



Safety requirements for lifts (elevators)

Part 2: Safety parameters meeting the global essential safety requirements (GESRs)



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 - Australian Industry Group
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-

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Australian Standard[®]

Safety requirements for lifts (elevators)

Part 2: Safety parameters meeting the global essential safety requirements (GESRs)

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-004, Lift Installations.

The objective of this Standard is to provide safety requirements of GESRs by specifying global safety parameters (GSPs) for use where applicable, however GSPs are not mandatory.

This Standard is identical with, and has been reproduced from ISO/TS 22559-2:2010, *Safety requirements for lifts (elevators)*, Part 2: *Safety parameters meeting the global essential safety requirements (GESRs)*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text ‘this part of ISO/TS 22559’ should read ‘this Australian Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

This Standard is recommended to be read in conjunction with the following:

AS ISO 22559.1, *Safety requirements for lifts (elevators)*, Part 1: *Global essential safety requirements (GESRs)*.

AS ISO 22559.3, *Safety requirements for lifts (elevators)*, Part 3: *Global conformity assessment procedures (GCAP)—Prerequisites for certification of conformity of lift systems, lift components and lift functions*.

ISO/TS 22559.4, *Safety requirements for lifts (elevators)*, Part 4: *Global conformity assessment procedures (GCAP)—Certification and accreditation requirements*.

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

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO		AS/NZS	
13857	Safety of machinery—Safety distances to prevent hazard zones being reached by upper and lower limbs	4024	Safety of machinery
		4024.1801	Part 1801: Safety distances to prevent danger zones being reached by the upper and lower limbs
14119	Safety of machinery—Interlocking devices associated with guards—Principles for design and selection	4024.1602	Part 1602: Interlocking devices associated with guards—Principles for design and selection
ISO/TS		AS ISO	
22559	Safety requirements for lifts (elevators)	22559	Safety requirements for lifts (elevators)
22559-1	Part 1: Global essential safety requirements (GESRs)	22559.1	Part 1: Global essential safety requirements (GESRs)

Only normative references that have been adopted as Australian or Australian/New Zealand Standard have been listed.

The term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

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INTRODUCTION

This part of ISO/TS 22559 was prepared in response to the need to set global safety parameters for lifts (elevators).

The objective of ISO/TS 22559 (all parts) 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 local, national or regional safety standards, while maintaining equivalent levels of safety. If such innovations become state of the art, they can be integrated into the detailed local safety standard at a later date;
- c) help remove trade barriers.

ISO/TS 22559-1 establishes global essential safety requirements (GESRs) for lifts (elevators) by addressing hazards and risks that can be encountered on a lift (elevator). The GESRs, however, state only the safety objectives of a lift (elevator).

This part of ISO/TS 22559 provides guidance and criteria for achieving conformance with safety requirements of GESRs by specifying global safety parameters (GSPs) for use and implementation, where applicable, in a lift (elevator) to eliminate hazards or mitigate safety risks addressed in the GESRs. However, GSPs are not mandatory.

Clause 4 describes the approach and methodology used in the development of this part of ISO/TS 22559. Clause 5 gives instructions for the use and implementation of GSPs. The GSPs are presented in Clause 6 in the sequence of GESRs in ISO/TS 22559-1.

This part of ISO/TS 22559 is a product safety standard in accordance with ISO/IEC Guide 51.

AUSTRALIAN STANDARD

Safety requirements for lifts (elevators)

Part 2:

Safety parameters meeting the global essential safety requirements (GESRs)

1 Scope

1.1 This part of ISO/TS 22559:

- a) specifies global safety parameters (GSPs) for lifts (elevators), their components and their functions;
- b) complements the system and methods specified in ISO/TS 22559-1 for mitigating safety risks that can arise in the course of the operation and use of, or work on, lifts (elevators).

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

1.2 This part of ISO/TS 22559 is applicable to lifts that can

- a) be located in any permanent and fixed structure within or attached to a building, except lifts located in
 - 1) private residences (single family units), or
 - 2) means of transport, e.g. ships,
- b) have any
 - 3) rated load, size of load-carrying unit (LCU) and speed, and
 - 4) travel distance and number of landings,
- c) be affected by fire in the load-carrying unit, earthquakes, weather or floods,
- d) be foreseeably misused (e.g. overloaded), but not vandalized.

