, etc.) as defined in the manual(s). Split-pins shall be spread effectively;

3) "R" clips shall be of the right size, in good condition and fitted correctly;

4) self-locking nuts shall not be used more than the maximum number of times specified in the manual(s);

5) close attention shall be paid to bolted joints by using tightening torques, dimensions and classes of bolt in accordance with the requirements of the manual(s); torque wrenches shall be used as required;

6) components having a specified operational life shall be checked to verify their operational life is not expired, checked in accordance with manual(s) and replaced when necessary.

If there is repeated, unexpected or unusual damage to safety related components, the manufacturer or designer and the inspection body shall be informed and advice of these parties sought. The fault shall be analysed by the designer/manufacturer/inspection body and the manufacturer shall issue a safety bulletin to known controllers of that model of ride.

When lifting equipment is used for the assembly of components, the manufacturer's instructions shall be followed so as not to adopt unsuitable lifting methods which might cause damage and subsequent danger during operation.

Steel wire ropes for erection and dismantling shall be used in accordance with EN 12385.

Synthetic fibre ropes for erection and dismantling shall be used in accordance with ISO 2307 and/or ISO 9554.

NOTE Lifting equipment, whether integral to the device or not, and depending on their function, may be subject to specific local regulations, including inspection and testing.

4.3.4.2 Hydraulic and pneumatic equipment

Controller shall ensure that pressure systems are operating within the limits set in the manual(s) as supplied by the manufacturer.

The pressure system shall also be examined in accordance with the written scheme of inspection.

Leakage shall be kept to a minimum, contained where possible, and not create risks. For further information, refer to ISO 4413 and ISO 4414.

4.3.4.3 Electrical equipment

4.3.4.3.1 Access and isolation

All electrical cabinets or enclosures shall be properly locked to prevent unauthorised access.

Devices shall be provided with means to disconnect (isolate) the supply to all live conductors and shall have a means permitting it to be locked in the off (isolated) position (e.g. by padlocks). Suitable means of disconnection are listed in IEC 60204-1.

Devices used for isolation shall have a visible gap or a position indicator that conforms with IEC 60947-3.

4.3.4.3.2 Inspection

All electrical equipment shall be inspected and tested in accordance with ISO 17842-3.

4.3.4.3.3 Operating control equipment

All operating controls shall be

a) clearly visible to the operator,

b) easily distinguishable from each other,

c) readily accessible to the operator,

d) easy to operate,

e) clearly marked to show the function and mode of operation. All markings shall be permanent and readable.

Written markings shall be in a suitable language(s).

The operator's working position shall

— be safe (and have safe access),

— be designed with ergonomic considerations,

— have adequate lighting,

— give, where possible, an unobstructed view of all areas of operation, and

— take into account environmental aspects e.g. temperature, vibration and noise

The design shall take account of any need for the operators to communicate between themselves and, where necessary, with the public, e.g.

— visibly,

— by phone/intercom,

— public address,

— through the ride control system (such as 2-button operating systems).

4.3.4.3.4 Control equipment operated by passengers

Controls equipment intended to be operated by passengers shall

— be clearly marked, in a language agreed with the controller, to show their functions,

— be accessible to all passengers within the designated size limits,

— not present a risk to passengers through their positioning or use,

— not be foreseeably capable of causing injury to passengers either directly (e.g. by trapping hands or fingers, electric shock, etc.) or by causing any controlled device to malfunction or operate inappropriately,

— only be operable by passengers when it is safe for them to do so,

— never override an operator selected control input where it would be unsafe to do so, and

— be able to be muted or over-ridden by the operator if necessary.

Control equipment located in public areas and accessible to the general public should be tamper-proof where necessary to prevent misuse.

Anticipated failure of controls equipment or misuse as well as the possibility of operator error shall not cause significant risk from such events.

Where an amusement ride or device has remote areas or areas obscured from the view of the operator, means of observing and communicating with passengers, as required by risk assessment, shall be provided at the control station.

NOTE Assisted views can be provided by means such as the use of closed-circuit television, mirrors or additional operators.

4.3.5 Trial operations and checks

4.3.5.1 Putting into use after assembly

After assembly the Controller, shall ensure that the device is checked by a competent person to ensure the assembly is in accordance with the manufacturer's manual(s).

