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Lifts for the transport of persons and goods —

Part 1: Safety rules for the construction and installation of passenger and goods passenger lifts

Elévateurs pour le transport de personnes et d'objets —

Partie 1: Règles de sécurité pour la construction et l'installation d'ascenseurs et d'ascenseurs de charge

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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 (see 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 (see 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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 178, *Lifts, escalators, passenger conveyors*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

A list of all parts in the ISO 8100 series can be found on the ISO website.

In this corrected version of ISO 8100:2019, the title has been changed.

Introduction

0.1 General

The content of this document was already published in EN 81-20:2014. This document contains only editorial changes and update of references.

This document is a type C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

0.2 General remarks

0.2.1 The object of this document is to define safety rules related to passenger and goods passenger lifts with a view to safeguarding persons and objects against the risk of accidents associated with the normal use, maintenance and emergency operation of lifts.

0.2.2 A study has been made of the various possible hazards with lifts, see [Clause 4](#).

0.2.2.1 Persons to be safeguarded:

- a) users, including passengers and competent and authorized persons, e.g. maintenance and inspection personnel (see EN 13015);
- b) persons in the surrounding area of the well, or any machine room and pulley room, who can be effected by the lift.

0.2.2.2 Property to be safeguarded: [ISO 8100-1:2019](#)

- a) loads in car;
- b) components of the lift installation;
- c) building in which the lift is installed;
- d) immediate surrounding area of the lift installation.

NOTE EN 81-71 gives additional requirements covering lifts resistant to acts of vandalism and EN 81-77 gives additional requirements covering lifts in seismic conditions.

0.2.3 When the weight, size and/or shape of components prevent them from being moved by hand, they are:

- a) fitted with attachments for lifting gear; or
- b) designed so that they can be fitted with such attachments (e.g. by means of threaded holes); or
- c) shaped in such a way that standard lifting gear can easily be attached.

0.3 Principles

0.3.1 General

In drawing up this document, the following principles have been used:

0.3.2 This document does not repeat all the general technical rules applicable to every electrical, mechanical, or building construction including the protection of building elements against fire.

However, it has been necessary to establish certain requirements for good construction, either because they are peculiar to lift manufacture or because, in the case of lift utilization, the requirements can be more stringent than elsewhere.

0.3.3 This document states minimum rules for the installation of lifts into buildings/constructions. There can be regulations for the construction of buildings in some countries which cannot be ignored.

Typical clauses affected by this are those defining minimum values for the height of the machine and pulley rooms and for the dimensions of their access doors.

0.3.4 As far as possible, this document sets out only the requirements that materials and equipment should meet in the interests of safe operation of lifts.

0.3.5 Risk analysis, terminology and technical solutions have been considered, taking into account the methods of ISO 12100, ISO 14798 and the IEC 61508 series of standards.

0.3.6 In order for this document to be a widely applicable standard, the average weight of a person has been determined to be 75 kg.

This document defines the maximum car area related to a specified design load in the car (rated load) and the minimum car area to transport a corresponding number of persons, based on 75 kg per person, in order to detect and discourage overloading.

0.4 Assumptions

0.4.1 General

In drawing up this document, the following assumptions have been made:

0.4.2 Negotiations have been made between the customer and the supplier, and an agreement was reached about:

- a) the intended use of the lift;
- b) the type and mass of the handling devices intended to be used to load and unload the car, in the case of goods passenger lifts;
- c) environmental conditions such as temperature, humidity, exposure to sun or wind, snow, corrosive atmosphere;
- d) civil engineering problems (for example, building regulations);
- e) other aspects related to the place of installation;
- f) the dissipation of heat from the components/equipment of the lift which would require ventilation of the well and/or the machinery space/location of equipment;
- g) information about the aspects relating to noise and vibrations emitted by the equipment.

0.4.3 Relevant risks have been considered for each component that can be incorporated in a complete lift installation and rules have been drawn up accordingly.

