

SS 550:2020+A1:2022
EN 81-20:2014, MOD
(ICS 91.140.90)

SINGAPORE STANDARD

Code of practice for installation, operation and maintenance of electric passenger and goods lifts

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(ICS 91.140.90)

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**Code of practice for installation, operation and
maintenance of electric passenger and goods lifts**

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National Foreword

This Singapore Standard was prepared by the Working Group on Lifts, Escalators and Passenger Conveyors set up by the Technical Committee on Building Facilities and Services under the purview of Electrical and Electronic Standards Committee.

This standard is a revision of SS 550 : 2009 + A3 : 2017 that was based mainly on the previous EN 81-1:1998, "Safety rules for the construction and installation of lifts – Part 1: Electric lifts". It is a modified adoption of EN 81-20:2014, "Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods – Part 20: Passenger and goods passenger lifts", published by European Committee for Standardisation, CEN, Avenue Marnix 17, 1000 Brussels.

The main changes made in this revision are as follows:

- a) Inclusion of local terms and definitions from 3.66 to 3.75.
- b) Adoption of most of the clauses in EN 81-20:2014 except for goods passenger lifts, positive drives and manual doors for passenger lifts.
- c) Inclusion of additional clauses on requirements using mechanical device for goods lift (traction type).
- d) change of average weight per passenger to 75 kg in line with EN 81-20.

Certain modifications due to national requirements are given in Annex ZB. To facilitate identification, the affected texts of the EN Standard which were changed within this standard are marked by a margin on the left.

NOTE 1 – Reference to International Standards are replaced by applicable Singapore Standards or Technical References.

NOTE 2 – Where numerical values are expressed as decimals, the comma is read as a full point.

NOTE 3 – Where applicable, refer to the IEC or ISO standard if the EN standard is an adoption of the IEC or ISO standard.

Diagrams in Annex E4.5 are provided by courtesy of Toshiba Elevator. The diagrams included as examples in this Singapore Standard are collectively contributed by the Working Group members for the sole purpose of illustration. The inclusion of diagrams in this Singapore Standard does not connote any endorsement whatsoever of any product, service and/or design concept by the Working Group and Enterprise Singapore.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "Mature Standards". Mature Standards will not be subject to further review, unless there are requests to review such standards.*
2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.*
3. *Compliance with a SS or TR does not exempt users from any legal obligations.*

0 Introduction

0.1 General

This standard is a type C standard as stated in EN 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 standard.

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 standard is to define safety rules related to passenger and goods 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 authorised persons, e.g. maintenance and inspection personnel (EN 13015 may be taken as reference);
- b) persons in the surrounding area of the well, or any machine room and pulley room, who may be effected by the lift.

0.2.2.2 Property to be safeguarded:

- a) loads in car;
- b) components of the lift installation;
- c) building in which the lift is installed;
- d) the 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) either 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 standard the following principles have been used:

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

It has, however, been necessary to establish certain requirements of good construction, either because they are peculiar to lift manufacture or because in the case of lift utilisation the requirements may be more stringent than elsewhere.

0.3.3 This standard states minimum rules for the installation of lifts into buildings/constructions. There may be in some countries regulations for the construction of buildings etc. 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 their access doors dimensions.

0.3.4 As far as possible the standard sets out only the requirements that materials and equipment have to 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 EN ISO 12100, EN ISO 14798 and the EN 61508 series of standards.

0.3.6 In line with EN 81-20, the average weight of a person has been determined to be 75 kg.

This standard 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 standard the following assumptions have been made:

0.4.2 Information exchange have been made between the customer and the supplier and agreement 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 lifts and service 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 concerning the aspects relating to noise and vibrations emitted by the equipment.

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

Components are:

a) designed in accordance with usual engineering practice and calculation codes, taking into account all failure modes;

NOTE – CEN/TR 81-12 can be used as reference.

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 their 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 will be 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 of this standard 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 standard and EN 81-50 needs not to be taken into consideration.

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

0.4.9 A user may, 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 neutralised, safe operation of the lift is no longer assured, but compensatory measures will be 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 the standard. Typically, where not otherwise specified in this standard, the energy exerted by a person results in an equivalent static force of:

- a) 300 N;
- b) 1000 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 the standard, including uncontrolled slipping of the ropes on the traction sheave will 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 standard 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 +38 °C.

NOTE – HD 60364-5-51, Code AA5 may be taken as reference.

0.4.17 The well is suitably ventilated, in compliance with regulatory requirements, 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 have 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 EN ISO 6743-4.

Code of practice for installation, operation and maintenance of electric passenger and goods lifts

1 Scope

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

1.2 In addition to the requirements of this standard, supplementary requirements shall 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 standard does not cover:

a) lifts with:

- 1) drive systems other than those stated in 1.1;
- 2) rated speed $\leq 0,15$ 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) (reserved for future use);

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 6.3.15.2.2) to a lift installed before this standard is brought into application;

f) safety during operations of transport, erection, repairs, and dismantling of lifts.

However, this standard may usefully be taken as a basis.

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

1.4 (reserved for future 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.

| >Deleted EN 81-28<

EN 81-50:2014, *Safety rules for the construction and installation of lifts — Examinations and tests — Part 50: Design rules, calculations, examinations and tests of lift components*

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+A1:2012, *Ladders — Requirements, testing, marking*

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

EN 10305-1, *Steel tubes for precision applications — Technical delivery conditions — Part 1: Seamless cold drawn tubes*

EN 10305-2, *Steel tubes for precision applications — Technical delivery conditions — Part 2: Welded cold drawn tubes*

EN 10305-3, *Steel tubes for precision applications — Technical delivery conditions — Part 3: Welded cold sized tubes*

EN 10305-4, *Steel tubes for precision applications — Technical delivery conditions — Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems*

EN 10305-5, *Steel tubes for precision applications — Technical delivery conditions — Part 5: Welded cold sized square and rectangular tubes*

EN 10305-6, *Steel tubes for precision applications — Technical delivery conditions — Part 6: Welded cold drawn tubes for hydraulic and pneumatic power systems*

EN 12015, *Electromagnetic compatibility — Product family standard for lifts, escalators and moving walks — Emission*

EN 12016, *Electromagnetic compatibility — Product family standard for lifts, escalators and moving walks — Immunity*

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

| ISO 4344:2004, *Steel wire ropes for lifts — Minimum requirements*

EN 12600:2002, *Glass in building — Pendulum test — Impact test method and classification for flat glass*

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 50205, *Relays with forcibly guided (mechanically linked) contacts*

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*

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

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

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

EN 60947-4-1:2010, *Low-voltage switchgear and controlgear — Part 4: Contactors and motor — starters - Section 1: Electromechanical contactors and motor-starters (IEC 60947-4-1:2009)*

EN 60947-5-1:2004, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:2003)*

EN 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 60947-5-5)*

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

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

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

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper and lower limbs (ISO 13857:2008)*

HD 60364-4-41:2007, *Low voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock (IEC 60364-4-41:2005)*

HD 60364-4-42:2011, *Low voltage electrical installations — Part 4-42: Protection for safety — Protection against thermal effects (IEC 60364-4-42:2010)*

HD 60364-6:2007, *Low voltage electrical installations — Part 6: Verification (IEC 60364-6:2006)*

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

IEC 60617, *Graphical symbols for diagrams*

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

| SS 638, *Singapore Standard on code of practice for electrical installations*