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Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods - Part 41: Vertical lifting platforms intended for use by persons with impaired mobility

Règles de sécurité pour la construction et l'installation des ascenseurs - Élévateurs spéciaux pour le transport des personnes et des charges - Partie 41: Plate-formes élévatrices verticales à l'usage des personnes à mobilité réduite

Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen - Spezielle Aufzüge für den Transport von Personen und Gütern - Teil 41: Senkrechte Plattformaufzüge bestimmt für den Einsatz von Personen mit eingeschränkter Beweglichkeit

This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 10.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (prEN 81-41:2008) has been prepared by Technical Committee CEN/TC 10 “Lifts, escalators and moving walks”, the secretariat of which is held by AFNOR.

This document is currently submitted to the Formal Vote.

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 EU Directive(s).

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

Introduction

The population of Europe is ageing and the prevalence of disability, including disability associated with the ageing process, is increasing. Older people and people with disabilities at present are estimated to number some 80 million people – a large and growing proportion of the European Union population. The changing demography presents both opportunities and challenges for the Union. The economic, social and cultural potential of older people and people with disabilities is underexploited at present. However there is a growing recognition that society needs to exploit this potential for the economic and social benefit of society generally.

This is one of the reasons that led to this standard on vertical lifting platforms for people with reduced mobility being one means to provide accessibility to buildings.

This standard is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type A and type 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.

The lifting platforms defined in this standard are suitable for type A and type B wheelchairs as defined in prEN 12183 and/or prEN 12184.

Those items relevant to lifting platforms referenced within EN 81-70 have been included within this standard.

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

It is essential that minimum passageways conform to national building regulations and are not obstructed by any open door or trap and/or any protection means provided for working areas outside of the enclosed liftway where fitted according to the maintenance instructions.

Assumptions

With the aim of clarifying the intentions of the standard and avoiding doubts when applying it, the following assumptions were made when producing it:

Vertical lifting platforms are installed in both new and existing buildings;

— components without specific requirements are:

a) designed in accordance with the usual engineering practice and calculation codes, including all failure modes;

b) of sound mechanical and electrical construction;

c) general hazards due to hydraulic, pneumatic, etc. equipment are dealt with according to relevant B level standards for common use.

d) Materials known to be harmful materials, such as asbestos are not to be used as part of the machine;

— components are kept in good repair and working order, in accordance with the maintenance manual, so that the required characteristics remain despite wear;

— by design of the load bearing elements, a safe operation of the machine is assured for loading ranging from zero to, the dynamic operation maximum working load and static loading, to the maximum static overload;

— to ensure the safe functioning, the operating temperature range of the equipment has to take into account the conditions of the place of use of the machinery, inside the maximum range of ambient temperature between + 5 °C and + 40 °C. For very hot or cold environments extra requirements may be necessary.

— negotiations have been made between the customer and the manufacturer about:

  — environmental conditions;

  — civil engineering problems;

  — other aspects related to the place of installation;

  — the use and places of use of the machinery;

  — the place of installation allows a safe use for the machine;

  — any additional fire protection requirements;

  — suitability for the user (see Annex B).

1 Scope

1.1 This European Standard deals with safety requirements for construction, manufacturing, installation, maintenance and dismantling of electrically powered vertical lifting platforms affixed to a building structure intended for use by persons with impaired mobility:

— travelling vertically between predefined levels along a guided path whose inclination to the vertical does not exceed 15°;

— intended for use by persons with or without a wheelchair;

— supported or sustained by wire ropes, chains, rack and pinion, hydraulic jack (direct or indirect), screw and nut, guided chain, friction/traction between wheels and the rail, or scissors mechanism;

— with enclosed liftways;

— with a speed not greater than 0,15 m/s;

— with platforms where the carrier is not completely enclosed

1.2 This standard deals with all significant hazards relevant to lifting platforms, when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

1.3 This European Standard does not specify the additional requirements for:

— operation in severe conditions (e.g. extreme climates, strong magnetic fields);

— lightning protection;

— operation subject to special rules (e.g. potentially explosive atmospheres);

— handling of materials, the nature of which could lead to dangerous situations;

— platform lifts whose primary function is the transportation of goods;

— platform lifts whose carriers are completely enclosed;

— vertical lifting platforms prone to vandalism;

— hazards occurring during manufacture;

— earthquakes, flooding;

— fire fighting, evacuation and behaviour during a fire;

— noise and vibrations;

— the design of concrete, hardcore, timber or other foundation or building arrangement;

— the design of anchorage bolts to the supporting structure;

— type C wheelchairs as defined in prEN 12183 and/or prEN 12184.

— NOTE For the actual type of machinery, noise is not considered a significant nor relevant hazard.

1.4 This standard is not applicable to Vertical Lifting Platforms intended for use by persons with impaired mobility which are manufactured before the date of its publication as an EN.

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 81-58*, Safety rules for the construction and installation of lifts - Examination and tests - Part 58: Landing doors fire resistance test*

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

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

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

EN 12016:2004, *Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks - Immunity*

prEN 12183, *Manual wheelchairs - Requirements and test methods*

prEN 12184, *Electrically powered wheelchairs, scooters and their chargers — Requirements and test methods*

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

EN 13411, *Terminations for steel wire ropes*

EN 50214, *Flat polyvinyl chloride sheathed flexible cables*

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- 32:1998)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

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*, Discrete semiconductor devices and integrated circuits - Part 5: Optoelectronic devices*

EN 60947-1:2007, *Low-voltage switchgear and controlgear - Part 1: General rules (IEC 60947-1:2007)*

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)*

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

EN 60950-1:2006, *Information technology equipment - Safety - Part 1: General requirements (IEC 60950-1:2005, modified)*

EN 61249-2, *Materials for printed boards and other interconnection structures - Part 2: Sectional specification set for reinforced base materials, clad and unclad*

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

EN 62326-1, *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 13849-1, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850, *Safety of machinery - Emergency stop - Principles for design (ISO 13850:2006)*

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

ISO 606, *Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets*

ISO 6336, *Calculation of load capacity of spur and helical gears*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

IEC 60417-DB, *Graphical symbols for use on equipment*

3 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
balancing weight
mass which saves energy by balancing all/or part of the mass of the unloaded lifting platform

3.2
competent person
person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required work to be carried out safely

3.3
down direction valve
electrically controlled valve in a hydraulic circuit for controlling the descent of the lifting platform

3.4
drive system
system that causes the lifting platform to move under power input

3.5
drive unit
unit, including the motor, that drives and stops the lifting platform

3.6
electric safety chain
the total of the electric safety devices, which can either be switches or safety circuits, connected in series with each other

3.7
electrical safety circuit
electrical or electronic circuit with an equivalent degree of safety to a switch containing electrical safety contacts

3.8
electrical safety contact
contact in which the separation of the circuit breaking elements is made by positive means

3.9
electrical safety device
either an electrical switch incorporating one or more electrical safety contacts, or a safety circuit

3.10
enclosed liftway
space that is fully bounded by the bottom of the pit and a solid enclosure (but not necessarily a ceiling) and landing doors

3.11
existing building
building which has been previously occupied and constructed prior to the requirement for a lifting platform

3.12
final limit device
electrical safety device operated by the lifting platform in the event of over-travel of the normal operation stop

3.13
full load pressure
static pressure exerted on the piping directly connected to the jack, the platform with the rated load being at rest at the highest landing level

3.14
guide rail
rigid components that provide guiding for the platform

3.15
guided chain
chain, which can be either fixed or moving, and which is completely guided over its entire length such that it can transmit a load either in thrust or tension

3.16
guided chain system
platform supported, raised and lowered by means of one or more chain transmission units

3.17
impaired mobility
in the context of this standard it means difficulty in using stairs because of impairment. Some examples, but not restricted to are; wheelchair user, person with pushchair, person with walking difficulties, walking aids, carers for persons with impaired mobility and/or children with impaired mobility and elderly persons

3.18
lifting platform
device permanently installed to serve predefined landings comprising a guided platform whose characteristics are primarily intended to permit the access of persons with impaired mobility

3.19
load carrying nut
internally threaded component which carries the load in conjunction with a screw

3.20
maximum static overload
rated load + overload possible as a relationship of EN 81-1 and EN 81-2 floor area calculations

3.21
maximum working load
rated load + overload

3.22
mechanical blocking device
device that, when set in position, guarantees a minimum safety space beneath the platform for the purposes of maintenance and inspection

3.23
over-speed governor
device which, when the lifting platform attains a pre-determined speed, causes the lifting platform to stop and if necessary causes the safety gear to be applied

3.24
overload
additional load which is permissible based upon one person

3.25
pressure relief valve
valve which limits the pressure to a pre-determined value by exhausting fluid

3.26
public access
any location where the user is unknown

3.27
rack
bar with teeth with which a driving pinion engages to form a slip free driving means converting rotary motion into linear motion

3.28
rated load
load for which the equipment has been designed

3.29
rated speed
speed of the lifting platform for which the equipment has been designed

3.30
restrictor
valve in which the inlet and outlet are connected through a restricted passageway

3.31
rupture valve
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

3.32
safety circuit
electrical or electronic circuit with an equivalent degree of safety to a circuit containing electrical safety contacts

3.33
safety factor
ratio, either of the yield load, or the ultimate tensile load to the load that can be imposed upon a member by the rated load for a particular material under static or dynamic conditions

3.34
safety gear
mechanical device for stopping and maintaining the platform stationary in case of over-speeding in the downward direction and/or breaking of the suspension

3.35
safety nut
internally threaded component which is linked to the load carrying nut but is unloaded during normal service which is capable of carrying the load if the load carrying nut should break

3.36
screw
external threaded component which carries the load in conjunction with the load carrying nut and in certain circumstances the load imposed by the safety nut

3.37
self-sustaining system
a screw and nut system that, under free running conditions ensure that the speed of the platform decreases

3.38
sensitive edge
device attached to an edge to provide protection against a trapping, shearing or crushing hazard

3.39
"shut-off" valve
a manually operated two-way valve which can permit or prevent flow in either direction

3.40
slack rope/chain device
device, or combination of devices, arranged to stop the lifting platform should any suspension rope or chain slacken by a pre-determined amount

3.41
stopping safety device
mechanical device for stopping the relative rotation between screw and nut in case of over-speeding and stopping the lifting platform and maintaining it stationary

3.42
toe guard
vertical component extending downwards from the platform entrance

3.43
transmission unit
assembly comprising the chain, and its associated elements, sprocket wheel, return housing, guided elements for the chain

3.44
unlocking zone
zone, extending above and below a landing, in which the platform floor must be positioned to enable the corresponding landing door/s to be unlocked

3.45
user
person making use of the services of the platform

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 standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

Table 1 show the hazards which have been identified and where the corresponding requirements have been formulated in this standard, in order to limit the risk or reduce these hazards in each situation.

The significant hazards are based upon EN ISO 14121-1. Also shown are the subclause references to the safety requirements and/or protective measures in this standard.

Before supplying any platform lift, it is important to review the risks in Table 1 to check that all site specific hazards have been identified in this clause.

NOTE Hazards resulting from allergic reactions to persons are not addressed in this standard, but advice on such materials is given in Annex D of EN 81-70:2003.

Table 1 — Significant hazards relating to the general design and construction of lifting platforms

	Hazards	Relevant clauses in prEN 81-41
1	**Mechanical hazards** a) shape; b) relative location; c) mass and stability(potential energy of elements may move under the effect of gravity); d) mass and velocity (kinetic energy of elements in controlled motion); e) inadequacy of energy inside the machinery e.g.);	5.1.5, 5.3, 5.9 5.4.6, 5.4.1
	— accumulation of energy inside the machinery e.g.: f) elastic elements (springs); g) liquids and gasses under pressure; h) the effect of vacuum.	5.4.10
1.1	Crushing hazard	5.1.3, 5.1.4.1.2, 5.1.4.2.1, 5.5.6, 5.6.1, 5.6.3, 5.6.5, 5.9
1.2	Shearing hazard	5.1.3, 5.5.5, 5.6.1, 5.6.3, 5.6.5, 5.8.4, 5.9
1.3	Cutting or severing hazard	5.1.4.1.2, 5.1.4.4.1.1, 5.5.5, 5.6.3, 5.6.5, 5.8.2, 5.9
1.4	Entanglement hazard	5.1.3, 5.1.4.1.2, 5.1.4.4.1.1, 5.5.5, 5.6.3, 5.9, 5.4.1.7
1.5	Drawing-in or trapping hazard	5.1.3, 5.1.4.1.2, 5.1.4.4.1.1, 5.1.11.3, 5.4.5.4.4, 5.4.5, 5.5.5, 5.6.5, 5.8.4, 5.9
1.6	Impact hazard	5.1.4.1.2, 5.1.4.4.1.1, 5.5.6, 5.8.7
1.7	Stabbing or puncture hazard	5.9
1.8	Friction or abrasion hazard	5.1.3, 5.6.3, 5.9

(to be continued)

Table 1 *(continued)*

	Hazards	Relevant clauses in prEN 81-41
1.9	High pressure fluid ejection hazard	5.1.4.4.1.1, 5.4.10
1.10	Falling hazard	5.1.3, 5.1.4.1.2, 5.1.4.2.3, 5.3, 5.6.3, 5.8.2, 5.8.3
2	**Electrical hazards**	
2.1	Electrical contact of persons with live parts	5.1.4.4.1.1, 5.5.1, 5.5.3, 5.5.8, 5.5.13
2.2	Electrical contact of persons with parts which have become live under faulty conditions	5.5.3
2.3	Approach to live part under high voltage	5.5.1.2, 5.5.8, 5.5.2
3	**Thermal hazards**	
3.1	Burns and scalds	5.1.4.4.1.1, 5.1.5, 5.5.12, 5.5.14
3.2	Health-damaging effects	5.1.5, 5.5.14.9
6	**Hazards generated by radiation**	5.5.9
7.1	Contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	5.5.14.9
7.2	Fire or explosion	5.1.5, 5.5.14.9
8	**Hazards generated by neglecting ergonomic principles in machine design**	
8.1	Unhealthy postures or excessive effort	5.1.4.2.2, 5.1.8, 5.4.3, 5.5.15, 5.8.2, 5.8.7
8.2	Inadequate consideration of human hand/arm or foot/leg anatomy	5.4.3, 5.5.14, 5.8.7
8.4	Inadequate area lighting	5.5.3, 5.5.5
8.6	Human error	5.4.3, 5.5.15
8.7	Inadequate design, location or identification of manual controls	5.5.15
8.8	Inadequate design or location of visual display units	5.5.15
9	Hazard combinations	Considered satisfied when all individual hazards have been addressed
10	Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders	
10.1	Failure/disorder of the control system	5.1.12, 5.4.2, 5.4.3, 5.5.11, 5.5.7
10.2	Restoration of the energy after an interruption	5.5.11
10.3	External influences on the electrical equipment	5.1.11
10.4	Other external influences (gravity, wind, etc.)	5.1.4, 5.1.11
10.5	Errors in software	5.5.15.5, 5.5.15.6
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities)	5.4.3, 5.5.15
11	Impossibility of stopping the machine in the best possible conditions	5.5.15.5, 5.5.15.7
11.1	Unsafe position	5.4.2
11.2	Over-speeding	5.3, 5.4.2
13	**Failure of the power supply**	
13.1	Over-speeding	5.3, 5.4.2
13.2	Unexpected .start	5.4.2, 5.5.11, 5.5.13
13.3	Change of direction	5.5.6.4, 5.5.11, 5.5.13
13.4	Loss of memory	5.5.11, 5.5.14
13.5	Unsafe position	5.4.2
13.6	Entrapment	5.4.3, 5.5.4, 5.5.11, 5.5.14, 5.5.16, 5.8.6
14	**Failure of the control circuit**	
14.1	Errors on software	5.5.15.5, 5.5.15.6
14.2	Failure to stop	5.5.6, 5.5.7, 5.5.11, 5.5.11.5, 5.5.17
14.3	Unexpected stop	5.5.6, 5.5.7, 5.5.11, 5.5.14, 5.5.17
14.4	Unexpected start	5.5.1.1, 5.5.6, 5.5.7, 5.5.8.2, 5.5.12, 5.5.13, 5.5.11.5, 5.5.17

(to be continued)

Table 1 *(continued)*

	Hazards	Relevant clauses in prEN 81-41
14.5	External influences	5.4.3, 5.5, 5.5.8, 5.5.17
14.6	Unexpected start See 14.4 above	
14.7	Failure to start	5.4.3, 5.5.6, 5.5.11.3, 5.5.17
14.8	Maintenance Operation	5.5.1, 5.5.5, 5.5.6.3, 5.5.6.4, 5.5.11, 5.5.13
14.9	Unexpected Activation	5.5.1.1, 5.5.13, 5.5.17
14.10	Brake remains lifted	5.4.2
14.11	Prevent stopping	5.4.2, 5.5.11
14.12	Ineffective protection	5.5.1
14.13	Isolation	5.5.1
15	**Errors of fitting**	**5.3, 5.5.13**
16	**Break-up during operation**	
16.1	Stress failure (and fatigue)	5.1.2, 5.1.10, 5.1.6, 5.3, 5.4.1, 5.4.2, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.4.10
16.2	Falling	5.1.4.1.2, 5.1.4.2.3, 5.1.6, 5.3, 5.4.1, 5.4.2, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.4.10
17	**Falling or ejected objects or fluid**	
17.1	Falling objects	5.6.3, 5.6.4, 5.6.5, 5.8.2, 5.8.3
18	**Loss of stability / overturning of machinery**	
18.1	Overturning	5.1.7, 5.2.1
18.2	Falling	5.1.7, 5.2.1
19	**Slip, trip and fall of persons (related to machinery)**	
19.1	Slipping	5.5.4, 5.8.4.6, 5.9
19.2	Tripping	5.4.2, 5.5.4, 5.5.15.7, 5.8.4.6, 5.8.5, 5.9
19.3	Falling	5.1.4.3.1, 5.5.4, 5.5.15.7, 5.6.3, 5.6.4, 5.6.5, 5.8.2, 5.8.3, 5.8.5,
19.4	Falling from the landing	5.1.4.3.1, 5.5.4, 5.6.3, 5.6.4, 5.8.2, 5.8.3, 5.8.4, 5.8.4.7, 5.8.5
27	**Mechanical hazards and hazardous events**	
27.1	From load falls, collisions, machine tipping caused by:	5.6.3
27.1.1	Lack of stability	5.2.1.1, 5.2.1.2
27.1.2	Uncontrolled loading- overloading- overturning moments exceeded	5.1.5, 5.1.7, 5.4.2, 5.4.3
27.1.3	Uncontrolled amplitude of movements	5.1.5, 5.4.2, 5.5.7
27.1.5	Inadequate holding devices/accessories	5.9.7
27.2	from access of persons to load support	5.4.4, 5.4.5, 5.4.6, 5.3, 5.4.7, 5.4.8, 5.8
27.3	from derailment	5.1.10, 5.2.1
27.4	from insufficient mechanical strength of parts	5.1.2, 5.1.10, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.4.10, 5.9, 5.8.4.7, 5.6.3.3, 5.6.3.4
27.5	from inadequate design of pulleys, drums	5.4.5.4
27.6	from inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	5.4.5, 5.4.8
27.7	from lowering of the load under the control of the friction brake	5.4.2 5.4.3
27.8	from abnormal conditions of assembly / testing / use / maintenance	7, 6.3
27.9	From the effect of load on the persons (impact by load or counterweight)	5.8.5, 5.8.12

(to be continued)

Table 1 *(end)*

	Hazards	Relevant clauses in prEN 81-41
34	**Mechanical hazards and hazardous events due to:**	
34.1	Inadequate mechanical strength – inadequate working coefficients	5.1.6, 5.1.8, 5.1.10, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.8, 5.4.9, 5.4.10, 5.6.3, 5.9
34.2	Failing of loading control (include overload device)	5.1.7
34.3	Failing of controls in person carrier (function, priority)	5.5.7, 5.5.11, 5.5.15.3
34.4	Over-speed of persons carrier	5.1.5, 5.3, 5.4.2
34.5	Loss of integrity of fixings	5.1.10, 5.8.4.7, 5.8.5
35	**Falling of person from person carrier**	**5.6.3.3, 5.6.3.4, 5.8.5**
36	**Falling or overturning of person carrier**	
36.1	Preventing of falling or overturning	5.1.6, 5.1.7, 5.3
36.2	Acceleration and braking	5.1.5, 5.3, 5.4.2
37	**Human error, human behaviour**	**7.3**

5 Safety requirements and/or protective measures

5.1 General requirements for lifting platforms

5.1.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100 for hazards relevant but not significant, which are not dealt with in this document (e.g. sharp edges).

It shall be ensured that the dimensions specified in this standard are maintained, despite wear. Consideration shall also be given to the need for protection against the effects of corrosion. The transmission of noise and vibration to any surrounding walls and other supporting structures shall be minimised.

