BRITISH STANDARD

BS EN 81-3:2000
+A1:2008

Incorporating corrigendum July 2009

Safety rules for the construction and installation of lifts —

Part 3: Electric and hydraulic service lifts

ICS 91.140.90

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National foreword

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The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1⟩ ⟨A1].

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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.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Committee and comes into effect on 15 January 2001

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ISBN 978 0 580 68516 3

Amendments/corrigenda issued since publication

Date	Comments
30 April 2009	Implementation of CEN amendment A1:2008, and alignment of BSI and CEN publication dates
31 March 2010	Implementation of CEN corrigendum July 2009

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NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 81-3:2000+A1

July 2008

ICS 91.140.90

Incorporating corrigendum July 2009
Supersedes EN 81-3:2000

English Version

Safety rules for the construction and installation of lifts - Part 3: Electric and hydraulic service lifts

Règles de sécurité pour la construction et l'installation des ascenseurs - Partie 3: Monte-charge électriques et hydrauliques

Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen - Teil 3: Elektrisch und hydraulisch betriebene Kleingüteraufzüge

This European Standard was approved by CEN on 13 October 2000 and includes Amendment 1 approved by CEN on 29 June 2008.

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Ref. No. EN 81-3:2000+A1:2008: E

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Foreword

This document (EN 81-3:2000+A1:2008) 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 January 2009, and conflicting national standards shall be withdrawn at the latest by January 2009.

This document includes Amendment 1, approved by CEN on 2008-06-29.

This document supersedes EN 81-3:2000.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ▌A1⟩ ⟨A1▌.

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

▌A1⟩ For relationship with EC Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. ⟨A1▌

This standard is part of the EN 81- series of standards “Safety rules for the construction and installation of lifts“.

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, 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 United Kingdom.

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Introduction

0.1 General

0.1.1 The object of this standard is to define safety rules related to service lifts with a view to safeguarding persons and objects against the risk of accidents associated with the user-, maintenance- and emergency operation of service lifts[1)]

0.1.2 A study has been made of the various aspects of incidents possible with service lifts in the following areas:

0.1.2.1 Risks possible due to:

a) shearing;

b) crushing;

c) falling;

d) impact;

e) trapping;

f) fire;

g) electric shock;

h) failure of material due to:

   1) mechanical damage,

   2) wear,

   3) corrosion.

0.1.2.2 Persons to be safeguarded:

a) users;

b) maintenance and inspection personnel;

c) persons outside the service lift well and the machine room, if any.

0.1.2.3 Objects to be safeguarded:

a) loads in car;

b) components of the service lift installation;

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1) Within CEN/TC 10 an interpretation committee has been established to answer questions about the spirit in which the experts have drafted the various clauses of this standard. The issued interpretations are available from National Standard Bodies.

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c) building in which the service lift is installed.

0.2 Principles

In drawing up this standard the following have been used.

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

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

0.2.2 This standard does not only address the essential safety requirements of the Machinery Directive, but additionally states minimum rules for the installation of service lifts into buildings/constructions. There may be in some countries regulations for the construction of buildings, etc. which cannot be ignored.

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

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

a) either fitted with attachments for lifting gear, or

b) designed so that they can be fitted with such attachments (e.g. by means of threaded holes), or

c) shaped in such a way that standard lifting gear can easily be attached.

0.2.4 As far as possible the standard sets out only the requirements that materials and equipment have to meet in the interests of safe operation of service lifts.

0.2.5 Negotiations have been made between the customer and the manufacturer, or his authorised representative, about:

a) the intended use of the service lift;

b) environmental conditions;

c) civil engineering problems;

d) other aspects related to the place of installation, e.g. presence of unsupervised children.

See also Annex J (information about access and maintenance with ladders).

0.2.6 This standard does not address the health and safety of domestic animals.

0.3 Assumptions

Possible risks have been considered of each component that may be incorporated in a complete service lift installation.

Rules have been drawn up accordingly.

0.3.1 Components are:

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

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b) of sound mechanical and electrical construction;

c) made of materials with adequate strength and of suitable quality;

d) be free of defects.

Harmful materials, such as asbestos are not used.

0.3.2 Components, and where appropriate well and machine room, are kept in good repair and working order, so that the required dimensions remain fulfilled despite wear.

0.3.3 Components will be selected and installed so that foreseeable environmental influences and special working conditions do not affect the safe operation of the service lift.

0.3.4 By design of the load bearing elements, a safe operation of the service lift is assured for loads ranging from 0 % to 100 % of the rated load.

0.3.5 The requirements of this standard regarding electrical 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.

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

0.3.7 Persons are not moved inside the well.

0.3.8 If in the course of maintenance work a safety device, normally not accessible to the users, is deliberately neutralised, safe operation of the service lift is no longer assured, but compensatory measures will be taken to ensure users safety in conformity with maintenance instructions.

