



BSI Standards Publication

Safety requirements for lifting tables

Part 2: Lifting tables serving more than 2 fixed landings of a building, for lifting goods with a vertical travel speed not exceeding 0,15 m/s

National foreword

This British Standard is the UK implementation of EN 1570-2:2016.

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

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

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

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English Version

Safety requirements for lifting tables - Part 2: Lifting tables serving more than 2 fixed landings of a building, for lifting goods with a vertical travel speed not exceeding 0,15 m/s

Prescriptions de sécurité des tables élévatrices - Partie 2 : Tables élévatrices desservant plus de deux paliers fixes d'un bâtiment utilisées pour transporter des marchandises et dont la vitesse ne dépasse pas 0,15 m/s

Sicherheitsanforderungen an Hubtische - Teil 2: Hubtische zum Heben von Gütern, die mehr als 2 Haltestellen eines Gebäudes anfahren und deren Hubgeschwindigkeit 0,15 m/s nicht überschreitet

This European Standard was approved by CEN on 27 August 2016.

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European foreword

This document (EN 1570-2:2016) has been prepared by Technical Committee CEN/TC 10 “Lifts, escalators and moving walks”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by May 2017.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the essential requirements of 2006/42/EU.

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

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

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

Introduction

This European Standard document was drafted as a design guidance manual to provide a means of achieving conformance to the essential safety requirements stipulated under Machinery Directive 2006/42/EC.

The machines concerned and the extent to which hazards, hazardous situations and hazardous incidents are covered are indicated in the scope of this European Standard. In addition, the machines should be designed according to the principles of EN ISO 12100 for relevant but non significant hazards, which are not dealt with in this standard.

As lifting tables are used in a wide range of applications, it is equally necessary to perform individual risk assessments in accordance with EN ISO 12100 for the actual operating conditions.

Products sold indirectly to end-users should be built to cover all the risks related to the use and all conditions foreseeable by the manufacturer, as described in the instruction manual.

Where the text gives an example of a safety measure for the purposes of greater clarity, this should not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent or increased level of safety is achieved.

While drafting this European Standard document, it was assumed that:

- the lifting tables are only operated by persons trained in using the equipment in accordance with the manufacturer's instructions, and that the working area is adequately lit;
- the lifting tables are installed on hard-standing, even, appropriately prepared surfaces.
- where there are special requirements on low noise levels, such as for hospital applications and theatres etc., the customer should specify these requirements and the manufacturer should then take all appropriate measures.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

1.1 This European Standard specifies the safety requirements applicable to lifting tables presenting the following characteristics:

- serving more than two fixed landings of a construction;
- able to pass landings;
- designed exclusively for lifting or lowering goods and not persons;
- only accessible to persons during the loading/unloading phases;
- with a travel speed of no more than 0,15 m/s;
- permanently installed.

1.2 This European Standard deals with all significant hazards pertinent, with the exception of noise, to lifting tables when used as intended and under the conditions foreseen by the manufacturer (see Clause 4). This European Standard specifies the appropriate technical measures for eliminating and reducing the risks arising from the significant hazards.

1.3 This European Standard does not apply to the following equipment:

- permanently installed lifting tables, serving specific levels of a construction, with a vertical travel speed exceeding 0,15 m/s (EN 81-31);
- lifting tables serving not more than two fixed landings of a construction (EN 1570-1);
- lifting tables, serving more than 2 fixed landings of a construction for lifting operators, with a vertical travel speed not exceeding 0,15 m/s;
- lifting tables carrying operators and installed in enclosures with a vertical travel speed not exceeding 0,15 m/s;
- lifting tables used on ships;
- lifting tables designed for artists and stage set features during artistic performances;
- lifting tables driven by pusher chains.

1.4 This European Standard does not establish the additional requirements for:

- electromagnetic compatibility;
- operation in severe conditions (e.g. extreme climates, freezer applications, strong magnetic fields);
- operation subject to special rules (e.g. potentially explosive atmospheres, mines);
- handling of loads, the nature of which could lead to dangerous situations (e.g. molten metal, acids, radiating materials, particularly brittle loads, loose loads (gravel, tubes));
- hazards occurring during construction, transportation and disposal;

- equipment installed on the load platform or the replacing or maintaining of it;
- integration into broader systems or other machines, etc.;
- cable-less controls;
- lifting tables where the hydraulic pressure is derived directly from gas pressure;
- lifting tables powered by internal combustion engines.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 349:1993+A1:2008, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body*

EN 13001 (all parts), *Cranes - General design*

EN 60204-1:2006¹, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60224-1:2005, modified)*

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

EN 60529:1991², *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60947-5-1:2004,³ *Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices (IEC 60947-5-1:2003)*

EN 60947-5-3:2013, *Low-voltage switchgear and controlgear - Part 5-3: Control circuit devices and switching elements - Requirements for proximity devices with defined behaviour under fault conditions (PDDb) (IEC 60947-5-3:2013)*

EN 61310-2:2008, *Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking (IEC 61310:2007)*

EN 61496-1:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests (IEC 61496-1:2012)*

EN 61496-2:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2013)*

EN ISO 4413:2010, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010)*

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

¹ As impacted by EN 60204-1:2006/A1:2009.