All materials shall be asbestos free.

5.1.2 Pattern of use

The mechanical design of the lifting platform shall take account of the frequency of usage to which it will be subjected.

5.1.3 Guarding

Components (for example gearing of the drive unit) shall be guarded to prevent the risk of personal injury. Access panels shall be secured by means requiring the use of a tool or key for their release. Their fixing systems shall remain attached to the guards or to the machinery when the guards are removed.

Guarding shall be designed and constructed in accordance with EN 953, EN ISO 13857 and EN 349.

5.1.4 Access for maintenance, repair and inspection

5.1.4.1 Working areas on the platform

5.1.4.1.1 General

Where machinery is to be maintained or inspected from the platform and if this work requires movement of the platform or is likely to result in uncontrolled and unexpected platform movement, the following applies.

5.1.4.1.2 Any kind of uncontrolled and unexpected movement of the platform resulting from maintenance/inspection that can be dangerous to persons carrying out maintenance/inspection work shall be prevented by a mechanical device. Such device shall ensure a minimum 300 mm clear space between the parts of the platform and rigid parts of the liftway where there is a risk of crushing. Monitoring of this device to ensure that the device is in the passive position before normal operation, shall be by means of an electrical safety device in accordance with 5.5.11.

5.1.4.1.3 Any necessary devices for emergency operation and for dynamic tests (such as brake tests, traction tests, safety gear tests) shall be arranged so that they can be operated from outside of the enclosed liftway.

5.1.4.2 Working areas under the platform

5.1.4.2.1 Where the lifting platform is to be maintained or inspected from underneath the platform the following applies:

a) If a clear space of 500 mm minimum is not available under the platform when at its lowest position, a manually positioned mechanical blocking device shall be provided to enable the platform to be held in a raised position and to create a free distance of at least 500 mm between the floor of the working area and the lowest parts of the platform. The device shall be able to stop the platform travelling downwards at rated speed with maximum working load.

b) The blocking device shall be in position before entering the pit and shall be provided with an electric safety device that detects the correct positioning of the mechanical blocking device and which will disable the car and landing controls and enable any inspection control station. The function shall be clearly marked with its intended purpose and position.

c) the opening of any door providing access to the pit shall be by use of a key and prevent normal operation of the lifting platform; visible information shall be available if the blocking device is not in its active position. The return of the platform to normal service shall only be made by operation of a reset device placed outside of the liftway and accessible to authorised persons only;

d) where it is necessary to move the platform from the pit, an inspection control station according to 5.5.18 shall be available for use.

e) the floor of the pit shall be able to support the loads and forces (N) imposed to it and to support at any position the mass of 2 persons, each counting for 1 000 N without permanent deformation.

5.1.4.2.2 When the platform is in the position according to 5.1.4.2.1 a), it shall be possible to leave the working area easily and safely.

5.1.4.2.3 Any necessary devices for emergency operation and for dynamic tests (such as brake tests, traction tests, safety gear tests, shall be arranged so that they can be operated from outside of the enclosed liftway.

5.1.4.3 Working areas outside of the enclosed liftway

5.1.4.3.1 When the machinery is in the enclosed liftway and is intended to be maintained/inspected from outside of the enclosed liftway, access to this equipment shall only be possible by a door/trap in conformity with 5.6.5.

5.1.4.4 Machinery outside of the enclosed liftway

5.1.4.4.1 Machinery cabinet.

5.1.4.4.1.1 If any part of machinery is located outside of the liftway e.g. control panel, drive machine, it shall be located inside a cabinet.

5.1.4.4.1.2 The machinery cabinet shall consist of imperforate walls, floor, roof and door(s).

The door(s) shall:

a) not open towards the inside of the cabinet;

b) be provided with a key-operated lock.

The only permissible openings are:

a) ventilation openings;

b) necessary openings for the functioning of the lift between the liftway and the machinery cabinet;

c) vent openings for escape of gases and smoke in the event of fire. These openings when accessible to non-authorised persons shall comply with the following requirements:

   — protection according to EN ISO 13857,

   — Table 5 against contact with danger zones;

   — IP2XD according to EN 60529

d) capable of being re-closed and re-locked without a key.

5.1.5 Rated speed

The rated speed of the lifting platform shall not be greater than 0,15 m/s.

5.1.6 Rated load

The rated load shall be calculated at not less than 250 kg/m^2 of the clear loading area, excluding handrails.

NOTE 250 kg/m^2 takes account of the surface and the load of a person alone using electrically powered class A or B wheelchairs.

The maximum permissible rated load shall be 500 kg.

The minimum values shall be as follows:

a) lone user either standing or in a type A wheelchair: 250 kg;

b) user in a type A or B wheelchair with an attendant; 315 kg.

Type A or type B wheelchairs as defined in prEN 12183 and/or prEN 12184.

NOTE See Table 2.

5.1.7 Load control

The platform shall be fitted with a device to prevent normal starting, excluding re-levelling of hydraulic drives in the event of overload on the platform. The overload is considered to occur when the rated load is exceeded by 75 kg.

In the event of overload:

a) users shall be informed by an audible and visible signal on the platform;

b) doors shall remain unlocked or unlockable in the unlocking zone.

5.1.8 Platform dimensions

5.1.8.1 The clear loading area of the platform including any sensitive edge, photo cell or light curtain, but excluding hand rails, shall not exceed 2 m^2.

5.1.8.2 For new buildings the plan dimensions of the platform floor, including any sensitive edge, photo cells or light curtain, but excluding handrails, to accommodate a standard type A or type B wheelchair according to prEN 12183 and/or prEN 12184, shall be equal to or greater than those given in Table 2.

For existing buildings where space is not available, other dimensions may be considered. Local building regulations should be observed.

Table 2 — Minimum dimensions of platform

Dimensions in millimetres

Principal use	**Minimum plan dimensions** (width × length)	**Minimum rated load** Kg
Type A and B wheelchairs with an attendant and adjacent entrances	1 100 × 1 400	385
Type A and B wheelchairs with an attendant	900 × 1 400	315
Lone user, either standing or in a type A wheelchair	800 × 1 250	250

5.1.8.3 In buildings with public access, the platform length shall not be less than 1400 mm, to enable sufficient space for an attendant.

5.1.9 Mechanical strength of the platform

Mechanical strength of the platform shall be such that foreseeable misuse (e.g.: overload of persons) is taken into consideration. Therefore the platform and its associated suspension attachments, shall be designed to support the load as determined in Table 3 with a static test coefficient of 1,25 (see 4.1.2.3 of the machinery directive).

Table 3

Maximum static overload, mass kg	Maximum available platform area m²	Maximum static overload, mass kg	Maximum available platform area m²
100	0,37	525	1,45
180	0,58	600	1,60
225	0,70	630	1,66
300	0,90	675	1,75
375	1,10	750	1,90
400	1,17	800	2,00
450	1,30		
For intermediate loads the area is determined by linear interpolation			

5.1.10 Resistance to operating forces

5.1.10.1 The complete lifting platform installation shall resist, without permanent deformation, the forces imposed on it during normal operation, during the application of the safety devices and at impact on mechanical stops when travelling at the rated speed. However, local deformation that does not affect the operation of the lifting platform arising from the safety gear gripping device is permissible.

5.1.10.2 Guiding components, their attachments and joints shall withstand deflections due to uneven loading without affecting normal operation.

5.1.10.3 A fatigue stress analysis shall be made for all load bearing components and joints, which are critical to fatigue. This analysis shall take into account the degree of stress fluctuation and the number of stress cycles, which can be a multiple of the number of load cycles.

Each load cycle shall be at the worst case condition and at least consist of one start (acceleration from rest to rated speed), 5 m travel and one stop (deceleration from rated speed).

The analysis shall be made by test and shall be conducted at 33,33% without load, with 33,33 % half of the load and 33,33% at rated load.

The minimum number of load cycles shall be 50 000.

Fixings shall be specified to ensure that their integrity is maintained during normal operating

5.1.11 Protection of equipment against harmful external influences

5.1.11.1 General

All mechanical and electrical components shall be protected from the harmful and hazardous effects of external influences that will be encountered at the proposed installation site, e.g.:

— the ingress of water and solid bodies;

— the effects of humidity, temperature, corrosion, atmospheric pollution, solar radiation, etc.;

— the actions of flora, fauna, etc.

5.1.11.2 Protection

Moisture shall be prevented from entering the liftway or drainage shall be provided.

The protection shall be designed and constructed and the lifting platform shall be installed in such a manner that the influences mentioned in 5.1.11.1 do not prevent the lifting platform from operating safely and reliably.

It shall not be possible for moisture to accumulate on the enclosed liftway floor.

5.1.11.3 Guarding of equipment from mechanical damage

Guarding shall be designed and constructed in accordance with EN 953, EN ISO 13857 and EN 349.

5.1.12 Degree of protection for outdoor use

For outdoor use, lifting platforms shall have a sufficient degree of protection for electrical equipment depending on site conditions, see assumptions, which is not less than IP54 as defined in EN 60529.

5.2 Platform support/guide system (including any scissor mechanism)

5.2.1 Platform support/guide system

5.2.1.1 Platform support/guide system shall be provided to retain and guide the platform throughout its travel. The system shall ensure that a maximum horizontal clearance of 20 mm between the inner surface of the enclosed liftway enclosure and platform components, on its accessible open sides, is maintained throughout the entire travel of the platform, under maximum working load conditions.

5.2.1.2 The platform support system shall ensure that the platform edges cannot tilt more than ± 10 mm from the horizontal when:

a) the rated load is distributed over half of the length of the platform; and

b) the rated load is distributed over half of the width of the platform.

5.2.1.3 Platform support/guide system structural members shall be made of metal.

5.2.1.4 General provisions concerning guide rails

The guide rails, their joints and attachments shall be sufficient to withstand the loads and forces imposed on them in order to ensure a safe operation of the lift.

The aspects of safe operation of the lift concerning guide rails are:

a) platform guidance shall be assured;

b) deflections shall be limited to such an extent, that due to them:

- unintended unlocking of the doors shall not occur;
- operation of the safety devices shall not be affected; and
- collision of moving parts with other parts shall not be possible.

Stresses shall be limited taking into account the distribution of the rated load in the platform as given in G.2, G.3 and G.4 of EN 81-1:1998 or according to the intended use.

NOTE Annex G of EN 81-1:1998 describes a method of selecting guide rails.

5.3 Safety gear and over-speed governor

5.3.1 Safety gear

5.3.1.1 General

The lifting platform shall be provided with a safety gear. The safety gear shall operate to stop and sustain the platform with the maximum static overload as defined in Table 3, taking into account associated shock loads.

There are two exceptions to this requirement as follows:

a) direct acting hydraulic jack drives do not require a safety gear (see 5.4.10.12 and 5.4.10.13);

b) when the platform is driven by a self-sustaining rotating screw or nut, together with a safety nut (see 5.4.6).

The safety gear shall be fitted on the platform, except on lifting platforms driven by guided chain where the safety gear may be fitted remote from the platform, provided the requirements of 5.4.8 for the guided chain drive are fulfilled.

When the safety gear is applied, no decrease in the tension of any rope or chain or other mechanism used for applying the safety gear or motion of the platform in the downward direction shall release the safety gear.

The safety gear shall be capable of stopping and sustaining the platform, carrying its rated load, within a distance of 150 mm from where the safety gear is engaged.

The safety gear shall be designed to grip the guide rail, or equivalent element, securely.

Any shaft, jaw, wedge or support that forms part of the safety gear and that is stressed during its operation shall be made of metal.

The application of the safety gear shall not cause the platform to change inclination by more than 5°.

5.3.1.2 Actuation

The safety gear shall be mechanically tripped before the platform exceeds a speed of 0,3 m/s by an over-speed governor, except on indirectly suspended hydraulic lifts where the safety gear may be tripped by a safety rope which is independent of the means of suspension or by slackening or breaking of a suspension rope or chain.

If the over-speed governor derives its drive from a main suspension chain, or rope, the safety gear shall also be operated by a mechanism actuated by breaking, or slackening of, the means of suspension.

5.3.1.3 Release

When a safety gear has tripped its release shall require the intervention of a competent person.

Release of the safety gear shall only be possible by raising the platform. After its release, the safety gear shall remain functional for further use.

5.3.1.4 Access for inspection

The safety gear shall be accessible for inspection and testing.

5.3.1.5 Electrical checking

When the safety gear is engaged, an electrical device conforming to 5.5.11 and activated by the safety gear shall immediately initiate stopping and shall prevent the starting of the machine.

5.3.2 Over-speed governor

5.3.2.1 General

Any friction drive to the over-speed governor shall be independent of the main friction drive on friction drive lifting platforms.

The over-speed governor or another device shall, by means of an electric safety device in conformity with 5.5.12, initiate the stopping of the lift machine at the latest at the moment the tripping speed of the over-speed governor is reached.

If after release of the safety gear (5.3.1.3) the over-speed governor does not automatically reset itself, an electric safety device in conformity with 5.5.11 shall prevent the starting of the lift while the over-speed governor is not in the reset position.

The breakage or excessive rope stretch of the governor rope shall cause the machine to stop by means of an electric safety device in conformity with 5.5.11.

The tensile force in the over-speed governor rope produced by the governor, when tripped, shall be at least the greater of the following two values:

- twice that necessary to engage the safety gear; or

- 300 N.

5.3.2.2 Over-speed governor rope, safety rope

The rope shall be a wire rope designed for that purpose.

The minimum breaking load of the rope shall be related by a safety factor of at least 8:

a) to the tensile force produced in the rope of the over-speed governor or the safety rope when tripped taking into account a friction factor μ_{max} equal to 0,2 for traction type over-speed governor;

b) to the force required to operate the safety gear or clamping device for safety ropes.

The nominal rope diameter shall be at least 6 mm.

The ratio between the pitch diameter of the pulleys for the over-speed governor rope and the nominal rope diameter shall be at least 30.

5.4 Driving units and drive systems

5.4.1 General requirements

5.4.1.1 The selected drive system shall be in accordance with one of the systems specified in 5.4.4 to 5.4.10.

5.4.1.2 All types of drive systems, except hydraulic, shall be powered in both directions of travel.

5.4.1.3 Safety factors used in the design of geared drive units shall be maintained, even after taking full account of the effects of wear, calculated using the designed life of the lifting platform.

Unless forming an integral part of its shaft or driving unit every sheave, rope drum, spur gear, worm and worm wheel or brake drum shall be fixed to its shaft or other driving unit by one of the following methods:

a) sunk keys;

b) splines;

c) cross pinning;

Gearing shall be guarded using imperforate material.

5.4.1.4 If chain or belt intermediate drives are employed, then the following conditions shall be met.

a) the output drive gearing shall be on the load side of the chain or belt intermediate drive and either;

b) the output drive gearing shall be self-sustaining;

or

c) the brake shall be on the load side of the chain or belt intermediate drive and a minimum of 2 belts or chains shall be used. The integrity of the chain or belt shall be monitored electrically.

5.4.1.5 As an alternative what is stated in 5.4.1.4, a system with two chains intermediate drive may be used. The intermediate chain shall be monitored by an electric safety device according to 5.5.11 that disconnects the supply to the motor and brake in the event of breakage of any chain.

5.4.1.6 Rope suspension or chain suspension systems shall incorporate a device that, in the event of a slack rope or chain, shall operate an electric safety device according to 5.5.11 that shall initiate a break in the electrical supply to the motor and brake and thus prevent any movement of the platform until the rope or chain is correctly re-tensioned.

5.4.1.7 Protection for traction sheaves, pulleys and sprockets.

For traction sheaves, pulleys, chainwheels and sprockets, provisions shall be made 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.

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.

The dismantling shall be necessary only in the following cases:

a) replacement of a rope/chain;

b) replacement of a pulley/sprocket.

5.4.2 Braking system

5.4.2.1 General

An electro-mechanical friction brake shall be fitted (except on hydraulically driven lifting platforms which conform to 5.4.10) which shall be capable of bringing the lifting platform smoothly to rest and holding it firmly in position with 25 % over load and capable of holding the platform firmly with the maximum static overload stated in Table 3. The brake shall be mechanically applied and electrically held off. The brake shall not be released in normal operation unless the electrical supply is simultaneously applied to the lifting platform motor.

5.4.2.2 Electro-mechanical brake

5.4.2.2.1 General

Brake linings shall be of flame retardant, self-extinguishing material and shall be so secured that normal wear will not weaken their fastenings. Residual magnetism shall not prevent the brake from being applied when the electrical supply to the driving motor is interrupted.

5.4.2.2.2 All the mechanical components of the brake which take part in the application of the braking action on the drum or disk shall be installed in two sets. If one of the components is not working a sufficient braking effort to slow down the platform, travelling downwards at rated speed and with rated load shall continue to be exercised.

Any solenoid plunger is considered to be a mechanical part, any solenoid coil is not.

5.4.2.2.3 Any brake capable of being released by hand shall require constant effort to keep the brake held off.

5.4.2.2.4 If coil springs are used to apply the brake shoes, such springs shall be in compression and supported.

5.4.2.2.5 The component on which the brake operates shall be coupled to the drum or sprocket or nut or screw by direct and positive mechanical means, unless the final driving element is self-sustaining or the drive system complies with 5.4.1.5.

5.4.2.2.6 In the case of self-sustaining drive systems, 5.4.2.2.2 may be omitted.

5.4.2.2.7 The interruption of the current to the brake shall be effected by at least two independent electrical devices, whether or not they are those, which cause the interruption of the current feeding the lift machine. If one of the contactors has not opened the main contacts whilst the lift is stationary, further movement of the platform shall be prevented, at the latest, before the next change in the direction of motion.

5.4.2.2.8 When the motor of the lift functions as a generator, it shall not be possible for the electric device operating the brake to be fed by the driving motor.

5.4.2.3 Stopping / levelling accuracy

Under intended use:

— The stopping accuracy of the lifting platform shall be ± 10 mm.

— A re-levelling accuracy of ± 20 mm shall be maintained.

— Stopping distances shall be no greater than 20 mm in response to operation of an electric safety device.

5.4.3 Emergency/manual operation

5.4.3.1 An emergency control device shall be provided.

The maximum time to move the platform to the nearest landing where the door can be opened shall be 15 min.

This emergency operation shall only be possible by an authorised or competent person from a position outside the liftway but with full control of the movement.

Where emergency operation is achieved by means of a manually operated hand-winding device, an electric safety device shall provide protection against inadvertent operation of the normal controls when under emergency operation. Where the manual effort is greater than 30 N to overcome the release of the brake by emergency hand-winding, there shall be provided a means of releasing the brake. Controlled descent shall be possible under all circumstances.

Emergency operation on hydraulic lifts shall comply with 5.4.10.17.

Alternatively, a standby power supply or device may be used for operation. The standby power supply shall be capable of bringing the platform with maximum working load to a landing. An electric safety device shall provide protection against inadvertent operation of the normal controls when under emergency operation. When on emergency electrical operation, the following conditions shall be met:

Maximum speed not greater than 0,05 m/s.

— Hold to run platform controls;

— the following electric safety devices may be bridged:

- slack rope device;

- emergency stop;

- safety gear electric safety device and over-speed governor electric safety device;

- sensitive edges, photo cells or light curtains.

A label, indicating the direction of travel, in accordance with 7.3.1.6.2 shall be provided.

5.4.4 Additional requirements for rack and pinion drive

5.4.4.1 General

The platform shall be supported, raised and lowered by means of one or more pinions, meshing with the rack. The drive shall be by means of one or more motors.

Steps shall be taken to prevent the penetration of foreign bodies between each drive or safety pinion and geared rack.

5.4.4.2 Load distribution

When there is more than one drive pinion in mesh with the rack, then either a self-adjusting means shall be provided to effectively share the loading on each drive pinion or the drive system shall be so designed as to accommodate all normal conditions of load distribution between the pinions.

5.4.4.3 Pinion

The driving pinion shall be designed with a safety factor not less than 2 against the endurance limit for tooth strength. Each pinion shall possess a minimum safety factor of 1,4 against the endurance limit for pitting. The safety factors used in the design of any driving pinion shall be maintained, even after taking full account of the effects of dynamic loading, wear and fatigue likely to arise during the designed life of the driving pinion and associated components. Undercutting of the gear teeth shall be avoided. The pinion shall be fixed slip free and wear free to the output shaft in accordance with 5.4.1.3.

5.4.4.4 Rack

5.4.4.4.1 The racks shall be securely attached. Joints in the rack shall be accurately aligned to avoid faulty meshing or damage to teeth.

5.4.4.4.2 The rack shall be made of material having properties matching those of the pinion in terms of wear and shall be designed according to ISO 6336, with regard to tooth strength and pitting. If the rack is subjected to a compressive load, a minimum factor of safety of 3 against buckling shall apply.

