

Safety rules for the construction and installation of lifts — Lifts for the transport of goods only

Part 31: Accessible goods only lifts

ICS 91.140.90

National foreword

This British Standard is the UK implementation of EN 81-31:2010.

The UK participation in its preparation was entrusted to Technical Committee MHE/4, Lifts, hoists and escalators.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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- Partie 31: Monte charge accessibles

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Foreword

This document (EN 81-31:2010) has been prepared by Technical Committee CEN/TC 10 “Lifts, escalators and moving walks”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2010, and conflicting national standards shall be withdrawn at the latest by October 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This standard is a part of the EN 81 series of standards, which covers safety rules for the construction and installation of lifts. See CEN/TR 81-10.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

0 Introduction

0.1 General

0.1.1 The object of this European Standard is to give safety rules related to the construction and installation of accessible goods only lifts, with a view to safeguarding persons and objects against the risk of accidents associated with the use, maintenance and emergency operation of accessible goods only lifts.

This document is a type C standard as specified in EN ISO 12100-1.

The accessible goods only lift installation concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different to 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.

0.1.2 The following are to be safeguarded:

- a) persons such as:
 - 1) operators and users;
 - 2) maintenance personnel;
 - 3) persons in the near vicinity, outside the accessible goods only lift well, the machine room/spaces and pulley room/spaces (if any);
- b) objects such as components of the accessible goods only lift installation and load inside the load carrying unit;
- c) building parts (see 0.2.5) such as those parts of the building which are directly associated with the accessible goods only lift.

0.2 Principles

0.2.1 In drawing up this European Standard the following have been used:

0.2.2 This European 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.

0.2.3 This European Standard addresses the essential safety requirements of the Machinery Directive including those related to the well and machinery spaces, excluding any other requirement for the building.

There can 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.

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

- 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.

0.2.5 Negotiations have been made between the parties involved and decisions have been taken, particularly about:

- a) the intended use of the accessible goods only lift and its limits;
- b) environmental conditions, including surrounding lighting;
- c) compliance of the civil engineering with the requirements of this European Standard for those parts of the installation, which belong to the building and are not provided by the manufacturer.

0.3 Assumptions

0.3.1 Risks have been considered for each component that may be incorporated in a complete accessible goods only lift installation.

Rules have been drawn up accordingly to mitigate such risks.

0.3.2 Components are:

- a) designed in accordance with usual engineering practice 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. Harmful materials, such as asbestos, are not used.

0.3.3 The machine is kept in good repair and working order, so that the initial safety level is maintained.

0.3.4 The IP code of electrical components is selected in relation with the intended use where not specified in this European Standard in accordance with EN 60529.

0.3.5 By design of the load bearing elements, a safe operation of the accessible goods only lift is assured for loads ranging from 0 % to 100 % of the rated load, including provisions for taking into account possible overloading.

0.3.6 The requirements of this European Standard regarding electric safety devices are such that the possibility of a failure of an electric safety device complying with all the requirements of the standard needs not to be taken into consideration.

0.3.7 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.

0.3.8 If in the course of maintenance work a safety device, normally not accessible to the user, is deliberately neutralised, safe operation of the accessible goods only lift is no longer assured, but compensatory measures will be taken to ensure safety of all persons in conformity with maintenance instructions according to EN 13015.

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

0.3.9 For horizontal forces, the following have been used:

- a) static force: minimum 300 N;
- b) force resulting from impact: minimum 1 000 N,

reflecting the values that one person can exert.

Higher values need to be taken into account where powered or hand powered means for loading and unloading are intended to be used (see 0.2.5).

0.3.10 With the exception of the items listed below, a mechanical device built according to good practice and the requirements of the standard will not deteriorate to a point of creating hazard without the possibility of detection as long as regular and periodical examinations, tests and maintenance are carried out according to the instruction manual delivered with the installation.

The following mechanical failures, where applicable, are considered in the requirements:

- a) breakage of the suspension;
- b) uncontrolled slipping of the ropes on the traction sheave;
- c) breakage and slackening of all linkage by auxiliary ropes, chains and belts;
- d) failure of one of the mechanical components of the electromechanical brake which takes part in the application of the braking action on the drum or disk;
- e) failure of a component associated with the main drive elements and the traction sheave;
- f) rupture in the hydraulic system (jack excluded).

0.3.11 When the speed of the load carrying unit is linked to the electrical frequency of the mains up to the moment of application of the mechanical brake, the speed is assumed not to exceed 115 % of the rated speed or a corresponding fractional speed.

0.3.12 When the device according to 5.2.14 is provided, the organisation within the building, where the accessible goods only lift is installed, is such that it can respond effectively to emergency calls without undue delay (see 0.2.5).

0.3.13 Means of access are provided for the hoisting of heavy equipment (see 0.2.5).

0.3.14 To ensure the correct functioning of the equipment in the machinery spaces, the ambient temperature in these spaces is assumed to be maintained between + 5 °C and + 40 °C (see EN 60204-1). When the temperature exceeds these limits, appropriate means are used to compensate the difference, such as heating or cooling (see 0.2.5).

0.3.15 Accessible goods only lifts are used only by authorised and instructed users. This can be achieved by the way of key operated control buttons, key card operated control or similar devices or the accessible goods only lifts are installed in an area where only trained persons have access (see 0.2.5).

0.3.16 The fixing system of guards, which have to be removed during maintenance and inspection, remains attached to the guard or to the equipment, when the guard is removed.

0.3.17 The location of the accessible goods only lift to be such that users using the accessible goods only lift have means conveniently available to them, to access the different landing levels served, either a staircase or a means for the transportation of persons, within a reasonable distance.

1 Scope

1.1 This European Standard applies to new electric accessible goods only lifts with traction or positive drive and new hydraulic accessible goods only lifts, permanently installed in restricted areas and/or only used by authorised and instructed persons (users), serving fixed and permanent landing levels, having a load carrying unit made of a single load carrying area, designed for the transportation of goods only, moving along a fixed path (e.g. scissor lifts, lifts with guide rails) and inclined not more than 15° to the vertical, with rated speed not exceeding 1 m/s.

This European Standard covers accessible goods only lifts with rated load exceeding 300 kg and not intended to move persons.

This standard deals with all significant hazards, hazardous situations and events with the exception of those listed in 1.3 below, relevant to accessible goods only lifts, when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

1.2 For the purpose of this European Standard, a goods only lift is regarded as accessible where one of the following conditions is satisfied:

- a) floor area of the load carrying unit is greater than 1,0 m²;
- b) depth of the load carrying unit is greater than 1,0 m;
- c) height of the load carrying unit is greater than 1,20 m.

In case of a platform, it is considered accessible when the height of the landing doors is more than 1,20 m.

1.3 Two types of accessible goods only lifts are addressed:

- a) Type A, where the intended use is bound to the following two simultaneous conditions:
 - 1) maximum rated speed: 0,30 m/s;
 - 2) maximum travelling height: 12 m;
- b) Type B, where one of the conditions mentioned above is not fulfilled.

1.4 This European Standard does not give the requirements to be met in special cases (potentially explosive atmosphere, extreme climate conditions, seismic conditions, transporting dangerous goods, etc.).

1.5 This standard is not applicable to:

- a) accessible goods only lifts:
 - 1) with more than one machine;
 - 2) where loading and unloading is automated or the load carrying unit floor is fitted with mobile devices (e.g. rollers) for loading and unloading purposes;
 - 3) intended to carry bulk loads (such as loose sand, gravel, etc.);
- b) lifting appliances, such as appliances with more than one load carrying unit, skips, goods only lifts for construction sites, for underground applications, mine winding gear, goods only lifts on seagoing vessels and mobile offshore units, machinery intended to move performers during artistic performances, goods only lifts specially designed and constructed for research purposes for temporary use in laboratories, goods only lifts specially designed and constructed for military or police purposes;
- c) installations where the inclination of the fixed course of movement to the vertical exceeds 15°;

- d) safety during transport, installation, repairs and dismantling of accessible goods only lifts;
- e) the use of translucent material for the walls of the well and machinery spaces, for the load carrying unit and for the landing doors with the exception of their vision panels;
- f) the use of programmable electronic systems in safety related applications for lifts (PESSRAL).

However, this European Standard may usefully be taken as guidance where relevant.

1.6 This European Standard is not applicable to accessible goods only lifts which were manufactured before the date of its publication as EN.

1.7 The significant hazards, hazardous situations and events dealt with by this standard are those listed in EN ISO 14121-1:2007, Annex A (see Clause 4) with the exception of:

- noise;
- vibration;
- fire;
- any form of radiation except EMC.

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.

EN 81-1:1998, *Safety rules for the construction and installation of lifts — Part 1: Electric lifts*

EN 81-2:1998, *Safety rules for the construction and installation of lifts — Part 2: Hydraulic lifts*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of human body*

EN 1005-3, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

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 12385-4, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

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

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

EN 50214, *Flat polyvinyl chloride sheathed flexible cables*

EN 60068-2-6:2008, *Environmental testing — Part 2-6: Tests — Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:2007)*

EN 60068-2-14:2009, *Environmental testing — Part 2-14: Tests — Test N: Change of temperature (IEC 60068-2-14:2009)*

EN 60068-2-27:2009, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock* (IEC 60068-2-27:2008)

EN 60068-2-29:1993, *Basic environmental testing procedures — Part 2: Tests — Test Eb and guidance: Bump* (IEC 60068-2-29:1987)

EN 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials* (IEC 60112:2003)

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements* (IEC 60204-1:2005, modified)

EN 60204-32, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines* (IEC 60204-32:2008)

EN 60664-1:2007, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests* (IEC 60664-1:2007)

EN 60747-5-1:1997, *Discrete semiconductor devices and integrated circuits — Part 5-1: Optoelectronic devices — General* (IEC 60747-5-1:1997)

EN 60747-5-2, *Discrete semiconductor devices and integrated circuits — Part 5-2: Optoelectronic devices — Essential ratings and characteristics* (IEC 60747-5-2:1997)

EN 60947-4-1:2001, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters; Electromechanical contactors and motor-starters* (IEC 60947-4-1:2000) (including EN 60947-4-1:2001/A1:2002)

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 60950 (all parts), *Information technology equipment — Safety*

EN 61249-2 (all sub-parts), *Materials for printed boards and other interconnecting structures — Part 2: Reinforced base materials, clad and unclad* (IEC 61249-2 (all sub-parts))