² As impacted by EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013

³ As impacted by EN 60947-5-1:2004/A1:2009

EN ISO 13849-1:2015, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13850:2015, *Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)*

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

EN ISO 14119:2013, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)*

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

ISO 606:2015, *Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets*

ISO 4347:2015, *Leaf chains, clevises and sheaves — Dimensions, measuring forces, tensile strengths and dynamic strengths*

3 Terms and definitions

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

3.1

lifting table

load-lifting device with a load-supporting platform rigidly guided throughout its travel (e.g. a scissor lift)

3.2

fixed landing

permanent level of the construction for loading and unloading the lifting table

3.3

platform

part of the lifting table designed to accommodate the working load; fork arms are considered as a load platform for goods only

3.4

vertical travel

vertical distance between the lowest and highest fixed landing for which the lifting table is designed

3.5

rated load

load that the manufacturer has stated that the machine is capable of lifting/lowering when used in accordance with the instruction handbook

3.6

guard

part of the machine specifically used to provide protection by means of a physical barrier

3.7

emergency stop control

component of emergency stop equipment which generates the emergency stop signal when the associated manual control (actuator) is operated

3.8

operator

person who is trained to operate the lifting table, according to the manufacturer's instructions

3.9

maximum working pressure

highest pressure in the hydraulic system at which it is intended to operate under normal working conditions with rated load

3.10

travel zone

space through which the lifting mechanism, platform and any attachment to it, moves

3.11

restricted area

area to which access is restricted only to persons who are authorized to be in that area, and not accessible to the public

3.12

public area

areas to which the public have access

3.13

travel speed

average lifting and lowering speed of the platform when measured throughout its normal travel range

3.14

screen

permanent protection from access to the hazard for the whole body, also called distance guards in EN ISO 14120:2015

3.15

guard-rail

device for protection against accidental fall or accidental access to a hazardous area, with which stairs, step ladders, landing or platforms and walkways (level surface used for moving from one point to another) may be equipped

3.16

enclosure

permanent protection where the whole of the travel zone is protected with rigid panels to make the lifting table inaccessible whilst in operation

3.17

automatic programmable controlled lifting table

lifting table designed for the lifting of goods only, where movement that takes place is not initiated by hold-to run manual controls

3.18

toe guard

vertical component extending downwards from the platform entrance

3.19

gate

opening part of the protection means, to give access from a fixed landing to the platform (e.g. barrier, door, vertical hinged, sliding...)

4 List of hazards

The table that contains all the significant hazards, hazardous situations and events, identified by risk assessment significant for lifting tables and for which require action to eliminate or reduce the risk is in Annex C.

5 Safety requirements and/or protective measures

5.1 General

Lifting tables shall comply with the safety requirements and/or protective measures within this clause. In addition, the lifting table shall be designed according to the principles of EN ISO 12100 for relevant but insignificant hazards, which are not dealt with by this standard.

5.2 Calculations

5.2.1 Stresses

5.2.1.1 The lifting table shall be designed in accordance with known standard calculation rules (e.g. EN 13001, all parts) and good engineering practices, and all equipment failure modes shall be taken into account, including fatigue failure.

5.2.1.2 The stresses in any part of the lifting table assessed using the permissible stress method shall not, under normal working conditions, exceed the lowest of the following values:

- a) 0,66 times the yield stress of the material used; or
- b) 0,50 times the ultimate tensile stress of the material used.

5.2.1.3 The stresses shall be calculated for a lifting table carrying its rated load and being used in compliance with the manufacturer's instructions.

The loads shall include all real static and dynamic forces, both vertical and horizontal, all wind forces, and all forces applied to the platform during loading and unloading.

5.2.1.4 The minimum dynamic forces to be used for the calculations set out under 5.2.1.3 shall result from:

- a) the total vertical load (this includes the rated load and the self-weight of the moving parts of the structure) increased by the dynamic factor for the category of lift shown in Table 1; and
- b) the horizontal load coefficient for the category of lift shown in Table 1, taken as acting horizontally at the platform level in the direction causing the maximum stress in the part being considered.

Table 1 — Load factors for lifting tables

Lift category	Dynamic factor	Horizontal load coefficient [in % of the rated load]	Lifetime ^b minimum load cycles under full load [x10 ³]	Examples of use (informative)
1	1,4	10 %	128 ^a	Lifting tables for general purpose.
2	1,1	2,5 %	8	Lifting tables with a clearly defined lifting load and where other forces can be excluded; height adjustment without systematic lateral forces.
3	1,2	5,0 %	32	Not applicable
4	1,3	10 %	128	Lifting tables suited for crossing with, e.g. manually operated industrial trucks, electric pallet-stacking trucks with a maximum braking of 10 %. Lifting tables with mounted gravity conveyors.
5	1,4	10 %	512	Lifting tables suited for a high number of cycles
When a lifting table is crossed by vehicles, or is integrated in a handling device, the lateral forces have to be verified in individual cases. Higher horizontal load coefficients have to be established if required.				
<p>^a This minimum number of cycles shall be increased by the manufacturer according to the use of the lifting table.</p> <p>^b When used (load cycle) according to lifting categories, the lifetime of lifting tables is generally 10 years when maintained in accordance with the manufacturer's instructions.</p>				

NOTE 1 If permanent protection prevents loading or unloading across a side, or other means prevent movement of the platform in a particular direction, the horizontal load coefficient in this direction need not be considered.

NOTE 2 Lifting tables are classified in 5 categories (called lift category) depending on the use for which it is designed. The dynamic factor, horizontal load coefficient and number of cycles used in the design calculations are defined in Table 1.

5.2.1.5 It shall be possible for the forces produced when the mechanical safety device is operated, to be accepted without permanent deformation of the normal load bearing parts, when used in accordance with the manufacturer's instructions.