The rack shall possess a minimum safety factor of 2,0 against the static limit for tooth strength, taking into account the maximum wear as stated in the manufacturer’s instruction handbook.

5.4.4.5 Rack/pinion engagement

5.4.4.5.1 Means shall be provided to maintain the rack and all the driving and safety device pinions in correct mesh under every load condition. Such means shall not rely upon the platform guide rollers or shoes.

The correct mesh shall be when the pitch circle diameter of the pinion is coincident with, or not more than 1/3 of the module beyond the pitch line of the rack.

5.4.4.5.2 Further means shall be provided to ensure that in the event of failure of the means provided in accordance with 5.4.4.5.1, the pitch circle diameter of the pinion shall never be more than 2/3 of the module out beyond the pitch line of the rack.

5.4.4.5.3 Means shall be provided to ensure that the width of the rack is always in full lateral engagement with pinion teeth of full form.

5.4.4.5.4 Further means shall be provided to ensure that in the event of failure of the means specified in 5.4.4.5.3, not less than 90 % of the width of the rack shall be in lateral engagement with pinion teeth of full form.

5.4.4.5.5 The pinion teeth and the rack teeth shall be square to each other in all planes, within a tolerance of ± 0,5°.

5.4.5 Additional requirements for rope and chain suspension drive

5.4.5.1 General

The following two methods of drive are permissible:

a) use of a drum and ropes; or

b) use of sprockets and chains.

5.4.5.2 Ropes and chains

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

5.4.5.2.2 The ropes shall correspond to the following requirements:

a) the nominal diameter of the ropes shall be at least 6 mm;

b) the other characteristics (construction, extension, ovality, flexibility, tests…) shall at least correspond to those specified in EN 12385-4.

5.4.5.2.3 Chains shall comply with the requirements of ISO 606.

5.4.5.2.4 The safety factor of the suspension ropes/chains shall be minimum; 12 for ropes and 10 for chains.

5.4.5.2.5 The minimum number of ropes/chains shall be two. Ropes/chains shall be independent.

5.4.5.3 Rope/chain terminations

5.4.5.3.1 The junction between the rope/chain and the termination shall be able to resist at least 80 % of the minimum breaking load of the rope/chain.

5.4.5.3.2 The ends of the ropes shall be fixed to the platform, balancing weight or suspension points by means according to EN 13411, or any other system with equivalent safety.

5.4.5.4 Pulley, drum and sprocket

5.4.5.4.1 The ratio between the pitch diameter of pulleys or drums and the nominal diameter of the suspension ropes shall be at least 25, regardless of the number of strands.

5.4.5.4.2 The drum shall be helically grooved and the grooves shall be suited to the ropes used. There shall only be one layer of rope wound on the drum. When the platform rests on its fully compressed cushioned stops, one and a half turns of rope shall remain in the grooves of the drum. The angle of deflection (fleet angle) of the ropes in relation to the grooves shall not exceed 4°.

5.4.5.4.3 All driving sprockets shall be made from metal and have a minimum of 16 machine-cut teeth. A minimum of 8 teeth shall be engaged. The minimum angle of engagement shall be 140°.

5.4.5.4.4 Means shall be provided to avoid jamming owing to miss feeding or slackening of the chains and to prevent the chains from leaving the sprockets or riding over the teeth of the sprockets.

Guards shall be fitted to prevent trapping hazards between sprocket and chain or chain and any other part.

5.4.5.5 Distribution of load between the ropes or the chains

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

5.4.5.5.2 For chains engaging with sprockets, the ends fixed to the platform as well as the ends fixed to the balancing weight shall be provided with such equalization devices.

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

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

5.4.6 Additional requirements for screw and nut drive

5.4.6.1 Precautions against free fall and descent with excessive speed of the platform

5.4.6.1.1 Devices, or combinations of devices and their actuation, according to Table 4, shall be provided to prevent the platform from:

a) free fall; or

b) descent with excessive speed.

Table 4 — Combinations of precautions against free fall of the platform and descent with excessive speed

FREE FALL	DESCENT WITH EXCESSIVE SPEED
Safety nut (5.4.6.1.4)	Stopping safety device according to 5.4.6.1.3 tripped by an over speed governor according to 5.3.2. OR Self-sustaining screw and nut system.

Other devices, or combinations of devices and their actuation, shall only be used if they give at least the same safety level as achieved by those of Table 4.

5.4.6.1.2 Self sustaining screw and nut system

The friction coefficient of a self sustaining screw and nut system shall be calculated to be not more than 0,06.

NOTE The figure above is based on a friction factor of 0,075 and with a safety factor of 1,25.

5.4.6.1.3 Stopping safety device

5.4.6.1.3.1 Introduction

When required by 5.4.6.1.1, the stopping safety device shall satisfy the following conditions:

5.4.6.1.3.2 General provisions

The stopping safety device shall operate only in the downward direction, and be capable of stopping the relative rotation between screw and nut with the platform carrying the maximum working load, at the tripping speed of the over speed governor and maintaining it stationary.

5.4.6.1.3.3 Conditions of use for different types of stopping safety device

Stopping safety devices shall be of the progressive type.

5.4.6.1.3.4 Methods of tripping

5.4.6.1.3.4.1 The tripping of stopping safety devices shall be by means according to 5.4.6.1.1.

5.4.6.1.3.4.2 Stopping safety devices shall not be tripped by devices which operate electrically, hydraulically or pneumatically.

5.4.6.1.3.5 Retardation

The average retardation in case of a descent with the tripping speed defined in 5.3.1.2 and with the maximum working load shall lie between 0,2 g and 1 g.

5.4.6.1.3.6 Release

5.4.6.1.3.6.1 The release of the stopping safety device shall only be possible by raising the platform.

5.4.6.1.3.6.2 After its release, the stopping safety device shall be in a condition to operate normally.

5.4.6.1.3.7 Constructional conditions

If the stopping safety device is adjustable, the final setting shall be sealed.

5.4.6.1.3.8 Inclination of the platform floor in case of stopping safety device operation.

When the stopping safety device operates, the floor of the platform without or with the load uniformity distributed, shall not incline more than 5 % from its normal position.

5.4.6.1.3.9 Electrical checking

When the stopping safety device is engaged, an electrical safety device in conformity with 5.5.12 shall immediately initiate stopping of the machine if the platform is travelling downwards and prevent starting.

5.4.6.1.3.10 The stopping safety device is regarded as a safety component and shall be verified according to the requirements of Annex E.

5.4.6.1.4 Safety nut

A second unloaded safety nut shall be provided to carry the load and operate an electric safety device in the event of failure of the driving nut such as to afford an equivalent degree of safety to that specified in 5.3.1. The electric safety device shall operate to cause power to be removed from the motor and brake in the event of failure of the driving nut.

Consideration shall be given to the need for protection to the electric safety device against the effects of pollution and vibration.

When required by 5.4.6.1.1, a safety nut shall be provided which shall be designed according to 5.4.6.2.3.3.2.

5.4.6.2 Drive of the platform

5.4.6.2.1 Possible drive types

Only direct acting drive is allowed.

If several screws and nuts are used it shall not be possible to disequilibria in load and travel. If the lifting platform inclination becomes greater than 1 % the lift shall be stopped.

The use of a balancing weight is not permitted.

5.4.6.2.2 General provisions for the screw

5.4.6.2.2.1 Positive mechanical means shall be provided to prevent separation of sections of a multiple section screw column.

5.4.6.2.2.2 Calculation of the screw

5.4.6.2.2.2.1 Tensile stress calculation

Screws under tensile loads shall be designed such that a safety factor of at least 5 is assured. This includes joints under maximum load and torque imposed by the machinery and platform.

5.4.6.2.2.2.2 Buckling calculation

Screw under compressive loads shall be designed such that, under full load compression on maximum length of screw, imposed by the maximum load including the platform, a safety factor of at least 3 against buckling is assured.

5.4.6.2.3 General provisions for nuts

5.4.6.2.3.1 The material of the load carrying nut shall be of less hardness than the mating screw.

5.4.6.2.3.2 It shall be possible to inspect and determine the wear of the load carrying nut.

5.4.6.2.3.3 Calculation of nuts

5.4.6.2.3.3.1 The load carrying nut shall, at state of maximum wear, be designed such that a safety factor of at least 5 is assured under maximum load and torque conditions.

5.4.6.2.3.3.2 The safety nut and its connection to the load carrying nut, shall be designed such that a safety factor of at least 5 is assured under maximum load and torque conditions, including dynamic forces caused by collapsing load carrying nut.

5.4.6.2.4 Connection platform/nut

5.4.6.2.4.1 In case of a lifting platform, with compressive loads on the screw, the connection between the platform and the nut(s) shall be flexible.

5.4.6.2.4.2 The load-screw mechanism shall be designed to prevent separation of the platform from the mechanism during normal use by positive mechanical means.

5.4.7 Additional requirements for friction/traction drive

5.4.7.1 Traction wheels

The traction wheels shall be made of metal, except that the running surface may consist of a tyre of other material. Wear shall not reduce the traction grip.

Continues travel with max. load under normal travelling conditions of the vertical lifting platform shall not damage the running surface or the connection between the metal and the other material.

5.4.7.2 Running surface

The running surface of the rail shall be made of metal and the design shall be such that the rail guarantees the traction grip even if the rail is wet. E.g. the addition of high friction material.

The rail shall be kept free of oil, grease and ice.

5.4.7.3 Traction

The traction between the traction wheels and the rail shall be proved by calculation and test, see Annex G. It shall be confirmed that this will be achieved, even after the effects of wear during normal service. The traction wheels shall adjust automatically positive to ensure that the traction grip is maintained in the effect of wear.

Traction shall be such that the following two conditions are fulfilled:

— the platform shall be maintained at floor level without slip when loaded to the maximum static overload as defined in Table 3,

— it shall be ensured that any emergency braking causes the platform, whether empty or with rated load, to decelerate with a value not exceeding 1g with the rated load at the tripping speed of the speed detection device.

5.4.8 Additional requirements for guided chain system

5.4.8.1 Guided chain system

5.4.8.1.1 General

5.4.8.1.1.1 Introduction

The platform shall be supported, raised and lowered by means of one or more transmission units. The drive shall be by means of one or more motors.

Steps shall be taken to prevent the penetration of foreign bodies between the chain and its associated elements.

5.4.8.1.1.2 Shaft, sprockets and safety gear

All sprocket (s) and the safety gear in 5.4.8.1.3, shall be securely fixed to their output shaft according to requirements in 5.4.1.3.

5.4.8.1.1.3 Load distribution

When there is more than one transmission unit, the sprockets shall be positively coupled to each other, according to 5.4.1.3.

5.4.8.1.1.4 Sprocket (s)

Each sprocket shall be designed with regard to tooth strength and pitting and shall take into account the requirements of 5.1.10.3 concerning fatigue stress analysis

Each sprocket shall possess a minimum safety factor of 2,0 against the endurance limit for tooth strength, taking into account the maximum wear as stated in the manufacturer's instruction handbook.

Each sprocket shall possess a minimum safety factor of 1,4 against the endurance limit for pitting.

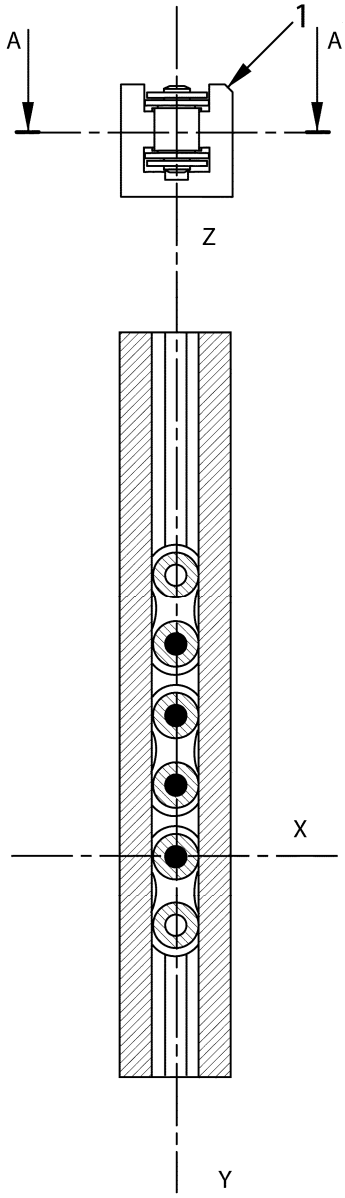
5.4.8.1.1.5 Guide elements for the chain

The chain shall be completely guided over its entire length such that it may transmit a load either in thrust or tension.

All driving sprockets shall be made from metal and have a minimum of 16 machine cut teeth. A minimum of 8 teeth shall be engaged.

The design of the wear of the guide elements, which guide the chain in X-direction (see Figure 1), shall not be allowed to be more than 5 % of the chain roller diameter.

And the design of the wear of the part of the guide elements, which protect the chain in Z-direction (see Figure 1), shall not be allowed to be less than 15 % of the inside width of the chain roller.



Key

1 chain guide rail

Figure 1 — Guide elements for the chain

5.4.8.1.1.6 Guided chain

The chain shall be of type roller chain according to ISO 606, and be pre-stretched to 50 % of tensile strength.

The safety factor for the chain, which works in the transmission unit, shall have a safety factor not less than 3.

5.4.8.1.1.7 Buckling calculation

The chain guides elements under compressive loads and with maximum wearing according to 5.4.8.1.1.5 shall be designed such that, under full load compression on maximum length of guide elements, imposed by the maximum load including the platform, a safety factor of at least 3 against buckling is assured.

5.4.8.1.2 Transmission unit

5.4.8.1.2.1 General

Each transmission unit shall be designed with regard to chain force acting in any direction. A fatigue stress analysis shall be made according to 5.1.10.3.

5.4.8.1.2.2 Drive of the platform

The platform shall be driven by means of one or more transmission units, and driven by one or more motors.

The drive motor/s shall be coupled to the transmission unit by a positive drive system, according to 5.4.1.3 that cannot be disengaged.

5.4.8.1.3 Safety gear

The platform shall be provided with a safety gear capable of operating in the downward direction and capable of stopping a platform carrying the maximum working load, at the tripping speed of the over-speed governor, even in the event of the failure of the lift machine. The safety gear, can be situated directly to the transmission units, if it is positively coupled to both transmission units, according to 5.4.1.3.

5.4.9 Additional requirements for scissors mechanism drive

All types of drive including their requirements, detailed in this standard shall equally apply to the drive for the scissor mechanism.

5.4.10 Additional requirements for hydraulic drive

5.4.10.1 General provisions

The two following methods of drive are permissible:

a) direct acting;

b) indirect acting.

If several jacks are used to raise the platform they shall be hydraulically connected to ensure pressure equilibrium.

For indirect acting method of drive, requirements for suspension chains and for suspension ropes according to 5.4.5.2 and 5.4.5.3 apply.

5.4.10.2 Jack

5.4.10.2.1 Calculations of cylinder and ram

5.4.10.2.1.1 Pressure calculations

The cylinder and the ram shall be designed such that under the forces resulting from a pressure equal to 2,3 times the full load pressure a safety factor of at least 1,7 referred to the proof stress $R_{P0,2}$ is assured.

For the calculation[1)] of the elements of telescopic jacks with hydraulic synchronizing means the full load pressure shall be replaced by the highest pressure, which occurs in an element due to the hydraulic synchronizing means.

In the thickness calculations a value shall be added of 1,0 mm for cylinder walls and cylinder bases, and 0,5 mm for walls of hollow rams for single and telescopic jacks.

The calculations shall be carried out according to EN 81-2:1998, Annex K.

5.4.10.2.2 Buckling calculations

Jacks under compressive loads shall fulfil the following requirements:

- They shall be designed such that, in their fully extended position, and under the forces resulting from a pressure equal to 1,4 times full load pressure a safety factor of at least two against buckling is assured.

- The calculations shall be carried out according to EN 81-2:1998, Annex K.

5.4.10.2.3 Tensile stress calculations

Jacks under tensile loads shall be designed such that under the forces resulting from a pressure equal to 1,4 times full load pressure a safety factor of at least 2 referred to the proof stress $R_{P0,2}$ is assured.

5.4.10.2.4 Limitation of the ram stroke

Means shall be provided to stop the ram at the end of its stroke.

The design of the stop shall be such that the average retardation of the platform does not exceed 1 g_n and that in case of an indirect acting lifting platform the retardation does not result in slack rope or chain.

5.4.10.2.5 Means of protection

If a jack extends into the ground it shall be installed in a protective tube. If it extends into other spaces it shall be suitably protected. The installation of the jack shall be designed such that the protection can be easily inspected for corrosion.

In the same manner:

a) the rupture valve(s)/restrictor(s);

b) the rigid pipes connecting a rupture valve(s)/restrictor(s) with the cylinder;

c) the rigid pipes connecting rupture valve(s)/restrictor(s) with each other;

shall be protected.

Leak and scrape fluid from the cylinder head shall be collected.

The jack shall be provided with an air-venting device.

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1) It may be possible that, due to incorrect adjustment of the hydraulic synchronizing means, abnormally high pressure conditions arise during installation. Account of this should be taken.

5.4.10.3 Connection platform/ram (cylinder)

5.4.10.3.1 In case of a direct acting lifting platform the connection between the platform and the ram (cylinder) shall not be rigid.

5.4.10.3.2 The connection between the platform and the ram (cylinder) shall be so constructed to support the weight of the ram (cylinder) and the additional dynamic forces. The connection means shall be secured.

5.4.10.3.3 In case of a ram made with more than one section, the connections between the sections shall be so constructed to support the weight of the suspended ram sections and the additional dynamic forces.

5.4.10.3.4 In the case of indirect acting lifting platforms, the head of the ram (cylinder) shall be guided.

This requirement does not apply for pulling jacks provided the pulling arrangement prevents bending forces on the ram.

5.4.10.3.5 In the case of indirect acting lifting platforms, no parts of the ram head guiding system shall be incorporated within the vertical projection of the platform.

5.4.10.4 Telescopic jacks

The following requirements apply additionally:

5.4.10.4.1 Stop shall be provided between successive sections to prevent the rams from leaving their respective cylinders.

5.4.10.4.2 The length of the bearing of each section of a telescopic jack without external guidance shall be at least 2 times the diameter of the respective ram.

5.4.10.4.3 These jacks shall be provided with mechanical or hydraulic synchronizing means.

5.4.10.4.4 When ropes or chains are used as synchronizing means the following requirements apply:

a) there shall be at least two independent ropes or chains;

b) pulley and sprockets shall be protected;

c) the safety factor shall be at least:

   1) 12 for ropes;

   2) 10 for chains.

The safety factor is the ratio between the minimum breaking load in Newton's of one rope (or chain) and the maximum force in this rope (or chain).

For the calculation of the maximum force the following shall be taken into consideration:

— the force resulting from the full load pressure;

— the number of ropes (or chains);

d) a device shall be provided which prevents the speed of the platform in downward movement exceeding the rated speed downward v_d by more than 0,15 m/s in the event of failure of the synchronizing means.

5.4.10.5 Piping

5.4.10.5.1 General

Piping and fittings, which are subject to pressure (connections, valves, etc.) as in general all components of the hydraulic system shall:

— be appropriate to the hydraulic fluid used;

— be designed and installed in such a way to avoid any abnormal stress due to fixing, torsion or vibration;

— be protected against damage, in particular of mechanical origin.

Pipes and fittings shall be appropriately fixed and accessible for inspection.

If pipes (either rigid or flexible) pass through walls or floor they shall be protected by means of ferrules, the dimensions of which allow the dismantling, if necessary, of the pipes for inspection.

No coupling shall be sited inside a ferrule.

5.4.10.5.2 Rigid pipes

Rigid pipes and fittings between cylinder and non-return valve or down direction valve(s) shall be designed such that under the forces resulting from a pressure equal to 2,3 times the full load pressure a safety factor of at least 1,7 referred to the proof stress $R_{P0,2}$ is assured.

In the thickness calculations a value shall be added of 1,0 mm for the connection between the cylinder and the rupture valve, if any, and 0,5 mm for the other rigid pipes.

The calculations shall be carried out according to EN 81-2:1998, Annex K.

When telescopic jacks with more than 2 stages and hydraulic synchronizing means are used an additional safety factor of 1,3 shall be taken into account for the calculation of the pipes and fittings between the rupture valve and the non-return valve or the down direction valve(s).

Pipes and fittings, if any, between the cylinder and the rupture valve shall be calculated on the same pressure basis as the cylinder.

5.4.10.5.3 Flexible hoses

The flexible hose between cylinder and non-return valve or down direction valve shall be selected with a safety factor of at least 8 relating full load pressure and bursting pressure.

The flexible hose and its couplings between cylinder and non-return valve or down direction valve shall withstand without damage a pressure of five times full load pressure, this test to be carried out by the manufacturer of the hose assembly.