EN 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products — Part 1: General requirements and tests* (IEC 61558-1:2005)

EN 62326-1:2002, *Printed boards — Part 1: Generic specification* (IEC 62326-1:2002)

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology* (ISO 12100-1:2003)

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles* (ISO 12100-2:2003)

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

EN ISO 14121-1:2007, *Safety of machinery — Risk assessment — Part 1: Principles* (ISO 14121-1:2007)

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

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

ISO 6403:1988, *Hydraulic fluid power — Valves controlling flow and pressure — Test methods*

HD 21.3 S3, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 3: Non-sheathed cables for fixed wiring (IEC 60227-3:1993, modified)*

HD 21.4 S2:1990, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 4: Sheathed cables for fixed wiring*

HD 21.5 S3:1994, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 5: Flexible cables (cords) (IEC 60227-5:1979, modified)*

HD 22.4 S4:2004, *Cables of rated voltages up to and including 450/750 V and having crosslinked insulation — Part 4: Cords and flexible cables*

HD 360 S2, *Circular rubber insulated lift cables for normal use*

HD 60364-5-54:2007, *Low-voltage electrical installations — Part 5-54: Selection and erection of electrical equipment — Earthing arrangement and protective bonding conductors (IEC 60364-5-54:2002, modified)*

3 Terms, definitions, units and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1.1

accessible goods only lift

fr monte charge accessible

de betretbarer Güteraufzug

permanently installed lifting equipment intended for the transport of goods only, serving fixed and permanent landing levels, comprising a load carrying unit accessible for loading and unloading, running along a fixed course, inclined not more than 15° to the vertical, for use only by authorised and instructed persons (users)

3.1.2

apron

fr garde-pieds

de Schürze

smooth vertical part extending downwards from the sill of the landing or load carrying unit entrance

3.1.3

available load carrying unit area

fr surface utile de la cabine

de Nutzfläche des Fahrkorbes

area of the load carrying unit measured at a height of 1 m above floor level, which is available for goods during operation of the lift

3.1.4

balancing weight

fr masse d'équilibrage

de Ausgleichgewicht

mass which saves energy by balancing all or part of the mass of the load carrying unit and of other suspended equipment

3.1.5

buffer

fr amortisseur

de Puffer

resilient stop at the end of travel, which may comprise a means of braking using fluids or springs (or other similar means)

3.1.6

clamping device

fr dispositif de blocage

de Klemmvorrichtung

mechanical device which when activated stops the load carrying unit in downward motion and maintains it stationary at any point of the travel to limit the extent of creep, by gripping the ram

3.1.7

counterweight

fr contrepoids

de Gegengewicht

mass which ensures traction

3.1.8

direct acting accessible goods only lift

fr monte charge accessible à action directe

de direkt angetriebener Aufzug

hydraulic accessible goods only lift where the means of driving is directly attached to the load carrying unit or its sling

3.1.9

dissipation type buffer

fr amortisseur à dissipation d'énergie

de Energie verzehrende Puffer

buffer that disperses the energy of a moving mass within defined levels of deceleration

3.1.10

down direction valve

fr soupape descente

de Abwärtsventil

electrically controlled valve in a hydraulic circuit for controlling the descent of the load carrying unit

3.1.11

electric safety chain

fr chaîne électrique des sécurités

de elektrische Sicherheitskette

total of the electric safety devices connected in series

3.1.12

full load pressure

fr pression à pleine charge

de Druck bei Volllast

static pressure exerted on the piping directly connected to the jack, the load carrying unit with the rated load being at rest at the highest landing level

3.1.13

guide rails

fr guides

de Führungsschienen

rigid components which provide guiding for the load carrying unit or the counterweight or the balancing weight, if there is one

3.1.14

headroom

fr partie supérieure de la gaine

de Schachtkopf

part of the well between the highest landing served by the load carrying unit and the ceiling of the well

3.1.15

hydraulic accessible goods only lift

fr monte charge accessible hydraulique

de hydraulisch betriebener betretbarer Güteraufzug

accessible goods only lift in which the lifting power is derived from an electrically driven pump transmitting hydraulic fluid to a jack, acting directly or indirectly on the load carrying unit (multiple motors, pumps and/or jacks may be used)

3.1.16

hydraulic buffer

fr amortisseur hydraulique

de hydraulischer Puffer

buffer that uses hydraulic fluid as a means to dissipate energy

3.1.17

indirect acting accessible goods only lift

fr monte charge accessible à action indirecte

de indirekt angetriebener betretbarer Güteraufzug

hydraulic accessible goods only lift where the means of driving is connected to the load carrying unit or its sling by suspension means (e.g. ropes, chains, belts)

3.1.18

instantaneous safety gear

fr parachute à prise instantanée

de Sperrfangvorrichtung

safety gear in which the full gripping action on the guide rails is almost immediate

3.1.19

jack

fr vérin

de Heber

combination of a cylinder and a ram forming a hydraulic actuating unit

3.1.20

levelling

fr nivelage

de Einfahren

operation which improves the accuracy of stopping at landings

3.1.21

lift machine

fr machine

de Triebwerk

unit which drives and stops the load carrying unit

3.1.22

load carrying unit

fr unité de transport

de Lastträger

part of the accessible goods only lift which carries the loads

3.1.23

machine room

fr local de machines

de Triebwerksraum

room in which machine or machines and/or the associated equipment are placed

3.1.24

machinery

fr machinerie

de Triebwerk und Steuerung

equipment traditionally placed in the machine room

NOTE Those equipment are usually cabinet(s) for control and drive system, lift machine, main switch(es) and means for emergency operations.

3.1.25

machinery space

fr emplacement de machinerie

de Aufstellungsort für Triebwerk und Steuerung

space(s) where the machinery (as a whole or in parts) is placed

3.1.26

minimum breaking load of a rope

fr charge de rupture minimale d'un câble

de Mindestbruchkraft eines Seiles

product of the square of the nominal diameter of the rope (in square millimetres) and the nominal tensile strength of the wires (in newtons per square millimetre) and a coefficient appropriate to the type of rope construction

3.1.27

non return valve

fr clapet de non retour

de Rückschlagventil

valve which allows flow in one direction only

3.1.28

one-way restrictor

fr clapet freineur

de Drossel-Rückschlagventil

valve which allows free flow in one direction and restricted flow in the other direction

3.1.29

overspeed governor

fr limiteur de vitesse

de Geschwindigkeitsbegrenzer

device which, when the accessible goods only lift attains a predetermined speed, initiates a stoppage of the accessible goods only lift load carrying unit and if necessary causes the safety gear, where provided, to be applied

3.1.30

pawl device

fr dispositif à taquet

de Aufsetzvorrichtung

mechanical device for stopping involuntary movement of the load carrying unit, and maintaining it stationary on fixed supports placed in the well

3.1.31

pit

fr cuvette

de Schachtgrube

part of the well situated below the lowest landing served by the load carrying unit

3.1.32

platform

fr plate-forme

de Plattform

load carrying unit including the floor, and which may have wall(s) and entrance(s)

3.1.33

positive drive accessible goods only lift

fr monte charge accessible à treuil attelé

de formschlüssig angetriebener betretbarer Güteraufzug

accessible goods only lift where chain or rope suspension is directly driven by means other than friction

NOTE This includes drum drive.

3.1.34

pressure relief valve

fr limiteur de pression

de Druckbegrenzungsventil

valve which limits the pressure to a pre-determined value by exhausting fluid

3.1.35

pulley space

fr emplacement de poulies

de Aufstellungsort von Seilrollen

space not containing the machine, in which pulleys are located, and in which the overspeed governor and the electrical equipment can also be housed

3.1.36

rated load

fr charge nominale

de Nennlast

load for which the equipment has been built

3.1.37

rated speed

fr vitesse nominale

de Nenngeschwindigkeit

speed v in metres per second (m/s) of the load carrying unit for which the equipment has been built

NOTE Three rated speed need to be addressed:

- v_m = rated speed upwards in metres per second (m/s);
- v_d = rated speed downwards in metres per second (m/s);
- v_s = the higher value of both rated speeds v_m and v_d in metres per second (m/s).

3.1.38

restricted area

fr zone réservée

de beschränkter Bereich

area in which only trained and/or authorized persons may have access

NOTE Such areas can be found in factories, warehouses, military establishments, theatres, etc.

3.1.39

restrictor

fr réducteur de débit

de Drossel

valve in which the inlet and outlet are connected through a restricted passage way

3.1.40

rupture valve

fr soupape de rupture

de Leitungsbruchventil

valve designed to close automatically when the pressure drop across the valve, caused by the increased flow in a pre-determined flow direction, exceeds a pre-set amount

3.1.41

safety gear

fr parachute

de Fangvorrichtung

mechanical device for stopping, and maintaining stationary on fixed means, the accessible goods only lift load carrying unit or counterweight/balancing weight by gripping the guide rails

3.1.42

safety rope

fr câble de sécurité

de Sicherheitsseil

auxiliary rope attached to the load carrying unit and the balancing weight for the purpose of tripping a safety gear in case of suspension failure

3.1.43

"shut-off" valve

fr robinet d'isolement

de Absperrventil

manually operated two-way valve which can permit or prevent flow in either direction

3.1.44

sling

fr étrier

de Rahmen

metal framework carrying the load carrying unit or counterweight/balancing weight, connected to the means of suspension

NOTE The sling can be integral with the load carrying unit enclosure.

3.45

stopping gear

fr dispositif d'arrêt

de Haltevorrichtung gegen unkontrollierte Bewegung

mechanical device for stopping, and maintaining stationary the load carrying unit in the case of unintended movement of the load carrying unit above and/or below a predetermined position in the well to protect person(s) on the load carrying unit roof and/or in the pit

3.1.46

traction drive accessible goods only lift

fr monte charge accessible à adhérence

de Treibscheiben-Aufzug

accessible goods only lift whose lifting ropes are driven by friction in the grooves of the driving sheave of the machine

3.1.47

travelling cable

fr câble pendentif

de Hängekabel

flexible cable between the load carrying unit and a fixed point

3.1.48

uncontrolled movement

fr mouvement incontrôlé

de unkontrollierte Bewegung

movement of the load carrying unit not controlled by the control system

3.1.49

unlocking zone

fr zone de déverrouillage

de Entriegelungszone

zone, extending above and below the stopping level, in which the load carrying unit floor needs to be to enable the corresponding landing door to be unlocked

3.1.50

user

fr utilisateur

de Benutzer

person making use of the services of an accessible goods only lift installation, except for maintenance purposes

3.1.51

vendor

fr vendeur

de Verkäufer/Errichter

person or organisation that makes the accessible goods only lift available for the first use¹⁾

3.1.52

well

fr gaine

de Schacht

space in which the load carrying unit and the counterweight/balancing weight, if there is one, travel

NOTE This space is usually bounded by the bottom of the pit, the walls and the ceiling of the well.