5.2.2 Platform deflection

All lifting tables shall be designed to meet the following minimum requirements:

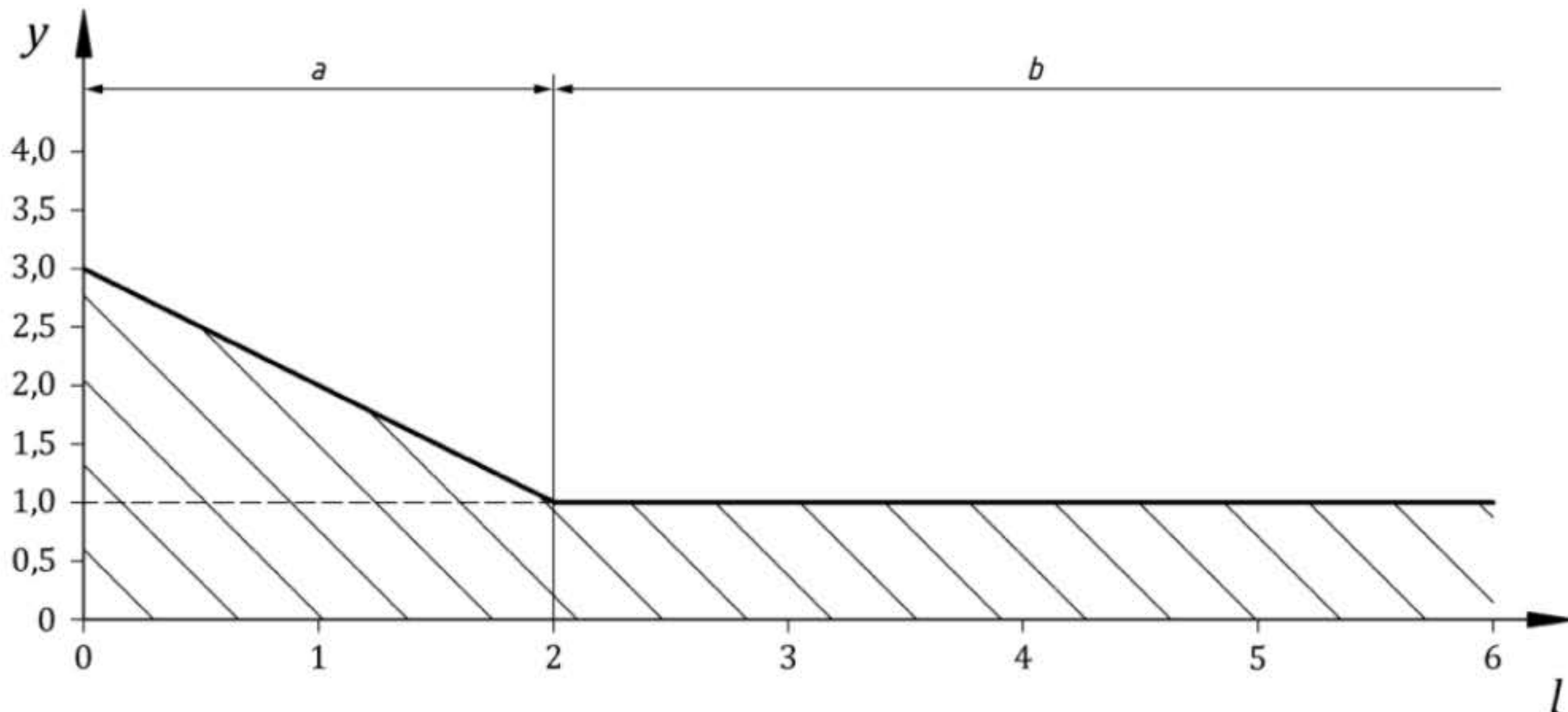
- a) in one case, lift half the rated load distributed over half the length or longest side of the platform;
- b) and in another case, lift one third of the rated load distributed over half the width or shortest side of the platform.

NOTE In cases involving upright-framed lifts, the length is considered as the edge running alongside the column.

In neither case shall hazardous tilting or deflection take place when used as intended by the manufacturer. The maximum tilting or deflection shall not exceed that shown in Figure 1 where;

- a) is the maximum tilting or deflection (y) of any side up to 2,0 m (l) long and is $y = (1 + (2 - l)) \%$
- b) is the maximum tilting or deflection (y) of any side above 2,0 m (l) long and is $y = 1,0 \%$

Dimensions in metres



Key

- y percentage tilting or deflection of a side l
- l length of the side of a lifting table platform (in metres)
- a maximum tilting or deflection of any side up to 2,0 m
- b maximum tilting or deflection of any side above 2,0 m

Figure 1 — Deflection of platform

5.2.3 Strength of the load-bearing structure

The support (and, if appropriate, the load-bearing structure of the construction) to which the lifting table is attached shall be built to withstand all the static and dynamic vertical and horizontal forces generated by both the load and the lifting table itself.

The design shall address all dynamic forces and all externally imposed forces, including those caused by load transfer on and off the platform and those caused by loading equipment.

These forces and loads are to be conveyed to the construction structural engineers to ensure the construction is designed and built in a manor to support the lifting table.

NOTE Those forces are to be included in the instructions for installation, as required in 8.3.5.

5.2.4 Stability

5.2.4.1 Lifting tables shall be stable (i.e. will not overturn) in all conditions, whether the platform is moving or not.

The calculated factor of safety shall not be less than 1,3. This shall be calculated by dividing the sum of all the stabilizing moments by the sum of all the overturning moments, including the relevant horizontal load coefficient as defined in 5.2.1.4. The overturning moments are to include all dynamic forces and all externally imposed forces, including those caused by transfer on and off the platform and those caused by operators. For this calculation the rated load shall be evenly distributed over an area half the length times half the width of the platform, in any overturning position.

5.2.4.2 Where operators are to enter the platform for loading/unloading, the worst case overturning moment of these persons shall be taken into account in these calculations. Manual forces applied by operators on the platform shall be multiplied by a factor of 1,1 and taken to be acting in the direction creating the greater overturning moment.

5.3 General requirements

5.3.1 Safety distances

Crushing and shearing shall be avoided by using the following minimum gaps between moving parts and between moving and fixed parts which are in reach of persons (see EN ISO 13857) on the platform or standing adjacent to the travel zone:

EN 349 defines the following values:

- for fingers, 25 mm;
- for toes, 50 mm;
- for hands, 100 mm;
- for arms and closed hands, 120 mm;
- for feet, 120 mm;
- for the body, 500 mm.