1.3 This part of ISO/TS 22559 does not specifically cover

- a) all the needs of users with disabilities¹⁾, or
- b) risks arising from
 - 1) work on lifts under construction, during testing, or during alterations and dismantling,
 - 2) use of lifts for firefighting and emergency evacuation,
 - 3) vandalism,
 - 4) fire outside the LCU,
 - 5) explosive atmosphere,
 - 6) transportation of dangerous goods.

1) Although the GESRs mentioned in this part of ISO/TS 22559 have been identified and evaluated by risk assessment, not all disabilities or combinations of disabilities of users have necessarily been addressed.

2 Normative references

The following referenced documents are indispensable for the application 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 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14119, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

ISO 14120:2002, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 14122-2:2001, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways*

ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails*

ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders*

ISO 14798:2009, *Lifts (elevators), escalators and moving walks — Risk assessment and reduction methodology*

ISO 15534-1, *Ergonomic design for the safety of machinery — Part 1: Principles for determining the dimensions required for openings for whole-body access into machinery*

ISO 15534-2, *Ergonomic design for the safety of machinery — Part 2: Principles for determining the dimensions required for access openings*

ISO 15534-3, *Ergonomic design for the safety of machinery — Part 3: Anthropometric data*

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

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

ISO/TS 22559-1:2004, *Safety requirements for lifts (elevators) — Part 1: Global essential safety requirements (GESRs)*

3 Terms and definitions

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

3.1

authorized person

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

[ISO/TS 22559-1:2004, definition 3.1]

3.2

cause

circumstance, condition, event, or action that in a hazardous situation contributes to the production of an effect

[ISO 14798:2009, definition 2.1]

3.3**counterweight**

mass that contributes traction in the case of a traction lift, or mass that saves energy by balancing all or part of the mass of the LCU (car) and the rated load

[ISO/TS 22559-1:2004, definition 3.5]

3.4**door**

landing or LCU mechanical device (including devices that partially or fully enclose the opening) used to secure an LCU or landing entrance

3.5**effect**

result of a cause in the presence of a hazardous situation

[ISO 14798:2009, definition 2.2]

3.6**electromagnetic compatibility****EMC**

degree of immunity to incident electromagnetic radiation and level of emitted electromagnetic radiation of electrical apparatuses

3.7**essential safety requirement****ESR**

requirement intended to eliminate or sufficiently mitigate the risk of harm to users, non-users and authorized persons using, or associated with, lifts

3.8**fully loaded load-carrying unit****fully loaded LCU**

LCU (car) with its rated load

3.9**global essential safety requirement****GESR**

globally agreed upon essential safety requirement

See 3.7.

3.10**global safety parameter****GSP**

globally agreed upon safety parameter

See 3.33.

3.11**harm**

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

[ISO/IEC Guide 51:1999, definition 3.3] [ISO 14798:2009, definition 2.3]

3.12**harmful event**

occurrence in which a hazardous situation results in harm

[ISO/IEC Guide 51:1999, definition 3.4] [ISO 14798:2009, definition 2.4]

3.13**hazard**

potential source of harm

[ISO/IEC Guide 51:1999, definition 3.5] [ISO 14798:2009, definition 2.5]

3.14**hazardous situation**

circumstance in which people, property or the environment are exposed to one or more hazards

[ISO/IEC Guide 51:1999, definition 3.6] [ISO 14798:2009, definition 2.6]

3.15**well (GB)****hoistway (US)**

travel path(s) of the LCU and related equipment, plus the spaces below the lowest landing and above the highest landing

3.16**hoistway enclosure (US)****well enclosure (GB)**

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

3.17**landing**

floor, balcony or platform used to receive and discharge persons or goods (freight) from the LCU

3.18**life cycle**

period of usage of a component or a lift system

[ISO 14798:2009, definition 2.7]

3.19**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 that is guided by a fixed guiding system from one landing to another, at an angle of more than 75° to the horizontal

NOTE 1 This term does not include mobile or other working platforms or baskets, or lifting appliances used in the course of construction of buildings or structures.