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

0.3.9 For horizontal forces, the following have been used:

a) static force: 300 N;

b) force resulting from impact: 1000 N;

reflecting the values that one person can exert.

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.

The following mechanical failures are considered:

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 a component associated with the main drive elements and the traction sheave;

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

f) small leakage in the hydraulic system (jack included).

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0.3.11 The possibility of devices against free fall or descent with excessive speed not setting, should the car free fall from the lowest landing, before the car strikes the buffer(s) is considered acceptable.

0.3.12 When the speed of the car 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.

0.3.13 From the definition (**3 Terms and definitions**), service lifts are regarded as inaccessible for users.

0.3.13.1 The well is regarded as inaccessible to maintenance personnel if either any opening giving access to the well has dimensions, one of which does not exceed 0,30 m or regardless of their dimensions:

a) the depth of the well does not exceed 1 m,

b) the area of the well does not exceed 1 m^2, and

c) provisions are taken to enable easy maintenance from outside.

0.3.13.2 The machine room is regarded as accessible to maintenance personnel if:

a) the openings giving access have a minimum size of 0,60 m x 0,60 m, and

b) the height of the machine room is at least 1,80 m.

0.3.14 Means of access are provided for the hoisting of heavy equipment (see **0.2.5** and **6.3.4**).

1 Scope

1.1 This standard specifies the safety rules for the construction and installation of permanently installed new electric service lifts with traction or positive drive, or hydraulic service lifts defined as lifting equipment, serving defined landing levels, having a car, the interior of which is regarded as inaccessible to persons on account of its dimensions and means of construction, suspended by ropes or chains or supported by a ram and moving between rigid vertical guide rails or guide rails whose inclination to the vertical does not exceed 15° and driven electrically or hydraulically.

This standard covers service lifts with rated load not exceeding 300 kilogrammes and not intended to move persons.

1.2 In addition to the requirements of this standard supplementary requirements shall be considered in special cases (potentially explosive atmosphere, extreme climate conditions, seismic conditions, transporting dangerous goods, etc.).

1.3 This standard does not cover:

a) service lifts with drives other than stated in **1.1**;

b) important modifications (see **annex E**) to a service lift installed before this standard is brought into application;

c) lifting appliances, such as paternosters, mines lifts, theatrical lifts, appliances with automatic caging, skips and hoists for building and public works sites, ships' hoists, platforms for exploration or drilling at sea, construction and maintenance appliances;

d) installations where the inclination of the guide rails to the vertical exceeds 15°;

e) safety during transport, installation, repairs and dismantling of service lifts;

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f) the use of glass for the walls of the well, for the car and for the landing doors including the vision panels.

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

Noise and vibrations are not dealt with in this standard because these are not relevant to the safe use of the service lift.

Fire propagation is not dealt with in this standard.

1.4 To satisfy the condition of inaccessibility to the car, the car dimensions shall not exceed:

a) for floor area, 1,0 m^2;

b) for depth, 1,0 m;

c) for height, 1,20 m.

The height of 1,20 m shall not be limited if the car comprises several permanent compartments, each of which satisfies the above requirements.

In particular, lifting equipment intended exclusively for the transportation of goods, but having a car with dimensions exceeding any one of the figures above shall not be entered in the category 'service lifts'.

1.5 This standard covers the safety requirements for service lifts with rated speeds up to 1 m/s.

NOTE For service lifts with higher rated speeds additional requirements shall be applied as appropriate in order to maintain the same level of safety.

2 Normative references

The This European standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

CEN/CENELEC standards

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*.

A1 EN 81-58:2003 A1, *Safety rules for the construction and installation of lifts – Part 8: Lift landing doors – Fire resistance testing*.

A1 EN ISO 13857:2008, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)* A1

EN 50214, *Flexible cables for lifts*.

EN 60068-2-6, *Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)*.

EN 60068-2-27, *Basic environmental testing procedures - Part 2: Tests - Test Ea and guidance: Shock*.

EN 60249-2-2, *Base materials for printed circuits - Part 2: Specifications – Specification N° 2: Phenolic cellulose paper copper-clad laminated sheet, economic quality*.

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EN 60249-2-3, *Base materials for printed circuits - Part 2: Specifications – Specification N° 3: Epoxide cellulose paper copper-clad laminated sheet of defined flammability (vertical burning test)*.

EN 60742: 1995, *Isolating transformers and safety isolating transformers – Requirements*.

EN 60947-4-1, *Low-voltage switchgear and controlgear - Part 4: Contactors and motor-starters – Section 1: Electromechanical contactors and motor-starters*.

EN 60947-5-1, *Low-voltage switchgear and controlgear - Part 5: Control circuit devices and switching elements - Section 1: Electromechanical control circuit devices*.

EN 62326-1, *Printed boards – Part 1: Generic specification*.

IEC standards

IEC 60664-1:2000, *Insulation co-ordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests*.

IEC 60747-5, *Semiconductor devices – Discrete devices and integrated circuits – Part 5: Optoelectronic devices*.