A similar check routine shall be carried out where an attraction has been idle for a long period, after it has been partially dismantled and re-erected or after any major maintenance.

The controller shall perform one or more trial runs without any member of the public according to the manufacturer's manual(s), simulating where possible emergency situations to verify particularly that control systems, emergency stops, safety equipment and emergency equipment work properly.

The Controller shall retain a record of the checks carried out in the device log.

Devices not open to the public shall be secured and/or immobilized and steps shall be taken to prevent public access.

The operating manual shall be available for the operator at the device.

The Controller shall ensure a safe system of work is in place and provide means for "locking-off" to ensure the element of the device cannot move inadvertently before all members of staff are in a safe position.

4.3.5.2 Daily check and trial run

The controller shall ensure that each device has a daily check before the public uses it. For a device the results of the daily check shall be in writing, and retained for at least 3 years.

The daily check shall be based on the requirements detailed in the manufacturers' manual(s) and shall at least cover the following:

a) list all parts and other matters which need daily checking to ensure safety and describe how they are to be checked;

b) include, where appropriate, details of the extent of acceptable variations, e.g. out-of-level, air pressures, torque settings, wear;

c) check that safety controls, brakes and other safety devices, including communication systems, operate effectively (these should be done daily unless it can be shown that a longer periodic inspection is appropriate;

d) include checks to make sure that barriers, guards, walkways etc. are in place and in good condition, and that all locking devices and securing pins are in place and in good condition;

e) ensure that cabinets, boxes, enclosures etc. containing hazardous equipment and/or substances are suitably secured;

f) for an amusement ride, require at least one complete operating cycle with all passenger modules which are put into service on this particular day (although some rides do not require this, e.g. dodgems).

The controller shall ensure the person(s) completing the daily check are competent and records of any relevant training provided are retained.

Only if all checks and trial runs are satisfactory can the device be made available to the public.

4.3.6 Operation

4.3.6.1 During operating cycle

Any amusement ride, except one specifically designed for unattended use, shall be under supervision (whether direct or indirect, such as CCTV) at all times when the ride is in use.

The operator shall be capable of working the device competently in a safe manner with due regard for passenger, public and staff safety and shall be in control throughout the operating cycle. The number of attendants required to operate it safely shall be on duty. An operator shall not be in charge of more than one device in operation at any one time unless the OURA determines it is safe to do so (e.g. for some simple devices).

The device shall only be used within the limitations (including weather conditions) specified in the manual(s) and registered in the device log (such as specified in an inspection body's report).

Particular regard shall be given to the extreme conditions which may be caused by gusting winds and the increased wind forces that can be created by the funnelling effect of adjacent structures. If required, appropriate wind measuring devices shall be used.

Where fares need to be taken on amusement rides during operation this shall be considered in the OURA.

4.3.6.2 Supervision of public

Appropriate steps, including stopping the device if necessary, shall be taken to prevent passengers' intentionally misusing equipment provided for their safety, behaving recklessly, or disregarding clear and reasonable instructions.

The number of people allowed on access platforms and grandstands shall not exceed the number specified by the number in the manual(s) and registered in the device log. In any case the number shall only be as many as will ensure safe operation.

Rescue paths shall be kept unobstructed. If necessary, the platforms shall be cleared before cars and gondolas are set in motion. If parts of a ride or passengers swing out less than 2,5 m above the ground, public access to these areas shall be fenced off according to ISO 13857.

Areas on or near devices where it is not safe for persons to stand, shall either be fenced off or clearly indicated and so far as is reasonably practicable, members of the public shall be prevented from access into these areas.

Where appropriate, safe areas shall be provided for the public to wait, controlled by such means as queuing rails, gates and/or additional supervision.

On dark rides, emergency exit routes shall be provided, be kept clear of obstructions and have good emergency lighting. Risks from tripping or falling shall be minimized, particularly where the emergency routes cross or run alongside rail tracks.

For rides with rail tracks, crossing places for the public shall be clearly marked and measures taken to prevent trips and falls.

4.3.6.3 Instruction to public

Legible signs, pictograms or notices in the appropriate language shall be prominently displayed at the device, clearly and simply stating any instructions and limitations for the safe use of the device as specified in the device log or manufacturers' instructions and/or as determined by the OURA.