5.3.2 High temperatures

If any parts of the driving system can operate at a temperature above 55°C during intended use, these parts shall be protected to avoid contact with persons (e.g. by covering or positioning).

5.3.3 Speed

5.3.3.1 The average lifting and lowering speed of the platform shall not exceed 0,15 m/s when measured throughout its normal travel range, except where the platform is automatically programme controlled within a production line system and safe by position.

5.3.3.2 Overspeed protection shall be ensured by devices fitted to all lifting tables to stop the descent of the platform before the speed exceeds 0,25 m/s.

NOTE This does not apply to structural failure.

5.4 Protection for the travel zone and for the platform

5.4.1 General requirements

Screens, guarding, guard-rails and gates shall be designed taking into account the safety distance / clearance / height of enclosures as defined in EN ISO 13857 and 5.3.1.

The height determined shall take into account any steps or similar surface where a person could conceivably stand, which is to be considered as the ground level. The minimum height to be used to protect persons or goods from falling is 1 100 mm.

Lifting tables installed in areas that are accessible to the public shall be fitted with non-perforated screens complying with EN ISO 13857 all around the travel zone.

Protection means (e.g. gates, guard-rails, screens etc.) shall be designed to prevent the risk of creating crushing or shearing points while the lift table is in operation.

Protection means (e.g. guard-rails, screens, gates etc.) are not primarily intended to restrain goods. Goods should be prevented from falling from the platform, or into the travel zone, and the method used is to be described in the instruction for use. See also 5.4.

All screens and guard-rails shall resist a minimum horizontal force of 300 N/m, without permanent deformation and without exceeding a deflection of 30 mm.

NOTE When needed, a horizontal force greater than 300 N/m can be defined when agreed between manufacturer and user.

When supplied, gates and their locks shall resist a minimum horizontal force of 300 N/m without permanent deformation and it shall be ensured that the gates are either:

- prevented from opening outwards from the platform (when mounted on the platform), or
- prevented from opening into the travel zone (when mounted on the fixed landing).

Any gate deflection should be minimized and not create any other hazard.

The ends of the guard-rails, gates or screens shall be designed in such a manner as to eliminate any risk of harm caused by sharp edges of the product or by catching of the user's clothing.

5.4.2 Protection of the travel zone

On each fixed landing edge, where there is a risk of falling more than 0,5 m, there shall be guard-rails compliant with 5.4.5, screens compliant with 5.4.8 or gates compliant with 5.4.6 fitted.

5.4.3 Protection for the area underneath the platform

When the lifting table is installed in a restricted area (i.e. non-public area), with a hold-to-run motion control placed in such a way that the operator has full visibility over the entire platform travel zone, then a trip device complying with 5.10.2 is the minimum requirement.

In cases where there is a risk of falling over 0,5 m into a pit or if the travel above the lower fixed landing is greater than 1,6 m, then flexible guards compliant with 5.4.7 shall be fitted to the lifting table if it is in a restricted area only, else guard-rails compliant with 5.4.5, screens compliant with 5.4.8 or gates compliant with 5.4.6 shall be fitted on the lower fixed landing.

NOTE When the risk of falling in a pit less than 0,5 m and the travel above the lower fixed landing is less than 1,6 m, no protection against falling is needed on the lower fixed landing in restricted areas.

In all other cases not considered above, the lifting table travel zone shall be protected by screens compliant with 5.4.8.

When the platform is used as part of the floor at a fixed landing, fall protection devices on the fixed landing(s) shall be so interlocked that the lifting platform shall not move unless the protective devices are in place and they shall not be removable unless the platform is in position. Interlocks shall comply with EN ISO 14119 and 5.4.6.1. Removable fall protection devices are to be considered as gates. Any removable fall protection devices on the platform shall be interlocked to meet the requirements of EN ISO 14119:2013, 3.2, with the performance level as determined in 5.4.6.1.

5.4.4 Protection for the platform

5.4.4.1 Falling of persons

The platform shall be fitted with guard-rails compliant with 5.4.5, screens compliant with 5.4.8 or gates compliant with 5.4.6, when the distance between the platform and walls or surrounding structures at the fixed landings is greater than 120 mm and/or when there is a risk of falling over 0,5 m.

5.4.4.2 Falling objects

When the distance between the platform and walls or surrounding structures at the fixed landings is greater than 30 mm but smaller than 120 mm, a toe-plate of at least 100 mm in height shall be fitted, 100 mm above the platform. The toe plate shall be fixed, removable or foldable.

5.4.5 Guard-rails

5.4.5.1 General

Guard-rails shall comply with EN ISO 14122-3:2001, 4.1, 4.2, 4.3 and 7.1.

The minimum clear horizontal distance between a guard-rail and structure of a machine or wall shall be:

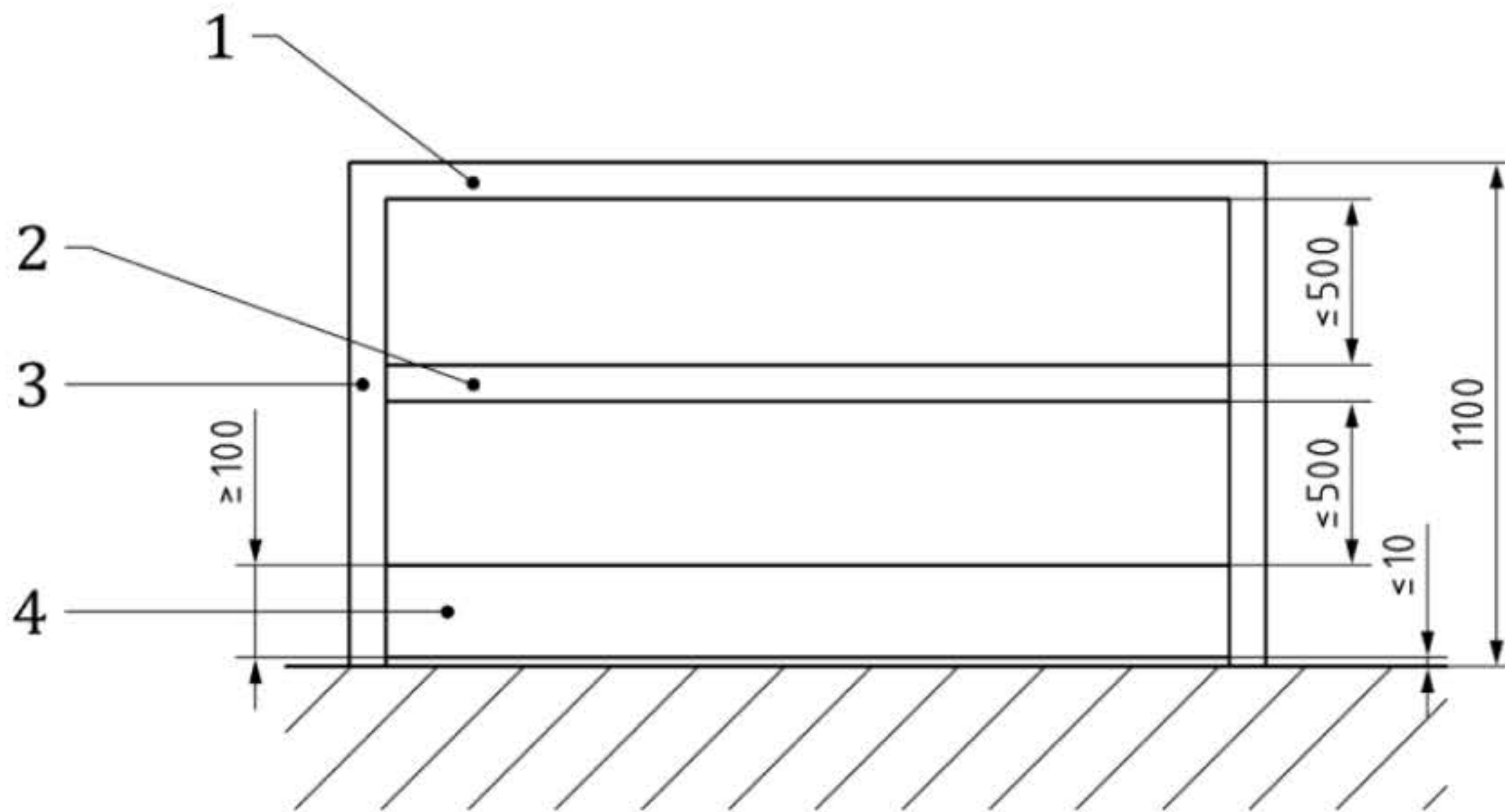
- 100 mm if there is no movement;
- 120 mm if there is a movement.

Where access through the guard-rail is required, a gate meeting the requirements of 5.4.6 shall be used.

5.4.5.2 Requirements for guard-rails

Guard-rails to prevent operators falling from the platform or into the travel zone shall be designed as described below. Figures 2a and 2b show the minimum height and spacing requirements for such guard-rails.