3.2 Units and symbols

3.2.1 Units

The units used are chosen from the International System of units (SI).

3.2.2 Symbols

Symbols are explained relevant to the equations used.

4 List of significant hazards

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk (see Table 1).

1) For the application of Machinery Directive in the European Union (EU) countries, the vendor acts as manufacturer.

Table 1 — List of significant hazards

No.	Hazards as listed in Annex A of EN ISO 14121-1:2007	Relevant clauses in this European Standard
Hazards, hazardous situations and hazardous events		
1	Mechanical hazards due to: - machine parts or work pieces, e.g.: - accumulation of energy inside the machinery, e.g.:	
	Crushing hazard	5.2.2.2, 5.2.2.3, 5.2.3.2.2, 5.2.9, 5.2.10, 5.2.11, 5.3, 5.4.3.2, 5.4.3.4.2, 5.4.6, 5.6.2, 5.7, Annex L
	Shearing hazard	5.2.3.2.2, 5.2.10, 5.3, 5.4, 5.5.1.7, 5.5.2.2, 5.6.2, 5.6.3
	Cutting or severing hazard	5.3, 5.5.1.3, 5.6.2
	Entanglement hazard	5.3, 5.4, 5.5.1.3, 5.5.1.7, 5.5.2.2, 5.6.2, 5.6.3
	Drawing-in or trapping hazard	5.2.3.2.1, 5.2.8, 5.2.14, 5.3, 5.4.3.2, 5.4.3.4.2, 5.4.6, 5.5.2.2, 5.6.2, 5.6.3
	Impact hazard	5.2.3.2, 5.2.10, 5.4, 5.5.1.2.4, 5.5.1.3, 5.5.1.4, 5.5.1.5, 5.6.2, 5.7
	Stabbing or puncture hazard	Not relevant
	Friction or abrasion hazard	5.3
	High pressure fluid injection or ejection hazard	Not relevant
	Loss of stability / overturning of machinery	5.2.5, Annex D, G.2
	Slip, trip and fall of persons (related to machinery)	5.2.8, 5.3, 5.4, 5.5.1.2
	From load falls, collisions, machine tipping caused by:	5.4.2.4
	— lack of stability	5.5.2.1, G.1, G.2, Annex I
	— uncontrolled loading – overloading – overturning moments exceeded	5.5.1.1
	— uncontrolled amplitude of movements	5.5.1.8, 5.6.2, 5.7
	— unexpected/unintended movement of loads	5.5.1.2.3, 5.5.1.3, 5.5.2.1

(to be continued)

Table 1 — List of significant hazards (continued)

No.	Hazards as listed in Annex A of EN ISO 14121-1:2007	Relevant clauses in this European Standard
	From access of persons to load support	5.4.2.2, 5.4.2.3
	From derailment	5.4.2.4, 5.7
	From insufficient mechanical strength of parts	5.4.2.3, 5.4.3.2, 5.4.4, 5.4.5, 5.5.1.1, 5.5.1.3, 5.6.1, 5.6.2, 5.7, 5.8, Annex F: F.2, F.3, F.4, F.5, F.6, G.1, G.2, Annex I
	From inadequate design of pulleys, drums	5.5.1.7, 5.5.2.2, 5.6.1, 5.6.2, 5.6.3, G.1
	From inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	5.3.3.3, 5.4.3.2, 5.4.3.3, 5.6.1, 5.6.2, 5.8, G.1, G.2
	Falling or ejected objects or fluids	5.2.8, 5.4.5, G.2, Annex I
	Falling of person from person carrier	5.5.1.5, 5.5.1.6
	Falling or overturning of person carrier	5.6.2
2	Electrical hazards due to:	
	Contact of persons with live parts (direct contact)	5.2.11.2.4, 5.3, 5.9, 5.10, 7.1, F.2, F.4, F.5
	Contact of persons with parts which have become live under faulty conditions (indirect contact)	5.3, 5.3.3.2, 5.5.1.8, 5.9, 5.10, 7.1, F.5
3	Thermal hazards , resulting in:	
	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	5.2.12, 5.3, 7.1, G.2
	Damage to health by hot or cold working environment	5.2.12, 5.3, G.2
4	Hazards generated by noise , resulting in:	
	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	7.2
	Interference with speech communication, acoustic signals, etc.	7.2
5	Hazards generated by vibration	Not relevant
6	Hazards generated by radiation	Not relevant
7	Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery	Not relevant
	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	Not relevant
8	Hazards generated by neglecting ergonomic principles in machinery design as, e.g. hazards from:	
	Unhealthy postures or excessive effort	5.2.11.2.3.1, 5.3.2.2, 5.3.3.2, 5.3.3.3, 5.4, 5.5.1.3, 5.5.1.6, 7.2, G.1

(to be continued)

Table 1 — List of significant hazards (continued)

No.	Hazards as listed in Annex A of EN ISO 14121-1:2007	Relevant clauses in this European Standard
	Inadequate local lighting	5.2.13, 5.4.2.5, 5.5.1.8, 5.5.1.9, 5.9, 7.2
	Human error, human behaviour	5.2.12, 5.3, 5.4.5, 5.6.2, 5.10, 7.1, 7.2, Annex C, Annex D, F.2, F.4, F.5, F.6, G.1, G.2, Annex K
	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	Annex K
	Errors of fitting	5.9, Annex D, Annex K
	Inadequate design, location or identification of manual controls	5.4.3.4.2, 7.2
	Inadequate holding devices/accessories	5.5.1.3, 5.5.2.1
	From abnormal conditions of assembly/testing/use/maintenance	5.6.2, 7.2, F.2, F.3, F.4, F.6, G.1
	Insufficient visibility from the driving position	5.4.2.5, 5.4.3.4.2, 5.5.1.3, 5.5.1.9, 7.2
9	Hazards associated with the environment in which the machine is used	
	Damage to health by hot or cold working environment	5.2.12, 5.3, G.2
	External influences on electrical equipment	5.9, Annex J
	Failure of the power supply	5.10
	Failure of the control circuit	5.10, Annex K
	Impossibility of stopping the machine in the best possible conditions	5.4.3.4.2, 5.5.1.8
	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction) from:	5.2.11.2.4, 5.5.1.8, 5.6.2, 5.10
	Failure/disorder of the control system	Annex K
	Restoration of energy supply after an interruption	5.10
	Failing of loading control	5.5.1.1, 5.6.2
	Failing of controls in person carrier (function, priority)	5.5.1.6
	Overspeed of person carrier	5.5.1.8, 5.6.2, G.2

5 Safety requirements and/or protective measures

5.1 General

Accessible goods only lifts shall comply with the safety requirements and/or protective measures of the following clauses. In addition the accessible goods only lifts shall be designed according to the principles of EN ISO 14121-1 for hazards relevant but not significant that are not dealt with by this document (e.g. sharp edges).

5.2 Lift well

5.2.1 General provisions

The requirements of this clause relate to wells containing one or more accessible goods only lifts.

The counterweight or the balancing weight of an accessible goods only lift shall be in the same well as the load carrying unit.

5.2.2 Well enclosure

5.2.2.1 An accessible goods only lift shall be separated from its surroundings by an enclosure.

5.2.2.2 Where the type A accessible goods only lift is located in a restricted area and the well is not required to contribute against the spread of fire, the well enclosure can be perforated and:

- a) it shall comply with EN ISO 13857:2008, Table 2;
- b) it shall not be possible to interfere with the operation of the lift by reaching lift equipment within the well.

5.2.2.3 The well shall be totally enclosed by imperforate walls, floor and ceiling (see **0.2.5**) in the following cases:

- a) type B accessible goods only lifts;
- b) type A accessible goods only lifts not placed in a restricted area;
- c) in sections of the building where the well is required to contribute against the spread of fire.

5.2.2.4 The only permissible openings in imperforate enclosures are:

- a) openings for landing doors;
- b) openings for inspection and emergency doors to the well and inspection traps;
- c) vent openings for escape of gases and smoke in the event of fire;
- d) ventilation openings;
- e) necessary openings for the functioning of the accessible goods only lift between the well and the machine or pulley rooms;
- f) openings in partition between lifts (passenger, goods passenger, goods only, etc.) according to 5.2.10.

5.2.3 Inspection doors – Vertically hinged inspection traps

5.2.3.1 Inspection doors and inspection traps to the well shall not be used except on grounds of the requirements of maintenance.

The dimensions of the inspection doors and traps shall be adapted to their position in the well, their purpose and the visibility for the work to be undertaken.

5.2.3.2 Inspection doors and vertically hinged inspection traps shall not open towards the interior of the well.

5.2.3.2.1 The inspection doors and inspection traps shall be provided with a key-operated lock, capable of being re-closed and re-locked without a key.

Any inspection door or trap greater than 0,50 m × 0,50 m shall be capable of being opened from inside the well without a key, even when locked.

5.2.3.2.2 Operation of the accessible goods only lift shall automatically depend on maintaining these inspection doors and inspection traps in the closed position. For this purpose, electric safety devices in conformity to 5.10.1.2 shall be used.

This requirement does not apply to doors and traps giving exclusive access to the machine and its associated parts, but applies to doors and traps giving access to overspeed governor, if any, installed in the well.

5.2.3.3 For type A accessible goods only lifts inspection doors and inspection traps shall be in compliance with EN ISO 13857:2008, Table 5 and for type B accessible goods only lifts they shall be imperforate. They shall satisfy the same requirements for mechanical strength as the landing doors.

NOTE Relevant regulations to the fire protection for the building concerned need to be taken into account (see 0.2.5).

5.2.3.4 Safe access to these inspection doors and inspection traps shall be provided according to 5.3.2.

5.2.4 Ventilation of the well

The well shall be ventilated. The stale air from other parts of the building shall not be extracted via the well.

5.2.5 Walls, floor and ceiling of the well

The structure of the well shall be able to support at least the loads which may be applied by the accessible goods only lift, e.g. by the machine, the guide rails at the moment of safety gear operation, due to eccentric loading in the load carrying unit as intended by the manufacturer, by the action of the fixed stops or buffers (see 0.2.5).