Attendants and operators shall be trained about what people should, and should not do, and ensure the instructions are followed.

This includes (but is not limited to)

— not carrying loose personal possessions, e.g. handbags, umbrellas,

— not wearing clothing such as scarves where these might create a risk by being dropped, ejected or becoming trapped in moving parts,

— where to place hands, feet etc. particularly where passengers need to brace themselves against the forces they will experience,

— not riding if they have use restrictions or for any reason why they cannot be securely contained.

Attendants and operators shall, in so far as they can reasonably do so, see that such exclusions are enforced.

Effective means by which the operator can communicate with the public shall be provided, maintained and tested daily before the device is open to the public

For standardized signs, see ISO 7001, ISO 7010, ISO 3864-1, ISO 3864-3, ISO 9186-1, ISO 22727 and ISO/TS 17929.

4.3.6.4 Device out of operation

When a device is out of operation, the manufacturer's instructions for safe isolation, access to controls and prevention of unauthorised use of the device shall be followed.

4.3.7 Duties for the supervision of the operation

When the device is operated the controller shall provide adequate systems and procedures to ensure that

— the operators and attendants are adequately trained and all information for safe operation is available,

— the minimum number of operators and attendants needed for safe operation are on duty,

— the operators and attendants have suitable working patterns and conditions to minimize fatigue and other occupational health issues, and

— the operators and attendants are identifiable to members of the public.

Information for safe operation shall consider the following, as a minimum:

a) the operating procedures and conditions stated in the operations manual, or any other condition that has been set by the controller or by the inspection body;

b) device loading to accommodate all users safely, which may include

   — taking all reasonable steps to ensure that the public are aware for whom the device is suitable,

   — taking all reasonable steps to exclude those whose behaviour suggests they may not be able to use the device safely, and

   — on a ride,

      i) loading cars in a particular pattern, for example the largest/smallest – passengers in the correct position,

      ii) correctly balancing the cars and the ride,

      iii) not allowing passengers to use any part of the ride where the passenger-–containment system is defective, and

      iv) making sure that all passengers are safely contained and no spectators are in an unsuitable place before starting;

c) procedures for foreseeable emergencies;

d) stopping the device or making it safe;

e) the need for a clear view of all loading or unloading points;

f) the need for an adequate communication method shall be used between operators and attendants.

4.3.8 Maintenance (servicing, repair, restoration and modification)

4.3.8.1 General

All maintenance work on a device shall be carried out by, or under the direct supervision of, persons trained or experienced in the maintenance procedures appropriate to that device. These procedures shall include preventive maintenance and component monitoring using best industry practices and information from the manual(s). Where issues arise, advice should be sought from the manufacturer

of the device and/or the inspection body. All guards, fences, equipment enclosures and access doors, which are removed for servicing or maintenance purposes, shall be replaced and effectively secured in position before the device is set in motion.

Where appropriate (e.g. flume rides) sufficient water quality according to EEC Directive 2006/7/EC (32006L0007) shall be achieved and kept.

4.3.8.2 Servicing

The servicing intervals recommended by the manufacturer shall not be exceeded, unless any extension in the period has been agreed and approved either with the manufacturer in writing or with the approval of the inspection body.

The frequencies at which servicing is carried out shall be in compliance with manufacturer's recommendations. Servicing recommendations shall deal with all components that have to be checked, tested, lubricated, adjusted or replaced at specified intervals.

Where necessary, these recommendations shall take into account information from the manual(s) which will include:

— diagrams of the mechanical, electrical, hydraulic, pneumatic, safety and security systems,

— instructions concerning the actions to be taken when checking, testing, lubricating, adjusting or replacing, and dismantling or assembling of components,

— specifications of the required condition of the parts in question, and permitted deviations,

— specifications of lubricants to be used, and

— the intervals at which the various checks and servicing work shall be carried out.

The ride controller shall ensure that replacement parts fitted during servicing operations are of the correct specification. If it becomes necessary to use replacement parts which are different from those specified by the manufacturer the ride controller shall treat these changes as a modification and take action as detailed in the 4.3.8.4.

