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Lifts for the transport of persons and goods —

Part 20: Global essential safety requirements (GESRs)

Élévateurs pour le transport de personnes et d'objets —
Partie 20: Exigences essentielles de sécurité globale

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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 and moving walks*.

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.

This first edition of ISO 8100-20 cancels and replaces ISO 22559-1:2014.

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

Introduction

0.1 After the publication of ISO/TR 11071-1 and ISO/TR 11071-2, discrepancies were noted in the lift safety standards, and it was agreed that there was a need for an ISO publication that would set global essential safety requirements for lifts (elevators). The work, however, could start only after ISO 14798 was completed. This methodology was a critical tool in the development of this document on safety requirements for lifts.

0.2 The objective of the ISO 8100-2X series of documents is to:

a) define a common global level of safety for all people using, or associated with, lifts (elevators);

b) facilitate innovation of lifts (elevators) not designed according to existing safety standards, while maintaining equivalent levels of safety; and

c) help remove trade barriers.

NOTE ISO/TS 8100-21 contains global safety parameters (GSPs) for lifts (elevators) that further assist in the use and implementation of the global essential safety requirements (GESRs) specified in this document.

0.3 Clause 4 describes the approach and methodology used in the development of this document. Clause 5 gives instructions for the use and implementation of GESRs. The GESRs are presented in Clause 6. Each GESR specifies a safety objective, i.e. what is to be achieved, not how to do it. This allows innovation and development of future technologies. Annex A gives an overview of GESRs in relation to lift subsystems.

0.4 The hazards associated with lifts are similar worldwide. For achieving an appropriate uniform safety level, the requirements in this document are considered in any safety assessment of new lifts.

0.5 This document's GESRs or the EU Lifts Directive 2014/33/EU essential health and safety requirements (EHSRs), as well as those EHSRs of the Machinery Directive 2006/42/EC applicable to lifts, when complied with, give an appropriate level of safety for lifts. See Annex B for application of European legislation.

0.6 The ISO 8100-2X series provides a process for assessment of conformity of lift systems, lift components or lift functions with the safety requirements specified in this document. It includes a structured methodology for establishing, documenting and demonstrating that necessary and appropriate protective measures are taken to eliminate hazards or sufficiently mitigate risks. This process is particularly useful for establishing safety of lift systems, lift components or lift functions involving innovative design or new technologies.

NOTE If one is using the process, ISO 8100-20 to 23 are used.

0.7 ISO/IEC Guide 51 has been taken into account as far as practicable at the time of drafting of this document. The process of risk reduction described in ISO/IEC Guide 51 is accomplished using ISO 14798.

Lifts for the transport of persons and goods —

Part 20:
Global essential safety requirements (GESRs)

1 Scope

This document

— specifies GESRs for lifts (elevators), their components and functions, and

— establishes a system and provides methods for minimizing safety risks that can arise in the course of, the operation and use of, or work on, lifts (elevators).

NOTE 1 Hereinafter, the term “lift” is used instead of the term “elevator”.

NOTE 2 See Clause 5 regarding the use and application of this document.

This document is applicable to lifts that are intended to carry persons or persons and goods that can:

a) be located in any permanent and fixed structure or building, except lifts located in means of transport, (e.g. ships);

b) have any

1) rated load, size of load carrying unit and speed, and

2) travel distance and number of landings;

c) be affected by fire in the load-carrying unit (LCU), earthquake, weather, or flood;

d) be foreseeably misused (e.g. overloaded) but not vandalized.

This document does not cover

a) all needs of users with disabilities;[1)] or

b) risks arising from

1) work on lifts under construction, testing, or during alterations and dismantling;

2) use of lifts for fire fighting and emergency evacuation;

3) vandalism; and

4) fire outside the LCU.

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 14798, *Lifts (elevators), escalators and moving walks — Risk assessment and reduction methodology*

1) Although the GESRs specified in this document have been identified and evaluated by risk assessment, not all disabilities or combinations of such disabilities of users have necessarily been addressed.