5.2.6 Strength of the walls

For the safe operation of the accessible goods only lift the walls shall have a mechanical strength such that when a force of at least 300 N, being evenly distributed over an area of 5 cm² in round or square section, is applied at a right angle to the wall at any point on either face they shall resist without:

- a) permanent deformation;
- b) elastic deformation greater than 15 mm.

See also 0.2.5, 0.3.9 and 5.2.8.

5.2.7 Strength of the pit floor

The floor of the pit shall be designed to withstand all dead and live loads with due allowance for moving masses and inertia forces, such as the application of the safety gear, if fitted and the action of stops, buffered or not, etc. (see 0.2.5 and 5.2.9).

NOTE EN 81-1:1998, Annex G, Table G.2 gives a value of the impact factor K that could be taken into account.

5.2.8 Construction and clearances of the walls of lift wells and landing doors facing a load carrying unit entrance

5.2.8.1 The horizontal distance between the sill of the load carrying unit and the sill of the landing doors shall not exceed 35 mm.

Where the load carrying unit entrance is provided with suitable protection means (see 5.5.1.2.3), the free distance between the landing sill and the landing doors facing the load carrying unit shall not exceed 35 mm.

5.2.8.2 Where the load carrying unit entrances are not provided with means as specified in 5.5.1.2.3, walls including doors facing load carrying unit access(es) shall have:

- a) a resistance in accordance with 5.2.6;
- b) a distance to the load carrying unit sill in accordance with 5.2.8.1; and
- c) the wall surface facing the load carrying access(es) plus 25 mm on both sides for a height of at least the unlocking zone extending above and below the load carrying unit entrance shall be:
 - 1) connected to the lintel of the next door; or
 - 2) extended downwards using a hard smooth chamfer whose angle to the horizontal plane shall be at least 60°. The projection to this chamfer on the horizontal plane shall not be less than 20 mm.

5.2.8.3 When manual levelling with door open is provided according to 5.10.2.2 below each landing doorsill the wall of the lift well shall comply with the following requirements:

- a) it shall form a vertical surface which is directly connected to the landing door sill, whose height is at least half the unlocking zone plus 10 mm and whose width is at least the clear opening of the load carrying unit access plus 25 mm on both sides;
- b) this surface shall be continuous and be composed of smooth and hard elements, such as metal sheets or equivalent. It shall be capable of withstanding a force of 300 N (see also 0.3.9) applied at a right angle to the wall at any point, being evenly distributed over an area of 5 cm² in round or square section; it shall resist without:
 - 1) permanent deformation;
 - 2) elastic deformation greater than 10 mm;
- c) any projections shall not exceed 5 mm. Projections exceeding 2 mm shall be chamfered at least 75° to the horizontal.

5.2.9 Protection of any spaces located below the load carrying unit, the counterweight or the balancing weight

If accessible spaces do exist below the load carrying unit, the counterweight or the balancing weight, the base of the pit shall be designed for an imposed load of at least 5 000 N/m², and either:

- a) there shall be installed below the counterweight buffer or under the travelling area of the balancing weight, a solid pier extending down to solid ground (see 0.2.5); or
- b) the counterweight or the balancing weight shall be equipped with safety gear.

NOTE Accessible goods only lift wells should preferably not be situated above a space accessible to persons.

5.2.10 Protection in the well

5.2.10.1 In the lower part of a well accessible to maintenance personnel the travelling area of the counterweight or balancing weight shall be guarded by either:

- a) a rigid screen extending from a position not more than 0,30 m above the accessible goods only lift pit floor to a position at least 2,50 m.

The width shall be at least equal to that of the counterweight plus 0,10 m on each side. If this partition is perforate, EN ISO 13857:2008, 4.2.4.1 shall be respected;

- b) or a means in accordance with 5.2.11.2.3.1, a), 3), limiting the travel of the counterweight or balancing weight at least 1,80 m above the pit floor.

5.2.10.2 Where the well contains several lifts there shall be a partition between the moving parts of different lifts.

If this partition is perforate, EN ISO 13857:2008, 4.2.4.1 has to be respected.

5.2.10.2.1 This partition shall extend at least from the pit floor to a height of 2,50 m above the floor of the lowest landing.

The width shall be as to prevent access from one pit to another.

5.2.10.2.2 The partition shall extend through the full height of the well if the horizontal distance between the outer edge of the load carrying unit and a moving part (load carrying unit, counterweight or balancing weight) of an adjacent lift is less than 0,50 m.

The width of the partition shall be at least equal to that of the moving part, or part of this, which is to be guarded, plus 0,10 m on each side.

5.2.11 Headroom and pit

5.2.11.1 Top clearances

5.2.11.1.1 Where the load carrying unit is not provided with a roof and the load carrying unit is in the extreme upward position it can reach, the following three conditions shall be satisfied at the same time:

- a) the load carrying unit guide rail lengths shall be such as would accommodate a further guided travel of at least 0,1 m;
- b) the free vertical distance between the lowest parts of the ceiling of the well and:
 - 1) the highest pieces of equipment fixed on the load carrying unit enclosure, except for those covered in 2) below, shall be at least 0,30 m;
 - 2) the highest part of the guide shoes or rollers, of the rope attachments and of the header or parts of vertically sliding doors, if any, and of an upward travelling part of the machinery assembly (ram head, etc.) shall be at least 0,10 m;
- c) the clearance between the load carrying unit floor and the lowest parts of the ceiling of the well shall be at least equal to the clear height of the tallest landing door plus 0,10 m. In no case shall it be less than 1,80 m.

5.2.11.1.2 For load carrying units with a roof (see 5.5.1.6):

- a) where no inspection control station is provided on the load carrying unit roof, a stopping device according to 5.10.2.4 shall be provided on the load carrying unit roof and requirements of 5.2.11.1.1, a) and 5.2.11.1.1, b) apply with the exception that the minimum clearance given in 5.2.11.1.1, b), 1) is reduced to 0,10 m;
- b) where an inspection control station is provided on the load carrying unit roof, in addition to the requirements of 5.2.11.1.1, clearances and free spaces according to 3) below shall be provided and,
 - 1) obtained by means of well dimensions; or
 - 2) achieved with the application of the requirements listed in L.2 or L.3 as applicable;
 - 3) when the counterweight or balancing weight rests on its fixed stops or fully compressed buffer(s), the following two conditions shall be satisfied at the same time:
 - i) the free vertical distance between the level of the highest area on the load carrying unit roof whose dimensions comply with 5.5.1.6.1 (areas on parts according to 5.2.11.1.1, b), 2) excluded) and the level of the lowest part of the ceiling of the well (including beams and

components located under the ceiling) situated in the projection of the load carrying unit shall be at least 1,0 m;

- ii) there shall be above the load carrying unit sufficient space to accommodate a rectangular block not less than 0,50 m × 0,60 m × 0,80 m resting on one of its faces. For lifts with direct roping, the suspension ropes and their attachments may be included in this space, provided that no rope centre-line shall be at a distance exceeding 0,15 m from at least one vertical surface of the block;
- c) type B accessible goods only lifts shall comply with the requirements of 5.2.11.1.2, b);
- d) for type A accessible goods only lifts with positive drive and type B accessible goods only lifts with positive drive and a speed of not more than 0,30 m/s the guided travel of the load carrying unit upwards from the top floor until it strikes the upper fixed stop(s) or buffer(s) shall be at least 0,20 m;
- e) for type B accessible goods only lifts with positive drive and a speed of more than 0,30 m/s the guided travel of the load carrying unit upwards from the top floor until it strikes the upper fixed stop(s) or buffer(s) shall be at least 0,50 m. The load carrying unit shall be guided to the limit of its buffer stroke.

5.2.11.1.3 When the load carrying unit rests on its fixed stops or fully compressed buffers, the counterweight or balancing weight guide rail lengths shall be such as would accommodate a further guided travel of at least 0,10 m.

5.2.11.2 Pit

5.2.11.2.1 General

The lower part of the well shall consist of a pit, the bottom of which shall be smooth and approximately level, except for any fixed stop or buffer, suspension equipment and guide rail bases and water drainage devices.

After the building-in of guide rail fixings, stops or buffers, any grids, etc., the pit shall be impervious to infiltration of water (see 0.2.5).

5.2.11.2.2 Access to the pit

A permanent means shall be provided inside the well, easily accessible from the landing door (see EN ISO 14122), to permit competent persons to descend safely to the floor of the pit. This shall not project into the clear running space of the lift equipment.

5.2.11.2.3 Pit clearances

5.2.11.2.3.1 Pit clearances and/or refuge spaces shall be provided either:

a) at least according to the following requirements:

- 1) there shall be a vertical clearance of at least 10 mm between the lowest parts of the moving equipment and the highest parts of the pit or the equipment installed in it when the fully loaded load carrying unit rests on its fixed stop(s) or fully compressed buffer(s); and
- 2) a stopping device in accordance with 5.10.2.4 shall be provided to prevent the load carrying unit from moving at the latest when a person is in the pit.

If the stopping device is manually operated it shall be accessible from outside of the well pit only when the lowest access door is open; and

- 3) for maintenance purposes, mechanical means, electrically checked with a safety switch according to 5.10.1.2.2, shall be provided to physically limit the travel of the load carrying unit behaving as fixed stops under the load carrying unit, to assure a clearance of minimum 1,80 m height between the floor of the pit and the lowest part of the load carrying unit or its supporting structure.

NOTE This means can be the same as the one used to prevent the load carrying unit from leaving the landing (5.6.2.3).

- i) If the effort required to position the mechanical means exceeds 200 N or the lower effort applicable according to EN 1005-3, its actuation has to be powered;
 - ii) the operation of the mechanical means, with the exception of means in accordance with 5.6.2.3, shall cause the illumination of an indicating lighting placed under the load carrying unit, and visible from the pit;
 - iii) the mechanical means shall be capable of taking a static load at least equal to three times the weight of the fully loaded load carrying unit, without permanent deformation, in such a way that the floor of the load carrying unit resting on these means, after having hit the stop, shall not depart by more than 5 % from the normal level;
- b) or when the load carrying unit rests on its fixed stops or fully compressed buffers, the following five conditions shall be satisfied at the same time:
- 1) there shall be in the pit sufficient space to accommodate a rectangular block not less than 0,50 m × 0,60 m × 1,0 m resting on one of its faces;
 - 2) the free vertical distance between the bottom of the pit and the lowest parts of the load carrying unit shall be at least 0,50 m. This distance may be reduced to a minimum of 0,10 m within a horizontal distance of 0,15 m between:
 - i) clamping device blocks, pawl devices, apron or parts of the vertical sliding door(s) and the adjacent wall(s);
 - ii) the lowest parts of the load carrying unit and the guide rails;
 - 3) the free vertical distance between the highest parts fixed in the pit, for instance jack supports, pipes and other fittings, and the lowest parts of the load carrying unit, except for items detailed in 2), i) and 2), ii) above, shall be at least 0,30 m;
 - 4) the free vertical distance between the bottom of the pit or the top of equipment installed there and the lowest parts of the downward travelling ram-head assembly of an inverted jack shall be at least 0,50 m.