Components are:

- a) designed in accordance with usual engineering practice (see ISO/TS 8100-21) and calculation codes, taking into account all failure modes;
- b) of sound mechanical and electrical construction;
- c) made of materials with adequate strength and of suitable quality;
- d) free of defects;
- e) free from harmful materials, e.g. asbestos.

0.4.4 Components are kept in good repair and working order, so that the required dimensions remain fulfilled despite wear. All lift components are considered as requiring inspection to ensure safe continued operation during use.

The operational clearances specified in the standard should be maintained not only during the examination and tests before the lift is put into service, but also throughout the life of the lift.

NOTE Components not requiring maintenance (e.g. maintenance free, sealed for life) are still required to be available for inspection.

0.4.5 Components are selected and installed so that foreseeable environmental influences and special working conditions do not affect the safe operation of the lift.

0.4.6 By design of the load bearing elements, safe normal operation of the lift is assured for loads ranging from 0 % to 100 % of the rated load, plus any designed overload capacity (see [5.12.1.2](#)).

0.4.7 The requirements in this document are such that the possibility of a failure of an electric safety device (see [5.11.2](#)) or a type tested safety component complying with all the requirements of this document and ISO 8100-2, does not need to be taken into consideration.

0.4.8 Users need to be safeguarded against their own negligence and unwitting carelessness when using the lift in the intended way.

0.4.9 A user can, in certain cases, make one imprudent act. The possibility of two simultaneous acts of imprudence and/or the abuse of instructions for use is not considered.

0.4.10 If in the course of maintenance work, a safety device normally not accessible to the users is deliberately neutralized, safe operation of the lift is no longer assured, but compensatory measures are taken to ensure users' safety, in conformity with maintenance instructions.

It is assumed that maintenance personnel are instructed and work according to the instructions.

0.4.11 Horizontal forces and/or energies to consider are indicated in the applicable clauses of this document. Typically, where not otherwise specified in this document, the energy exerted by a person results in an equivalent static force of: [ISO 8100-1:2019](#)

a) 300 N;

b) 1 000 N where impact can occur.

0.4.12 With the exception of the items listed below, which have been given special consideration, a mechanical device built according to good practice and the requirements of this document (including uncontrolled slipping of the ropes on the traction sheave) does not deteriorate to a point of creating hazard without the possibility of detection, provided that all of the instructions given by the manufacturer have been duly applied:

a) breakage of the suspension;

b) breakage and slackening of all linkage by auxiliary ropes, chains and belts;

c) failure of one of the mechanical components of the electromechanical brake which take part in the application of the braking action on the drum or disk;

d) failure of a component associated with the main drive elements and the traction sheave;

e) rupture in the hydraulic system (jack excluded);

f) small leakage in the hydraulic system (jack included, see [6.3.10](#)).

0.4.13 The possibility of the safety gear not engaging should the car free fall from a stationary position, at the lowest landing before the car strikes the buffer(s), is considered acceptable.

0.4.14 When the speed of the car is linked to the electrical frequency of the mains, the speed is assumed not to exceed 115 % of the rated speed or a corresponding lesser speed where specified in this document for inspection control, levelling, etc.

0.4.15 Means of access are provided for the hoisting of heavy equipment [see 0.4.2 e)].

0.4.16 To ensure the correct functioning of the equipment in the well and machinery space(s), i.e. taking into account the heat dissipated by the equipment, the ambient temperature in the well and the machinery space(s) is assumed to be maintained between +5 °C and +40 °C.

NOTE See IEC 60364-5-51, Code AA5.

0.4.17 The well is suitably ventilated, according to national building regulation, taking into consideration the heat output as specified by the manufacturer, the environmental conditions of the lift and the limits given in 0.4.16, e.g. ambient temperature, humidity, direct sunlight, air quality and air tightness of buildings due to energy saving requirements.

NOTE See 0.4.2 and [E.3](#) for further guidance.