Dimensions in millimetres



Key

- 1 top hand rail
- 2 intermediate knee rail
- 3 vertical upright
- 4 toe-plate

Figure 2a — Horizontal guard-rail

Dimensions in millimetres

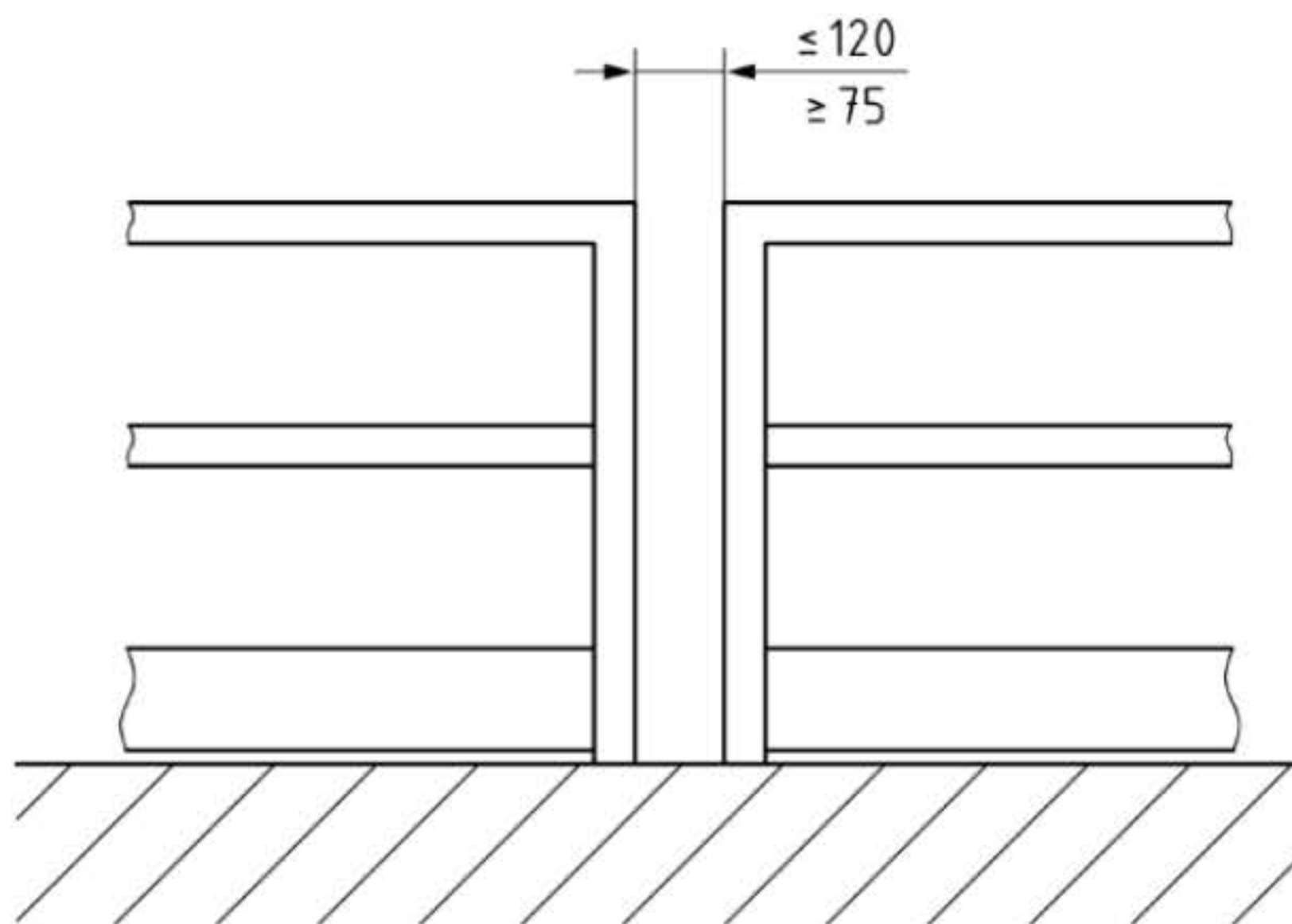


Figure 2b — Clear space between two guard-rail segments

The guard-rail shall include at least one intermediate knee-rail or any other equivalent protection. The clear space between the handrail and the knee-rail, as well as the knee-rail and the toe-plate, shall not exceed 500 mm.

To protect against trapping where horizontal bars pass members closer than 120 mm, the whole of the guard-rail shall be sheeted with rigid material conforming to EN ISO 13857.

When vertical uprights are used instead of a knee-rail the clear horizontal distance between those uprights shall be 180 mm maximum.

The distance between the axes of the upright stanchions is preferred to be limited to 1 500 mm but, if this distance is exceeded, special attention shall be paid to the stanchion anchoring strength and the fixing devices.

In the case of an interrupted guard-rail, to prevent hand traps the clear space between the two segments shall be not less than 75 mm and not greater than 120 mm (see Figure 2b). Where any gap is less than 8 mm, the guard-rail may be considered as continuous.

5.4.6 Gates

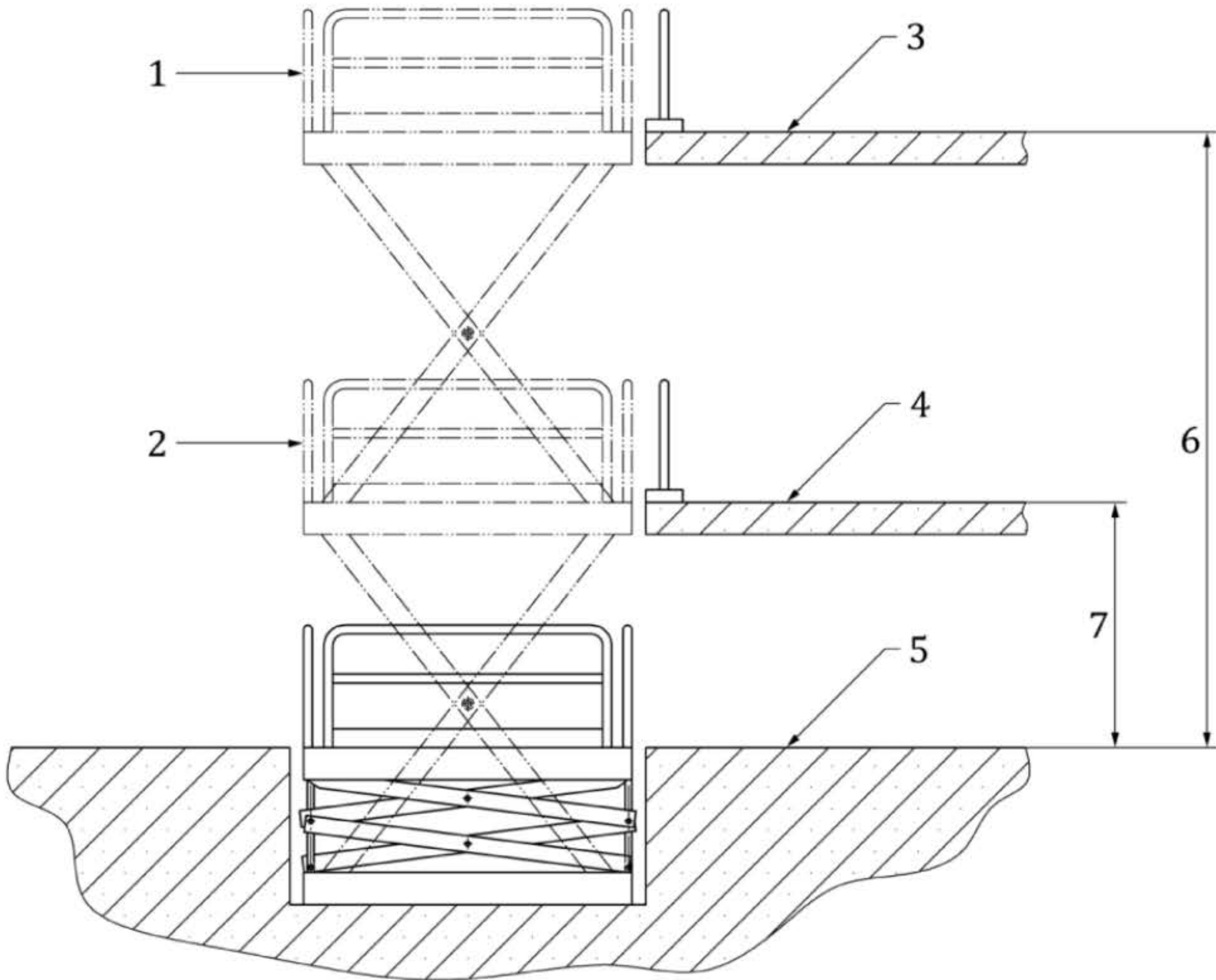
5.4.6.1 General Requirements

It shall not be possible for the platform to move vertically by more than 150 mm from a fixed landing unless the gates are closed and locked as in Figure 3. Landing gates are not to open into the travel zone.