However, if it is impossible to gain involuntary access under the counterweight or the ram head assembly (for example by providing screens in accordance with 5.2.10.1), this vertical distance may be reduced from 0,50 m to 0,10 m minimum;

- 5) the free vertical distance between the bottom of the pit and the lowest guiding yoke of a telescopic jack below the load carrying unit of a direct acting lift shall be at least 0,50 m.

5.2.11.2.3.2 In case of type B accessible goods only lifts having rated speed greater than 0,30 m/s pit clearances and refuge spaces shall be provided according to:

- a) 5.2.11.2.3.1, b); or
- b) the requirements listed in L.4.

5.2.11.2.4 Equipment in the pit

There shall be in the pit:

- a) stopping device(s) accessible on opening the door(s) giving access to the pit, and from the pit floor, in conformity with the requirements of 5.10.2.4 and 7.1.9;
- b) a socket outlet (5.9.5.5.2).

In the pit of type B accessible goods only lifts there shall also be means to switch the lift well lighting (5.9.5.6.2), accessible on opening the access door(s) to the pit.

5.2.12 Exclusive use of the lift well

The well shall be exclusively used for the accessible goods only lift. It shall not contain cables or devices, etc., other than for the accessible goods only lift. The well may, however, contain heating equipment for the lift well excluding steam heating and high-pressure water heating. However, any control and adjustment devices of the heating apparatus shall be located outside of the well.

5.2.13 Lighting of the well

At least a socket outlet shall be provided in the well for lighting by means of portable lamp (see 0.2.5).

Where the load carrying unit roof is intended to be used as a working platform for maintenance and service operation, such as for type B accessible goods only lifts, there shall be lighting in the well giving a minimum light intensity of 50 lux at the working places.

5.2.14 Alarm device

If there is a risk for persons working in the well being trapped and no means are provided to escape, either through the load carrying unit, or through the well, or no means of communication within the user's premises are present (see 0.2.5), alarm devices shall be installed at places where this risk exists.

The alarm devices shall fulfil at least the following requirements:

- a) the power for this device shall be from an electric charging supply which is capable of feeding the device for 1 h in case of interruption of the normal power supply;
- b) this device shall at least cause the operation of an audible and visible alarm in an area close to the accessible goods only lift well and/or in an area close to potential rescuers. The sound level shall be appropriate to the environment with a minimum of 60 dB(A) (see also 0.2.5);
- c) the device activating the alarm shall be easily recognisable and accessible, visible even in case of power supply failure.

5.3 Machinery spaces

5.3.1 General provisions

5.3.1.1 Machinery and pulleys shall be located in machinery spaces. These spaces and the associated working areas shall be only accessible to authorised persons (e.g. maintenance personnel, inspection personnel). The spaces and the associated working areas shall be suitably protected against environmental influences intended by the manufacturer to be taken into consideration and provisions shall be made for suitable areas for maintenance/inspection work. See 0.2.3 and 0.2.5.

5.3.1.2 Machinery spaces shall not be used for purposes other than accessible goods only lifts. They shall not contain ducts, cables or devices other than for the accessible goods only lift.

These spaces may, however, contain:

- a) machines for lifts;
- b) equipment for air-conditioning or heating of these rooms, excluding steam heating and high pressure water heating;
- c) fire detectors or extinguishers, with a high operating temperature, appropriate for the electrical equipment, stable over a period of time, and suitably protected against accidental impact.

5.3.1.3 Machinery spaces may be:

- a) rooms, comprising solid walls, ceiling, floor and door and/or trap;
- b) cabinet(s), consisting of imperforate walls, floor, roof and door(s);
- c) part of the lift well (see also 5.2.2.2).

5.3.1.4 The only permissible openings in the machinery spaces imperforate enclosures are:

- a) ventilation openings;
- b) necessary openings for the functioning of the lift between the well and the machinery cabinet, if any;
- c) vent openings for escape of gases and smoke in the event of fire.

5.3.1.5 These openings when accessible to non-authorised persons shall comply with the following requirements:

- a) protection according to EN ISO 13857:2008, Table 5 against contact with danger zones; and
- b) degree of protection of at least IP 2XD against contact with electrical equipment.

5.3.1.6 Diverter pulleys may be installed in the headroom of the well provided that:

- a) protection means are fitted according to 5.6.3, Table 4;
- b) retaining devices to prevent diverter pulleys from falling in the event of a mechanical failure. The devices shall be able to support the weight of the pulley and the suspended loads;
- c) examinations and tests and maintenance operations can be carried out in complete safety from the load carrying unit roof/floor or from outside of the well.

5.3.2 Access

5.3.2.1 General

Access to the machine and its associated equipment shall be possible only for authorised persons. Access means shall comply with the requirements of EN ISO 14122-3.

Safe and unobstructed access door(s) and trap door(s) shall be provided to the lift machine and its associated equipment.

The clear dimensions of openings giving access for replacement of the lift machine and its associated equipment shall allow the possible replacement of the accessible goods only lift components. This might include the dismantling of machine room enclosure panels.

Their dimensions shall be at least 0,60 m × 0,60 m or, where the size of the machine room does not allow, other openings can be adapted to suit the replacement of components.

In the open position the doors and traps shall not penetrate into the clear spaces mentioned in 5.3.1.3.

5.3.2.2 Accessible machinery spaces

A machinery space is regarded as accessible to maintenance personnel if:

- a) the openings giving access have a minimum size of 0,60 m × 0,60 m; and
- b) the height of the machinery space is at least 1,80 m.

Where maintenance is intended to be carried out from inside of the machinery spaces, the sill of the access door shall not be higher than 0,40 m above the access level. The access doors and access traps shall be provided with a key-operated lock, capable of being re-closed and re-locked without a key. They shall be capable of being opened from inside the space without a key, even when locked.

5.3.2.3 Non accessible machinery spaces

Where maintenance is intended to be carried out from outside of the machinery spaces, the distance from the sill of doors or traps to any components requiring maintenance, adjustment or inspection shall not exceed 0,60 m.

The level of the lower edge of the doors or traps shall be placed at least at 1,10 m above the level of the working area.

The door or trap door shall:

- a) not open towards the inside of the machinery spaces;
- b) be provided with a key-operated lock, capable of being re-closed and relocked without a key.

Suitable provisions shall be taken where the maximum forces to be exerted during maintenance operation exceed the values given in EN 1005-3.

5.3.3 Construction and equipment of machinery spaces

5.3.3.1 General

Standing areas used for maintenance shall be slip resistant (e.g. chequer plate, grids).

5.3.3.2 Dimensions

5.3.3.2.1 In no case shall the clear height, for movement or for standing to work, be less than 1,80 m.

This full height for movement or working is taken to the underside of the ceiling or the structural roof beams and measured from:

- a) the floor of the access area;
- b) the floor of the working area(s).

NOTE See also 0.2.3 for National Regulations and 0.2.5 for negotiations.

5.3.3.2.2 In front of control panels and cabinets there shall be a clear horizontal area. This is defined as follows:

- a) depth, measured from the external surface of the panels, at least 0,70 m;
- b) width, the greater of the following values: 0,50 m or the full width of the cabinet or panel.

5.3.3.2.3 In front of mechanical parts where inspection, maintenance or manual operation (see G.1.5) is intended by the manufacturer, there shall be a clear horizontal area of at least 0,50 m × 0,60 m.

5.3.3.2.4 Where inspection and maintenance is intended to be carried out from outside of the machinery spaces, in front of the sill of the inspection door there shall be a clear space of at least the height of the door lintel. The projection of which on the horizontal section is a minimum of 0,70 m × 0,60 m, allowing in all cases the door to be fully opened.

5.3.3.2.5 There shall be a clear space of at least 0,30 m height above the pulleys, or protection has to be fitted.

5.3.3.3 Handling of equipment

Provisions with the indication of the safe working load (7.1.6.6) shall be provided in the machinery spaces ceiling or on the beams, conveniently positioned to permit the hoisting of heavy equipment (see 0.2.5 and 0.3.13).

5.4 Landing doors

5.4.1 General provisions

The openings in the well giving access to the load carrying unit shall be provided with doors to prevent persons from falling into the well or being damaged because of the relative movement of the lift equipment.

The landing doors shall comply with the regulations relevant to the fire protection for the building concerned.

5.4.2 Height, width, sills of openings at landings

5.4.2.1 Height

The clear height of the openings at landings shall be more than 1,20 m.

When the clear height is less than 2,00 m, loading and unloading of the load carrying unit shall be carried out from outside of the well, e.g. by use of containers or pallets.

5.4.2.2 Width

The clear width of the openings at landings shall not extend more than 50 mm beyond the clear load carrying unit entrance on both sides.

5.4.2.3 Sills

Every opening at landings shall incorporate a sill of sufficient strength to withstand the passage of loads being introduced into the load carrying unit.

NOTE It is recommended that a slight counter slope be provided in front of each landing sill to avoid water from washing, sprinkling, etc., draining into the well.

5.4.2.4 Guides for landing doors

5.4.2.4.1 Landing doors shall be designed to prevent, during normal operation, derailment, mechanical jamming, or displacement at the extremities of their travel.

Where the guides may become ineffective due to wear, corrosion or fire, emergency guidance shall be provided to maintain the landing doors in their position.