CENELEC Harmonisation Documents

HD 21.3 S3:[AC1⟩1995⟨AC1], *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring*.

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:[AC1⟩1994⟨AC1], *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*.

[AC1⟩HD 22.4 S4:2004⟨AC1], *Rubber insulated cables of rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables*.

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

HD 384.4.41 S2:1996, *Electrical installations of buildings - Part 4: Protection for safety – Chapter 41: Protection against electric shock*.

HD 384.5.54 S1, *Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Chapter 54: Earthing arrangements and protective conductors*.

HD 384.6.61 S1, *Electrical installations of buildings - Part 6: Verification – Chapter 61: Initial verification*.

ISO Standards

ISO 1219-1:1991, *Fluid power systems and components – Graphic symbols and circuit diagrams – Part 1: Graphic symbols*.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply:

3.1
apron (garde-pieds) (Schürze)
smooth vertical part extending downwards from the sill of the landing or car entrance

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3.2
available car area (surface utile de la cabine) (Nutzfläche des Fahrkorbes)
area of the car measured at floor level available for goods during operation of the service lift

3.3
balancing weight (masse d'équilibrage) (Ausgleichgewicht)
mass which saves energy by balancing all or part of the mass of the car

3.4
buffer (amortisseur) (Puffer)
a resilient stop at the end of travel, and comprising a means of braking using fluids or springs (or other similar means)

3.5
car (cabine) (Fahrkorb)
a part of the service lift which carries the loads

3.6
counterweight (contrepoids) (Gegengewicht)
mass which ensures traction

3.7
direct acting service lift (monte charge à action directe) (direkt angetriebener Kleingüteraufzug)
hydraulic service lift where the ram or cylinder is directly attached to the car or its sling

3.8
down direction valve (soupape descente) (Abwärtsventil)
electrically controlled valve in an hydraulic circuit for controlling the descent of the car

3.9
electric anti-creep system (système électrique anti-dérive) (elektrisches Absinkkorrektursystem)
a combination of precautions against the danger of creeping

3.10
electric safety chain (chaîne élecrique des sécurités) (elektrischer Sicherheitskette)
the total of the electric safety devices connected in series

3.11
electric service lift (monte charge électrique) (elektrische Kleingüteraufzug)
service lift in which the lifting power is transmitted by means of ropes or chains to the service lift car from an electrically driven machine

3.12
full load pressure (pression à pleine charge) (Druck bei Vollast)
static pressure exerted on the piping directly connected to the jack, the car with the rated load being at rest at the highest landing level

3.13
guide rails (guides) (Führungsschienen)
the rigid components which provide guiding for the car, the counterweight or balancing weight

3.14
Headroom (partie supérieure de la gaine) (Schachtkopf)
part of the well between the highest landing served and the ceiling of the well

3.15
hydraulic service lift (monte charge hydraulique) (hydraulischer Kleingüteraufzug)
service 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 car (multiple motors, pumps and/or jacks may be used)

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3.16
indirect acting service lift (monte charge à action indirecte) (indirekt angetriebener Kleingüteraufzug)
a hydraulic service lift where the ram or cylinder is connected to the car or the car sling by suspension means (ropes, chains)

3.17
instantaneous safety gear (parachute à prise instantanée) (Sperrfangvorrichtung)
a safety gear in which the full gripping action on the guide rails is almost immediate

3.18
jack (vérin) (Heber)
a combination of a cylinder and a ram forming a hydraulic actuating unit

3.19
levelling (nivelage) (Einfahren)
an operation which improves the accuracy of stopping at landings

3.20
lift machine (machine) (Triebwerk)
the unit which drives and stops the service lift, including the motor for electric service lifts, or comprising the pump, the pump motor and control valves

3.21
machine room (local de machines) (Triebwerksraum)
a room in which machine or machines and/or the associated equipment are placed

3.22
minimum breaking load of a rope (charge de rupture minimale d'un câble) (Mindestbruchkraft eines Seiles)
the 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

3.23
non-return valve (clapet de non retour) (Rückschlagventil)
a valve which allows flow in one direction only

3.24
one-way restrictor (clapet freineur) (Drossel-Rückschlagventil)
a valve which allows free flow in one direction and restricted flow in the other direction

3.25
overspeed governor (limiteur de vitesse) (Geschwindigkeitsbegrenzer)
a device which, when the service lift attains a predetermined speed, causes the service lift to stop, and if necessary causes the safety gear to be applied

3.26
pit (cuvette) (Schachtgrube)
the part of the well situated below the lowest landing served by the car

3.27
positive drive service lift (includes drum drive) (monte charge à treuil attelé) (Trommelaufzug, Kettenaufzug)
a service lift where the car is suspended by chains or ropes driven by means other than friction

3.28
pressure relief valve (limiteur de pression) (Druckbegrenzungsventil)
a valve which limits the pressure to a pre-determined value by exhausting fluid

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3.29
rated load (charge nominale) (Nennlast)
the load for which the equipment has been built.