3 Terms, definitions and abbreviated terms

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
authorized person
person with authorization to access restricted *lift* (3.17) areas [e.g. machinery spaces, lift *well* (3.14) (*hoistway*), pit and LCU top] skilled and trained to work therein, for the purpose of inspecting, testing, repairing and maintaining the lift or for rescuing *users* (3.36) from a stalled *load-carrying unit* (*LCU*) (3.18)

3.2
cause
circumstance, condition, event, or action that in a *hazardous situation* (3.13) contributes to the production of an *effect* (3.5)

[SOURCE: ISO 14798:2009, 2.1]

3.3
counterweight
mass that contributes traction in the case of a traction *lift* (3.17), or mass that saves energy by balancing all or part of the mass of the *load-carrying unit* (*LCU*) (3.18) and the *rated load* (3.24)

3.4
door
<landing or load-carrying unit (LCU)> mechanical device (including devices that partially or fully enclose the opening) used to secure an *LCU* (3.18) or *landing* (3.16) entrance

3.5
effect
result of a *cause* (3.2) in the presence of a *hazardous situation* (3.13)

[SOURCE: ISO 14798:2009, 2.2]

3.6
electromagnetic compatibility
EMC
degree of immunity to incident electromagnetic radiation and level of emitted electromagnetic radiation of electrical apparatus

3.7
essential health and safety requirement
EHSR
requirement intended to eliminate or sufficiently mitigate the *risk* (3.26) of *harm* (3.10) to *users* (3.36), *non-users* (3.20) and *authorized persons* (3.1) using, or associated with, *lifts* (3.17)

3.8
fully loaded load-carrying unit
fully loaded LCU
load-carrying unit (3.18) with its *rated load* (3.24)

3.9
global essential safety requirement
GESR
globally agreed upon essential safety requirement

Note 1 to entry: See 4.3.3.

3.10
harm
physical injury or damage to the health of people, or damage to property or the environment

[SOURCE: ISO 14798:2009, 2.3]

3.11
harmful event
occurrence in which a *hazardous situation* (3.13) results in *harm* (3.10)

[SOURCE: ISO 14798:2009, 2.4, modified — The Note has been removed.]

3.12
hazard
potential source of *harm* (3.10)

[SOURCE: ISO 14798:2009, 2.5, modified — The Note has been removed.]

3.13
hazardous situation
circumstance in which people, property or the environment are exposed to one or more *hazards* (3.12)

[SOURCE: ISO 14798:2009, 2.6]

3.14
hoistway
well
travel path (3.33)of the *load-carrying unit* (*LCU*) (3.18) and related equipment plus the spaces below the lowest *landing* (3.16) and above the highest landing

3.15
enclosure
fixed structural elements that isolate the *well* (3.14) (*hoistway*) from all other areas or spaces

3.16
landing
floor, balcony or *platform* (3.22) used to receive and discharge persons or goods (freight) from the *load-carrying unit* (*LCU*) (3.18)

3.17
lift (GB)
elevator (US)
lifting appliance intended to transport persons with or without goods or freight by means of a power-operated *load-carrying unit* (*LCU*) (3.18) that is guided by a fixed guiding system from one *landing* (3.16) to another, at an angle of more than 75° to the horizontal

Note 1 to entry: This term does not include mobile or other working *platforms* (3.22) or baskets, or lifting appliances used in the course of construction of buildings or structures.

Note 2 to entry: See ISO/TR 11071-1:2004, Clause 2, for use of the term “lift” versus the term “elevator” in current national standards for lifts.

3.18
load-carrying unit
LCU
car
part of a *lift* (3.17) designed to carry persons and/or other goods for the purpose of *transportation* (3.32)

3.19
maintenance
process of examination, lubrication, cleaning and adjustments of *lift* (3.17) parts to ensure the safe and intended functioning of the lift and its components after the completion of the installation and throughout its life cycle

3.20
non-user
person in the vicinity of a *lift* (3.17) but not intending to access or use the lift

3.21
overload
load in the *load-carrying unit* (*LCU*) (3.18) that exceeds the *rated load* (3.24) of the *lift* (3.17)

3.22
platform
part of the *load-carrying unit* (*LCU*) (3.18) that accommodates persons and load for the purpose of *transportation* (3.32)

3.23
protective measure
means used to reduce *risk* (3.26)

Note 1 to entry: Protective measures include risk reduction by inherently safe design, protective devices, use of personal protective equipment, information for use and installation, and training.