5.4.2.4.2 Horizontally sliding landing doors shall be guided top and bottom.

5.4.2.4.3 Vertically sliding landing doors shall be guided at both sides.

5.4.2.5 "Load carrying unit here" indication

An indication of the presence of the load carrying unit at the landing shall be given by means of:

- a) an illuminated signal, which can only light up when the load carrying unit is about to stop or has stopped at the particular landing. The signal shall remain illuminated whilst the load carrying unit remains there; or
- b) one or more transparent vision panels conforming to the following five conditions at the same time:

- 1) mechanical strength as specified in 5.4.3.2;
- 2) minimum thickness of 6 mm;
- 3) minimum glazed area per landing door of 0,015 m² with a minimum of 0,01 m² per vision panel;
- 4) width of at least 60 mm, and at most 150 mm. The lower edge of vision panels which are wider than 80 mm shall be at least 1 m above floor level;
- 5) the load carrying unit shall be continuously electrically illuminated (see 5.5.1.9).

5.4.3 Doors

5.4.3.1 General

Doors of accessible goods only lifts, including their frame, shall be imperforate.

5.4.3.2 Mechanical strength

5.4.3.2.1 Doors, with their locks, shall have a mechanical strength such that in the locked position and when a force of 300 N, being evenly distributed over an area of 5 cm² in round or square section, is applied at a right angle to the panel at any point on either face they shall resist without:

- a) permanent deformation;
- b) elastic deformation greater than 15 mm

during and after such a test the safety function of the door shall not be affected.

See also 0.2.5 and 0.3.9.

5.4.3.2.2 When closed, the clearance between panels, or between panels and uprights, lintels or sills, shall be as small as possible.

This condition is considered to be fulfilled when the operational clearances do not exceed 6 mm. This value, due to wear, may reach 10 mm. These clearances are measured at the back of recesses, if present.

Under the application of a manual force (without a tool) of 150 N in the direction of the opening of the leading door panel(s) of horizontally sliding doors and folding doors, at the most unfavourable point, the clearances defined above may exceed 10 mm, but they shall not exceed:

- a) 30 mm for side opening doors;
- b) 45 mm in total for centre opening doors.

5.4.3.2.3 Landing doors made of glass shall not be used with the exception of vision panel (5.4.2.5, b)).

5.4.3.3 Suspension of vertically sliding doors

5.4.3.3.1 Panels of vertically sliding landing doors shall be fixed to two independent suspension elements.

5.4.3.3.2 Suspension ropes, chains, belts shall be designed with a safety factor of at least 8.

5.4.3.3.3 The pitch diameter of suspension rope pulleys shall be at least 20 times the rope diameter.

5.4.3.3.4 Suspension ropes and chains shall be guarded against leaving the pulley grooves or sprockets.

5.4.3.4 Protection in relation to door operation

5.4.3.4.1 General

The doors and their surrounds shall be designed in such a way as to minimise risk of damage or injury due to jamming of a part of the person, clothing or other object.

Exception to these requirements is made for the access to the unlocking triangle defined in Annex B.

5.4.3.4.2 Power operated doors

Automatic power operated doors shall not be used.

Non-automatic power operated doors shall be designed to reduce to a minimum the harmful consequences of a person being struck by a door panel.

The movement of non-automatic power operated doors shall depend on:

- a) a hold to run control device located such as to allow supervision of the door movement by the operator;
- b) a stopping device in conformity with 5.10.2.4 adjacent to the manual control actuator; and
- c) the maximum speed of the closing edge of the door limited to 0,3 m/s.

5.4.4 Protection against risk of falling and shearing

5.4.4.1 A locking device in conformity with 5.4.5 shall be provided to prevent, in normal operation, the opening of a landing door (or any of the panels in the case of a multi-panel door) unless the load carrying unit has stopped, or is on the point of stopping, in the unlocking zone of that landing.

The unlocking zone shall not extend more than 0,20 m above and below the landing level.

Operation with landing doors open is permitted in the unlocking zone to permit levelling and re-levelling at the corresponding floor level provided the requirements of 5.10.2.2 are met.

5.4.4.2 It shall not be possible in normal operation to start the accessible goods only lift nor keep it in motion if a landing door or any of the panels in the case of a multi-panel door is open (see 5.4.6).

5.4.5 Locking and manual unlocking

5.4.5.1 Each landing doors shall be provided with a locking device satisfying the conditions of 5.4.4.1. This device shall be protected against deliberate misuse.

5.4.5.2 For hinged landing doors, locking shall be effected as near as possible to the vertical closing edge(s) of the landing doors, and maintained even in the case of wear of the hinge.

5.4.5.3 For sliding doors with multiple, mechanically linked panels, it is permitted to lock only one panel provided that:

- a) this single locking prevents the opening of the other panel(s); and
- b) these are not fitted with a handle.

5.4.5.4 The load carrying unit shall not be able to start until the locking elements are engaged by at least 7 mm; see Figure 1.

Dimensions in millimetres

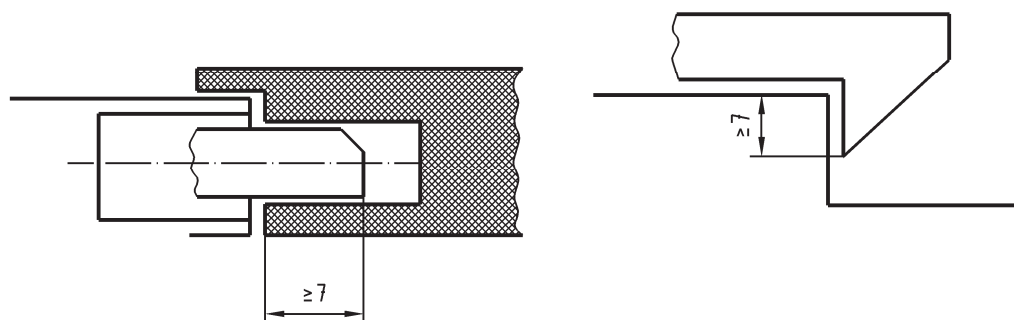


Figure 1 — Examples of locking elements

5.4.5.5 The locking elements and their fixings shall be resistant to shock, and be made from or reinforced with metal.

5.4.5.6 The engagement of the locking elements shall be achieved in such a way that a force of 300 N in the opening direction of the door does not diminish the effectiveness of locking.

5.4.5.7 The lock shall resist without permanent deformation a test according to F.2.2.2 or equivalent.

5.4.5.8 The locking action shall be effected and maintained by the action of gravity, permanent magnets, or springs. The springs shall act by compression, be guided and of such dimensions that, at the moment of unlocking, the coils are not compressed solid.

In the event of the permanent magnet (or spring) no longer fulfilling its function, gravity shall not cause unlocking.

If the locking element is maintained in position by the action of a permanent magnet, it shall not be possible to neutralize its effect by simple means (e.g. heat or shock).

5.4.5.9 The locking device shall be protected against the risk of an accumulation of dust, which could hinder its proper functioning.

5.4.5.10 In the case of accessible goods only lifts with landing doors, the locking element shall be fitted with an electric safety device in conformity with 5.10.1.2. The elements of the electric safety device proving the locked condition of the landing doors shall be positively operated without any intermediate mechanism by the locking element. It shall be foolproof but adjustable if necessary.

From positions normally accessible to persons, it shall not be possible to operate the lift with a landing door open or unlocked, after one single action not forming part of the normal operating sequence.

Inspection of the working parts shall be easy, as, for example, by use of a vision panel.

In the case where the lock contacts are in a box, the fixing screws for the cover shall be of the captive type, so that they remain in the holes in the cover or box when opening the cover.

The locking device is regarded as a safety component. F.2 gives a method to test the locking device.

5.4.5.11 Each landing door with a locking device shall be fitted with an emergency unlocking device operated from the outside of the well with the aid of a key, which fits to the unlocking triangle as defined in Annex B.

In case of type B accessible goods only lifts with reduced headroom (5.2.11.1.2, b), 2)), only the lowest and highest landing doors shall be provided with the manual unlocking device.

After a manual unlocking, the locking device shall not be able to remain in the unlocked position with the landing door closed.

In the case of landing doors driven by the load carrying unit door, a device (either weight or springs) shall ensure the automatic closing of the landing door if this door becomes open, for whatever reason, when the load carrying unit is outside of the unlocking zone.

5.4.6 Electrical device for proving the landing doors closed

5.4.6.1 Each landing door shall be provided with an electric safety device in conformity with 5.10.1.2 for proving the closed position, so that the conditions imposed by 5.4.4.2 are satisfied.

Operation of the load carrying unit with landing doors not in their closed position is permitted in the unlocking zone to permit levelling or manual re-levelling at the corresponding floor level, provided the requirements of 5.10.2.2 are met (see 5.4.4.1).

5.4.6.2 In the case of hinged landing doors, this device shall be placed adjacent to the closing edge of the door or barrier or on the mechanical device proving their closed condition.

5.4.6.3 Where horizontally sliding landing doors are coupled with load carrying unit doors, this device may be in common with the device for proving the locked condition, provided that it is dependent upon the effective closing of the landing door.

5.4.6.4 For sliding doors with multiple, mechanically linked panels, it is permitted to place the device required in 5.4.5.1 or 5.4.5.3, on a single panel.

Where the mechanical link is indirectly made (e.g. by rope, belt or chain) the closed position of the panel(s) not locked by the locking device and not hooked in the closed position, shall be proved by an electric safety device in conformity with 5.10.1.2.

5.5 Load carrying unit, counterweight and balancing weight

5.5.1 Load carrying unit

5.5.1.1 General

5.5.1.1.1 The load carrying unit structure can range from a platform with protection means in accordance with 5.5.1.2.1 up to a fully enclosed load carrying unit.

5.5.1.1.2 The rated load shall be linked to the weight of the goods to be transported (see 0.2.5).

To prevent an overloading of the load carrying unit by goods, the relation between the rated load and available area of the load carrying unit shall not be less than 200 kg/m².

Where the rated load exceeds 1 000 kg, an overload device shall be provided (5.10.2.7).

The floor of the load carrying unit shall be capable of supporting the local load caused by the weight of the goods to be transported and the weight of the persons and/or handling equipment when loading or unloading according to the intended use (see 0.2.5).

5.5.1.1.3 The assembly of the load carrying unit comprising components such as the sling, guide shoes, walls, guarding, floor and roof shall have sufficient mechanical strength to resist the forces which will be applied in normal lift operation and in safety devices operation or impact of the load carrying unit on its stops, buffered or not.

In addition, design calculations for the load carrying unit shall take into account not only the load carried but also the weight of handling devices, which may enter the load carrying unit (see 0.2.5).

5.5.1.2 Enclosure

5.5.1.2.1 Means shall be provided to prevent the risk of persons falling off the load carrying unit during loading and unloading. This can be achieved by guarding at the load carrying unit sides. The guarding shall consist of a handrail at 1,10 m height, a toe guard of 0,15 m height and an intermediate bar at half the height of the guarding.