3.30
rated speed (vitesse nominale) (Nenngeschwindigkeit)
the speed v, in metres per second, of the car for which the equipment has been built.
Different rated speeds for upward and downward direction may be stated for hydraulic service lifts:
vm = rated speed upwards in metres per second; vd = rated speed downwards in metres per second;
vs = the higher value of both rated speed vm and vd in metres per second

3.31
re-levelling (isonivelage) (Nachstellen)
an operation, after the service lift has stopped, to permit the stopping position to be corrected during loading or unloading, if necessary by successive movements (automatic or inching)

3.32
restrictor (réducteur de débit) (Drossel)
a valve in which the inlet and outlet are connected through a restricted passage way

3.33
rupture valve (soupape de rupture) (Leitungsbruchventil)
a valve designed to close automatically when the pressure drop across the valve, caused by the increased flow in a predetermined flow direction, exceeds a pre-set amount

3.34
safety gear (parachute) (Fangvorrichtung)
a mechanical device for stopping, and maintaining stationary on the guide rails, the service lift car, counterweight or balancing weight in case of overspeeding in the downward direction or breaking of the suspension

3.35
safety rope (câble de sécurité) (Sicherheitsseil)
an auxiliary rope attached to the car as well as to the counterweight or balancing weight for the purpose of tripping a safety gear in case of suspension failure

3.36
service lift (monte charge) (Kleingüteraufzug)
lifting equipment serving defined landing levels, having a car, the interior of which is regarded as inaccessible to persons on account of its dimensions and means of construction, moving between rigid vertical guide rails or guide rails whose inclination to the vertical does not exceed 15°.
To satisfy the condition of inaccessibility to the car, the car dimensions do not exceed:

a) for floor area, 1,0 m^2;

b) for depth, 1,0 m;

c) for height, 1,20 m.

A height greater than 1,20 m is permissible, however, if the car comprises several permanent compartments, each of which satisfies the above requirements

3.37
shut-off valve (robinet d'isolement) (Absperrventil)
a manually operated two-way valve which can permit or prevent flow in either direction

3.38
single acting jack (vérin à simple effet) (einfach wirkender Heber)
jack in which displacement in one direction is by fluid action and in the other by another force

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3.39
sling (étrier) (Rahmen)
the metal framework carrying the car, counterweight or balancing weight, connected to the means of suspension. This sling can be integral with the car enclosure

3.40
traction drive service lift (monte charge à adhérence) (Treibscheiben-Kleingüteraufzug)
a service lift whose lifting ropes are driven by friction in the grooves of the driving sheave of the machine

3.41
travelling cable (câble pendentif) (Hängekabel)
flexible cable between the car and a fixed point

3.42
unlocking zone (zone de déverrouillage) (Entriegelungszone)
a zone, extending above and below the stopping level, in which the car floor must be to enable the corresponding landing door to be unlocked

3.43
user (usager) (Benutzer)
person making use of the services of a service lift installation, except for maintenance purposes

3.44
vendor (vendeur) (Verkäufer)
person or organisation who makes the service lift available for the first use [2)]

3.45
well (gaine) (Schacht)
the space in which the car and the counterweight or balancing weight travels. This space is bounded by the bottom of the pit, the walls or separation screens (if any) in the well and the ceiling of the well

4 Units and symbols

4.1 Units

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

4.2 Symbols

Symbols are explained relevant to the formulae used.

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

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5 Service lift well

5.1 General provisions

5.1.1 The requirements of this clause relate to wells containing one or more service lift cars.

5.1.2 The counterweight or the balancing weight of a service lift shall be in the same well as the car.

5.1.3 Jack(s) of a service lift shall be in the same well as the car. It may extend into the ground or other space.

5.2 Well enclosure

5.2.1 A service lift shall be separated from the surroundings by imperforate walls, floor and ceiling.

The only permissible openings are:

a) openings for landing doors;

b) openings for inspection 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 service lift between the well and the machine room;

f) openings in partition between service lifts or between service lift(s) and lift(s) according to **5.5**;

g) for accessible machine rooms (**0.3.13.2**), perforations in the ceiling separating the well from a machine room.

5.2.2 Inspection doors – Vertically hinged inspection traps

5.2.2.1 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.

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

5.2.2.2.1 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.

If persons are likely to become trapped they shall be capable of being opened from inside the well without a key, even when locked.

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5.2.2.2.2 Operation of the service lift shall automatically depend on maintaining these inspection doors and inspection traps in the closed position. For this purpose electric safety devices in conformity with **14.1.2** shall be employed.

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 (**9.9.2.6.2**).

5.2.2.3 Inspection doors and inspection traps shall be imperforate, 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**).

5.2.2.4 Safe access to these inspection doors and inspection traps shall be provided according to **6.2**.

5.2.3 Ventilation of the well

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

5.2.4 Components inside the well

5.2.4.1 The distance from any point of a landing door sill to any components requiring maintenance, adjustment or inspection shall exceed 600 mm.