4.3.8.3 Repairs

The repair of damaged parts shall be carried out with caution, as this could lead to a departure from the approved original design.

After a repair, a device shall not be used until the following has been carried out.

— Every repaired part has been checked against the specification and/or procedure. If there are differences the repair shall be treated as a modification.

— Details of the repair and any relevant tests and inspections are recorded in the logbook.

— Welding or other hot work may constitute a modification. If any welding is done, the correct materials and techniques shall have been verified so that the integrity of the device is not adversely affected.

Defects in any safety-related components shall not be repaired without first consulting the manufacturer/designer or an inspection body. The manufacturer/designer, where possible, shall be informed so that causes can be investigated and remedied. The manufacturer/designer shall give the necessary information regarding the repairs and/or safe operating conditions.

4.3.8.4 Modification

Before modifying any device, the controller shall ensure that the proposed modification will be safe. A risk assessment, carried out by a competent person, may be necessary to determine whether the modification is safety related. If in doubt, the modification shall be treated as safety related.

A safety-related modification includes any detrimental change to the following:

— loading (e.g. changing seating arrangements, fitting heavier passenger units);

— speed or operating cycle;

— range (e.g. height of lift);

— safety envelope;

— structural and mechanical components;

— drive mechanisms;

— control mechanisms (e.g. brakes, shock absorbers, speed limiters, speed or position sensors);

— software;

— passenger containment (including fencing and barriers);

— passenger accessibility restrictions

— where the item(s) undergoing modification are determined to be safety related by means of a DRA.

A safety-related modification also includes

— use of a device outside its specification or the normal environment for which it was designed, and

— re-installation of a fixed device in a different location.

Where a modification is safety-related the advice of the designer/manufacturer or a competent person shall be sought.

Even apparently insignificant modifications may lead to the accelerated failure of the components of a device, and using a device outside the manufacturer's specification or the normal environment for which it was designed, is a safety-related modification.

For example, the stiffening or strengthening of one component can produce higher stresses in adjacent components which in turn could fail. Welding shall follow the provisions of International Standards.

Any safety related modification will require a pre-use inspection.

If safety-related components have been modified by the controller without the designer's and/or manufacturer's approval the controller shall bear the responsibility for any consequences.

4.4 Duties of the device operator

The operator shall be in direct control of a device when it is in use, unless specifically designed to be unattended (i.e. operated without the presence or intervention of an operator or attendant).

4.4.1 General requirements

For a device under their control, the operator shall

a) be competent,

b) understand their responsibilities,

c) understand the nature of the device,

d) understand the specific operating procedures,

e) maintain proper supervision,

f) ensure employees and others are safe in areas under their control,

g) operate the device safely,

h) follow all safety instructions,

i) report incidents and safety issues immediately to the appropriate person,

j) not misuse health and safety equipment, and

k) not modify or circumvent anything provided for safety.

4.4.2 Safe operation

When the device is operated, the operator shall be in control at all times and ensure that

a) attendants are competent for the tasks that they are expected to undertake,

b) all information to allow safe operation is available, including

   1) procedures for foreseeable emergencies,

   2) stopping the device or making it safe,

   3) having a clear view of all loading or unloading points, and

   4) a clear and positive signalling system between operators and attendants,

c) the minimum number of operators and attendants specified for safe operation are on duty,

d) they and their attendants give their full attention to ensure safe operation,

e) they and their attendants are identifiable to members of the public,

f) the device is not operated outside the operating conditions stated in the operations manual, or any other condition that has been set by the controller,

g) the device is loaded to accommodate all users safely, which may include

   — taking all reasonable steps to exclude people for whom the device may be unsuitable,

   — taking all reasonable steps to exclude those whose behaviour suggests they may not be able to use the device safely, and

   — on a ride,

      i) loading cars in a particular pattern, for example the largest/smallest passengers in the correct position,

      ii) correctly balancing the cars and the ride,

      iii) not allowing passengers to use any part of the ride where the passenger-containment system is defective, and

      iv) making sure that all passengers are safely contained and no spectators are – in an unsuitable place before starting.