The flexible hose shall be marked in an indelible manner with:

a) the name of the manufacturer or the trade mark;

b) the test pressure;

c) the date of the test.

The flexible hose shall be fixed with a bending radius not less than that indicated by the hose manufacturer.

5.4.10.6 Stopping the machine and checking its stopped condition

A stop of the machine due to the operation of an electrical safety device shall be controlled as detailed below.

Upwards motion

For upward motion, the supply to the electric motor shall be interrupted by at least two independent contactors, the main contacts of which shall be in series in the motor supply circuit.

Downwards motion

For downwards motion, the supply to the down direction valve(s) shall be interrupted either:

a) by at least two independent electrical devices connected in series; or

b) directly by the electrical safety device.

5.4.10.7 If whilst the lifting platform is stationary, one of the contactors has not opened the main contacts or one of the electrical devices has not opened, a further start shall be prevented, at the latest at the next change in the direction of motion.

5.4.10.8 Hydraulic control and safety devices

5.4.10.8.1 Shut-off valve

A shut-off valve shall be provided. It shall be installed in the circuit which connects the cylinder(s) to the non-return valve and the down direction valve(s).

5.4.10.9 Non-return valve

A non-return valve shall be provided. It shall be installed in the circuit between the pump(s) and the shut-off valve.

The non-return valve shall be capable of holding the lifting platform with the maximum static overload at any point when the supply pressure drops below the minimum operating pressure.

The closing of the non-return valve shall be effected by the hydraulic pressure from the jack and by at least one guided compression spring and/or by gravity.

5.4.10.10 Pressure relief valve

A pressure relief valve shall be provided. It shall be connected to the circuit between the pump(s) and the non-return valve. The hydraulic fluid shall be returned to the tank.

The pressure relief valve shall be adjusted to limit the pressure to a maximum of 140 % of the full load pressure.

If necessary due to high internal losses (head loss, friction), the pressure relief valve may be set to a greater value but not exceeding 170 % of full load pressure. In this case, for the calculations of the hydraulic equipment (including jack) a fictitious full load pressure equal to:

$$\frac{\text{Selected pressure setting}}{1{,}4}$$

shall be used.

In the buckling calculation the over pressure factor of 1,4 shall then be replaced by a factor corresponding to the increased setting of the pressure relief valve.

5.4.10.11 Down direction valves

Down direction valves shall be held open electrically. Their closing shall be affected by the hydraulic pressure from the jack and by at least one guided compression spring per valve.

5.4.10.12 Protection against hydraulic system failure

One of the following 3 protection methods shall be used:

5.4.10.12.1 Rupture valve

Rupture valve, fitted directly to the cylinder outlet, which in the event of failure of any part of the hydraulic circuit (excluding the jack) shall arrest the descent of the platform. The rupture valve shall be either:

— integral with the cylinder;

— or directly and rigidly flange mounted;

— or placed close to the cylinder and connected to it by means of short rigid pipes, having welded, flanged or threaded connections;

— or connected directly to the cylinder by threading. The rupture valve shall be provided with a thread ending with a shoulder. The shoulder shall butt up against the cylinder.

Other types of connections such as compression fittings or flared fittings are not permitted between the cylinder and the rupture valve.

The rupture valve shall be capable of stopping the platform in downward movement, and maintaining it stationary. The rupture valve shall be tripped at the latest when the speed reaches a value equal to rated speed downwards v_d plus 0,15 m/s.

Rupture valves shall be calculated as the cylinder.

5.4.10.12.2 Combination of restrictor, down direction valve and non-return valve

Combination of restrictor, down direction valve and non-return valve, which in the event of failure of any part of the hydraulic circuit (excluding the jack) shall prevent the downward speed of the platform with maximum working load exceeding the rated speed. In addition if an emergency stop or safety edge is operated it shall arrest the descent of the platform.

All three devices shall be configured to be:

— integral with the cylinder;

— or directly and rigidly flange mounted;

— or placed close to the cylinder and connected to it by means of short rigid pipes, having welded, flanged or threaded connections.

Other types of connections such as compression fittings or flared fittings are not permitted between the cylinder and the devices.

5.4.10.13 Restrictor

5.4.10.13.1 Restrictor, fitted directly to the cylinder outlet, which in the event of failure of any part of the hydraulic circuit (excluding the jack) shall prevent the downward speed of the platform with maximum working load exceeding the rated speed. The restrictor shall be either:

— integral with the cylinder;

— or directly and rigidly flange mounted;

— or placed close to the cylinder and connected to it by means of short rigid pipes, having welded, flanged or threaded connections;

— or connected directly to the cylinder by threading. The restrictor shall be provided with a thread ending with a shoulder. The shoulder shall butt up against the cylinder.

Other types of connections such as compression fittings or flared fittings are not permitted between the cylinder and the restrictor.

5.4.10.14 Filters

In the circuit between the tank and the pump(s), and in the circuit between the shut-off valve and the down direction valve(s), filters or similar devices shall be installed. The filter or similar device between the shut-off valve and the down direction valve shall be accessible for inspection and maintenance.

5.4.10.15 Checking the pressure

A pressure gauge shall be provided. It shall be connected to the circuit between the non-return valve or the down direction valve(s) and the shut-off valve.

A gauge shut-off valve shall be provided between the main circuit and the connection for the pressure gauge.

The connection shall be provided with an internal thread of either M 20 x 1,5 or G 1/2”.

5.4.10.16 Tank

The tank shall be designed and constructed for:

a) easy check of the level of the hydraulic fluid in the tank;

b) easy filling and draining.

5.4.10.17 Emergency operation

5.4.10.17.1 Moving the platform downwards

The lifting platform shall be provided with a manually operated emergency lowering valve allowing the platform, even in the case of a power failure, to be lowered to a level where the passengers can leave the platform. The emergency lowering valve is to be positioned outside of the liftway.

The speed of the platform shall not exceed 0,15 m/s.

The operation of this valve shall require a continual manual force.

This valve shall be protected against involuntary action.

In the case of indirect acting lifting platforms where slack rope/chain can occur, manual operation of the valve shall not cause the sinking of the ram beyond that causing the slack rope/chain.

5.4.10.17.2 Moving the platform upwards

A hand-pump which causes the platform to move in the upwards direction shall be permanently installed for every lifting platform whose platform is fitted with a safety gear or a clamping device.

The hand-pump shall be connected to the circuit between the non-return valve or down direction valve(s) and the shut-off valve.

The hand-pump shall be equipped with a pressure relief valve limiting the pressure to 2,3 times the full load pressure.

5.4.10.18 Protection against creeping of the platform

5.4.10.18.1 Devices, or combinations of devices and their actuation, according to Table 5, shall be provided on lifting platforms with hydraulic drive to prevent the platform from creeping from a landing level by more than ± 20 mm and likewise, creeping below the lower end of the unlocking zone.

Other devices, or combinations of devices and their actuation, shall only be used if they give at least the same safety level as achieved by those of Table 5.

5.4.10.18.2 The anti-creep switching device shall be an electrical safety contact or device in conformity with 5.5.11, Table 7.

On hydraulic lifts, if power operated doors are supplied, they shall guarantee to be able to close even during any loss of normal power supply unless a pawl device is provided to maintain the platform at the landing level.

Table 5 — Combinations of precautions creeping

		Precautions against creeping			
		Additional tripping of safety gear (5.3) by downward movement of the platform	**Clamping device (5.4.10.19), tripped by downward movement of the platform (5.3.2)**	**Pawl device (5.4.10.20)**	**Electrical anti-creep system (5.4.10.21)**
Direct acting lifting platforms	Safety gear (5.3.1) tripped by over-speed governor (5.3.2)	X		X	X
	Rupture valve (5.4.10.11.1)		X	X	X
	Restrictor (5.4.10.13)		X	X	
Indirect acting lifting platforms	Safety gear (5.3.1) tripped by over-speed governor (5.3.2)	X		X	X
	Rupture valve (5.4.10.12.1) plus safety gear (5.3.1) tripped by failure of suspension gear (5.3.1.2) or by safety rope (5.3.2.2)	X		X	X
	Restrictor (5.4.10.13) plus safety gear (5.3.1) tripped by failure of suspension gear (5.3.1.2) or by safety rope (5.3.2.2)	X		X	
X = Alternative combinations to be selected.					

5.4.10.19 Clamping device

5.4.10.19.1 Introduction

When required by 5.4.10.18, a clamping device shall be provided, which satisfies the following conditions.

5.4.10.19.2 General provisions

The clamping device shall operate only in the downward direction, and be capable of stopping the platform, with a maximum working load and rated speed.

5.4.10.19.3 Conditions of use for different types of clamping device

5.4.10.19.3.1 Methods of tripping

The tripping of clamping devices shall be by means according to 5.3.2.

5.4.10.19.3.2 Release

When a clamping device has tripped, its release shall require the intervention of a competent person.

The release and automatic reset of a clamping device shall only be possible by raising the platform.

5.4.10.19.3.3 Electrical checking

When the clamping device is engaged, an electrical safety device actuated by it which complies with the requirements of 5.5.12 shall immediately initiate stopping of the machine if the platform is travelling downwards and prevent starting of the machine in downward motion.

5.4.10.20 Pawl device

When required by 5.4.10.18 an electrical anti creep system shall be provided which will energise the platform in the up direction independent of the position of the doors, when the platform is in a zone which extends from maximum 20 mm below the landing level to the lower end of the unlocking zone.

A pawl device shall be provided which satisfies the following conditions:

a) the pawl device shall operate only in the downward direction, and be capable of stopping the platform, with a maximum working load at a rated speed. If the pawl device has operated to stop a descending platform, it shall not be possible to retract the pawl until the platform has been lifted off of the support;

b) there shall be provided at least one electrically retractable pawl designed in its extended position to stop the downward moving platform against fixed supports;

c) for each landing supports shall be provided arranged at two levels:

   i) to prevent the platform sinking below the landing level by more than 20 mm, and

   ii) to stop the platform at the lower end of the unlocking zone;

d) the movement of the pawl(s) to the extended position shall be effected by guided compression spring(s) and/or by gravity;

e) the supply to the electric retraction device shall be interrupted when the machine is stopped;

f) the design of the pawl(s) and supports shall be such that, whatever the position of the pawl, during upward movement the platform cannot be stopped nor any damage caused;

g) when several pawls are provided precautions shall be taken to ensure that all pawls engage on their respective supports even in the case of the disconnection of the electrical power supply during a downward movement of the platform;

h) an electric device, which complies with the requirements of 5.5.12 shall prevent any normal down movement of the platform when a pawl is not in the retracted position.

5.4.10.21 Electrical anti creep system

When required in 5.4.10.18 an electrical anti creep system shall be provided which will energize the platform in the up direction independent of the position of the doors, when the platform is in a zone which extends from a maximum of 20 mm below the landing level to the lower end of the unlocking zone.

5.4.10.22 Control of levelling, re-levelling and anti creeping with doors open

Operation with doors open is permitted in the unlocking zone to permit levelling, relevelling or electrical anti creeping at the corresponding floor level.

Movement of the lifting platform with landing doors open is permitted for levelling, re-levelling and anti creeping on condition that:

1) all movement of the lifting platform outside the unlocking zone shall be prevented by at least one switching device mounted in the bridge or shunt of the door and lock electric safety devices;

2) this switching device shall:

   — either be an electrical safety contact in conformity with 5.5.11.2, or

   — be connected in such a way as to satisfy the requirements for safety circuits in 5.5.11.3;

3) if the operation of the devices is dependent upon an indirectly mechanically link to the lifting platform, e.g. by rope, belt or chain, the breaking of or slack in the connecting link shall cause the machine to stop through the action of an electric safety device in conformity with 5.5.11;

4) during levelling operations, the means for making the electric safety devices of doors inoperative shall only function after the stopping signal for this landing has been given.

5.5 Electrical installation and equipment

5.5.1 General

5.5.1.1 Power supply

Lifting platforms shall be connected to a dedicated power supply conforming with EN 60204-1, terminating at a main switch and fuse or overload, a means to lock it in the ‘off’ position or disconnected state (see 5.6 of EN 60204-1:2006), fuse or overload device. Supply to outlets on the platform lift shall be provided with a 30 mA RCB. The requirement for the supply to be dedicated does not apply to battery operated lifting platforms.

The main switch shall not interrupt the circuits supplying the following:

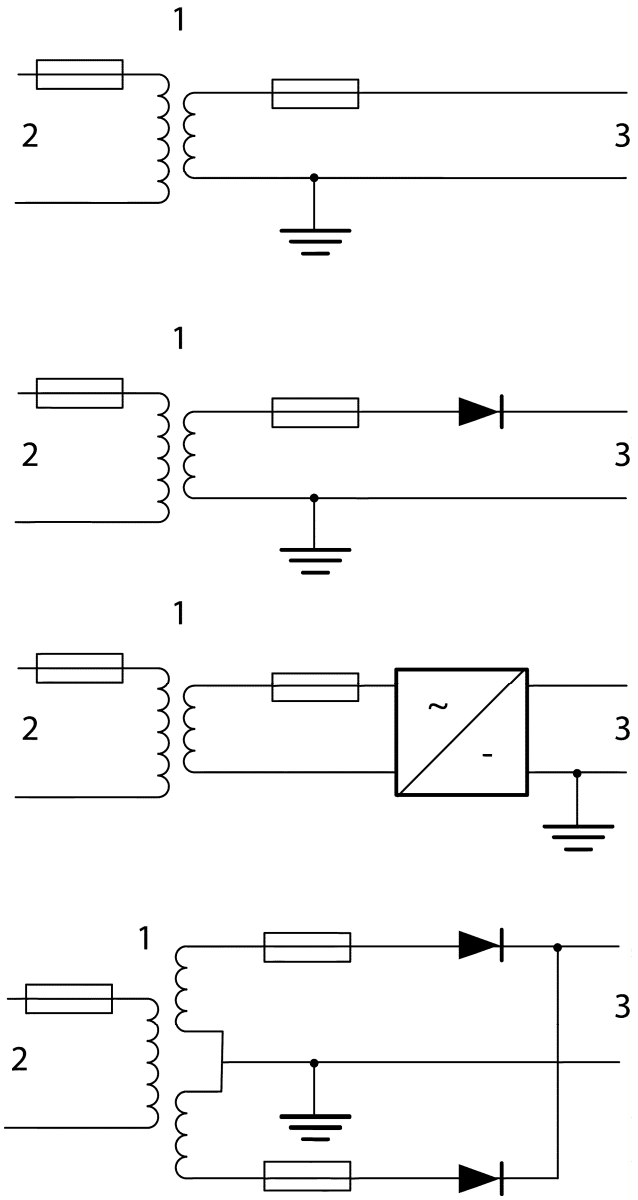
— any lighting associated with the lifting platform (see 5.5.4);

— the power socket outlet provided for maintenance purposes (see 5.5.5).

The requirements of 4.3 and Clause 5 of EN 60204-1:2006 apply.

5.5.1.2 Electrical installation

The electrical installation and equipment shall comply with the requirements of EN 60204-1. The nominal main DC voltage or the AC voltage between conductors and between conductors and earth shall not exceed 250 volts for control and safety circuits. Mains supplied control circuits, other than line to earthed neutral supplies, shall be derived from the secondary winding of an isolating transformer complying with EN 61558-1. One line of the control circuit shall be earthed (or grounded on isolated circuits) and the other line shall be fused in accordance with Figure 2.



Key

1 isolating transformer
2 primary supply
3 control circuit

Figure 2 — Control circuit supply

NOTE SELV protected circuits in accordance with IEC 60364 may be considered as an alternative, provided an equivalent level of safety can be assured.

Equivalent requirements for battery powered lifting platforms are given within 5.5.14.

The requirements of 7.2.7 of EN 60204-1:2006 apply.

The operating voltage of the drive unit shall not be greater than 500 volts.

5.5.2 Conductors of different circuits

The requirements of 13.1.3 of EN 60204-1:2006 apply.

5.5.3 Insulation resistance of the electrical installation (CENELEC HD 384.6.61 S1)

The insulation resistance shall be measured between each live conductor and earth.

Minimum values of insulation resistance shall be taken from Table 6.

Table 6 — Insulation resistance

Nominal circuit voltage V	Test voltage (d.c.) V	Insulation resistance MΩ
SELV	250	≥ 0,25
≤ 500	500	≥ 0,5
> 500	1 000	≥ 1,0

When the circuit includes electronic devices, phase and neutral conductors shall be connected together during measurement.

5.5.4 Lighting

The lighting at the floor of the platform, at the platform control devices and the vicinity of the landings doors shall be not less than 50 lux as measured at the floor. Lighting used shall minimise glare, reflection, confusing shadows or pools of light & dark. Where a light switch is provided, it shall be protected against unauthorised operation. Lifting platforms shall be fitted with an automatically rechargeable emergency supply, which is capable of feeding at least 1W lamp for one hour in the case of an interruption of the normal lighting supply. This lighting shall come on automatically upon failure of the normal lighting supply.

5.5.5 Socket outlet

An electrical output socket shall be provided adjacent to the lifting platform for local lighting during inspection and servicing.

The requirements of Clause 15 of EN 60204-1:2006 apply.

5.5.6 Drive contactors

5.5.6.1 Main contactors (as required in 5.5.7) shall be to a minimum specification of:

a) utilisation category AC-3 for contactors for AC motors; and

b) utilisation category DC-3 for contactors for DC motors.

as specified in EN 60947-4-1.

5.5.6.2 If, because of the power they carry, relays shall be used to operate the main contactors, those relays shall belong to the following categories as specified in EN 60947-5-1:

a) AC 15 for relays controlling AC contactors;

b) DC 13 for relays controlling DC contactors.

5.5.6.3 Each contactor specified in 5.5.6.1 and 5.5.6.2 shall operate such that:

a) if one of the “break” contacts (i.e. normally closed) is closed, then all the “make” contacts are open; and

b) if one of the “make” contacts (i.e. normally open) is closed, all the break contacts are open.

5.5.6.4 Contactors for reversing the direction of travel shall be electrically interlocked.

5.5.7 Motors supplied directly from AC mains

5.5.7.1 The supply to the motor and brake shall be interrupted by two independent contactors, the contacts of which shall be in series in the motor and brake supply circuits. If, whilst the lifting platform is stationary, one of the contactors has not opened the main contacts, further movement of the lifting platform shall be prevented at the latest at the next change in the direction of motion.

5.5.7.2 AC or DC motors controlled and supplied by solid-state elements. One of the following methods shall be used:

a) as 5.5.7.1; or

b) a system consisting of:

   i) a contactor interrupting the current at all poles. The coil of the contactor shall be released at least before each change in direction. If the contactor does not release, any further movement of the lifting platform shall be prevented;

   ii) an independent control device blocking the flow of energy in the static elements;

   iii) a monitoring device to verify the blocking of the flow of energy each time the lifting platform is stationary.

If, during a normal stopping period, the blocking by the static elements is not effective, the monitoring device shall cause the contactor to release and any further movement of the lifting platform shall be prevented.

5.5.7.3 The electrical supply to the drive motor and brake shall be interrupted following the termination of a direction control signal or following the failure of the electrical supply or upon the operation of any electric safety device.

5.5.8 Creepage and clearance distances and enclosure requirements

5.5.8.1 Enclosure requirements

The live parts of controllers and electrical safety contacts shall be located within a protective enclosure of at least IP2X.

Covers shall be retained by clamping devices requiring the use of a tool for their removal.

Additionally, for the electronic parts, the ambient temperature for use as stated by the manufacturer, shall be taken into account. Where the ambient temperature limits set in EN 60204-32 are exceeded, the appropriate means (such as heating or cooling) shall be used.

The requirements of 6.2.2 and 11.2.1 of EN 60204-1:2006 apply.

5.5.8.2 Creepage and clearance distances

Creepage and clearance distances for power circuits, safety circuits and any components connected after safety circuits or electrical safety contacts and whose failure would cause an unsafe condition shall conform to the requirements of EN 60947-1:2007, Table XV in accordance with the working voltage and 3.2 of EN 60947-1:2007. Minimum pollution degree 2. The printed wiring material column is not to be used.

5.5.9 Electromagnetic compatibility

The electromagnetic compatibility shall comply with the requirements of EN 12015 and EN 12016.

5.5.10 Protection against electrical faults

Any single fault listed below, occurring in the electrical equipment of the lifting platform, shall not, on its own, be the cause of dangerous mal-function of the lifting platform:

a) absence of voltage;

b) voltage drop;

c) phase reversal on multi-phase supplies;

d) insulation fault between an electrical circuit and metalwork or earth;

e) short circuit or open circuit, change of value or function in an electrical component such as, for example, resistor, capacitor, transistor or lamp;

f) non attraction, or incomplete attraction, of the moving armature of a contactor or relay;

g) non separation of the moving armature of a contactor or relay;

h) non opening or non closing of a contact;

i) loss of continuity of a conductor.