Where this is not possible, inspection door(s) or trap(s) shall be provided and positioned to meet the same requirement.

NOTE Attention should be paid to the distance between landings.

5.2.4.2 When components are not installed according to **5.2.4.1**, the well shall be accessible and the car shall be provided with devices allowing it to be immobilised near to any landing. The devices shall fulfil the requirements of **9.7.4** (and the car roof shall comply with **8.3.2.2**).

NOTE Attention should be paid to the distance between landings.

5.3 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 machine, by the jacks, by the guide rails at the moment of safety gear operation, in the case of eccentric load in the car, by the action of the buffers, by loading and unloading the car, etc.

NOTE Relevant National Building Regulations for the building concerned need to be taken into account (see **0.2.5**).

5.4 Protection of any spaces located below the car, the counterweight or the balancing weight

If accessible spaces do exist underneath the service lift well within the area of the car, the counterweight or the balancing weight, precautions according to **9.7** and **10.3.2** shall be taken.

5.5 Protection in the well

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

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

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The width shall be at least equal to that of the counterweight plus 0,10 m on each side.

If this partition is perforate, 4.5.1 of ▌A1⟩ EN ISO 13857:2008 ⟨A1▌ has to be respected;

b) b) or a means in accordance with **5.6.4.2**, limiting the travel of the counterweight or balancing weight at least 1,80 m above the pit floor.

5.5.2 Where the well contains several lifts and/or service lifts there shall be a partition between the moving parts of different service lifts, and between service lifts and lifts.

If this partition is perforate, 4.5.1 of ▌A1⟩ EN ISO 13857:2008 ⟨A1▌ has to be respected.

5.5.2.1 This partition shall extend at least from the lowest point of travel of the car, the counterweight or balancing weight 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.

5.5.2.2 The partition shall extend through the full height of the well if the horizontal distance between the edge of the car roof and a moving part (car, counterweight or balancing weight) of an adjacent lift/service lift is less than 0,50 m.

The width of this 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.

5.6 Headroom and pit

Any device as required in **5.2.4.2** shall allow to ensure in the headroom, a free vertical distance of 1,80 m above the car roof.

5.6.1 Top clearances for traction drive service lifts

5.6.1.1 When the counterweight rests on its fixed stop(s) or its fully compressed buffer(s), the car guide rail length shall be such as would accommodate a further guided travel of at least 0,10 m.

5.6.1.2 When the car rests on its fixed stop(s) or its totally compressed buffer(s), the counterweight guide rail lengths shall be such as would accommodate a further guided travel of at least 0,10 m.

5.6.2 Top clearances for positive drive service lifts

5.6.2.1 The guided travel of the car upwards from the top floor until it strikes the ceiling of the well shall be at least 0,20 m.

5.6.2.2 When the car rests on its fixed stop(s) or its fully compressed buffer(s) the guide rail lengths of the balancing weight shall be such as would accommodate a further guided travel of at least 0,10 m.

5.6.3 Top clearances for hydraulic service lifts

5.6.3.1 When the ram is in its ultimate position, achieved through the means of ram stroke limitation according to **12.3.2.3**, the car guide rail length shall be such as would accommodate a further guided travel of at least 0,10 m.

5.6.3.2 When the car rests on its fixed stop(s) or its fully compressed buffer(s) the guide rail lengths of the balancing weight, if there is one, shall be such as would accommodate a further guided travel of at least 0,10 m.

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5.6.4 Pit

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

After the building-in of guide rail fixings, buffers, any grids, etc., the pit shall be impervious to infiltration of water.

5.6.4.2 When the well is accessible (**0.3.13**), it shall be possible by movable means to guarantee on an area of 0,20 m x 0,20 m, a free vertical distance of 1,80 m between the bottom of the pit and the lowest parts of the car, when it rests on this means.

Any device provided for this purpose shall be permanently attached inside the well to ensure its availability.

5.6.4.3 When the well is accessible (**0.3.13**), there shall be in the pit:

a) a stopping device accessible on opening the door(s) to the pit in conformity with the requirements of **14.2.2** and **15.7**;

b) a socket outlet (**13.6.2**).

5.6.4.4 When the well is not accessible (**0.3.13**), the bottom of the pit shall be able to be cleaned from the outside.

5.7 Exclusive use of the service lift well

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

6 Machine rooms

6.1 General provisions

6.1.1 Machine rooms shall not be used for purposes other than service lifts. They shall not contain ducts, cables or devices other than for the service lift.

6.1.2 If the machine room is not adjacent to the well, the hydraulic piping and the electric wiring connecting the machine room with the service lift well shall be installed in a duct or trough, or in a section of a duct or trough, especially reserved for this purpose (see **12.3.3**).