Each guarding shall have at least a mechanical strength such that when a force of 1 000 N is applied on the handrail in the most unfavourable position, it shall resist without any permanent deformation and with elastic deformation not greater than 10 mm.

If a load carrying unit wall replaces the guarding, requirement for mechanical strength at least according to 5.2.6 apply (see also 5.5.1.1.3).

A guarding can be replaced by a well enclosure provided its strength is according to 5.2.6 and the distance between the outer edge of the load carrying unit and the surface of the wall does not exceed 35 mm. This surface shall be continuous and be composed of smooth and hard elements, such as metal sheets, hard facings or materials equivalent with regard to friction.

The enclosure shall be of limited flammability, e.g. according to EN 13501-1:2007, class C.

Particular attention shall be given to load carrying units constructed with openings on opposite or adjacent sides to prevent goods from projecting outside of the load carrying unit (see examples in Annex H). See also 0.2.5.

5.5.1.2.2 For type B accessible goods only lifts the load carrying unit shall be completely enclosed by walls, floor and roof, the only permissible openings being as follows:

- a) entrances for the normal access of users;
- b) trap doors;
- c) ventilation openings.

The walls may be perforated with openings in conformity with EN ISO 13857:2008, Table 4.

5.5.1.2.3 Where the goods to be transported could move during travel, devices, e.g. walls, ceiling, retainers, barriers, roller blinds, doors, shall be provided to prevent the goods from falling outside of the load carrying unit. These means shall be part of the load carrying unit and appropriate in strength and design to the goods to be transported. See also 0.2.5.

5.5.1.2.4 The entrances to the load carrying unit and its interior clear height shall be at least 2,00 m except if loading and unloading do not require the load carrying unit to be entered, e.g. by use of container or pallet.

Where the load carrying unit is not fitted with a ceiling, the minimum clear height above the platform shall be considered as equal to the minimum clear height of the landing entrances and the maximum shall be related to the goods to be transported (see also 0.2.5).

5.5.1.3 Doors at load carrying unit entrances

5.5.1.3.1 General

With the exception of the unlocking zone as specified in 5.4.4.1, it shall not be possible in normal operation to start the accessible goods only lift nor keep it in motion if a load carrying unit entrance door, where fitted, is open. This shall be achieved by means of an electric safety device in conformity with 5.10.1.2.

Where vertically opening doors are used, any unintended movement of them shall be prevented.

Where manually operated doors are used, ergonomic principles shall be taken into consideration.

(see EN 1005-3).

Automatic power operated entrance doors shall not be used.

Non-automatic power operated entrance doors and their surrounds shall be designed in such a way as to minimise risk of damage or injury due to jamming of a part of the person, clothing or other objects.

The movement of any power-operated load carrying unit doors, where fitted, shall depend on:

- a) a hold to run control device located at the landings such as to allow supervision, by the user actuating the control device, of the movement of the door;
- b) a stopping device in conformity with 5.10.2.4 adjacent to the hold to run control device; and
- c) the speed of the closing edge of the door limited to 0,30 m/s.

NOTE The devices in a) and b) above can be the same as those mentioned in 5.4.3.4.2 if landing and load carrying unit doors are operated simultaneously.

The horizontal distance between the load carrying unit door and the closed landing doors or the access distance between the doors during the whole of their normal operation shall not exceed 0,12 m.

In the case of the combination of a hinged landing door and a folding load carrying unit door it shall not be possible to place a ball with a diameter of 0,15 m in any gap between the closed doors.

5.5.1.3.2 Doors

5.5.1.3.2.1 The load carrying unit door, where provided, shall be fitted with a vision panel(s) complying with 5.4.2.5, b) requirements when the landing door has a vision panel(s) for the purpose of "Load carrying unit here" indication.

The vision panel(s) shall be positioned in the load carrying unit door such that it is in visual alignment with the landing door vision panel(s) when the load carrying unit is at the level of the landing.

5.5.1.3.2.2 For sliding door with multiple, mechanically linked panels it is permitted to place the device required to prove the closed position (5.5.1.3) either:

- a) on a single panel (the leading panel in the case of telescopic doors); or
- b) on the door-driving element if the mechanical connection between this element and the panels is direct.

Where the mechanical link is indirectly made (e.g. by rope, belt or chain), the closed position of the panel(s) not hooked in the closed position, shall be proved by an electric safety device in conformity with 5.10.1.2.

5.5.1.4 Apron

When manual re-levelling is fitted according to 5.10.2.2, under the load carrying unit sill an apron shall be provided equal to that required under the landing door sill (5.2.8.2).

5.5.1.5 Trap doors

If there is a trap door in the load carrying unit roof, it shall conform to 5.5.1.6.1, a) and also to the following. It shall:

- a) measure at least 0,35 m × 0,50 m;
- b) be opened from outside of the load carrying unit without a key and from inside of the load carrying unit with a key suited to the triangle defined in Annex B;
- c) not open towards the inside of the load carrying unit;

- d) not project, in the open position, beyond the edge of the lift load carrying unit;
- e) be provided with a means for manual locking. This manual locking shall be proved by means of an electric safety device in conformity with 5.10.1.2 and shall cause the lift to stop if the locking ceases to be effective.

Restoring the lift to service shall only be possible after deliberate relocking.

5.5.1.6 Load carrying unit roof

In addition to 5.5.1.2.1, the load carrying unit roof shall fulfil the following requirements:

5.5.1.6.1 It shall:

- a) be able to support at any position the mass of two persons, each counting for 1 000 N on an area of 0,20 m × 0,20 m, without permanent deformation;
- b) have at one point a clear area for standing of at least 0,12 m², in which the lesser dimension is at least 0,25 m;
- c) be provided with a balustrade (5.5.1.6.2) where the free distance in a horizontal plane, beyond and perpendicular to its outer edge exceeds 0,30 m. The free distances shall be measured to the wall of the well allowing a larger distance in recesses, the width or height of which is less than 0,30 m.

5.5.1.6.2 The balustrade shall fulfil the following requirements:

- a) considering the free distance in a horizontal plane beyond the outer edge of the handrail of the balustrade, its height shall be at least:
 - 1) 0,70 m where the free distance is up to 0,85 m;
 - 2) 1,10 m where the free distance exceeds 0,85 m;
- b) it shall consist of a handrail, a toe guard of 0,15 m height and an intermediate bar at half the height of the balustrade;
- c) the balustrade at the access side(s) shall provide safe and easy access to the load carrying unit roof;
- d) the balustrade shall be located within 0,15 m maximum of the edges of the load carrying unit roof;
- e) where maintenance operations from the load carrying unit roof need movement of the load carrying unit:
 - 1) the horizontal distance between the outer edge of the handrail and any part in the well (counterweight or balancing weight, switches, rails, brackets, etc.) shall be at least 0,10 m;
 - 2) a warning sign or a notice (7.1.4.2, d)) about the danger of leaning over the balustrade shall be fixed to it, where appropriate.

5.5.1.7 Pulleys and/or sprockets

Pulleys and/or sprockets fixed to the load carrying unit shall have protection according to 5.6.3 where maintenance operations from the load carrying unit need movement of the load carrying unit.

5.5.1.8 Equipment on top of the load carrying unit

Where the load carrying unit roof is intended to be used as a working platform for maintenance and service operations, the following shall be provided:

- a) stopping device(s) in conformity with 5.10.2.4.1, d) and 7.1.4.2, a);

- b) socket outlet in conformity with 5.9.5.5 at the working area;
- c) an inspection control station box in conformity with 5.10.2.3 (inspection operation) if the maintenance operations are intended to be carried out with movement of the load carrying unit.

Provisions of 5.5.1.8, c) above shall always apply to type B accessible goods only lifts.

5.5.1.9 Lighting

The load carrying unit shall be continuously illuminated with a light intensity of at least 50 lux at floor level when the landing door is open.

The lighting of the landing can contribute to the lighting of the load carrying unit if it is always available when the lift is used (see also 0.2.5).

If lighting is of the incandescent type and where vision panels are provided (see 5.4.2.5, b)), there shall be at least two lamps connected in parallel.

5.5.2 Counterweight and balancing weight

5.5.2.1 If the counterweight or the balancing weight incorporates filler weights, necessary measures shall be taken to prevent their displacement. To this effect the following shall be used either:

- a) a frame in which the fillers are secured; or
- b) if the fillers are made of metal, a minimum of two tie-rods on which the fillers are secured.

5.5.2.2 Pulleys and/or sprockets fixed to the counterweight or to the balancing weight shall have protection according to 5.6.3.

5.6 Suspension, uncontrolled movement and overspeed protection

5.6.1 Suspension

5.6.1.1 General

5.6.1.1.1 Suspension means for traction drive lifts, positive drive lifts, indirect acting hydraulic lifts and/or for the connection between the load carrying unit and the counterweight/balancing weight shall comply with the following requirements.

5.6.1.1.2 Load carrying units, counterweights or balancing weights shall be suspended from steel wire ropes, or steel chains with parallel links (Galle type) or roller chains.

5.6.1.1.3 The ropes shall correspond to the following requirements:

- a) the ratio between the minimum breaking load, in newtons (N), of one suspension rope/chain and the maximum force, in newtons (N), in this rope/chain, when the load carrying unit is stationary at the lowest landing with its rated load, shall be at least 8;
- b) the tensile strength of the wires shall be:
 - 1) 1 570 N/mm² or 1 770 N/mm² for ropes of single tensile; or
 - 2) 1 370 N/mm² for the outer wires and 1 770 N/mm² for the inner wires of ropes of dual tensile;
- c) the other characteristics (construction, extension, ovality, flexibility, tests, etc.) shall at least correspond to those specified in EN 12385-4 or EN 12385-5.

5.6.1.1.4 The minimum number of separate ropes or chains shall be two.

5.6.1.2 Sheave, pulley, drum and rope diameter ratios, rope/chain terminations

The ratio between the pitch diameter of sheaves, pulleys or drums and the nominal diameter of the suspension ropes shall be at least 30.

The fixing of the ropes on the drums, where present, shall be carried out using a system of blocking with wedges, or using at least two clamps or any other system with equivalent safety.

The ends of each rope/chain shall be fixed to the load carrying unit, counterweight or balancing weight, or suspension points of the dead parts of reeved ropes/chains by means of suitable terminations metal or resin filled sockets, self tightening wedge type sockets, heart shaped thimbles with at least three suitable rope grips, hand spliced eyes, ferrule secured eyes, or any other system with equivalent safety.