0.4.18 Access ways to the working areas are adequately lit (see 0.4.2).

0.4.19 Minimum passageways, corridors, fire escapes, etc. are not obstructed by the open door/trap of the lift and/or any protection means for working areas outside of the well, where fitted according to the maintenance instructions (see 0.4.2).

0.4.20 Where more than one person is working at the same time on a lift, an adequate means of communication between these persons is ensured.

0.4.21 The fixing system of guards, used specifically to provide protection against mechanical, electrical or any other hazards by means of a physical barrier, which need to be removed during regular maintenance and inspection, remains attached to the guard or to the equipment when the guard is removed.

0.4.22 The fluids used for the operation of hydraulic lifts are according to ISO 6743-4.

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Lifts for the transport of persons and goods —

Part 1:

Safety rules for the construction and installation of passenger and goods passenger lifts

1 Scope

1.1 This document specifies the safety rules for permanently installed new passenger or goods passenger lifts, with traction, positive or hydraulic drive, serving defined landing levels, having a car designed for the transportation of persons or persons and goods, suspended by ropes, chains or jacks and moving between guide rails inclined not more than 15° to the vertical.

1.2 In addition to the requirements of this document, supplementary requirements need to be considered in special cases (use of lifts by persons with disabilities, in case of fire, potentially explosive atmosphere, extreme climate conditions, seismic conditions, transporting dangerous goods, etc.).

1.3 This document does not cover:

- a) lifts with:
 - 1) drive systems other than those stated in [1.1](#);
 - 2) rated speed less than or equal to 0,15 m/s;
- b) hydraulic lifts:
 - 1) with a rated speed exceeding 1 m/s;
 - 2) where the setting of the pressure relief valve ([5.9.3.5.3](#)) exceeds 50 MPa;
- c) new passenger or goods passenger lifts in existing buildings¹⁾ where, in some circumstances due to limitations enforced by building constraints, some requirements of this document cannot be met and local requirements, e.g., EN 81-21 need to be considered;
- d) lifting appliances, such as paternosters, mine lifts, theatrical lifts, appliances with automatic caging, skips, lifts and hoists for building and public works sites, ships' hoists, platforms for exploration or drilling at sea, construction and maintenance appliances or lifts in wind turbines;
- e) important modifications (see [Annex C](#)) to a lift installed before this document is brought into application;
- f) safety during operations of transport, erection, repairs, and dismantling of lifts.

However, this document can usefully be taken as a basis.

Noise and vibrations are not dealt with in this document as they are not found at levels which could be considered harmful with regard to the safe use and maintenance of the lift (see also 0.4.2).

1.4 This document is not applicable to passenger and goods passenger lifts, which are installed before the date of its publication.

1) An existing building is a building which is used or was already used before the order for the lift was placed. A building whose internal structure is completely renewed is considered a new building.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1219-1, *Fluid power systems and components — Graphical symbols and circuit diagrams — Part 1: Graphical symbols for conventional use and data-processing applications*

ISO 3008-2, *Fire-resistance tests — Part 2: Lift landing door assemblies*

ISO 4344, *Steel wire ropes for lifts — Minimum requirements*

ISO 8100-2:2019, *Safety rules for the construction and installation of lifts — Examinations and tests — Part 2: Design rules, calculations, examinations and tests of lift components*

ISO/TS 8100-3, *Requirements from Other Standards (ASME A17.1/CSA B44 and JIS A 4307-1/ JIS A 4307-2) not included in ISO 8100-1 or ISO 8100-2*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 22200, *Electromagnetic compatibility — Product family standard for lifts, escalators and moving walks — Immunity*

ISO 22199, *Electromagnetic compatibility — Product family standard for lifts, escalators and moving walks — Emission*

ISO 29584:2015, *Glass in building — Pendulum impact testing and classification of safety glass*

IEC 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60227-6, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 6: Lift cables and cables for flexible connections*

IEC 60245-5, *Rubber insulated cables — Rated voltages up to and including 450/750 V — Part 5: Lift cables*