6.1.3 A floor shall be only required for accessible machine rooms (**0.3.13.2**).

6.2 Access

6.2.1 General

Access to the machine and its associated equipment shall be possible only for authorised persons.

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

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The clear dimensions of openings giving access to the service lift machine and its associated equipment shall allow the possible replacement of the service lift components.

In the open position the doors and traps shall not penetrate into the clear spaces mentioned in **6.3.2**.

6.2.2 Inaccessible machine rooms

Access to the service lift machine and its associated equipment shall be provided at least by inspection doors or traps. The dimensions shall be at least 0,60 m x 0,60 m or, where the size of the machine room does not allow, the openings shall be adapted to suit the replacement of components.

The distance from the sill of inspection doors or traps sill to any components requiring maintenance, adjustment or inspection shall not exceed 600 mm.

6.2.3 Accessible machine rooms

6.2.3.1 Horizontally hinged access trap doors for persons shall give a clear passage at least 0,64 m^2, the smaller side of this area being not less than 0,65 m, and shall be counterbalanced.

All trap doors, when they are closed, shall be able to support two persons, each counting for 1000 N on an area of 0,20 m x 0,20 m at any position, without permanent deformation.

Trap doors shall not open downwards, unless they are linked to retractable ladders. Hinges, if any, shall be of a type which cannot be unhooked.

When a trap door is in the open position, precautions shall be taken to prevent the fall of persons (e.g. a 1,10 m high guard rail).

6.2.3.2 Access doors shall have dimensions of at least 0,60 m x 0,60 m.

The sill shall not be higher than 0,40 m above the access level.

6.2.3.3 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 room without a key, even when locked.

6.3 Construction and equipment of machine rooms

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

6.3.2 Dimensions

6.3.2.1 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.

6.3.2.2 In front of mechanical parts in need of inspection or maintenance, or emergency manual operation (**12.2.4**), there shall be a clear area of at least the height of the door, the horizontal projection of which is a minimum of 0,50 m x 0,60 m, allowing in all cases the door to be fully opened:

a) in front of the component, or

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b) in front of the sill of the inspection door (0,70 m x 0,60 m).

6.3.2.3 In no case shall the clear height for movement or working be less than 1,80 m.

This full height for movement or working is taken to the underside of 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 **0.2.2** for National Regulations and **0.2.5** for negotiations.

6.3.3 Socket outlet

At least one socket outlet (**13.6.2**) shall be provided.

NOTE For lighting, see **13.6**.

6.3.4 Handling of equipment

Provisions with the indication of the safe working load (**15.4.4**), shall be provided in the machine room ceiling or on the beams, conveniently positioned to permit the hoisting of heavy equipment (see **0.2.5** and **0.3.14**).

7 Landing doors

7.1 General provisions

The openings in the well giving access to the service lift car shall be provided with imperforate landing doors.

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.

7.2 Strength of doors and their frames

7.2.1 Doors and their frames shall be constructed in such a way that they will not become deformed in the course of time.

NOTE It is recommended that they are made of metal.

7.2.2 Behaviour under fire conditions

NOTE Landing doors needs to comply with the regulations relevant to the fire protection for the building concerned. ▌A1⟩ EN 81-58 ⟨A1▌ describes a method of the fire test.

7.2.3 Mechanical strength.

7.2.3.1 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 cm^2 in round or square section, is applied at right angles to the panel at any point on either face they shall:

a) resist without permanent deformation;

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b) resist without elastic deformation greater than 15 mm;

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

7.2.3.2 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 sliding doors at the most unfavourable point, the clearances stated in **7.1** may exceed 6 mm.

In any case, the requirements of ▌A1⟩ EN ISO 13857 ⟨A1▌ apply for the minimum distance to moving parts.

7.3 Height and width of entrances

The clear car entrance shall not be smaller than the clear entrance of the landing doors, on all sides.

7.4 Sills, guides, door suspension

7.4.1 Sills

Every landing entrance shall incorporate a sill of sufficient strength to withstand the passage of loads being introduced into the car (see **0.2.5**).

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.

7.4.2 Guides

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

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

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

They shall not leave their guiding even when the suspension elements break.

7.4.3 Suspension of vertically sliding doors

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

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

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

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

7.4.3.5 Panels shall be balanced.

7.5 Protection in relation to door operation

7.5.1 General

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

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Where handles are fitted on manually operated doors, the minimum distance in the direction of movement of the doors between the handle and any other part of the service lift shall not be less than 50 mm. This distance can be reduced to 30 mm for handles which cannot be grasped.

7.5.2 Power operated doors

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

To this effect, the following requirements shall be met:

7.5.2.1 Sliding doors

7.5.2.1.1 The effort needed to prevent the door closing shall not exceed 150 N.

7.5.2.1.2 A protective device shall automatically initiate re-opening of the door in the event of a person or goods being struck, or about to be struck, by the door during the closing movement.

Such a device may be neutralised where the closing of the doors is manually initiated at the entrance with the open door.