The non opening of an electrical safety contact need not be considered.

The earthing of an energised circuit, in which there is an electric safety device, shall cause the immediate halt and prevent re-starting of the lifting platform.

5.5.11 Electric/Electronic safety devices

5.5.11.1 General provisions

5.5.11.1.1 During operation of one of the electric safety devices required in several clauses, movement of the machine shall be prevented or it shall be caused to stop immediately as indicated in 5.5.11.1.3. A list of such devices is given in Table 7.

The electric safety devices shall consist of:

a) either one or more electrical safety contacts satisfying 5.5.11.2 directly cutting the supply to the contactors referred to in 5.5.7 or their relay-contactors;

b) or safety circuits satisfying 5.5.11.3, consisting of one or a combination of the following:

1) either one or more electrical safety contacts satisfying 5.5.11.2 not directly cutting the supply to the contactors referred to in 5.5.7 or their relay-contactors ;

2) contacts not satisfying the requirements of 5.5.11.2 ;

3) components in accordance with Annex A.

Table 7 — Electrical safety devices

Devices	Relevant clauses
Door locking safety device for: a) closed position of landing doors; b) locking of landing doors at limits of unlocking zone.	 5.8.5.2 5.8.5.3
Safety device for detecting slack in a suspension rope or chain	5.4.1.6
Emergency stop device	5.5.15.5
Devices operated by sensitive edges, surfaces, photo cells or light curtains	5.9.2
Final limit device	5.5.15.6
Safety gear device	5.3.1.5
Screw/nut drive failure device	5.4.6.1.4
Trap door device	5.6.5.3
Stop device for working area	5.1.4.2.1, 5.1.4.1
Stopping safety device	5.4.6.1.3.9
Drive control	5.5.6, 5.5.7
Levelling, re-levelling and anti-creep	5.4.10.18.2

5.5.11.1.2 Apart from exceptions permitted in this standard (see 5.4.10.21 *Electrical anti creep system*, 5.4.10.22 *Control of levelling, re-levelling and anti creeping with doors open*) no electric equipment shall be connected in parallel with an electric safety device.

Connections to different points of the electric safety chain are only permitted for gathering information. The devices used for that purpose shall fulfil the requirements for safety circuits according to 5.5.11.3.

5.5.11.1.3 The effects of internal or external induction or capacity shall not cause failure of electric safety devices.

5.5.11.1.4 An output signal emanating from an electric safety device shall not be altered by an extraneous signal emanating from another electric device placed further down the same circuit, which would cause a dangerous condition to result.

5.5.11.1.5 In safety circuits comprising two or more parallel channels, all information other than that required for parity checks shall be taken from one channel only.

5.5.11.1.6 Circuits which record or delay signals shall not, even in event of fault, prevent or appreciably delay the stopping of the machine through the functioning of an electric safety device, i.e. the stopping shall occur in the shortest time compatible with the system.

5.5.11.1.7 The construction and arrangement of the internal power supply units shall be such as to prevent the appearance of false signals at outputs of electric safety devices due to the effects of switching.

5.5.11.2 Electrical safety contacts

5.5.11.2.1 The operation of an electrical safety contact shall be by positive separation of the circuit-breaking devices. This separation shall occur even if the contacts have welded together.

The design of an electrical safety contact shall be such as to minimize the risk of a short-circuit resulting from component failure.

NOTE Positive opening is achieved when all the contact-breaking elements are brought to their open position and when for a significant part of the travel there are no resilient members (e.g. springs) between the moving contacts and the part of the actuator to which the actuating force is applied.

5.5.11.2.2 The electrical safety contacts shall be provided for a rated insulation voltage of 250 V if the enclosure provides a degree of protection of at least IP 4X, or 500 V if the degree of protection of the enclosure is less than IP 4X.

The electrical safety contacts shall belong to the following categories as defined in EN 60947-5-1:

a) AC-15 for safety contacts in A.C. circuits;

b) DC-13 for safety contacts in D.C. circuits.

5.5.11.2.3 If the degree of protection is equal or less than IP4X, the clearances shall be at least 3 mm, the creepage distances at least 4 mm and the distances for breaking contacts at least 4 mm after separation. If the protection is better than IP4X the creepage distance can be reduced to 3 mm.

5.5.11.2.4 In the case of multiple breaks, the distance after separation between the contacts shall be at least 2 mm.

5.5.11.2.5 Abrasion of conductive material shall not lead to short circuiting of contacts.

5.5.11.3 Safety circuits

5.5.11.3.1 Safety circuits shall comply with the requirements of 5.5.11 relative to the appearance of a fault.

5.5.11.3.2 Furthermore, as illustrated by Figure 3 the following requirements shall apply.

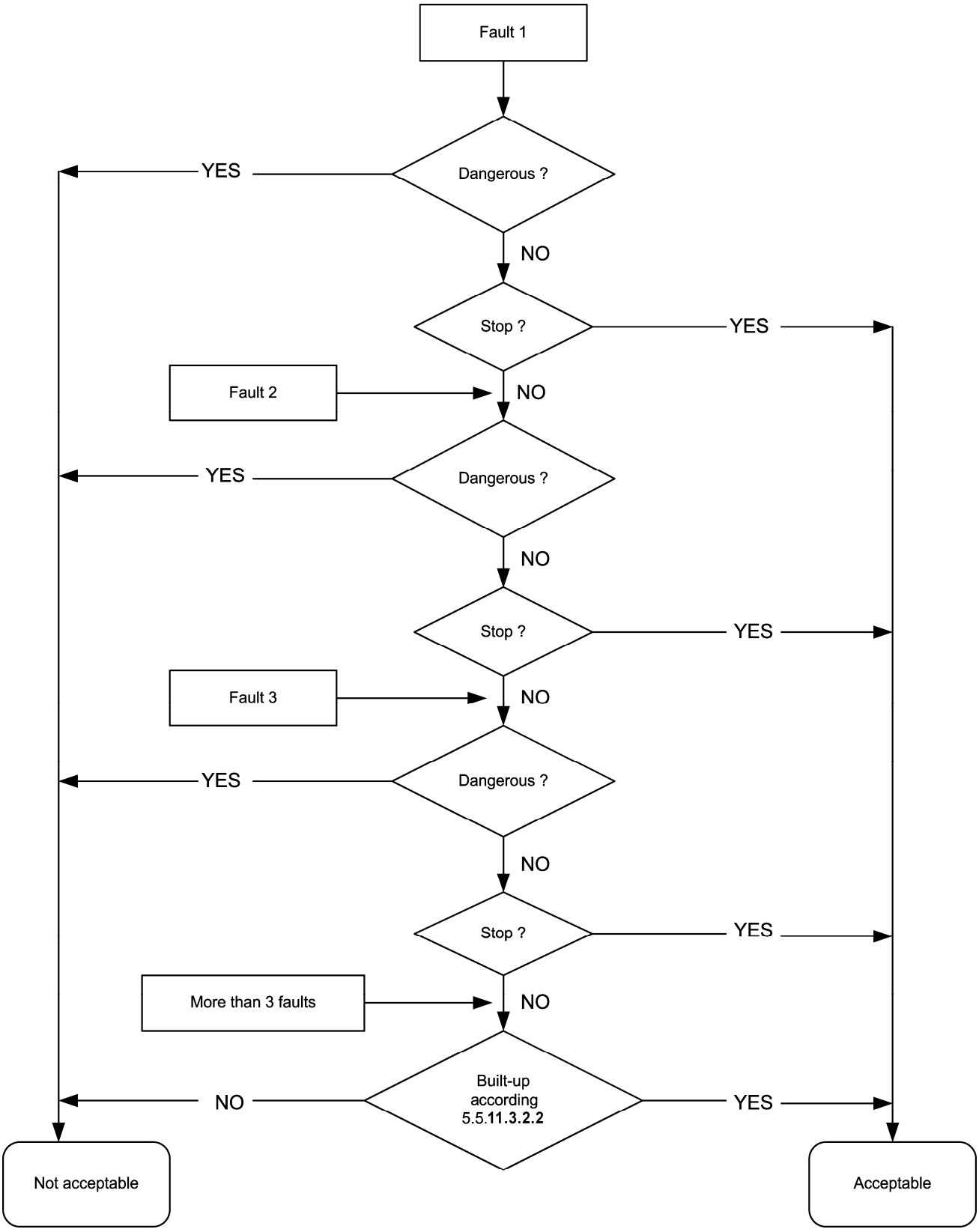


Figure 3 — Diagram for assessing safety circuits

5.5.11.3.2.1 If one fault combined with a second fault can lead to a dangerous situation, the lifting platform shall be stopped at the latest at the next operating sequence in which the first faulty element should participate.

All further operation of the lifting platform shall be impossible as long as this fault persists.

The possibility of the second fault occurring after the first, and before the lifting platform has been stopped by the sequence mentioned above is not considered.

5.5.11.3.2.2 If two faults which by themselves do not lead to a dangerous situation, when combined with a third fault can lead to a dangerous situation, the lifting platform shall be stopped at the latest at the next operating sequence in which one of the faulty elements should participate.

The possibility of the third fault leading to a dangerous situation before the lifting platform has been stopped by the sequence mentioned above, is not considered.

5.5.11.3.2.3 If a combination of more then three faults is possible, then the safety circuit shall be designed with multiple channels and a monitoring circuit checking the equal status of the channels.

If a different status is detected the lifting platform shall be stopped.

In case of two channels the function of the monitoring circuit shall be checked prior to a re-start of the lifting platform at the latest, and in case of failure, re-starting shall not be possible.

5.5.11.3.2.4 On restoration of the power supply after it has been disconnected, maintenance of the lifting platform in the stopped position is not necessary, provided that during the next sequence stopping is reimposed in the cases covered by 5.5.11.3.2.1 up to 5.5.11.3.2.3.

5.5.11.3.2.5 In redundancy-type circuits measures shall be taken to limit as far as possible the risk of defects occurring simultaneously in more than one circuit arising from a single cause.

5.5.11.3.3 Safety circuits containing electronic components are regarded as safety components.

5.5.11.4 Operation of electric safety devices

When operating to ensure safety, an electric safety device shall prevent the setting in motion of the machine or initiate immediately its stopping.

The electric safety devices shall act directly on the equipment controlling the supply to the machine in accordance with the requirements of 5.5.7.

If, because of the power to be transmitted, relay contactors are used to control the machine, these shall be considered as equipment directly controlling the supply to the machine for starting and stopping.

5.5.11.5 Actuation of electric safety devices

The components actuating the electric safety devices shall be built so that they are able to function properly under the mechanical stresses resulting from continuous normal operation.

If the devices for actuating electric safety devices are through the nature of their installation accessible to persons, they shall be so built that these electric safety devices cannot be rendered inoperative by simple means.

NOTE A magnet or a bridge piece is not considered a simple means.

In the case of redundancy-type safety circuits, it shall be ensured by mechanical or geometric arrangements of the transmitter elements that a mechanical fault shall not cause loss of redundancy.

5.5.12 Protection of the driving motor

Driving motors shall be protected against overloading and potentially damaging excess currents by means of a device, which automatically disconnects the supply. The device may automatically re-set after an appropriate interval.

Where protection is provided by means of a temperature-monitoring device, it is permissible for the lifting platform to continue in operation to a normal stop at a landing to allow passenger to leave the platform. An automatic return to normal operation of the platform shall only occur after sufficient cooling down.

5.5.13 Electrical wiring

5.5.13.1 Conductors, insulation and earth bonding

For the cross sectional area of conductors see 12.4 of EN 60204-1:2006.

5.5.13.2 Insulation

The requirements in 13.1.3 of EN 60204-1:2006 shall apply.

All exposed metalwork, other than conductors, liable to become electrically charged shall be earth bonded, see 6.3.1 g), referring to the earth bond test.

5.5.13.3 Trailing cables

Trailing electrical power and control cables shall be securely clamped at each end to ensure no mechanical load is transmitted to cable terminations. It is required that flat cables shall be constructed in accordance with EN 50214.

5.5.13.4 Terminals and connectors

5.5.13.4.1 General

Connectors and devices of the plug-in type shall be protected by position or design against accidental misconnection.

5.5.13.4.2 Terminations shall cause no damage to the conductors or insulation.

5.5.13.4.3 Mains input terminals shall be conveniently accessible within the equipment and shall be correctly identified.

5.5.13.5 Electrical identification

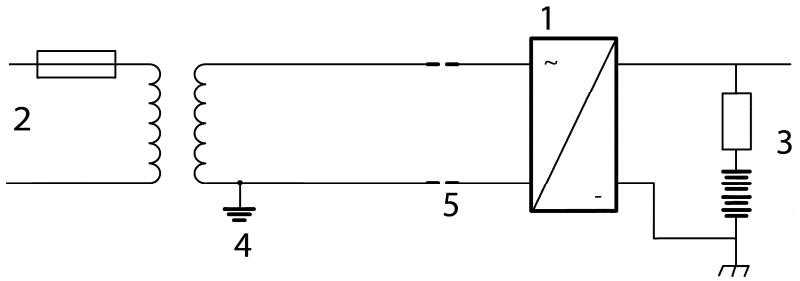
Terminals, connectors and electrical components shall be marked with a suitable means of identification. See 13.2 of EN 60204-1:2006.

5.5.14 Additional requirements for battery powered supply

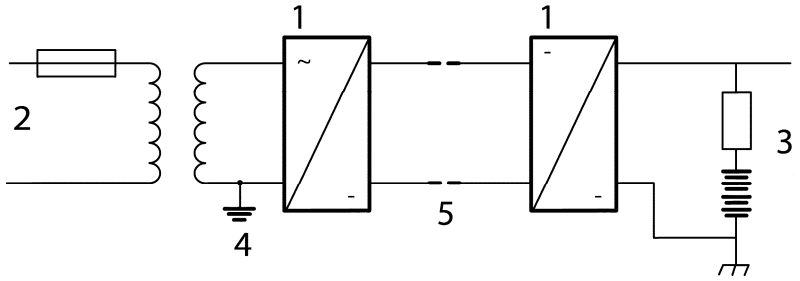
5.5.14.1 For battery powered lifting platforms, the control circuit voltage shall not exceed 60 volts.

5.5.14.2 A fuse shall be fitted in line with the battery supply near the negative pole of the battery, which is only accessible by the use of an appropriate tool(s). This fuse shall isolate the battery supply within 0,5 s of the supply being short-circuited and within 5 s of twice-average peak current being drawn.

5.5.14.3 The charging arrangement for the batteries shall be as Figure 4 a) for AC charging and Figure 4 b) for DC charging. The maximum voltage potential when measured with respect to earth shall be as 6.2 of EN 60204-1:2006.



a) a.c. charge contacts



b) d.c. charge contacts

Key

1 step-up a.c. – d.c. converter
2 step-up d.c. – d.c. converter
3 control circuit 60 V max.
4 see note
5 charge contacts

NOTE The ⏚ symbol denotes the negative side of the battery supply is connected to the chassis of the lifting platform.

Earthing is not required on SELV-protected charging circuits

Figure 4 — Charging supply for battery – powered lifting platforms

5.5.14.4 Battery terminals and charge contacts shall be physically protected against short-circuiting.

5.5.14.5 A secure location or fixing for the batteries shall be provided.

5.5.14.6 A battery isolating switch shall be provided which will isolate the control and drive motor circuits.

5.5.14.7 The arrangements for the charging of the battery shall be such that if the lifting platform is brought to rest out of the reach of the charge contacts, this shall be indicated to the user visually and audibly.

5.5.14.8 The carriage platform chassis shall be earthed as shown in Figure 4.

5.5.14.9 Batteries shall not leak. Batteries shall not emit fumes during normal operation, including charging.

5.5.15 Control devices

5.5.15.1 Control devices shall be provided at each landing and on the platform. See Table 8 below.

Table 8 — Control devices

Element	Requirements
Minimum dimension of the active part of the buttons	Inscribed circle with a diameter of 20 mm
Identification of active part of buttons	Identifiable visually and by touch from face plate or surrounds
Identification of faceplate	Colour to contrast with its surrounds
Operating force	2,5 – 5,0 N
Mechanical operating feed back	Required to inform user that the pushed button has been operated
Position of symbol	Preferable on active part (or 10-15 mm left of it)
Size of symbol (relief)	15 - 40 mm
Height of relief	min. 0,8 mm
Distance between active parts of call buttons	10 mm
Distance between groups of call buttons and other group of buttons	Minimum twice the distance between active parts of call buttons
Minimum height between the floor level and the centre line of any button	900 mm
Maximum height between the platform floor level and the centre line of the highest button on platform	1 200 mm (preferably 1 100 mm)
Maximum height between the landing floor level and the centre line of the highest button on landing	1 100 mm
On a platform suitable for wheelchairs, the minimum lateral space between the centre line of any buttons to a corner in the platform or outside the landing	400 mm

5.5.15.2 Control devices shall operate as follows:

i. Control devices located on the platform, which are used to control the movement of the platform shall be dependent upon hold-to-run

ii. Control devices located at landings, which are used to control the movement of the platform shall not be hold to run. This is to ensure the conditions of 5.5.15.3 can be met.

NOTE When the user has difficulty in operating normal control devices, it may be necessary to consider special devices to suit the particular disability providing the platform hold to run feature is maintained. Recommendations for such devices are given in Annex C.

5.5.15.3 For lifting platforms in enclosed liftways platform operation shall override landing operation and it shall not be possible to initiate a call from any landing if the platform is not located at a fixed landing.

5.5.15.4 There shall be a minimum delay of 1 s before the lifting platform can be started when either of the following occurs:

— the lifting platform is called from another landing;

— the landing door of the landing at which the lifting platform is resting is closed;

— the stopping of the lifting platform and its being re-started in either direction.

5.5.15.5 An emergency stopping device in accordance with EN ISO 13850 shall be fitted on the platform that, when operated, shall directly interrupt the electric safety chain.

This device shall be clearly visible and accessible to the user, easy to operate.

5.5.15.6 Terminal limit devices and final limit electric safety devices shall be provided.

The opening of the final limit electric safety device shall prevent further movement of the lifting platform in both directions of travel. The return to service of the lifting platform shall not occur automatically.

5.5.15.7 The means provided to stop the lifting platform shall be independent of the final limit electric safety device.

5.5.15.8 The lower final limit electric safety device may be omitted in the case of hydraulic drives or those drives incorporating slack rope or slack chain electric safety devices. In addition, the lower final limit electric safety devices may be omitted when the design of the drive system is such that over travel beyond the normal limits of travel is not possible, even without the use of mechanical end stops.

The lower final limit electric safety device may be omitted if the lower terminal limit switch is an electric safety device and if bottom over-travel results in operation of the platform underside electric safety devices.

5.5.16 Emergency alarm devices

5.5.16.1 In order to call for outside assistance, passengers shall have available in the platform an easily recognisable and accessible device for this purpose. This device shall allow a two way voice communication allowing a permanent contact with a rescue service.

5.5.16.2 Emergency alarm device shall be equipped with a standby power source (such as battery back-up and charger), in case of the interruption of the normal power supply. The duration of the standby power source shall be at least one hour.

NOTE The emergency alarm device should work even in event of electrical power supply failure. In the case of connection to a public telephone network, 5.5.16.2 does not apply.

5.5.16.3 An intercom system, or similar device, powered by the emergency supply referred to in 5.5.4, shall be installed between the inside of the platform or in the working area under the platform and the machine room/cabinet if a direct acoustic communication between the machine room/cabinet and the liftway is not possible.

5.5.17 Cable-less controls

5.5.17.1 The cable-less control system shall be designed to work with a single lifting platform. It shall be designed such that the lifting platform shall not respond to signals from another lifting platform or other similar cable-less control system (For example, by use of an appropriate frequency spectrum, coded signals and range).

On platforms installed in public buildings, the cable-less control system shall be in a fixed position in order that it cannot be removed.

5.5.17.2 The cable less communication link shall be designed so as to be fail-safe in the event of signal failure.

5.5.18 Control of inspection operation

To facilitate inspection and maintenance, a readily accessible inspection control station may be provided.

The inspection control station shall be brought into operation by a device (inspection operation switch) which shall satisfy the requirements for electric safety devices according to 5.5.11.

This device, which shall be bi-stable, shall be protected against involuntary operation.

The following conditions for functioning shall be satisfied simultaneously:

a) engagement of the inspection operation shall neutralize the normal operation controls;

b) the movement of the platform shall be dependent on a constant pressure on a push-button protected against accidental operation and with the direction of movement clearly indicated;

c) the control device shall also incorporate a stopping device;

d) the operation of the lift shall remain dependent on the electric safety devices.