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

[ISO/TS 22559-1:2004, definition 3.19]

3.20**load-carrying unit****LCU****car**

part of a lift designed to carry persons and/or other goods for the purpose of transportation

[ISO/TS 22559-1:2004, definition 3.20]

3.21**machinery space**

space inside or outside the well (hoistway), which contains the lift's mechanical equipment, and can also contain electrical equipment used directly in connection with the lift

NOTE This space can also contain the electric driving machine, the hydraulic machine or means for emergency operation.

3.22**maintenance**

process of examination, lubrication, cleaning, adjustment and routine replacement of lift parts to ensure the safe and intended functioning of the lift and its components after completion of the installation and throughout its life cycle

3.23**non-user**

person in the vicinity of a lift, but not intending to access or use the lift

3.24**overload****overloaded**

load in the LCU that exceeds the rated load of the lift

3.25**platform**

part of the LCU that accommodates persons and load for the purpose of transportation

3.26**protective measures**

means used to reduce risk

NOTE Protective measures include risk reduction by inherently safe design, protective devices, personal protective equipment, information for use and installation and training.

[ISO/IEC Guide 51:1999, definition 3.8] [ISO 14798:2009, definition 2.8]

3.27**rated load**

load that the lift is designed and installed to transport

3.28**relative movement**

situation where a lift 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 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 (hoistway).

3.29**risk**

combination of the probability of occurrence of harm and the severity of that harm

[ISO/IEC Guide 51:1999, definition 3.2] [ISO 14798:2009, definition 2.10]

3.30**risk analysis**

systematic use of available information to identify hazards and to estimate the risk

[ISO/IEC Guide 51:1999, definition 3.10] [ISO 14798:2009, definition 2.11]

3.31**risk assessment**

overall process comprising a risk analysis and a risk evaluation

[ISO/IEC Guide 51:1999, definition 3.12] [ISO 14798:2009, definition 2.12]

3.32**risk evaluation**

consideration of the risk analysis results to determine if the risk reduction is required

[ISO 14798:2009, definition 2.13]

3.33**safety parameter****SP**

quantitative unit, the value of which, in the form of numerical values or references to International Standards or other standards, provides a level of safety consistent with that provided by relevant standards in current use in the lift industry and good engineering practices

3.34**scenario**

sequence of a hazardous situation, cause and effect

[ISO 14798:2009, definition 2.14]

3.35**severity**

level of potential harm

[ISO 14798:2009, definition 2.15]

3.36**transportation**

process in the course of which persons enter, or goods are moved into, an LCU, which is then lifted or lowered to another landing, where the person exits, or goods are removed from, the LCU

3.37**travel path**

path and related space between the lift terminal landings within which an LCU travels

NOTE For "space" above and below terminal landings, see 3.15.

3.38**uncontrolled movement**

situation where

- the LCU moves when, according to the design of the lift, it was to remain stationary, or
- the LCU travels at a speed that is beyond the control of the means designed and intended to control the LCU speed during the lift operation

EXAMPLE 1 The LCU starts to move away from a landing while the users are entering or leaving the LCU due to failure or breakdown of lift components, such as the speed control or brake system.

EXAMPLE 2 The LCU speed exceeds its designed speed or does not decelerate or stop as intended due to failure or breakdown of lift components, such as the speed control or brake system.

3.39**user**

person using the lift for the purpose of normal transportation, 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 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.

3.40**vandalism**

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

3.41**working area****working space**

area or space defined for use by authorized persons to perform maintenance, repair, inspection or testing of the lift

4 Development of global safety parameters (GSPs)

4.1 Purpose of GSPs

4.1.1 To enable verification that the lift and its selected components and functions have achieved safety objectives of applicable GESRs, GSPs, such as strength, clearances, acceleration or retardation values, are provided in this part of ISO/TS 22559 in the form of numerical values or references to International Standards or other standards.

4.1.2 According to ISO/TS 22559-1:2004, 5.1.5, “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.”. ISO 14798 describes a risk assessment process that can help to establish that the GESRs have been fulfilled with a specific design or lift configuration. In order to mitigate specific risks identified in the risk assessment process, specific components, functions or GSPs may be used.