[SOURCE: ISO 14798:2009, 2.8, modified — In Note 1 to entry, "use of" has been added.]

3.24
rated load
load that the *lift* (3.17) is designed and installed to transport

3.25
relative movement
situation where a *lift* (3.17) component moves in the vicinity of another lift component that is stationary or that moves at a different speed or in a different direction

Note 1 to entry: This can also occur in a situation where a lift component moves in the vicinity of a structure where persons can be present.

EXAMPLE Building floor surrounding the lift *well* (3.14) (*hoistway*).

3.26
risk
combination of the probability of occurrence of *harm* (3.10) and the *severity* (3.31) of that harm

[SOURCE: ISO 14798:2009, 2.10]

3.27
risk analysis
systematic use of available information to identify hazards and to estimate the *risk* (3.26)

[SOURCE: ISO 14798:2009, 2.11]

3.28
risk assessment
overall process comprising a *risk analysis* (3.27) and a *risk evaluation* (3.29)

[SOURCE: ISO 14798:2009, 2.12]

3.29
risk evaluation
consideration of the *risk analysis* (3.27) results to determine if the *risk* (3.26) reduction is required

[SOURCE: ISO 14798:2009, 2.13]

3.30
scenario
sequence of a *hazardous situation* (3.13), *cause* (3.2) and *effect* (3.5)

[SOURCE: ISO 14798:2009, 2.14]

3.31
severity
level of potential *harm* (3.10)

[SOURCE: ISO 14798:2009, 2.15]

3.32
transportation
process in the course of which persons enter, or goods are moved, into a *load-carrying unit* (*LCU*) (3.18), which is then lifted or lowered to another *landing* (3.16), where the person exits, or goods are removed from, the LCU

3.33
travel path
path and related space between the *lift* (3.17) terminal *landings* (3.16) within which an LCU travels

Note 1 to entry: For "space" above and below terminal landings, see 3.14 for "*hoistway*" or "*well*".

3.34
uncontrolled movement

situation where the *load-carrying unit* (*LCU*) (3.18) travels at a speed that is beyond the control of the means designed and intended to control the LCU speed during the *lift* (3.17) operation

EXAMPLE The LCU speed exceeds its designed speed or does not decelerate or stop as intended, due to failure of, or breakdown in, lift components, such as the speed control or brake system.

3.35
unintended movement
situation where the *load-carrying unit* (*LCU*) (3.18) moves when, according to design of the *lift* (3.17), it was to remain stationary

EXAMPLE The LCU starts to move away from a *landing* (3.16) while the *users* (3.36) are entering or leaving the LCU, due to failure of, or breakdown in, lift components, such as the speed control or brake system.

3.36
user
person using the *lift* (3.17) for the purpose of normal *transportation* (3.32), without any help or supervision, including a person carrying goods and a person using a specially dedicated operating system to transport goods or loads

Note 1 to entry: An example of use of a specially dedicated operating system is "independent service" for transport of hospital patients, whereby the operation of the lift is under the sole control of the patient's attendant.

3.37
vandalism
deliberate destruction of, or damage to, property for no obvious gain or reason

3.38
working area
working space
area or space defined for use by *authorized persons* (3.1) to perform *maintenance* (3.19), repair, inspection or testing of the *lift* (3.17)

4 Approach and methodology

4.1 Background

4.1.1 During the 1970s, the ISO 4190 series was published, which specifies the building dimensions necessary to permit the installation of lifts. This series also specified criteria for the planning and selection of lifts and the standards for lift fittings.

4.1.2 In order to facilitate further standardization of lift installations and components, ISO/TC 178 carried out extensive comparisons of regional and national safety standards and codes for lifts. The results were published in the ISO/TR 11071 series of documents. These Technical Reports gave directions for possible harmonization of several specific design — and safety-related rules in regional and national standards. No agreement among the experts could be reached for global harmonization of most rules, mainly for the following reasons:

a) the compared standards and codes were based on different assumptions and experiences and written at different stages of industry development, without using a consistent methodology or consistent procedures, as recommended in ISO/IEC Guide 51; and

b) they were written in prescriptive rather than performance language.