5.6 Specific requirements for lifting platforms with enclosed liftways

See example Figure 5

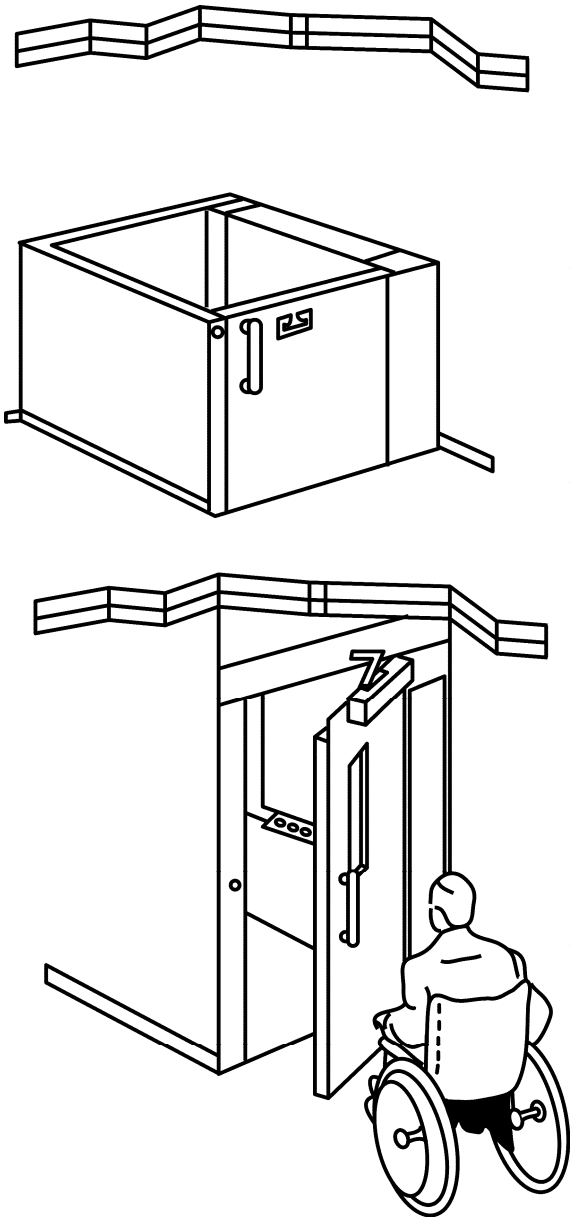


Figure 5 — Example of vertical lifting platform with enclosed liftway

5.6.1 Top clearance

When the lifting platform is in contact with the upper mechanical stop, the vertical clearance between the floor of the platform and the lowest parts of overhead obstacles shall not be less than 2 m.

5.6.2 Risks for persons working in the liftway

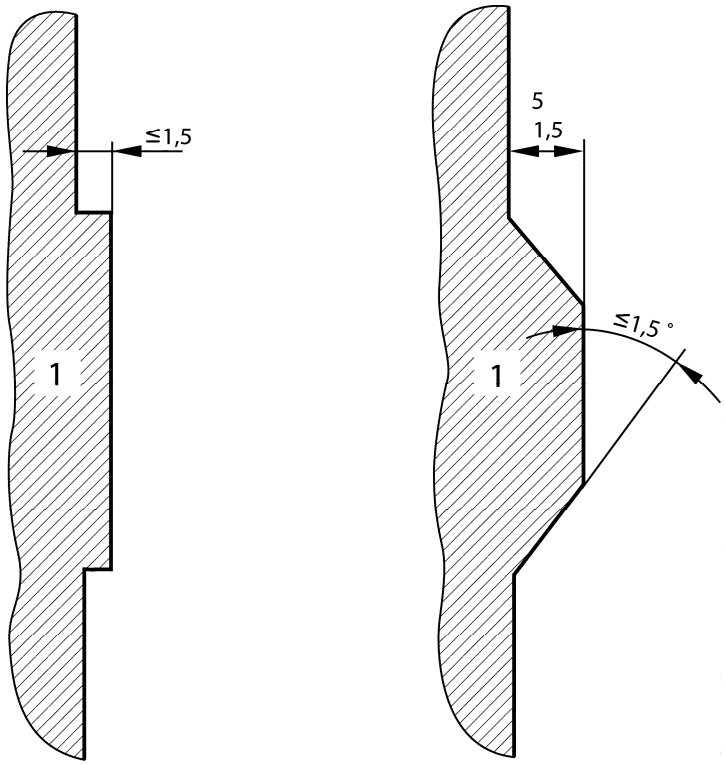
If there is a risk for persons working in the liftway being trapped and no means are provided to escape, through the liftway, alarm devices shall be installed at places where this risk exists. The alarm devices shall fulfil the requirements of 5.5.16.2 and 5.5.16.3.

No other services may be installed in the liftway except ones related to the lifting platform installation.

5.6.3 Enclosure construction

5.6.3.1 Each wall of the enclosure shall form a continuous vertical smooth surface and be composed of hard elements.

5.6.3.2 Any hollows in or projections from internal surfaces of enclosure walls shall not exceed 5 mm and projections exceeding 1,5 mm shall be chamfered to at least 15° to the vertical (see Figure 6).



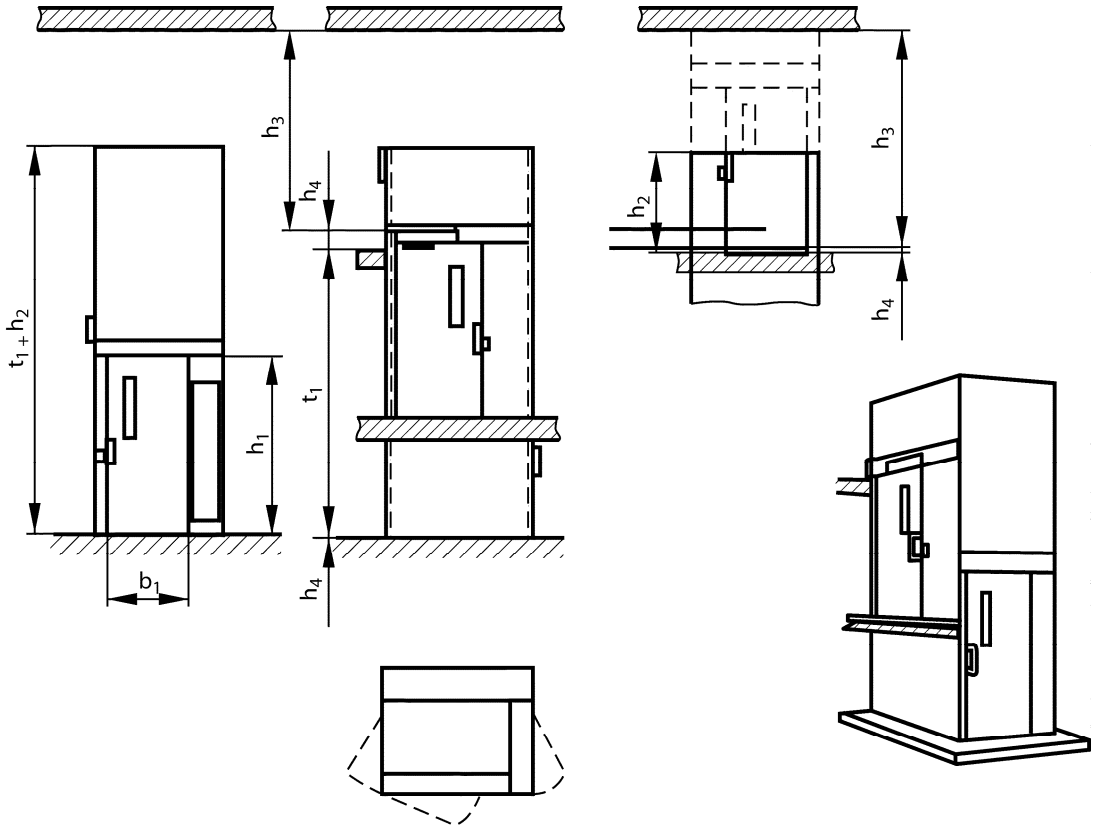
Key

1 door surface of enclosure wall

Figure 6 — Dimensions of permissible projections for enclosed liftway (see 5.6.3.2)

5.6.3.3 The enclosure walls shall be able to withstand the application of a force of 300 N, acting at right angles at any point over an area of 5 cm^2 of round or square shape, without elastic deformation exceeding 15 mm and without any permanent deformation. However, the elastic deformation of the enclosure walls shall not exceed running clearance between the platform and the enclosure walls.

5.6.3.4 For lifting platforms with travel height up to 3 m the enclosure shall extend to a height of not less than 1,1 m above the floor of the upper landing level (see Figure 7). For travel heights over 3 m the enclosure shall extend to a height of not less than 2,0 m above the floor of the upper landing level.



NOTE h_4 is the overtravel distance

Description	Subclause	Symbol	Dimension mm
Travel		t_1	–
Clear access height	5.8.2	h_1	≥ 2 000
Enclosure height/Upper landing door height	5.6.3.4 5.8.3.1	h_2	≥ 1 100 ≥ 2 000 (if travel > 3 m)
Top clearance	5.6.1	h_3	≥ 2 000
Unlocking zone	5.9.3	h_4	≥ Half of unlocking zone

Figure 7 — Lifting platform with enclosed liftway

In addition, the enclosed liftway enclosure shall be so constructed that it extends at least to the upper edge of the platform enclosure when the platform is at the highest point in its travel, including over travel.

5.6.4 Glass

When glass is used in the construction of the enclosed liftway enclosure or hinged doors, it shall fulfil the conditions stated in Tables 9 and 10 as appropriate. Glass panels shall always be fixed on all sides in a frame.

Table 9 — Glass panels to be used in walls of enclosed liftway or of the platform

Dimensions in millimetres

Type of glass	Minimum thickness in mm	
	Diameter of inscribed circle	
	1 000 max.	2 000 max.
Toughened and laminated	8 (4 + 4 + 0,76)	10 (5 + 5 + 0,76)
Laminated	10 (5 + 5 + 0,76)	12 (6 + 6 + 0,76)

Table 10 — Glass panels to be used in hinged doors

Dimensions in millimetres

Type of glass	Minimum thickness	Maximum diameter of inscribed circle
Toughened	8	100
Toughened and laminated	8 (4 + 4 + 0,76)	1 000
Laminated	10 (5 + 5 + 0,76)	1 000

Where the requirements of Tables 9 and 10 are not fulfilled the glass shall be tested according to Annex J of EN 81-1:1998 and EN 81-2:1998, J.1 to J.6.

5.6.5 Inspection doors and traps

5.6.5.1 Inspection doors and traps shall not interfere with the travel of the platform.

5.6.5.2 Inspection doors and traps shall be capable of being opened from outside with the aid of a special key or tool.

5.6.5.3 Inspection doors and traps shall be mechanically locked and electrically controlled in accordance with 5.5.12.

5.7 Fire protection

Landing doors shall comply with the regulations relevant to the fire protection for the building concerned. EN 81-58 defines a method of fire test.

5.8 Enclosed liftway entrances

5.8.1 General

Enclosed liftway entrances shall be protected by landing doors.

5.8.2 Swing hinged landing doors

The clear width of the platform and its entrance and of the landing entrances shall be not less than 800 mm.

However for use by standing lone users (not intended for wheelchairs type A and B), in buildings with private access only, a clear width of the entrances of 500 mm is permitted providing national regulations permit.

The clear height of the entrance shall not be less than 2 000 mm.

Openings giving access to the platform shall be provided with landing doors which:

a) are imperforate;

b) are self-closing. A hold open feature is permitted providing that:

   i) if the doors contribute to the fire rating of the building they shall close automatically on activation of a fire management device;

   ii) if it is possible for a platform to move away from the floor unsupervised, the doors shall close automatically.

c) do not open into the enclosed liftway;

d) require a force to open them which is not more than 40 N at the handle; and

e) are provided with a vision panel when the door or gate is made of non-transparent material and is over 1,1 m in height, which shall;

   1) be not less than 60 mm in width;

   2) have its lower edge located between 300 mm and 900 mm above the floor level;

   3) have a minimum glazed area per landing door of 0,015 m^2 with a minimum of 0,01 m^2 per vision panel.

Doors supplied in accordance with EN 81-1 and EN 81-2, where the vision panel is located higher than 900 mm from the bottom of the door are permitted, providing platform here indication is provided in accordance with EN 81-1 and EN 81-2:1998, 7.6.2.

5.8.3 Height of landing doors

5.8.3.1 Upper level

For lifting platforms with travel height up to 3 m the door shall extend to a height of not less than 1,1 m above the floor of the upper landing level (see Figure 7). For travel heights over 3 m the door shall extend to a height of not less than 2,0 m at each floor, including the upper landing level.

In addition, the landing door at the upper level shall be so constructed that it extends at least to the upper edge of the platform enclosure when the platform is at the highest point in its travel including over travel.

5.8.3.2 Lower and intermediate levels

The height of the landing door protecting a enclosed liftway entrance at the lower or intermediate level shall correspond to the full height of the entrance or extend to the top edge of the enclosed liftway enclosure, whichever is the smaller.

5.8.3.3 Existing buildings

The minimum clear height of the entrance of a landing door may be reduced but shall be the maximum allowed by the building constraints, however not less than 1,80 m. When the height is less than 2,0 m, suitable warnings shall be appropriately placed in the platform and at the landing.

5.8.4 Construction of landing doors

5.8.4.1 Inner surface

The inside of the landing doors shall form a continuous hard smooth vertical surface.

Any hollows in or projections from internal surfaces of landing doors shall not exceed 5 mm and projections exceeding 2 mm shall be chamfered to at least 15° to the vertical (see Figure 6).

5.8.4.2 Alignment

The inner surface of the landing doors shall form a continuous plane with the interior surface of the enclosed liftway.

5.8.4.3 Glazing

Any glazing materials used in landing doors shall conform to 5.6.4.

5.8.4.4 Clearances

Any gap under, over, at side of or between the landing doors shall be not greater than 6 mm throughout the travel and over travel of the platform.

5.8.4.5 Guiding of doors

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

5.8.4.6 Sills

The entrance shall be provided with a sill or ramp, of sufficient strength to withstand the passage of rated loads on to the platform.

Ramps shall be fitted on all platform access edges incorporating a step greater than 10 mm high. They shall have an inclination, which is no greater than as given below. A step of up to 10 mm high is permissible at the leading edge of any ramp.

Ramping inclinations shall not be greater than:

a) 1:4 on a vertical rise up to 50 mm;

b) 1:6 on a vertical rise up to 75 mm;

c) 1:8 on a vertical rise up to 100 mm; and

d) 1:12 on a vertical rise over 100 mm.

5.8.4.7 Strength of landing doors

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 right angles to the panel at any point on either face they shall :

a) resist without permanent deformation;

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.

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).

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

5.8.5 Door locking

5.8.5.1 It shall not be possible in normal operation to open a landing door when the platform is more than 50 mm from the sill level of that door.

5.8.5.2 It shall not be possible to make the lifting platform start or continue in motion with a landing door open. The closed position shall be detected by an electric safety device complying with 5.5.11. The electrical safety contact shall not close until the locking elements are engaged by at least 7 mm. See Figure 8.

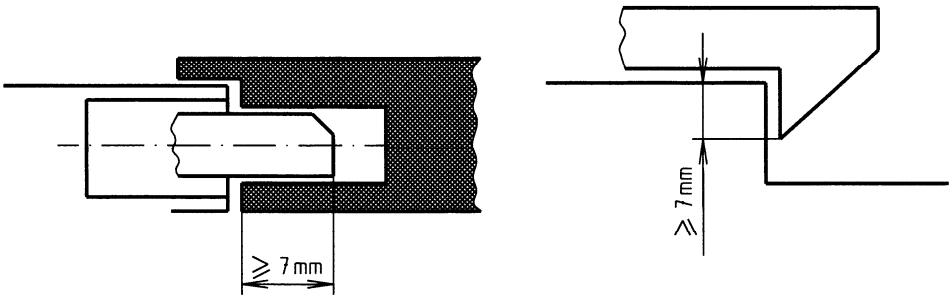


Figure 8 — Examples of locking elements

5.8.5.3 It shall not be possible to make the lifting platform start or continue in motion with a landing door unlocked when the lifting platform is more than 50 mm from the sill level of that door. This may be achieved by means of an electrical safety contact bridging the locking contact within the unlocking zone. An electric safety device complying with 5.5.11 shall detect whether the locking elements are properly engaged.

5.8.5.4 The connection between one of the contact elements which opens the circuit and the device which mechanically locks shall be positive and failsafe, but adjustable if necessary.

5.8.5.5 The locking elements and their fixings shall be resistant to shock.

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

5.8.5.7 The lock shall resist, without permanent deformation, a minimum force of 3 000 N, on the locking element at the level of the lock and in the direction of opening of the door.

5.8.5.8 Locks on landing doors shall be located at, or close to, the closing edge of the door and shall continue to lock effectively should the door sag.

5.8.5.9 The locking devices shall be designed and situated to be inaccessible from the outside and the inside when in normal use and shall be protected against deliberate misuse. Inspection of the working parts shall be easy, as, for example, by use of a vision panel.

5.8.6 Emergency unlocking

It shall be possible to unlock each landing door from the outside with the aid of a special key or tool such as that to fit the unlocking triangle shown in Figure 9. After emergency opening, it shall be possible to close and lock the doors without the use of a tool.

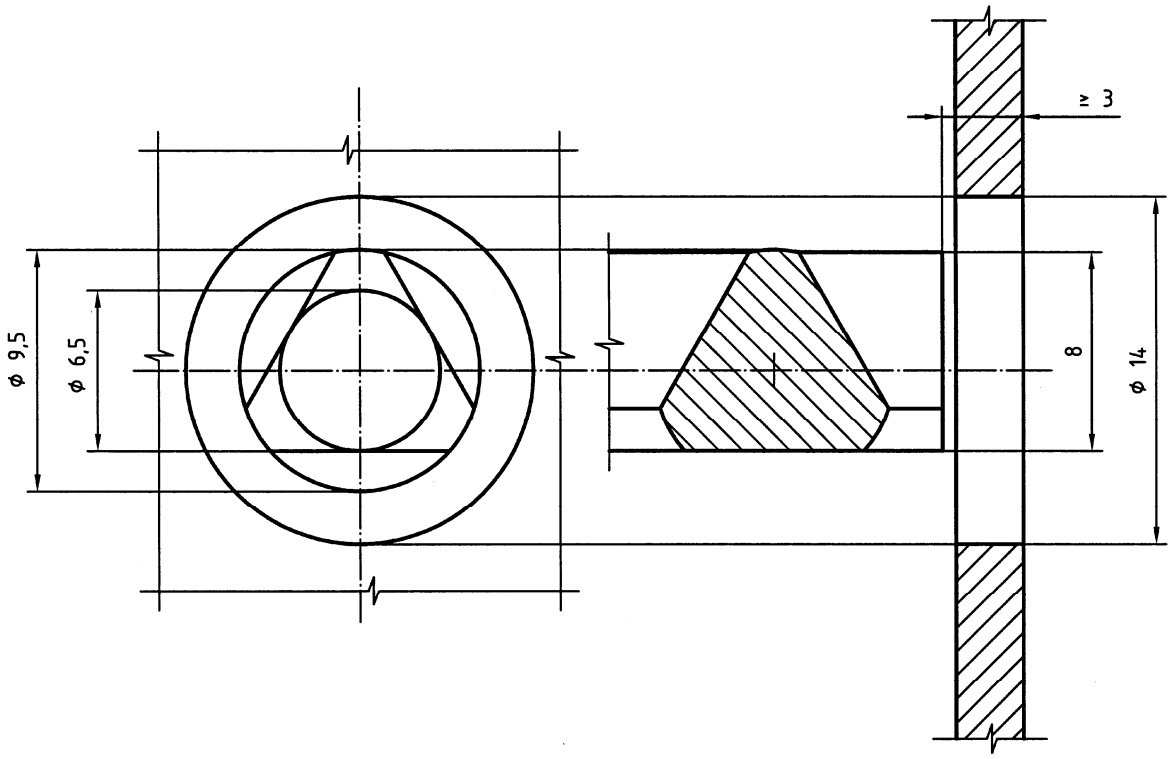


Figure 9 — Unlocking triangle (see 5.8.6)

5.8.7 Protection during door operation

5.8.7.1 The effort needed to resist movement of a power-operated door shall not exceed 150 N, as measured at its leading edge.

5.8.7.2 The kinetic energy of any power operated door and of the mechanical elements which are rigidly connected to it, calculated or measured at the average closing speed, shall not exceed 10 J.

5.8.7.3 To allow users to enter and leave the lifting platform unhindered, the door dwell time shall be initially set to 5 s. The control system shall allow the door dwell time to be adjustable between 2 s and 20 s. The means of the adjustments shall not be accessible to users.