The effect of the device may be neutralised during the last 50 mm of travel of each leading door panel.

7.5.2.1.3 To avoid the risk of shearing during operation, the exterior face of power operated sliding doors shall not have recesses or projections exceeding 3 mm. Edges of these shall be chamfered in the opening direction of movement.

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

7.5.2.2 Other types of doors

When using other types of doors, e.g. swing doors, with power operation, where there is a risk when opening or closing, of striking persons, precautions similar to those laid down for power operated sliding doors shall be taken.

7.6 Local lighting and 'car here' signal lights

7.6.1 Local lighting

The natural or artificial lighting shall be at least 50 lux at the sill of the landing doors, such that the service lift can be safely used (see **0.2.5**).

7.6.2 'Car here' indication

In the case of landing doors with manual opening, the user needs to know, before opening the door, whether the car is there or not. The signal used shall remain all the time that the car remains there.

7.7 Locking and closed landing door check

7.7.1 Protection against the risk of falling

It shall not be possible in normal operation to open a landing door (or any of the panels in the case of a multi-panel door) unless the car has stopped, or is on the point of stopping, in the unlocking zone of that door.

This does not apply in the case of **7.7.3.1**.

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The unlocking zone shall not extend more than 0,10 m above and below the landing level.

7.7.2 Protection against shearing

7.7.2.1 It shall not be possible in normal operation to start the service 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.

7.7.2.2 Operation with doors open is permitted in the unlocking zone (**7.7.1**) to permit levelling, re-levelling or electrical anti-creeping at the corresponding floor level, provided the requirements of **14.2.1.2** and **14.2.1.3** are met.

7.7.3 Locking and emergency unlocking

Each landing door shall be provided with a locking device satisfying the requirement of **7.7.1**.

This device shall be protected against deliberate misuse.

7.7.3.1 Locking

7.7.3.1.1 For service lifts with:

a) rated speed ≤ 0,63 m/s, and

b) door height ≤ 1,20 m, and

c) height of the door sill ≥ 0,70 m above the floor level,

the locking need not be controlled electrically. It is then not necessary for the landing door locking to precede the movement of the car.

However, when the car leaves the unlocking zone, the locking element shall automatically close and, in addition to the normal locking position, there shall be at least a second locking position where the door closing electrical control device (**7.7.4**) remains inactive.

If any of the above conditions are not met the lock shall comply with the requirements of EN 81-1 or EN 81-2.

The requirements of EN 81-1:1998 or EN 81-2:1998, 7.7.5 need not apply where service lifts are installed in an area where the public is not allowed access.

7.7.3.1.2 For hinged doors, locking shall be effected as near as possible to the vertical closing edge(s) of the doors, and maintained even in the case of panels sagging. The locking element shall engage by at least 10 mm.

7.7.3.1.3 For sliding doors locking shall be effected as near as possible to the closing edge of the leading panel. For vertical sliding centre opening doors the lock shall be located on the upper panel.

7.7.3.1.4 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.

7.7.3.1.5 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.

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

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

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

7.7.3.2 Emergency unlocking

Each of the landing doors shall be capable of being unlocked from the outside with the aid of a key, which will fit the unlocking triangle as defined in **annex B**.

Keys of this type shall be given only to a responsible person. They shall be accompanied by a written instruction detailing the essential precautions to be taken in order to avoid accidents which could result from an unlocking which was not followed by effective re-locking.

After an emergency 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 car 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 car is outside the unlocking zone.

7.7.4 Electrical device for proving the landing door closed

7.7.4.1 Each landing door shall be provided with an electrical device in conformity with **14.1.2** for proving the closed position (door contact), so that the conditions imposed by **7.7.2** are satisfied.

7.7.4.2 In the case of sliding landing doors, coupled with car 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.

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

7.7.5 Sliding doors with multiple, mechanically linked panels

7.7.5.1 If a sliding door comprises several directly mechanically linked panels, it is permitted:

a) to place the device required in **7.7.4.1** or **7.7.4.2**, on a single panel, and

b) to lock only one panel, provided that this single locking prevents the opening of the other panel(s) by hooking the panels in the closed position in case of telescopic doors.

7.7.5.2 If a sliding door comprises several indirectly, mechanically linked panels (e.g. by rope, belt or chain), it is permitted to lock only one panel provided that this single locking will prevent the opening of other panels, and that these are not fitted with a handle.

The closed position of the other panel(s), not locked by the locking device, shall be proved by an electric safety device in conformity with **14.1.2**.

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8 Car, counterweight and balancing weight

8.1 Height of car

See **1.4**.

8.2 Available car area and rated load

See **1.1** and **1.4**.

8.3 Walls, floor and roof of the car

8.3.1 The car shall be completely enclosed by walls, floor and roof, the only permissible openings being the entrance for loading and unloading.