Any failure of the locking system shall not lead to an unsafe or hazardous condition.

Unless otherwise stated, all gates shall be equipped with an interlocking device:

- as defined in EN ISO 14119:2013, 3.2, with a required performance level PLr = b according to EN ISO 13849-1 when, in the worst case, the risk of falling is less than or equal to 1,6m;
- as defined in EN ISO 14119:2013, 3.5, with a required performance level PLr = d according to EN ISO 13849-1 when, in the worst case, the risk of falling is greater than 1,6m.



Key

- 1 PLr = d
- 2 PLr = b
- 3 top fixed landing
- 4 fixed landing above the lowest landing
- 5 lowest landing
- 6 height = 4,5 m
- 7 height = 1,6 m

Figure 3 — Performance level depending on the fall risk

NOTE The values shown in this figure are for illustrative purposes only.

In addition:

- gates on the platform that are inward opening shall be constructed to either return automatically or be equipped with an interlocking device as defined in EN ISO 14119:2013, 3.2, with a required performance level PLr = b according to EN ISO 13849-1. Inadvertent opening shall not be possible. If a gate is vertically hinged, the barrier member shall not require effort greater than 150 N to operate at the end furthest from the pivot. The barrier member shall be self-supporting in the vertical position.

All gates that are of a similar design to guard-rails shall meet the requirements of 5.4.5.1.

Any vertically hinged gates shall have a top and knee rail. Risk assessments should be carried out to assess the removal of the toe plate with regards goods / personnel falling under the barrier.

5.4.6.2 Power-driven gates

When gates are power-driven, they shall:

- a) open only when the platform is stationary at that level (if on the landing) or at a fixed landing (if on the platform). It shall not be possible for the lift to depart unless the gates are closed;
- b) only be able to be opened manually for maintenance purposes with a dedicated tool;
- c) be protected by an emergency stop device, complying with EN ISO 13850, which will also stop the lifting table when operated;
- d) be operated as defined in 5.4.6.3;
- e) meet the requirements of its own product standard, where applicable, while complying with all additional requirements of this standard;
- f) have a maximum closing speed not greater than 0,3 m/s. If there is a risk of the gate impacting personnel (i.e. a swing gate) then the opening speed shall also not exceed 0,3 m/s;
- g) be equipped with an interlocking device in compliance with the requirements of 5.4.6.1.

5.4.6.3 Control of power-driven gates

- a) The control station for power-driven gates shall be located on the landing in the vicinity of the gate, so that the operator has a clear view of the entrance. It shall be positioned such that, when operated, any unsecured load will not fall onto the landing causing injury to the operator or other personnel as the gate opens.
- b) Gate control stations may be, but are not limited to, push buttons or pull cord switches etc. Stop devices shall be supplied in accordance with 5.4.6.2 c). If any remote control system is supplied this shall be covered by its own risk assessment; only be operable when in sight of the landing entrance and be compliant with the requirements of EN 60204-32.
- c) If the control station is safe by position as 5.4.6.3 a) then the gate opening control may be semi-automatic (i.e. momentary operation of open / close control device by an operator will initiate full opening / closing when safe to do so). In all other cases, opening shall be of a hold-to-run control. Fully-automatic gate opening (i.e. door will automatically drive with no operator intervention when it is safe to do so) is prohibited, unless the load is correctly retained on the platform so there is no risk of goods falling on to personnel.
- d) Gate closing control shall be either of a hold-to-run control, or semi-automatic if the leading edge of the gate is provided with a trip device to stop movement which, if mechanically actuated, shall have a required performance level PLr = c according to EN ISO 13849-1. Trip devices non-mechanically actuated shall comply with EN 61496-1 and type 2 of EN 61496-2.

Fully-automatic gate closing is prohibited in case of entrapment.

5.4.7 Flexible guards

When required, the travel zone below the platform shall be protected from access by flexible guards, e.g. roller blinds or concertina bellows or mesh curtains that expand and contract as the platform moves.

Any gaps between adjacent sections of flexible guards shall not exceed 100 mm. Any horizontal gap between flexible guards and the edge of the pit shall not exceed 200 mm at any time where there is a risk of falling over 500 mm.

5.4.8 Screens

Screens that are provided to protect the travel zone of the lifting table shall make it inaccessible while the lifting table is in operation.

Panels providing access to the travel zone for maintenance purposes shall:

- either be interlocked to prevent operation of the lifting table unless closed and locked, as defined in EN ISO 14119:2013, 3.5, with a required performance level PLr = d according to EN ISO 13849-1; or
- shall be opened only with a dedicated tool.

These panels or gates shall open either out and away from the machine or in such a way that they do not enter the travel zone. The horizontal distance between the screen and the moving part of the lifting table shall not exceed 120 mm.

Fixed guards shall be fixed by systems that can be opened or removed only with tools. Their fixing systems shall remain attached to the guards or to the machinery when the guards are removed. Where possible, guards shall be incapable of remaining in place without their fixings.

5.5 Design of the platform

Platforms which are entered by persons shall be fitted with an anti-slip surface (e.g. tear-drop profile, tread plate, grit surface, anti-slip mats).