4.1.3 ISO/TS 22559-1 and this part of ISO/TS 22559 do not mandate the use of specific designs of components and functions (such as specific designs of “safety gear”, “door interlocks” or “spring buffers”) as they are commonly specified and required in prescriptive lift standards. Such components and functions are not mandated in this part of ISO/TS 22559 as that would inhibit design innovations.

4.1.4 All applicable GESRs shall be fulfilled, in accordance with ISO/TS 22559-1, irrespective of whether or not there is a GSP specified in this part of ISO/TS 22559.

4.2 Approach

4.2.1 As was the case with development of ISO/TS 22559-1, the development of this part of ISO/TS 22559 also involved experts from various parts of the world working in three regional study groups (North American, European and Asia-Pacific). Specialized task groups carried out research in areas, such as anthropometric, ergonomic, spatial and environmental influences by review of relevant International Standards and other standards.

4.2.2 Individual experts and task groups derived safety parameters from independent research of existing standards, anthropometric data, clearances, forces, etc. and a comparison of major codes. GSPs that were determined to provide sufficient mitigation of risks related to relevant GESRs are included in this part of ISO/TS 22559.

5 Understanding and implementing GSPs

5.1 Overall objective

5.1.1 Consistent with the purpose described in 4.1, global safety parameters in relation to individual GESRs are specified in Clause 6.

5.1.2 The objective of the global safety parameters in Clause 6 is to

- a) introduce parameters that provide universal means to demonstrate compliance with GESRs, and
- b) stimulate the harmonization of safety parameters in existing national and regional standards.

5.1.3 To accomplish the safety objective of a GESR, a GSP, although not mandatory, may be an adequate means of achieving compliance. The list of GSPs in Table 2 is not exhaustive.

Table 2 specifies fixed minimum or maximum values. Where the GSP gives a possible range of values in the referenced International Standards, dependent on the circumstance in which it is used, justification that the correct value has been chosen can be required to suit the particular hazardous situation(s).

5.1.4 Listed GSPs should not be interpreted as the only measure of conformity with a GESR. Conformance with a GESR may be achieved by deviating from the listed GSPs, provided that the risk is mitigated using other equally effective protective measures. Parameters consistent with good engineering practices or selected from applicable codes or standards may be used. In such cases, it shall be demonstrated that the type of parameters chosen

- a) sufficiently mitigate the risk addressed in the GESR, and
- b) ensure that any new risks created by implementation of the parameter(s) are sufficiently mitigated.

NOTE See ISO 14798 (e.g. ISO 14798:2009, 4.4.1.3).

5.2 Properties and use of GSPs

5.2.1 GSPs

5.2.1.1 The GSPs are listed in Table 2.

NOTE 1 International Standards and other standards have been used wherever applicable for developing GSPs as they represent long-standing history in lift safety or scientifically developed data which has been applied for some time in safety-related applications. The other standards include lift safety codes, electrical codes, anthropometric standards and various materials standards. In all cases, the use of the relevant standard is to assist the user of this part of ISO/TS 22559.

NOTE 2 This part of ISO/TS 22559 recognizes that slightly different or non-identical values for safety-related criteria have been used around the world in order to ensure the safe operation of lifts. Examples of these are safety factors, space sizes to prevent body part entry, space sizes to allow body part entry, forces, deceleration levels and illumination levels. In many cases, the values vary only slightly (e.g. as a result of conversions of imperial to SI units of measurement or due to different origins of the units). Nevertheless, these slightly differing values have proven to result in safe lift operation over many years.

5.2.1.2 Safety factors should be considered relative to the material being used and its application, based on good engineering practice.

5.2.1.3 It is recognized that electronic safety devices and programmable electronic systems in safety-related applications (i.e. PESSRAL) are being extensively used in many industries. Where used in lift safety applications, guidance on safety integrity levels (SILs) is provided in ISO 22201.

For devices using electro-mechanical or non-programmable electronic devices, methods such as Failure Modes and Effects Analysis (FMEA) should be considered to establish the safety level.