The operator shall remain aware at all times of the factors which may affect the safety of the device, in particular the following:

a) bad weather conditions, including

   — strong and gusting winds,

— heavy rain which may make the ground soft,

— lightning,

— fog reducing visibility,

— snow and ice;

b) changes in the way the device is running, unusual noises or vibrations;

c) deviations from operating procedures;

d) unsafe behaviour including horseplay and the effects of taking drink or drugs;

e) overloading or congestion of loading platforms or access points.

Operators shall be trained/informed about what people should, and should not do, and ensure the instructions are followed.

Where necessary, they shall give instructions before starting the device.

4.5 Duties of the attendant

The attendant shall

a) follow the instructions given by the controller and/or operator,

b) give full attention to the safety of the public, passengers and the other members of the staff,

c) be able to communicate effectively with the operator at all times,

d) ensure that passengers are safely contained with any restraint or other device correctly fitted, locked and properly adjusted prior to signalling for the device to start,

e) observe the device in operation and take appropriate action if any person appears to be at risk, and

f) ensure people leave safely when the ride finishes.

The attendant shall not

— ride in an unsafe way or position, or

— jump on or off a ride if it poses a risk of injury or incident to any person.

Attendants shall be trained/informed about what people should, and should not do, and ensure the rules are followed.

4.6 Inspection

4.6.1 Annual in-service inspection

4.6.1.1 General

The purpose of in service inspection is to check on the fitness of a device for continued further use during its operational life. It is a check on the safety related components of a device to ensure it can continue to operate safely. The findings of the inspection and the requirements shall be recorded in a report along with the interval to the next inspection.

National regulations will determine the specific requirements for in-service inspection.

The inspection shall be in accordance with ISO 17842-3.

4.7 General safety provisions

The controller shall identify all emergency situations (including those identified by the designer/manufacturer) which may arise during the operation and plan procedures to cover these situations. Such situations may include but are not limited to ride breakdown, severe weather conditions, explosion, fire, terrorist threat, loss of power etc. The OURA shall cover the potential risks associated with the device in emergency situations.

Easy access for emergency vehicles and equipment must be covered in the emergency plan.

4.7.1 Means of evacuation and escape

Exits and exit routes shall be clearly indicated by notices and directional signs, which are self-illuminating. In enclosed structures, the emergency lighting shall adequately illuminate exit routes, staircases, changes in level and signs. Where necessary in the event of power failure, effective emergency lighting shall form part of the arrangements for safe evacuation of persons from passenger carrying devices.

While any person is within the structure, the doors of the structure and of any room within the structure which afford a means of exit shall not be locked or fastened in such a manner that they cannot be easily and immediately opened from the inside. All doors on an exit route shall open outwards so that people can escape in an emergency without impediment. Where exit doors have to be secured against outside intruders, they shall be fitted with panic-type bolts only.

Exits, which consist of wall flaps or similar materials, shall be boldly indicated at the edges. They shall be arranged, so as to be easily opened from the inside.

4.7.2 Fire

4.7.2.1 General

The provisions of this clause are basic requirements, which relate to fairgrounds and parks, without prejudice to any statutory fire regulations.

The fire precautions and procedures shall be determined by the controller carrying out a fire risk assessment.

4.7.2.2 Fire procedures

Operators and attendants shall receive instructions on fire procedures and be given a demonstration of the use of fire-fighting equipment by the fire service, where this is practicable.

Every enclosed structure shall have a sufficient number of persons in attendance to direct the public to safety in the event of emergency. One person shall be nominated to be in charge of the structure.

All persons connected with the operation shall be instructed in the action to be taken in case of fire. A responsible person shall be in charge of fire precautions and shall ensure that all employees are familiar with their duties.

Instructions in fire procedures shall include the use of fire-fighting equipment provided, the need to call emergency services immediately and the system to be used to call them.

Notices dealing with the fire procedures shall be exhibited at suitable positions.

4.7.2.3 Provisions in case of fire

Means shall be provided for giving a warning in case of fire and any such warning/alarm system shall be visual/audible throughout the facility and clearly distinguishable from other sounds.

The means of raising the alarm shall be made in such a way as to avoid creating panic in an audience, while giving instant warning to the appropriate members of staff.

Fairgrounds or amusement parks shall provide and keep in working order appropriate means for fire-fighting (for example portable fire-fighting extinguishers). They shall also be placed so as to be readily available for use.