4.1.3 It further became clear that prescriptive standards not only continually lag behind the development of lift technologies and the state of the art, but also present impediments to the progress and innovation of industry. Differences in regional and national safety requirements affecting lift designs also pose barriers to free trade. Therefore, a new approach to the development of lift standards affecting lift safety needed to be taken.

4.2 Approach

4.2.1 ISO/IEC Guide 51 has been taken into account as far as practicable at the time of drafting of this document.

4.2.2 The intent was to develop EHSRs for lifts whereby the lift is defined in broad terms as a “unit” carrying load from one floor to another, without any design constraints such as those that are usually specified in the regional or national lift standards.

A load-carrying unit (LCU) of a lift in this document is not necessarily a “car” that consists of a platform with fully enclosed sides and ceiling. The space in which the unit travels is not necessarily a fully enclosed “well” or “hoistway” as these terms are defined in national standards.

4.2.3 By taking this approach and by using the systematic risk assessment process in accordance with ISO 14798, it was possible to establish EHSRs for lifts without imposing restrictions on the design of, or materials and technologies used in, the lifts.

4.3 Methodology

4.3.1 In order to involve experts from various parts of the world, three regional study groups were formed (North American, European and Asia-Pacific) with broad participation of local lift experts.

4.3.2 Following the risk assessment process set out in ISO/IEC Guide 51 and the methodology specified in ISO 14798, each study group:

a) identified all safety risk scenarios, including hazardous situations and harmful events (causes and effects and possible resulting harm) that could arise at all stages and in all conditions of the operation and use of lifts;

b) assessed the risk; and

c) formulated EHSRs that, when implemented, would mitigate the risks.

Table 1 gives examples of risk scenarios related to GESRs.

4.3.3 Reports on the assessment of all risk scenarios and essential safety requirements proposed by each study group were compared and debated within ISO/TC 178 before the final proposals for GESRs for lifts specified in Clause 6 were established.

Table 1 — Examples of risk scenarios related to GESRs

Risk scenarios[a]	**— Hazards** **— Persons exposed**	**Applicable GESR requiring implementation of protective measures**
EXAMPLE 1	Shearing, crushing or abrasion hazards, when:	6.2.5 Hazards due to relative movement
1.1 Users are on a moving LCU that has low or perforated guards on its sides. User extends a hand or protrudes a foot beyond the LCU perimeters; user's hand or foot engages with external lift objects and become sheared, crushed or cut.	1.1 persons inside the LCU	Users and non-users shall be protected from the effects of shearing, crushing or abrasion, or other injuries due to a) the relative movement of the LCU and external objects; and b) the relative movement of the lift equipment. NOTE 1 For authorized persons, see 6.6.9. NOTE 2 This GESR addresses the safety of persons located inside and outside the LCU.
1.2 Users are in the lift entrance area and enter the LCU when the door is closing. The doors contact the users who are entering the LCU. Persons are crushed or sheared or they are destabilized, possibly resulting in an injury due to a fall.	1.2 entering/exiting the LCU; or	
1.3 Non-users are at the floor area in the vicinity of the lift entrance or at the floor around the LCU travel path; enclosure around the LCU travel path is low in height or perforated. Person extends a hand or protrudes a foot towards the moving LCU or any other moving lift equipment in the travel path, which engages with the hand or foot, the person's hand or foot is sheared, crushed or cut.	1.3 located at the floor area in the vicinity of an operating lift	