IEC 60364-4-41:2005, *Low voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock*

IEC 60364-4-42:2010, *Low voltage electrical installations — Part 4-42: Protection for safety — Protection against thermal effects*

IEC 60364-6:2006, *Low voltage electrical installations — Part 6: Verification*

IEC 60417, *Database — Graphical symbols for use on equipment*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60617, *Graphical symbols for diagrams*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests*

IEC 60947-4-1:2009, *Low-voltage switchgear and controlgear — Part 4: Contactors and motor — starters - Section 1: Electromechanical contactors and motor-starters*

IEC 60947-5-1:2003, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices*

IEC 60947-5-5, *Low-voltage switchgear and controlgear — Part 5-5: Control circuit devices and switching elements — Electrical emergency stop device with mechanical latching function*

IEC 61310-3, *Safety of machinery - Indication, marking and actuation — Requirements for the location and operation of actuators*

IEC 61800-5-2:2007, *Adjustable speed electrical power drive systems — Part 2: Safety requirements. Functional)*

IEC 61810-1, *Electromechanical elementary relays — Part 1: General requirements*

EN 12385-5, *Steel wire ropes — Safety — Stranded ropes for lifts*

EN 81-28, *Safety rules for the construction and installation of lifts — Lifts for the transport of persons and goods — Part 28: Remote alarm on passenger and goods passenger lifts*

EN 81-58, *Safety rules for the construction and installation of lifts — Examinations and tests - Part 58: Landing door fire resistance test*

EN 131-2:2010, *Ladders — Requirements, testing, marking*

EN 1993-1-1, *Eurocode 3 — Design of steel structures — Part 1-1: General rules and rules for buildings*

EN 10305 (all parts), *Steel tubes for precision applications — Technical delivery conditions*

EN 13015, *Maintenance for lifts and escalators — Rules for maintenance instructions*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 50214, *Flat polyvinyl chloride sheathed flexible cables*

EN 50274, *Low-voltage switchgear and controlgear assemblies — Protection against electric shock — Protection against unintentional direct contact with hazardous live parts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

apron

smooth vertical part extending downwards from the sill of the landing or car entrance

3.2

authorized person

person with the permission of the natural or legal person who has the responsibility for the operation and use of the lift, to access restricted areas (machinery spaces, pulley rooms and lift well) for maintenance, inspection or rescue operations

Note 1 to entry: Authorized persons should be competent for the tasks they have been authorized for (see also 3.7).

3.3

available car area

area of the car, which is available for passengers or goods during operation of the lift

3.4

balancing weight

mass which saves energy by balancing all or part of the mass of the car

3.5

buffer

resilient stop at the end of travel, and comprising a means of braking using fluids or springs (or other similar means)

3.6

car

part of the lift which carries the passengers and/or other loads

3.7

competent person

person, suitably trained, qualified by knowledge and practical experience, provided with necessary instructions to safely carry out the required operations for maintaining or inspecting the lift, or rescuing users

Note 1 to entry: National regulations can require certification of competence.

3.8

counterweight

mass which ensures traction

3.9

direct acting lift

hydraulic lift where the ram or cylinder is directly attached to the car or its sling

3.10

down direction valve

electrically controlled valve in a hydraulic circuit for controlling the descent of the car

3.11

drive control system

system controlling and monitoring the running of the lift machine

3.12

electrical anti-creep system

combination of precautions for hydraulic lifts against the danger of creeping

3.13

electric safety chain

the total of the electric safety devices connected in such a way as to stop the lift when one of them is activated

3.14

full load pressure

static pressure exerted on the piping, jack, valve block, etc., with the car and rated load being at rest at the highest landing level

3.15

goods passenger lift

lift mainly intended for the transport of goods, which are generally accompanied by persons

3.16

guide rails

rigid components which provide guiding for the car, the counterweight or the balancing weight

3.17

headroom

part of the well between the highest landing served by the car and the ceiling of the well