5.9 Platform

5.9.1 Construction

Vertical parts of the platform shall be able to withstand the application of a force of 300 N, acting at right angles at any point over an area of 5 cm^2 of round or square shape without elastic deformation exceeding 15 mm and without any permanent deformation.

Where the driving, guiding or lifting mechanisms present hazards at the sides of a platform, the mechanisms shall be guarded to protect the users. The guarding shall be smooth, hard and continuous.

5.9.2 Sensitive edges, photo cells or light curtains

5.9.2.1 General

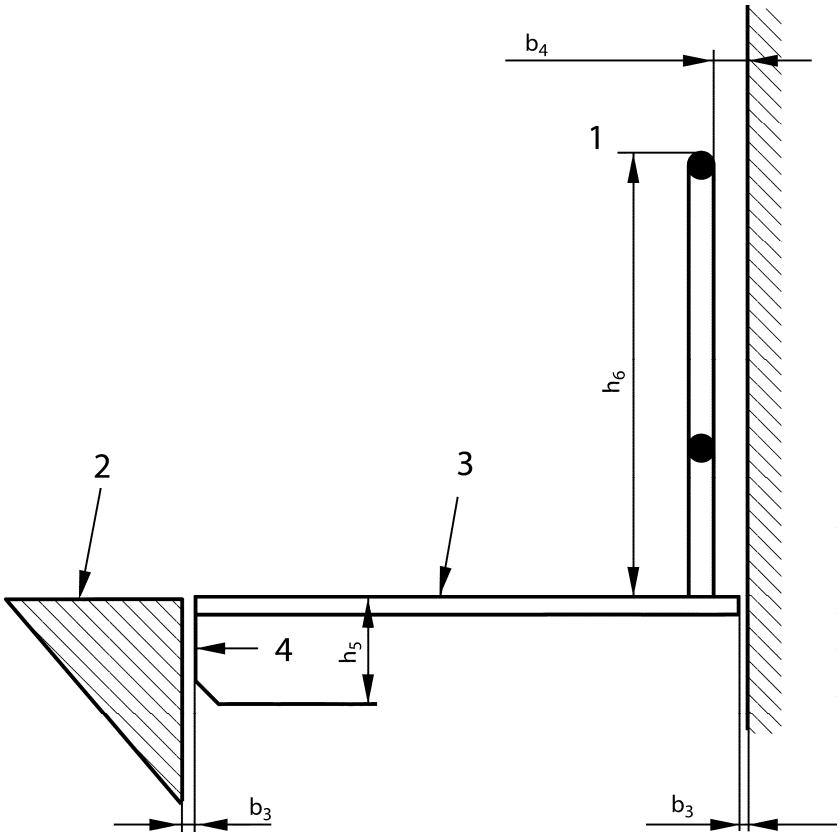
Platforms shall have a sensitive edge, photo cell, light curtain located along the floor edges of any open sides. Sensitive edges, photo cells or light curtains are also required on any other surfaces of the platform if there is a risk of crushing between parts of the platform and an adjacent surface. There is considered to be a risk of crushing if the part of the structure is less than 100 mm to an adjacent surface.

5.9.2.2 The operation of any sensitive edge, photo cells or light curtain, shall initiate a break in the electrical supply to the motor and brake in the direction in which the lifting platform is operating. This shall be achieved by the use of a safety switch or safety circuit in accordance with a category 2 device to EN ISO 13849-1.

The average force required to operate any sensitive edge shall not exceed 30 N when measured at each end and the mid point.

5.9.2.3 The operation of these devices shall stop the lifting platform before any rigid parts come into forceful contact.

5.9.2.4 The horizontal distance between the platform sensitive edges, photo cells or light curtains (5.9.2) and the enclosure or between platform and landing sills shall not exceed 20 mm (see Figure 10).

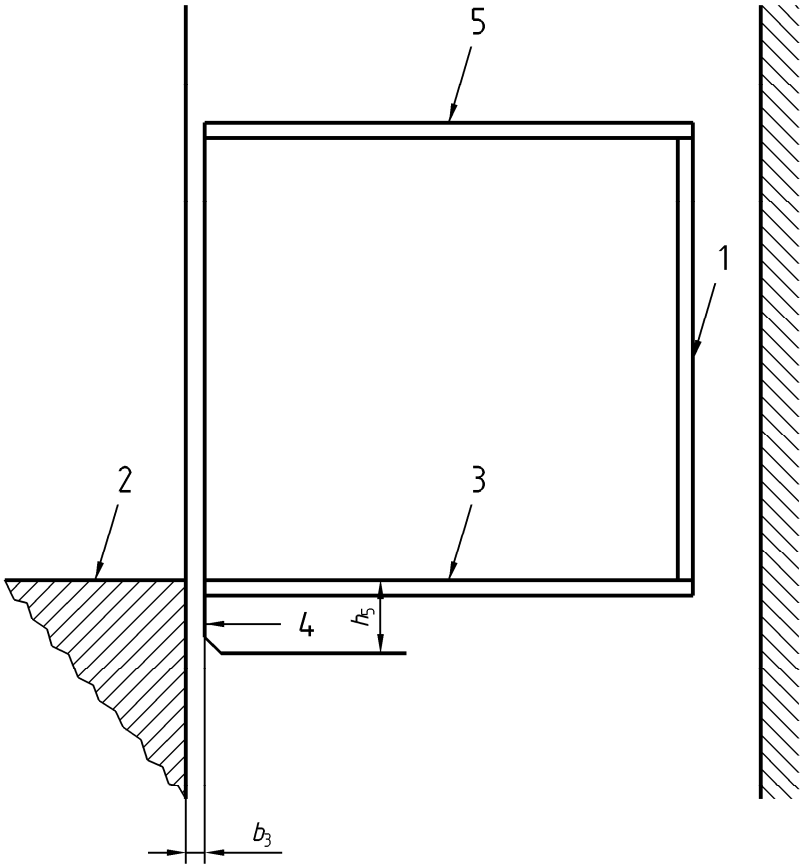


Key

1 protection device required if $b_4 < 100$ mm
2 landing level
3 platform
4 toe guard

Description	Subclause	Symbol	Dimension mm
Distance between enclosure and platform edges	5.9.2.4	b_3	≤ 20
Distance between handrail and fixed surfaces	5.9.7	b_4	≥ 35
Distance between handrail and moving surfaces	5.9.7	b_4	≥ 100
Toe guard height	5.9.3	h_5	≥ Half of unlocking zone
Handrail height	5.9.7	h_6	900 ± 25

Figure 10a — Dimensions and clearances for lifting platform with enclosed lift-way Platform without walls and ceiling



Key

1 platform wall
2 landing level
3 platform floor
4 toe guard
5 platform ceiling

Description	Subclause	Symbol	Dimension mm
Distance between enclosure and platform edges	5.9.2.4	b_3	≤ 20
Toe guard height	5.9.3	h_5	≥ Half of unlocking zone

Figure 10b — Dimensions and clearances for lifting platform with enclosed lift-way Platform with walls and ceiling

5.9.3 A toe guard, which extends over the full width of the landing entrance it faces, shall be provided under each platform sill. The vertical dimensions of the toe guard shall be at least equal to half the unlocking zone (see Figure 10).

5.9.4 Floor covering

The floor covering of the platform shall be slip resistant and contrast in colour and luminance with landing surface. See Annex B (informative).

5.9.5 Ceilings and roofs

5.9.5.1 Ceilings

Where ceilings only are provided to the platform, maintenance shall be carried out from the platform floor. The ceiling shall be able to support the mass of at least one person, counting for 1 000 N on an area of 0,2 m x 0,2 m, without permanent deformation.

The opening of any door providing access to the ceiling shall be by use of a key and prevent normal operation of the lifting platform. The return of the platform to normal service shall only be made by operation of a reset device placed outside of the liftway and accessible to authorised persons only.

Labels giving warning against treading on the ceiling shall be provided.

Figure 11 — Example of warning against treading on the ceiling

5.9.6 Control panel

The following equipment shall be located on one side of the platform:

a) control devices (see 5.5.15);

b) an emergency stop device (see 5.5.15.5);

c) an emergency alarm control device (see 5.5.16).

Items a), b) and c) shall be positioned in the zone specified in 5.5.15.1.

5.9.7 Handrail

A handrail shall be installed at least on one side wall of the platform. The gripping part of this handrail shall have cross-sectional dimensions between 30 mm and 45 mm with a minimum radius of 10 mm. The free space between the fixed wall and the gripping part shall be minimum 35 mm. This clearance dimension shall be increased to a minimum of 100 mm if the handrail is adjacent to a moving surface. The height of the top edge of the gripping part shall be within (900 ± 25) mm from the platform floor.

If the handrail position obstructs the buttons or controls the handrail shall be interrupted so that clear access to the buttons or controls are provided.

Where the handrail projects into the clear access space of any landing door, the projecting ends of handrails shall be closed and turned towards the wall to minimise the risk of injury.

5.9.8 Glass

When glass is used in vertical parts of the platform it shall fulfil the conditions of Table 9.

5.9.9 Tip up seat

Where a tip-up seat is provided, the seat shall have the following characteristics:

i) the seat height from the floor 500 mm ± 20 mm;

ii) the depth 300 mm to 400 mm;

iii) the width 400 mm to 500 mm;

iv) the supported mass 100 kg.

6 Verification of safety requirements and/or protective measures

6.1 Verification of design

Table 11 indicates the methods by which the safety requirements and measures described in Clause 5 shall be verified by the manufacturer for each new model of lifting platform, together with a reference to the corresponding sub-clauses in this standard. Secondary sub-clauses, which are not listed in the table, are verified as part of the quoted sub-clause. For example, secondary sub-clause 5.1.8.1 is verified as part of sub-clause 5.1.8. All verification records shall be kept by the manufacturer.

Table 11 — Means of verification of the safety requirements and/or measures

Sub clause	Safety requirements	Visual inspection[1]	Performance check/test[2]	Measurement[3]	Drawing/ Calculation[4]	User info[5]
5.1	General	✓	✓	✓	✓	✓
5.1.2	Pattern of use	✓	✓		✓	✓
5.1.3	Guarding	✓	✓	✓	✓	
5.1.4	Access for maintenance, repair and inspection	✓		✓		✓
5.7	Fire resistance				✓	✓
5.1.5	Rated speed			✓	✓	
5.1.6	Rated load and platform dimensions			✓	✓	✓
5.1.7	Load control		✓	✓		
5.1.8	Internal floor area			✓		
5.1.9	**Mechanical strength of the platform**		✓		✓	
5.1.10	Resistance to operating forces		✓		✓	
5.1.11	Protection of equipment against harmful external influences	✓	✓		✓	✓
5.1.11.3	Guarding	✓	✓	✓	✓	

(to be continued

Table 11 *(continued)*

Sub clause	Safety requirements	Visual inspection[1]	Performance check/test[2]	Measurement[3]	Drawing/ Calculation[4]	User info[5]
5.1.12	Degree of protection for outdoor use	✓			✓	
5.2.1	Platform support/guide system	✓	✓	✓	✓	
5.3	Safety gear and overspeed governor[6]	✓	✓	✓	✓	
5.4.1	Driving units and drive systems - General requirements	✓	✓	✓	✓	
5.4.2	Braking system	✓	✓	✓	✓	
5.4.3	Emergency/Manual operation	✓	✓			✓
5.4.4	Rack and pinion drive - Additional requirements	✓	✓	✓	✓	
5.4.5	Rope and chain suspension drive - Additional requirements	✓	✓	✓	✓	
5.4.6	Screw and nut drive additional requirements	✓	✓	✓	✓	
5.4.7	Friction traction drive additional requirements	✓	✓	✓	✓	
5.4.8	Guided chain drive additional requirements	✓	✓	✓	✓	
5.4.9	Scissors mechanism drive additional requirements	✓	✓	✓	✓	
5.4.10	Hydraulic drive additional requirements	✓	✓	✓	✓	
5.5	Electrical installation and equipment					
5.5.1.1	Power supply	✓		✓	✓	✓
5.5.1.2	Electrical installation	✓		✓	✓	✓
5.5.1.2	Operating voltage	✓		✓	✓	✓
5.5.2	Neutral conductor	✓			✓	✓
5.5.3	Insulation resistance			✓	✓	
5.5.4	Lighting	✓		✓		✓
5.5.5	Socket outlet	✓			✓	✓
5.5.6	Drive contactors	✓			✓	
5.5.7	Motor and brake circuit	✓	✓	✓	✓	
5.5.8.1	Enclosures requirements	✓	✓		✓	
5.5.8.2	Creepage and clearance distances	✓		✓	✓	
5.5.10	Protection against electrical fault	✓	✓		✓	✓
5.5.11	Electric/Electronic safety devices	✓	✓		✓	✓
5.5.15.4	Time delay			✓		✓
5.5.12	Protection of the driving motor		✓		✓	✓
5.5.13	Electrical wiring	✓			✓	
5.5.11.3	Safety circuits	✓	✓	✓	✓	
5.5.14	Additional requirements for battery powered supply	✓	✓	✓	✓	✓
5.5.15	Control devices	✓	✓	✓		✓
5.5.15.6	Terminal limit switches and final limit devices	✓	✓	✓	✓	✓

(to be continued

Sub clause	Safety requirements	Visual inspection[1]	Performance check/test[2]	Measurement[3]	Drawing/ Calculation[4]	User info[5]
5.5.16	Emergency alarm devices	✓	✓			✓
5.5.17	Cable less controls		✓		✓	✓
5.6	Specific requirements for lifting platforms with enclosed liftways					
5.6.1	Top clearance			✓		
	Equipment requiring inspection or servicing					
5.6.3.1	Wall of the enclosure	✓				✓
5.6.3.2	Internal surfaces of the enclosure projections	✓		✓		✓
5.6.3.3	Enclosure walls resistance		✓	✓	✓	✓
5.6.3.4	Enclosure height above the floor of upper landing			✓		✓
5.9.2.4	Distance between the platform and enclosure			✓		
5.6.4	Glass in the enclosed liftway enclosure			✓	✓	
5.6.5	Inspection doors and traps	✓	✓			✓
5.8.2	Landing doors	✓		✓		
5.8.3	Height of landing doors			✓		
5.8.4	Construction of landing doors	✓	✓	✓	✓	
5.8.5	Door locking	✓	✓	✓	✓	
5.8.6	Emergency unlocking	✓	✓			✓
5.8.7	Protection during door operation	✓	✓	✓		
5.9.1	Platform construction		✓	✓		
5.9.2	Sensitive edges	✓	✓	✓		
5.9.3	Toe guard	✓		✓		
5.9.4	Floor covering	✓				✓
5.9.5	Ceiling	✓				✓
5.9.6	Control panel	✓	✓		✓	✓
5.9.7	Handrail	✓		✓		
5.9.8	Glass	✓			✓	
5.9.9	Tip up seat	✓		✓		

1 Visual inspection will be used to verify the features necessary for the requirement by visual examination of the components supplied.

2 A performance check / test will verify that the features provided perform their function in such a way that the requirement is met.

3 Measurement will verify by the use of instruments that requirements are met, to the specified limits.

4 Drawings / calculations will verify that the design characteristics of the components provided meet the requirements.

5 Verify, that the relevant point is dealt with in the instruction handbook or by marking.

6 See verification tests for safety gear and overspeed governor.

6.2 Verification tests

6.2.1 Over-speed safety device

See EN 81-1:1998, F.4.

6.2.2 Rupture valve/Restrictor

See EN 81-2, F.7.

6.2.3 Safety gear

See EN 81-1:1998, F.3.

6.2.4 Self-sustaining system

See E.4.

6.2.5 Stopping safety device

See E.3.

6.2.6 Landing door locking devices

See EN 81-1:1998, F.1.

6.2.7 Safety circuits containing electronic components

See Annex A.

6.3 Verification tests on each machine before first use

6.3.1 Immediately upon completion of installation and prior to being put into service, lifting platforms shall be subjected to a thorough examination and test by a competent person in accordance with the following:

a) all control devices function correctly;

b) all door locking devices operate correctly;

c) stopping distance of the lifting platform is within specified limits;

d) all electrical safety devices function correctly;

e) the suspension elements and their attachments are in order;

f) the correct clearance dimensions from the surrounding structure are maintained throughout the full travel of the lifting platform;

g) the lifting platform shall be subjected to electrical tests by instruments to include insulation and earth continuity;

h) verify that the polarity of the mains supply connection is correct;

i) tests to verify correct tripping speed of the overspeed governor (or on hydraulic systems, the rupture valve) and correct function of the safety gear at rated load and speed shall be carried out;

j) verify that the mechanism for emergency/manual operation operates correctly;

k) the alarm device when activated operates correctly;

l) the mechanical blocking device is provided and effective;

m) all notices, etc., are correctly displayed;

n) triggering of overload detection device operates correctly (rated load + 75 kg);

o) undergo without failure a dynamic test, with the maximum working load at the rated speed;

p) undergo without permanent deformation a static test with rated load multiplied by a coefficient of 1,25;

q) check safety nut rotates, check distance between main nut and safety nut and check correctly positioned safety nut electric contact device.

6.3.2 A test and examination document which declares at least all the information and the results of all checks on-site listed above shall be completed and held by the installer.

7 Information for use

7.1 General

Operating instructions shall include advice that the safety gear shall only be released and reset by a competent person.

7.2 General

EN ISO 12100-2 details the general requirements for information, location and nature of the information for use, signals and warning devices, markings, signs (pictograms), written warnings, accompanying documents (in particular the instruction handbook).

7.3 Signals and warning devices

7.3.1 Information to be displayed

7.3.1.1 General

Notices bearing the following minimum information shall be displayed on the platform:

7.3.1.2 Rated load

The rated load and the maximum number of persons.

Size of text or symbols shall be at least 10 mm upper case and 7 mm lower case.

7.3.1.3 Function devices

The function of all devices controlling the operation of the lifting platforms shall be identified, see 5.5.15.1.

7.3.1.4 Emergency alarm device

Any emergency alarm device specified in 5.5.16 shall be coloured yellow and shall be identified by a bell symbol, Symbol No. 5013 in IEC 60417-DB.

7.3.1.5 Disabled persons symbol

On lifting platforms with public access, an International Symbol of Access-ISA, Symbol No. 0100 of ISO 7000 shall be displayed at each landing. The height of the symbol shall be not less than 50 mm.

7.3.1.6 Emergency manual operation

7.3.1.6.1 Detailed step by step emergency manual operating instructions in accordance with 5.4.3. shall be displayed in a prominent position adjacent to the emergency lowering device.

7.3.1.6.2 Where it is possible for the device to be operated to move the platform in both the up and down direction a direction label indicating the direction of movement of the platform, when the device is operated, shall be fitted in a prominent position.

7.3.1.6.3 On hydraulic powered lifting platforms, a notice bearing the following legend shall be displayed adjacent to the manual lowering value:

" DANGER — Emergency Lowering Valve ".

7.3.1.6.4 By the main electrical switch.

7.3.1.6.5 The switch for the main electrical supply to the lifting platform shall be identified.

7.3.1.6.6 For hydraulically powered lifting platforms the switch identification shall also bear the following legend:

" Switch off only when the lifting platforms is at the lowest level ".

7.3.1.6.7 Fragile ceiling/roof

A ceiling/roof notice shall be affixed to the ceiling/roof in a position which is clearly visible from any access door.

7.3.1.6.8 Located on the platform sill toe-guard shall be the following warning text:

"HAZARD OF FALLING INTO THE LIFTWAY - MOVE THE PLATFORM TO THE LANDING LEVEL –

IF THIS IS NOT POSSIBLE, THE RESCUE OPERATION OF PERSONS MUST BE CARRIED OUT ONLY BY A COMPETENT PERSON"

7.3.1.6.9 The business name and full address of the manufacturer and, where applicable, his authorised representative, the designation of the machinery and the year of construction.

7.3.2 Operating instructions

7.3.2.1 On lifting platforms where assistance to users is not available, operating instructions shall be provided.

7.3.2.2 The information for the user shall be provided as detailed in Clause 6 of EN 12100-2:2003.

7.4 Accompanying documents (in particular: Instruction handbook)

7.4.1 General

7.4.1.1 Information provided by the manufacturer, to the lift owner, shall accompany the lifting platforms, as detailed in 6.5 of EN ISO 12100-2:2003, which includes the following:

a) the intended use as detailed in 1.1;

b) specific warnings against any foreseeable misuse;

c) training on the practical operation of the lifting platforms;

d) recommended intervals for routine inspection and servicing, including the specification of spare parts where the use of incorrect parts would affect the safety of the stairlift;

e) warning of residual risks;

f) information regarding the conditions for the stability of the lifting platform during transportation, assembly, use, dismantling when out of service, testing and any foreseeable breakdowns;

g) a copy of the verification tests in 6.3.1;

h) a statement highlighting that the lifting platform shall not be used for fire-fighting or evacuation during a fire;

i) a repeat of the information with which the machinery is marked;

j) instructions for use of the controls;

k) alarm system;

l) emergency operations, including the method to be followed in the event of an accident or breakdown;

m) instructions for correct replacement type of batteries, maintenance period and type of charger;

n) the operating method to be followed in the event of accident or breakdown; if a blockage is likely to occur, the operating method to be followed so as to enable the equipment to be safely unblocked;

o) the specifications of spare parts to be used, when these affect the health and safety of operators;

p) a test report detailing the static and dynamic tests carried out by or for the manufacturer or his authorised representative;

q) a statement that the emission sound pressure level at the operators position is expected not to exceed 70 dB(A).