The routes forming access to or egress from devices shall be kept clear of obstruction at all times when members of the public are permitted to be present. The layout of devices shall ensure that there is an easy and prompt access to a means of escape from the fairground.

Where natural lighting is deficient and during the hours of darkness, artificial/emergency lighting shall be provided. Particular attention shall be paid to exit routes, staircases and enclosed structures. Where lighting is derived from a number of portable generators with separate supply circuits, other generators nearby may be used to provide emergency lighting in the event of a failure.

Devices shall be kept free of flammable materials and waste.

Access to fire appliances, fire hydrants and other supplies of water for fire-fighting shall not be obstructed, nor shall hydrant indicator plates be obscured.

Special arrangements may be necessary to minimize the risk of fire spread where large modular structures are erected.

4.7.2.4 Fire precautions

Flammable liquids such as petrol and diesel fuel shall be kept in suitable closed containers and shall be safely stored and secured against unauthorised interference. Containers shall be clearly marked to indicate their contents.

Such liquids shall not be stored in loose containers beneath lorries, trailers or caravans, near live cables or electrical equipment. Advice with regard to the storage of these liquids may be obtained from the Fire Service.

Particular care shall be taken when fuel tanks of vehicles and generator sets have been filled from cans or drums. Re-fuelling shall not take place while the engine or generator is running, and shall be carried out with adequate ventilation, preferably in the open air.

The spaces beneath and between devices, vehicles and caravans, shall not be used for the storage of combustible materials. Rubbish of all kinds shall be deposited in suitable non-combustible containers, and arrangements shall be made for their removal at frequent intervals.

Heating equipment not fixed in position and/or heaters using open non-protected flames shall not be allowed in structures while the public are present. If used at other times such equipment shall be under constant supervision and be switched off or extinguished and removed when not in use.

The use of flammable liquids, highly flammable materials or open non-protected flames for special effects during performances is prohibited unless special precautions are taken to prevent uncontrolled fire.

Flammable gas shall not be used for filling balloons, whether for sale or for decoration.

Flammable materials, liquids and gasses shall be stored in a safe position and in compliance with national regulations. Straw and fodder for animals shall be stored in a separate enclosure and be suitably protected against interference. Smoking shall be prohibited in animal quarters and in straw and fodder enclosures. A notice dealing with the fire procedures shall be exhibited in positions indicated by the fire service.

Flame retardant properties of materials used for structures and theming shall be in accordance with national regulations. The retardant properties may deteriorate and require replenishment.

4.7.2.5 Fire extinguishers

Fire extinguishers shall be made available, in accordance with ISO 7165.

Their number, type and size and, to a certain extent, their operating location, depend on the kind of hazards involved. The latter are linked to the type and size of the device.

In addition to fire extinguishers, larger fire-fighting units may be used (e.g. mobile fire-fighting equipment).

Annex A
(informative)

Training, qualification and experience for competent persons

Role/responsibility/task	Training/qualifications/experience
Designer, or other individual (whether or not nominated by the designer) responsible for undertaking work for which the designer would normally be responsible in accordance with this part of ISO 17842.	This person should possess formal (tertiary) qualifications in engineering and sufficient experience to fully comprehend the concept of the device, its probable mode and environment of operation, and the provisions relative to its maintenance.
Non-destructive testing (NDT) of components	Any person conducting or reporting on NDT should have certified qualifications appropriate to the type and method of inspection being undertaken.
Repairs	Any person carrying out repairs to a device should have trade qualifications relevant to the work being carried out.
Testing (to failure) of components	Any person carrying out sample testing (to failure) of components should have formal technical certification in the type of testing to be undertaken.
Hazard identification and risk assessment	Any person conducting hazard identifications and risk assessments should have sufficient experience of the operation of the device (or part/component thereof) to enable an exhaustive assessment to be carried out and documented.
Inspection of documentation	Any person inspecting historical documentation relating to used components, which are to form part of a device, should, where the safety of the device may be affected by the failure of such components, possess qualifications equivalent to those of the designer of the device.
Inspection/assessment of devices and components thereof for strength, suitability for purpose or repair.	Any person conducting and documenting a formal inspection of a device or any part thereof for strength, suitability for purpose or repair should possess qualifications equivalent to those of the designer of the device.

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