8.3.2 The walls, floor (see **0.2.5**) and roof shall have sufficient mechanical strength. The assembly comprising the sling, guide shoes, walls, floor and roof of the car shall have sufficient mechanical strength to resist the forces which will be applied in normal service lift operation, in the operation of the safety gear if it exists, the rupture valve if it exists, or the impact of the car on its buffer(s) or its fixed stop(s).

8.3.2.1 Each wall of the car shall have a mechanical strength such that when a force of 300 N, being evenly distributed over an area of 5 cm² in round or square section, is applied at right angles to the wall at any point from the inside of the car towards the outside, it shall:

a) resist without any permanent deformation;

b) resist without elastic deformation greater than 15 mm.

8.3.2.2 The car roof of a service lift in a well regarded as accessible to maintenance persons (0.3.13) shall be able to support at any point the mass of two persons, each counting for 1000 N on an area of 0,20 m x 0,20 m without permanent deformation.

8.3.2.3 Pulleys and/or sprockets fixed to the car sling shall have protection according to **9.6** if within reach from outside the well.

8.3.3 The walls, floor and roof shall not be made of materials likely to become dangerous through too great a flammability or through the nature and quantity of gas and fumes they may generate.

8.4 Apron and automatic bridging sills

8.4.1 Apron

8.4.1.1 Each car sill shall be fitted with an apron which extends to the full width of the clear landing entrance which it faces. This vertical section shall be extended downwards by a chamfer whose angle with the horizontal plane shall be greater than 60°. The projection of this chamfer of the horizontal plane shall be not less than 20 mm.

8.4.1.2 The height of the vertical portion shall be at least equal to that of the effective unlocking zone.

8.4.2 Automatic bridging sills

In the case of a service lift with vertical sliding doors and with service position located at ground level, the apron defined in **8.4.1** may be replaced by automatic bridging sills fixed at the landing levels which shall:

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a) withstand the normally foreseeable loads (see **0.2.5**) during loading and unloading operations;

b) move automatically in all cases, e.g. by gravity or assistance, into service position upon the opening of the landing doors;

c) have a width equal to at least the width of the car entrance;

d) have a length greater than or equal to the greater of the following two values:

   1) half the unlocking zone plus 50 mm;

   2) the distance separating the car floor from the landing sill plus 20 mm;

e) overlap the car floor by at least 20 mm in all positions of the car;

f) lift up under the effect of the closing of the landing doors.

8.5 Car entrance

In the cases where the goods intended to be transported (see **0.2.5**) could come into contact with the wall(s) of the well during travel suitable means, e.g. retainers, barriers, roller blinds, car doors, etc., shall be provided at car entrances.

Moveable means shall have an electric safety device in conformity with **14.1.2** proving the closed position.

Particular attention shall be given to cars constructed with openings on opposite or adjacent sides to prevent goods from projecting outside the car (see examples in **annex F**).

8.6 Car doors

8.6.1 The car doors when they exist shall be:

a) imperforate, or

b) of mesh, or

c) perforated panel form.

The dimensions of the mesh or perforations shall be chosen with consideration to the loads to be transported.

8.6.2 The car doors when closed shall, apart from the necessary clearances, completely close the car entrances.

8.6.3 Sills, guides, door suspension

The provisions of **7.4** relevant to car doors shall be fulfilled.

8.7 Protection during operation of doors

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

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8.7.1 Power operated sliding doors

8.7.1.1 The effort needed to prevent the door closing shall not exceed 150 N.

8.7.1.2 If the car door is closed before the landing door, means in accordance with **7.5.2.1** shall be provided.

8.8 Counterweight and balancing weight

The use of a balancing weight is defined in **12.2.1.1** for the electric service lifts.

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

a) either 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.

8.8.2 Pulleys and/or sprockets fixed to the counterweight or to the balancing weight shall have protection according to **9.6**, if within reach from outside the well.

9 Suspension, precautions against free fall, descent with excessive speed and creeping of the car

Suspension means for electric service lifts and indirect acting hydraulic service lifts and/or for connection between the car and a balancing weight of hydraulic service lifts shall comply with the requirements of **9.1** to **9.6**.

9.1 Suspension

9.1.1 Cars, counterweights and balancing weights shall be suspended from steel wire ropes, or steel chains with parallel links (Galle type) or roller chains.

9.1.2 The ropes shall correspond to the following conditions:

a) the ratio between the minimum breaking load, in newtons, of one suspension rope or one chain and the maximum force, in newtons, in this rope or chain, when the car 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) 1570 N/mm^2 or 1770 N/mm^2 for ropes of single tensile, or

   2) 1370 N/mm^2 for the outer wires and 1770 N/mm^2 for the inner wires of ropes of dual tensile;

c) the other characteristics (construction, extension, ovality, flexibility, tests....) shall at least correspond to those specified in the relevant European standards.

9.1.3 The minimum number of ropes or chains shall be two.

Ropes or chains shall be independent.

The use of a single rope -or chain- is permitted on positive drive electric service lifts provided the service lift fulfils the six following conditions:

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