7.4.1.2 An electrical circuit wiring diagram showing the electrical connections and components, together with all necessary identification markings (see 5.5.14);

7.4.1.3 Assembly instructions, including:

a) forces imposed upon the building structure;

b) anchorage requirements.

7.4.2 Marking

Each lifting platform shall be marked legibly and indelibly with the following minimum particulars:

a) the business name and full address of the manufacturer and, where applicable, his authorised representative;

b) year of construction;

c) designation of series or type, if any;

d) serial or identification number;

e) rating information; voltage, frequency, power, rated load.

7.4.3 Building clearance requirements

The following information shall be supplied within the installation manual and the instruction handbook:

The dimensions of working areas in front of machinery cabinets shall be sufficient to permit easy and safe working on equipment.

In particular there shall be provided at least a clear height of 2 m at working areas, and:

a) a clear horizontal working area of at least 0,50 m x 0,60 m for maintenance and inspection of parts at points where this is necessary;

b) a clear horizontal space in front of the control panels and cabinets, defined as follows:

    1) depth, measured from the external surface of the enclosures, at least 0,70 m;

    2) width, the greater of the following values: 0,50 m or the full width of the cabinet or panel.

Only for existing buildings, the minimum clear height may be reduced but shall be the maximum allowed by the building constraints, however not less than 1,80 m. When the height is less than 2,0 m, suitable warnings shall be appropriately placed at the cabinet.

Annex A
(normative)

Electronic components: failure exclusion

The faults to be considered in the electric equipment of a lift are listed in 5.5.11.

Failure exclusion shall only be considered provided that components are applied within their worst case limits of characteristics, value, temperature, humidity, voltage and vibrations.

The following Table A.1 describes the conditions under which the faults envisaged in 5.5.11 can be excluded.

In the table:

— the " NO " in the cell means: failure not excluded, i.e. shall be considered;

— the unmarked cell means: the identified fault type is not relevant.

NOTE Design guidelines.

Some dangerous situations are recognized coming from the possibility of bridging one or several electrical safety contacts by short circuiting or by local interruptions of common lead (earth) combined with one or several other failures. It is good practice to follow the recommendations given below, when information is collected from the safety chain for control purposes, for remote control, alarm control, etc.:

— design the board and circuits with distances in accordance with specifications 3.1 and 3.6 of Table A.1;

— organize common of the connections to the safety chain on the printed circuit board so that the common to the contactors or relay-contactors as mentioned in 5.5.11 will switch off at interruption of the common lead on the print board;

— make always failure analyses for the safety circuits as mentioned in 5.5.14.6. If modifications or additions are made after the lift installation the failure analyses involving new and existing equipment shall be carried out again;

— always use outside (out of element) resistors as protective devices of input elements; internal resistor of the device should not be considered as safe;

— components shall only be used within to the manufacturer specification;

— backwards voltage coming from electronics shall be considered. Using galvanically separated circuits can solve the problems in some cases;

electrical installations regarding earthing should be in accordance with HD 384.5.54 S1. In that case, the interruption of the earth from the building to the controller collection bar (rail) can also be excluded.

Table A.1 — Exclusions of failures

Component	Possible failure exclusion					Conditions	Remarks
	Open circuit	Short circuit	Change to higher value	Change to lower value	Change of function		
1 Passive components							
1.1 Resistor fixed	NO	(a)	NO	(a)		(a) Only for film resistors with varnished or sealed resistance film and axial connection according to applicable IEC Standards, and for wire wound resistors if they are made of a single layer winding protected by enamel or sealed.	
1.2 Resistor variable	NO	NO	NO	NO			
1.3 Resistor, non linear NTC, PTC, VDR, IDR	NO	NO	NO	NO			
1.4 Capacitor	NO	NO	NO	NO			
1.5 Inductive components coil choke	NO	NO		NO			
2 Semiconductors							
2.1 Diode, LED	NO	NO			NO		Change of function refers to a change in reverse current value.
2.2 Zener Diode	NO	NO		NO	NO		Change to lower value refers to change in Zener voltage. Change of function refers to change in reverse current value.
2.3 Thyristor, Triac, GTO	NO	NO			NO		Change of function refers to self triggering or latching of components.

Table A.1 — *(continued)*

<table>
<tr><th rowspan="2">Component</th><th colspan="5">Possible failure exclusion</th><th rowspan="2">Conditions</th><th rowspan="2">Remarks</th></tr>
<tr><th>Open circuit</th><th>Short circuit</th><th>Change to higher value</th><th>Change to lower value</th><th>Change of function</th></tr>
<tr><td>2.4 Optocoupler</td><td>NO</td><td>(a)</td><td></td><td></td><td>NO</td><td>(a) Can be excluded under condition that the optocoupler is according to EN 60747-5, and the isolation voltage is at least according to table below, EN 60664-1:2007, Table 1.
<table><tr><th>Voltage phase-to-earth derived from rated system voltage up to and including Vrms and d.c.</th><th>Preferred series of impulse withstand voltages in volts for installation</th></tr><tr><td></td><td>Category III</td></tr><tr><td>50</td><td>800</td></tr><tr><td>100</td><td>1 500</td></tr><tr><td>150</td><td>2 500</td></tr><tr><td>300</td><td>4 000</td></tr><tr><td>600</td><td>6 000</td></tr><tr><td>1 000</td><td>8 000</td></tr></table></td><td>Open circuit means open circuit in one of the two basic components (LED and photo transistor). Short circuit means short circuit between them.</td></tr>
<tr><td>2.5 Hybrid circuit</td><td>NO</td><td>NO</td><td>NO</td><td>NO</td><td>NO</td><td></td><td></td></tr>
<tr><td>2.6 Integrated circuit</td><td>NO</td><td>NO</td><td>NO</td><td>NO</td><td>NO</td><td></td><td>Change in function to oscillation, 'and' gates becoming 'or' gates, etc...</td></tr>
<tr><td colspan="8"></td></tr>
</table>

Table A.1 — *(continued)*

Component	Possible failure exclusion					Conditions	Remarks
	Open circuit	Short circuit	Change to higher value	Change to lower value	Change of function		
3 Miscellaneous							
3.1 Connectors Terminals Plugs	NO	(a)				(a) If the protection is IP4X or better, the short circuits of connectors can be excluded if the minimum values are according to the tables (taken over from EN 60664-1) with the criteria: pollution degree is 3; material group is III; inhomogeneous field; printed wiring material column not used. These are absolute minimum values which can be found on the connected unit, not pitch dimension or theoretical values. If the protection of the connector is IP5X or better, the creepage distances can be reduced to the clearance value, e.g. 3 mm for 250 Vrms.	
3.2 Neon bulb	NO	NO					
3.3 Transformer	NO	(a)	(b)	(b)		(a) (b) Can be excluded under condition that isolation voltage between windings and core is in line with EN 61558-1, and the working voltage is the highest possible voltage of Table 6 between live and earth	Short-circuits include short-circuits of primary or secondary windings, or between primary and secondary coils. Change in value refers to change of ratio by partial short-circuit in a winding.

Table A.1 — *(continued)*

Component	Possible failure exclusion					Conditions	Remarks
	Open circuit	Short circuit	Change to higher value	Change to lower value	Change of function		
3.4 Fuse		(a)				(a) Can be excluded if the fuse is correctly rated, and constructed according to the applicable IEC Standards.	Short circuit means short circuit of the blown fuse.
3.5 Relay	NO	(a) (b)				(a) Short-circuits between contacts, and between contacts and coil can be excluded if the relay fulfils the requirements of EN 81-1:1998, 13.2.2.3 (EN 81-1:1998, 14.1.2.2.3). (b) Welding of contacts cannot be excluded. However, if the relay is constructed to have mechanically forced interlocked contacts, and made according to EN 60947-5-1, the assumptions of EN 81-1:1998, 13.2.1.3 apply.	
3.6 Printed circuit board (PCB)	NO	(a)				(a) The short circuit can be excluded provided: the general specifications of PCB are in accordance with EN 62326-1; the base material is in accordance with the specifications of one of the EN 61249-2 series of standards; the PCB is constructed according to the above requirements and the minimum values are according to the tables (taken over from EN 60664-1) with the criteria: the pollution degree 3; material group III; inhomogeneous field; printed wiring material column not used; the creepage distances are 4 mm and the clearances 3 mm for 250 Vrms. For other voltages refer to EN 60664-1.	

Table A.1 — *(concluded)*

Component	Possible failure exclusion					Conditions	Remarks
	Open circuit	Short circuit	Change to higher value	Change to lower value	Change of function		
3.6 Printed circuit board (PCB)						If the protection of the PCB is IP5X or better, or the material involved of higher quality, the creepage distances can be reduced to the clearance value, e.g. 3 mm for 250 Vrms. For multi-layer boards comprising at least 3 prepreg or other thin sheet insulating materials short circuit can be excluded (see EN 60950-1).	
4 Assembly of components on printed circuit board (PCB)	NO	(a)				(a) Short circuit can be excluded under circumstances where the short circuit of the component itself can be excluded and the component is mounted in a way that the creeping distances and clearances are not reduced below the minimum acceptable values as listed in 3.1 and 3.6 of this table, neither by the mounting technique nor by the PCB itself.	

Annex B
(informative)

Guidance in selection of lifting platforms

B.1 Introduction

The guidance given in this annex is to assist in the selection of a lifting platform. It reminds suppliers and purchasers and installers of additional factors that will require their attention.

B.2 Selection of lifting platforms

B.2.1 Suitability

B.2.1.1 When selecting a lifting platform, consider the abilities of the user and if the needs of the user are likely to change in the future.

B.2.1.2 Select a lifting platform with a rated load that is capable of carrying the maximum foreseeable load.

B.2.1.3 Ensure that the user(s) can be safely transported on the lifting platform, whether sitting, standing or seated in a wheelchair.

B.2.1.4 Where either manual or automatic operation is optionally available for devices such as doors consider which is more appropriate for the user.

B.2.1.5 Ensure that there are means of escape in the event of fire.

NOTE EN 81-41 is based upon hold to run platform controls for normal operation. When the emergency evacuation system of the building is activated it is possible to actuate an automatic return of the platform to a safe building exit floor and to shut the lift down. It is for national building authorities to decide whether a system such as this, should be considered for lifting platforms.

B.2.2 Control devices

B.2.2.1 Consider the position, type and number of controls that would suit users with differing disabilities.

B.2.2.2 Consider whether a key switch, electronic card or similar means is necessary to restrict the use of the lifting platform to authorised users.

B.2.3 Location of the lifting platform

Check whether the proposed location of the lifting platform is suitable. For example, check:

a) that the installation will not obstruct normal activities in and about the building;

b) that the site location and proposed supporting structure is strong enough to support the lifting platform;

c) that there is an unobstructed manoeuvring space of 1 500 mm $\times$ 1 500 mm (public access) or 1 200 mm $\times$ 1 200 mm (private domestic use), or a straight access route at least 900 mm wide;

d) that the class of protection against external influences is adequate for the intended application.

B.2.4 Duty cycle

The anticipated maximum number of journeys per hour should be determined by the purchaser and communicated to the supplier.

B.3 Electrical supply and lighting

Ensure that a suitable electrical supply is available.

Ensure that lighting to a minimum value of 50 lux is available on the landings whilst the lifting platform is in use.

B.4 Maintenance

Ensure that the purchaser is informed of requirements for the examination, testing and servicing of the lifting platforms and of any associated national regulatory requirements.

Annex C
(informative)

Recommendations for the provisions and use of specially adapted control devices, switches and sensors

C.1 Control devices

C.1.1 It is recommended that the operation of the lifting platform is by means of conventional pushbuttons, joysticks or similar devices, except where these are unsuitable due to the disability of the user.

C.1.2 In such cases, the control device placement, whether on a wall, wheelchair, pendant, etc., should be such that accidental operation by the user is minimised.

C.1.3 Regardless of the type of control switches/devices used, a bi-stable electric safety device shall be fitted on the lifting platform in accordance with 5.5.15.5. Additional stopping devices, which are either specially adapted switches or remotely controlled, may also be fitted.

C.2 Specially adapted switches

C.2.1 Where switches such as low force switches, blowpipe operated switches or pull-cords are used, the design should be such that their immunity to electrical and mechanical interference will prevent accidental operation of the lifting platform.

C.2.2 Such a switch may be used to stop the lifting platform if required, in addition to the stopping devices referred to in C.1.3.

C.3 Assistance

C.3.1 If the disability of the user is such that an adapted switch or a remote control device cannot be operated to control the lifting platform, then the assistance of others should be sought.

Annex D
(informative)

In-use periodic examination, tests and servicing

D.1 Periodic examinations and tests

The lifting platforms should be thoroughly examined at intervals not exceeding 12 months, particular attention being given, upon which a report should be prepared, to the effectiveness of the following features:

a) interlocking devices;

b) electrical safety circuits;

c) earthing continuity;

d) supporting and suspension means for lifting;

e) driving unit and brakes;

f) devices for preventing free fall and descent with excessive speed e.g. safety gear;

g) alarm system;

h) safety edges;

i) inspection of internal surfaces (distances, surfaces and sharp edges);

j) inspection of guides and guide shoes or rollers;

k) lighting and emergency lighting.

D.2 Servicing

Regular servicing should be carried out as specified in the Instruction Handbook provided by the manufacturer.

Annex E
(normative)

Safety components – Tests procedures for verification of conformity

E.1 General provisions

E.1.1 The precision of the instruments shall allow, unless particularly specified, measurements to be made within the following tolerances:

a) ± 1 % masses, forces, distances, speeds;

b) ± 2 % accelerations, retardations;

c) ± 5 % voltages, currents;

d) ± 5 °C temperatures;

e) recording equipment shall be capable of detecting signals, which vary in time of 0,01 s;

f) ± 2,5 % flow rate;

g) ± 1 % pressure $p \leq 200$ kPa;

h) ± 5 % pressure $p > 200$ kPa.

E.2 Test report

The examination certificate shall contain the following information.

TEST REPORT

Name of the examiner: .....

examination certificate: .....

examination N°: .....

1 Category, type and make or trade name: .....

2 Manufacturer's name and address: .....

3 Name and address of certificate holder: .....

4 Date of submission for examination: .....

5 Certificate issued on the basis of the following requirement: .....

6 Test laboratory (if any): .....

7 Date and number of report: .....

8 Date of examination: .....

9 The following documents, bearing the examination number shown above, are annexed to this certificate: .....

10 Any additional information: .....

.....

.....

Place: ....

(Date)

.....

(Signature)

E.3 Screw and nut (not self sustaining system) stopping safety device

E.3.1 General provisions

The range of use provided shall be stated, i.e.:

a) minimum and maximum total masses;

b) maximum rated speed and maximum tripping speed;

c) detailed information shall be provided on the materials used, the type of screw and its design.

E.3.2 Check on the characteristic of the stopping safety device

E.3.2.1 Test sample

E.3.2.1.1 There shall be submitted a complete test rig with: guide rails, frame, screw/nut system, motor, brakes, cushioned stops, speed governor, test load and stopping safety device.

The travel of the test rig shall be so long that the frame under free running conditions reaches the tripping speed of the speed governor at least 2 m before it strikes the cushioned stops under all conditions.

The frame shall be adapted for loading test loads in order to reach the minimum and maximum total mass.

The test rig shall be designed for the maximum total mass.

The brakes shall be possible to release to create free running conditions.

E.3.2.2 Test

E.3.2.2.1 Method of test

The test shall be carried out in free running. Direct or indirect measurements shall be made of:

a) the total height of the fall;

b) the braking distance on the screw;

c) the sliding distance of the over-speed governor, or that of the device used in its place;

d) the total travel of the elements forming the spring.

Measurements a) and b) shall be recorded as a function of the time. The following shall be determined:

a) the average braking force;

b) the greatest instantaneous braking force;

c) the smallest instantaneous braking force.

E.3.2.2.2 Test procedure

E.3.2.2.2.1 Stopping safety device for a single total mass

There shall be carried out four tests with the total mass (P+Q). Between each test the friction parts shall be allowed to return to their normal temperature.

During the tests several sets of friction parts may be used. However, one set of parts shall be capable of three tests.

E.3.2.2.2.2 Stopping safety device certified for different total masses

Adjustment in stages or continuous adjustment. Two series of tests shall be carried out for:

— maximum; and

— the minimum value applied for.

E.3.2.2.3 Determination of the braking force of the stopping safety device

E.3.2.2.3.1 Stopping safety device for a single total mass

The braking force of which the stopping safety device is capable for the given adjustment is taken as equal to the average braking forces determined during the tests.

A check shall be made that the average values determined during the test lie within a range of ± 25 % in relation to the value of the braking force defined above.

E.3.2.2.3.2 Stopping safety device for different total masses

Adjustments in stages or continuous adjustment.

The braking force of which the stopping device is capable shall be calculated as laid down in E.3.2.2.3.1 for the maximum and minimum values applied for.

E.3.2.2.4 Checking after the tests

a) The deformations and modifications (for example cracks, deformations or wear of the gripping elements, appearance of the rubbing surfaces) shall be checked.

b) If necessary, the stopping safety device assembly and the gripping elements shall be photographed in order to reveal deformations or fractures.

E.3.2.3 Calculation of the permissible total mass

E.3.2.3.1 Stopping safety device for a single total mass

The permissible total mass shall be calculated using the following formula:

$$(P+Q) = \frac{\text{Braking force}}{16}$$

where

(P+Q) permissible mass (kg);

Braking force the force (N) determined in accordance with E.3.2.2.3.

E.3.2.3.2 Stopping safety device for different total masses

E.3.2.3.2.1 Adjustment in stages

The permissible total mass shall be calculated for each adjustment as laid down in E.3.2.3.1.

E.3.2.3.2.2 Continuous adjustment

The permissible total mass shall be calculated as laid down in .E.3.2.3.1 for the maximum and minimum values applied for and in accordance with the formula proposed for the intermediate adjustments.

E.3.2.4 Possible modification to the adjustments

If, during the tests, the values found differ by more than 20 % from those expected by the applicant, other tests may be made with his agreement, after modification of the adjustments if necessary.

NOTE If the braking force is clearly greater than that allowed for, the total mass used during the test would be clearly smaller than that which one would be led to authorize by calculation E.3.2.3.1 and consequently the test would not allow the conclusion that the stopping safety device is able to dissipate the required energy with the total mass resulting from the calculation.

E.3.3 Comments

a) When it is applied to a given lift, the mass stated by the installer shall not differ from the permissible total mass defined in E.3.2.3 by ± 7,5 %;

b) to evaluate the validity of welded parts, reference shall be made to standards on this subject;

c) a check shall be made that the possible travel of the gripping elements is sufficient under the most unfavourable conditions (accumulation of manufacturing tolerance);

d) the friction parts shall be suitably retained so that it can be certain that they will be in place at the moment of operation;

e) it shall be checked that the travel of the components forming the spring is sufficient.

E.3.4 Test report

The test report shall indicate the following:

a) information according to EN 81-1 and EN 81-2;

b) type and application of stopping device;

c) the limits of the permissible total masses (see E.3.3 a));

d) the tripping speed of the over-speed governor;

e) the type of screw/ nut system;

f) the state of lubrication of the screw.

E.4 Self sustaining system

The system shall be tested to ensure that under free running conditions, the speed of the platform decreases within 0,4 m under maximum working load conditions.

Annex F
(informative)

Steel guide rail calculation

See Annex G of EN 81-1:1998 and EN 81-2:1998.

Annex G
(normative)

Friction/traction drive – Calculation and test for verification of traction conformity

G.1 General provisions

G.1.1 A calculation shall be provided.

G.1.2 The platform shall undergo a test to ensure that when it is subjected to the maximum static overload the platform will be maintained at its position without slip.

G.1.3 Also a dynamic test shall be completed at rated speed and maximum working load to ensure that traction is maintained during acceleration and deceleration. These conditions shall be maintained despite wear.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 98/37/EC amended by 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard (except 7.4.3), confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Annex ZB
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard (except 7.4.3), confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

EN 81-70:2003, *Safety rules for the construction and installations of lifts — Particular applications for passenger and goods passenger lifts — Part 70: Accessibility to lifts for persons including persons with disability*

EN 13501-1:2007, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

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