The rope termination shall be able to resist at least 80 % of the minimum breaking load of the rope.

5.6.1.3 Winding up of ropes for positive drive lifts

The drum, which can be used in the conditions laid down in G.1.1, b), shall be helically grooved.

When the load carrying unit rests on its fixed stops or fully compressed buffers, one and a half turns of rope shall remain in the grooves of the drum.

There shall only be one layer of rope wound on the drum.

The angle of deflection (fleet angle) of the ropes in relation to the grooves shall not exceed 4°.

5.6.1.4 Distribution of load between the ropes or the chains

5.6.1.4.1 An automatic device shall be provided for equalizing the tension of suspension ropes or chains, at least at one of their ends.

5.6.1.4.1.1 For chains engaging with sprockets, the ends fixed to the load carrying unit as well as the ends fixed to the balancing weight shall be provided with such equalization devices.

5.6.1.4.1.2 For chains in the case of multiple return sprockets on the same shaft, these sprockets shall be able to rotate independently.

5.6.1.4.2 If springs are used to equalize the tension they shall work in compression.

5.6.1.4.3 In the case of two rope or two chain suspension of the load carrying unit an electric safety device in conformity with 5.10.1.2 shall cause the lift to stop in case of abnormal relative extension of one rope or chain.

For lifts with two or more jacks this requirement applies for each suspension set.

5.6.1.4.4 The devices for adjusting the length of ropes or chains shall be made in such a way that these devices cannot work themselves loose after adjustment.

5.6.2 Uncontrolled movement and overspeed

5.6.2.1 Means to prevent uncontrolled movement of the load carrying unit

5.6.2.1.1 Depending on the driving system the uncontrolled movements of the load carrying unit indicated in Table 2 shall be taken into consideration.

Table 2 — Uncontrolled movement of the load carrying unit

Drive system	Downwards movement	Upwards movement	Creeping
Traction drive	X	X	
Positive drive	X		
Hydraulic direct acting	X		X
Hydraulic indirect acting	X		X

5.6.2.1.2 Means shall be applied as specified in Table 3 to prevent uncontrolled movement of the load carrying unit from those positions where it needs to be accessed, including access for maintenance purposes either to the platform or to the roof.

Table 3 — Means against uncontrolled movements

Safeties	Downwards movement	Upwards movement	Creeping ^a	Overspeed
Safety gear	X	X	X ^b	X ^c
Clamping device	X		X ^b	
Pawl device	X	X	X ^b	
Rupture valve	X			X
Restrictor				X
Rope brake	X	X	X ^b	X ^c
Stops in the pit, with or without buffers	X ^d		X ^d	
^a Creeping only with hydraulic drives. ^b Tripped at landings. ^c In combination with an overspeed governor. ^d Only for uncontrolled movement from the lowest landing.				

5.6.2.1.3 For hydraulic accessible goods only lifts, in the case of creeping, the load carrying unit can be manually re-levelled in accordance with 5.10.2.2 within the distance specified in 5.6.2.2.2, where applicable, or in 5.6.2.3.1, a).

5.6.2.1.4 Where an inspection control station is provided on the load carrying unit, protection means against overspeed shall be fitted.

5.6.2.2 Detecting device for uncontrolled movement from a stopped position

5.5.2.2.1 A device which detects that a load carrying unit is moving away uncontrolled from a stopped position shall be provided.

5.6.2.2.2 This device shall have detected the uncontrolled movement of the load carrying unit when the load carrying unit has moved away up to a maximum of 0,10 m in either direction from the stopped position.

5.6.2.2.3 After detection of the uncontrolled movement, this device shall operate the mechanical safety device (5.6.2.3) either mechanically or by means of an electric safety circuit (5.10.1.2).

5.6.2.2.4 Where an overspeed protection means is provided, the same device can be used for detecting the uncontrolled movement.

5.6.2.3 Mechanical safety device for stopping uncontrolled movement of the load carrying unit

5.6.2.3.1 A mechanical safety device shall be provided to stop uncontrolled movement of the load carrying unit. This device shall fulfil the following requirements:

- a) it shall be able to stop the fully loaded load carrying unit from rated speed and maintain it stopped;
- b) it shall operate in conjunction with either the guide rails, or the ram, or stops fixed in the well;
- c) parts of the device shall not be used for the guiding of the load carrying unit;
- d) it shall not be tripped by devices that are operated electrically, hydraulically or pneumatically;
- e) its operation shall not cause permanent deformation to the parts of the lift, except where they can be removed or replaced, if needed, after release;
- f) when it is engaged,
 - 1) the floor of the load carrying unit without or with the load uniformly distributed, shall not incline more than 5 % from its normal position; and
 - 2) an electric safety device according to 5.10.1.2 shall be operated to electrically prevent the normal movement of the accessible goods only lift;
- g) its release and automatic reset shall:
 - 1) require the intervention of a competent person;
 - 2) only be possible by moving the load carrying unit in the opposite direction;
 - 3) not cause the return of the accessible goods only lift automatically to normal operation.

The combined operation of this mechanical stopping device together with the detecting device for the uncontrolled movement (5.6.2.2) shall cause the load carrying unit to stop within a distance of 0,30 m from the stopped position.

5.6.2.3.2 The following devices are considered as complying with the above listed requirements:

- a) safety gear;
- b) clamping devices;
- c) pawl devices.

5.6.2.3.3 For accessible goods only lifts fitted with inspection control station in the load carrying unit or on the load carrying unit roof, the load carrying unit shall be provided with a mechanical safety device according to 5.6.2.3.1 which shall prevent overspeed and uncontrolled movement of the load carrying unit from any position along the travel path.

5.6.2.4 Safety devices for preventing overspeed

5.6.2.4.1 Overspeed governor

5.6.2.4.1.1 When required by 5.6.2.1.2, Table 3, an overspeed governor shall be provided.

5.6.2.4.1.2 The overspeed governor shall comply with the following:

- a) tripping of the overspeed governor for the load carrying unit and/or the counterweight safety gear shall occur at a speed at least equal to 115 % of the rated speed and not exceeding:
 - 1) 150 % of the rated speed; or
 - 2) 0,80 m/s,whichever is the higher;
- b) the overspeed governor or another device shall, by means of an electric safety device in conformity with 5.10.1.2, initiate the stopping of the lift machine at least when the load carrying unit speed, either up or down, reaches the tripping speed;
- c) an electric safety device in conformity with 5.10.1.2 shall prevent the starting of the lift while the overspeed governor is not in the reset position;
- d) the overspeed governor shall be accessible and reachable for inspection and maintenance;
- e) the overspeed governor is regarded as a safety component.

5.6.2.4.1.3 For rope driven overspeed governors:

- a) the tensile force in the rope produced by the device, when tripped, shall be at least the greater of the following two values:
 - 1) twice that necessary to engage the safety gear; or
 - 2) 300 N;
- b) overspeed governors using only traction to produce the force shall have grooves, which ensure the necessary traction, and:
 - 1) have been submitted to an additional hardening process; or
 - 2) have an undercut.

NOTE EN 81-1:1998, Annex M gives a method of determining the design elements of the grooves.

- c) the direction of rotation, corresponding to the operation of the safety gear, shall be marked on the overspeed governor;
- d) the overspeed governor shall be driven by a wire rope designed for that purpose, with a minimum diameter of 6 mm and a safety factor of at least 8 to the tensile force produced in the rope of the overspeed governor when tripped;
- e) the overspeed governor rope shall be tensioned by a tensioning pulley. This pulley (or its tensioning weight) shall be guided;
- f) the breakage or excessive rope stretch of the overspeed governor rope shall cause the motor to stop by means of an electric safety device in conformity with 5.10.1.2;

- g) the overspeed governor is regarded as a safety component. F.4 gives a method for testing the rope driven overspeed governor.

5.6.2.4.2 Rupture valve

When required by 5.6.2.1.2, Table 3, a rupture valve shall be provided and shall comply with the requirements listed in G.2.5.5.

5.6.2.4.3 Restrictor, also one-way-restrictor

When required by 5.6.2.1.2, Table 3, a restrictor/one-way-restrictor shall be provided and shall comply with the requirements listed in G.2.5.6.

5.6.3 Protection for traction sheaves, pulleys and sprockets

5.6.3.1 For traction sheaves, pulleys and sprockets, provisions shall be made according to Table 4 to avoid:

- a) bodily injury;
- b) the ropes/chains leaving the pulleys/sprockets, if slack;
- c) the introduction of objects between ropes/chains and pulleys/sprockets.

Where overhung pulleys or sprockets are used, devices according to Table 4 shall be provided.

Depending on the intended environmental conditions (see 0.2.5) attention shall be paid to avoid the accumulation of dust and debris in the guards.

Table 4 — Protection for traction sheaves, pulleys and sprockets

Location of protections			Risk according to 5.6.3.1		
			a)	b)	c)
Load carrying unit	On the roof		X	X	X
	Under the floor			X	X
On the counterweight / balancing weight				X	X
In the machinery spaces			X ^a	X	X ^b
In the pulley spaces			X ^a	X	
Lift well	Headroom	Above load carrying unit	X	X	
		Beside load carrying unit		X	
	Between pit and headroom			X	X ^b
	Pit		X	X	X
At the rope driven overspeed governor and its tensioning pulley				X	X ^b
Jack	Extending upwards		X ^a	X	
	Extending downwards			X	X ^b
	With mechanical synchronizing means		X	X	X

X risk shall be taken into account.

^a Protection shall be nip guards as a minimum.

^b Required only if the ropes/chains are entering the traction sheave or the pulley/sprocket horizontally or at any angle above the horizontal up to a maximum of 90°.

5.6.3.2 The devices used shall be constructed so that the rotating parts are visible, and do not hinder examination and maintenance operation. If they are perforated the gaps shall comply with EN ISO 13857:2008, Table 4.

EN 349 shall be applied to prevent crushing.

The dismantling shall be necessary only in the following cases:

- a) replacement of a rope/chain;
- b) replacement of a pulley/sprocket;
- c) re-cutting of the grooves.

5.6.4 Guarding of machinery

Effective protection shall be provided for accessible rotating parts, which may be dangerous, in particular:

- a) keys and screws in the shafts;
- b) tapes, chains, belts;
- c) gears, sprockets;
- d) projecting motor shafts;
- e) fly-ball type overspeed governors.