Table 1 *(continued)*

Risk scenarios[a]	— Hazards — Persons exposed	Applicable GESR requiring implementation of protective measures
EXAMPLE 2	Falling into the lift well	6.3.1 Falling into the well (hoistway)
2.1 There are no guards between the LCU travel path and the floors surrounding the travel path are high above the bottom of the well; a person is close to the well A person leans over the floor edge or the entrance opening sill. The person falls down the well (hoistway).	2.1 Persons close to unguarded well.	Means shall be provided to sufficiently mitigate the risk to users, non-users, and authorized persons of falling into the well (hoistway). NOTE This GESR addresses the risk of falling into the well (hoistway) — from surrounding floors, and — from landing doors when the LCU is absent.
2.2 Guards in example 2.1 are provided but do not have adequate strength. A person leans against a guard The person breaks through the guard and fall down into the well (hoistway).	2.2 Persons inside LCU or close to the well, whose guard is not sufficiently strong.	
EXAMPLE 3	Various hazards	6.2.3 Equipment inaccessible to users and non-users
Users or non-users have access to lift machinery and/or the equipment installed to move or control the LCU. Persons inadvertently or deliberately come into contact with moving or rotating machinery or electrical equipment. This contact results in death or serious injury if the person is drawn into, or comes into contact with, the machinery; or the person is electrocuted if they come into contact with exposed electrical equipment.	Unauthorized persons in areas containing lift machinery or equipment	Equipment that is hazardous shall not be directly accessible to users and non-users. NOTE Locations that are not accessible include the location behind the enclosure, a locked cover or door, or out-of-reach locations.
EXAMPLE 4	Falling from working area	6.6.4 Strength of working areas
An authorized person is working on top of the LCU. The working space that does not have sufficient strength to support the authorized person and tools; the working surface collapses. The authorized person falls into the LCU sustaining serious injuries.	Authorized person in a designated working area.	Means shall be provided to accommodate and support the mass of authorized person(s) and associated equipment in any designated working area(s). NOTE The number of authorized persons and the equipment that they carry or use to fulfil the anticipated working activities should be determined. Those activities do not include major repairs when the working area needs to be enlarged and reinforced.

[a] Risk assessment of all scenarios concluded that all identified risks need mitigation.

5 Understanding and implementing GESRs

5.1 Overall objective

5.1.1 Clause 6 contains a complete set of safety objectives for lifts in the form of global essential safety requirements (GESRs), which shall be taken into consideration when mitigating safety risks that lifts can present.

5.1.2 The objectives of the global essential safety requirements in Clause 6 are to:

a) introduce a universal approach to identifying and mitigating potential safety risks on new lift or lift component designs that use new technologies, materials or concepts that are not adequately addressed in existing standards; and

b) stimulate harmonization of current lift safety standards.

5.1.3 The GESRs contained in this document shall be followed wherever possible. However, given the present state of the art, the objectives that the GESRs specify are sometimes unattainable. In such cases, the lift or its components shall be designed and built in such a way as to approximate to those objectives to the greatest possible extent.

5.1.4 A GESR states only the safety objective, or "what" shall be done or accomplished but not "how" to accomplish the objective. Therefore, in order to achieve the safety objective of a GESR, appropriate designs of lift components and functions shall be selected and their compliance with the GESR shall be verified. In other words, the ability of the selected components, functions or GSPs to eliminate or sufficiently mitigate the safety risks shall be demonstrated.

5.2 Use of GESRs

5.2.1 Basis

Each GESR specified in Clause 6 was established after performing the risk assessment of one or more "risk scenarios" that can result in harm to persons (see Table 1). Consequently, when assessing the safety of a lift or its components or functions, all risk scenarios shall be analysed and applicable GESRs shall be identified.

The risk assessment shall be carried out in accordance with ISO 14798.

5.2.2 Ways of using GESRs

5.2.2.1 With respect to a specific task affecting lift safety, such as designing a lift or its components, GESRs can be used in two ways:

— one can begin with the risk assessment of risk scenarios related to the task in order to identify the applicable GESRs as in 5.2.2.2; or

— one can begin with a review of all GESRs in order to identify those that can be applicable to the task, as in 5.2.2.3.

NOTE In addition to designing, tasks can include servicing of, or writing design-prescriptive safety standard for, lifts or components thereof.

5.2.2.2 When designing a lift or its component, a review of the intended use, foreseeable misuse (see ISO 14798:2009, 4.5.5.4) and the design shall be made, in which all possible risk scenarios are formulated, and risk assessment is performed, in order to find out which, if any, GESRs are applicable to the design. All risk scenarios that can occur during operation and use shall be considered, as well as during the maintenance or inspection of the lift.

The risk scenarios shall include specifications of all hazardous situations, combined with all harmful events (causes, effects and possible levels of harm). The risk analysis of a scenario shall be followed by the process of risk estimation and evaluation in accordance with the methodology specified in