If platforms are not locked and retained at fixed landings, they shall be fitted with a toe guard below the platform flooring and adjacent to each access point. The toe guard shall cover a length at least equal to the access opening width and at a vertical depth at least equal to the 150 mm specified in 5.3.6.1. Platforms that are designed to carry wheeled or rolling loads shall be shaped or have a device that will prevent the intended load from unintentionally rolling off during movement. This device shall retract only when the platform is in a safe position to allow the transfer of the load.

When the platform is used as part of the floor at each landing, the mechanical strength of the platform shall be defined by an agreement between user and manufacturer.

5.6 Levels and clearances of fixed landings

- a) The vertical tolerance between the floor of the platform and the fixed landing shall be as small as possible.

It is recognized that due to the diverse variety of products and applications, the tolerance cannot be dictated by this standard and should be agreed between the manufacturer and the user. Where it results in a risk of tripping, an information / safety sign (see Annex B) shall be placed near the entrance. Additional information shall be provided as required in 8.2 (Information for use).

- b) Means shall be provided to limit the horizontal clearance between the platform and the landing to less than 30 mm when loading and unloading at a fixed landing.

The surface of the landing doors or gates facing the lifting table should be smooth, flush and imperforate, and be flush with the vertical surface above and below the landing entrance over the 150 mm height specified in 5.4.6.1.

5.7 Driving system

NOTE For types of driving systems not described hereafter, guidance can be found in EN 1570-1.

5.7.1 Mechanical chains driving system

5.7.1.1 If chains are used as suspension elements, they shall be leaf or roller type only. They shall be dimensioned in accordance with:

- ISO 4347 for leaf type and
- ISO 606 for other types.

The safety factor, calculated as the total of the guaranteed breaking load of all the chains divided by the maximum supported static load, shall not be less than 4.

Where chains are reeved, the number of chains to be taken into account shall be the number of independent chains not the number of falls.

5.7.1.2 All lifting tables using a mechanical drive system with chains for lifting shall be fitted with a device which will only allow a maximum of 135 % of the motor torque to be developed when raising the rated load. If an overloaded condition exceeding the motor torque is detected, an audible-visual signal at each operating control panel / station shall give warning to the user of an overload condition and the lift call shall be removed. The sound level of the audible signal shall not be less than 75 dB (A).

5.7.1.3 Lifting tables, where the travel zone below the platform is not sufficiently shielded from access shall be fitted with a device to stop the descent of the platform within 100 mm and before the descent speed of the platform reaches the max speed defined in 5.3.3, and hold the platform, in the event of a breakage of the load bearing part. When actuated, the device shall also stop the drive motor and keep it stopped.

5.7.1.4 A safety device (e.g. a slack chain switch) shall be fitted to all lifting tables where slack chain can occur. When actuated, the device shall stop the drive motor and keep it stopped.

5.7.1.5 A braking system shall be fitted on all drives. The braking system shall be automatically applied when the drive is no longer energised. This braking system shall ensure that the loaded platform can be stopped and held at any position under all possible conditions of operation including any failure during power loss. Unintentional release of this device shall not be possible.

5.7.1.6 All drives used for lifting shall be of a positive type (e.g. chain transmission). Friction drives (e.g. friction clutches) shall not be used.

5.7.2 Hydraulic system

5.7.2.1 The hydraulic system shall conform to the requirements of EN ISO 4413.

NOTE The provision of an emergency lowering system is not required within the scope of this standard.

5.7.2.2 All hydraulic cylinders, pipes, valves, fittings etc. shall be designed to withstand a static pressure equal to twice the maximum working pressure, without permanent deformation.

5.7.2.3 All hydraulic hoses and their fittings shall be designed for a bursting pressure of at least three times the maximum working pressure.

5.7.2.4 To prevent lifting from the fully lowered position when overloaded, a pressure relief valve shall be fitted in all systems and shall be positioned and set so that not more than 110 % of the maximum working pressure can be achieved. Where adjustable, the adjustment of this valve shall require the use of tools. It shall be positioned so that it will not cause the platform to descend out of control if an overload is placed on the raised platform. When the rated load has been exceeded by more than the greater of either 100 kg or 10 % of its rated load, it shall not be possible for the platform to start from the lift platforms fully lowered position.

5.7.2.5 It shall not be possible for the hydraulic fluid to drain out of the cylinders if the platform descent is blocked and the lowering control still actuated.

5.7.2.6 On all hydraulic circuits it shall be easily possible to connect a device to measure the hydraulic pressure in the circuit. The method of fitting this device shall be specified in the manufacturer's maintenance instructions.

5.7.2.7 All hydraulic lifting tables shall be equipped with either a pipe rupture protection device or flow control valve based on the risk assessments. Table 2 summarizes the most common situations found in practice.

Table 2 — Hydraulic pipe rupture protection device requirement

Safety device	1 ^{a)}	1 ^{a)}	2 ^{b)}	NA ^{c)}	1 ^{a)}	1 ^{a)}	2 ^{b)}	NA ^{c)}	1 ^{a)}	2 ^{b)}	2 ^{b)}	2 ^{b)}	NA ^{c)}	1 ^{a)}	NA ^{c)}
Restricted area	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
Lifting height ≤ 1,6m	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No
Fully enclosed by imperforate screens	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Fully enclosed by flexible guards	-	Yes	No	No	-	Yes	No	No	-	Yes	Yes	No	No	-	-
Operator has a clear view of travel zone	-	-	Yes	No	-	-	Yes	No	-	Yes	No	Yes	No	-	-

^{a)} 1 = Safety device according 5.7.2.7 (Using pipe rupture valves or flow control valves)

^{b)} 2 = The safety device shall prevent the platform from descending in the event of a partial failure of the hydraulic supply line while complying with the remaining requirements in 5.7.2.7

^{c)} NA = The combination is not applicable or to be considered

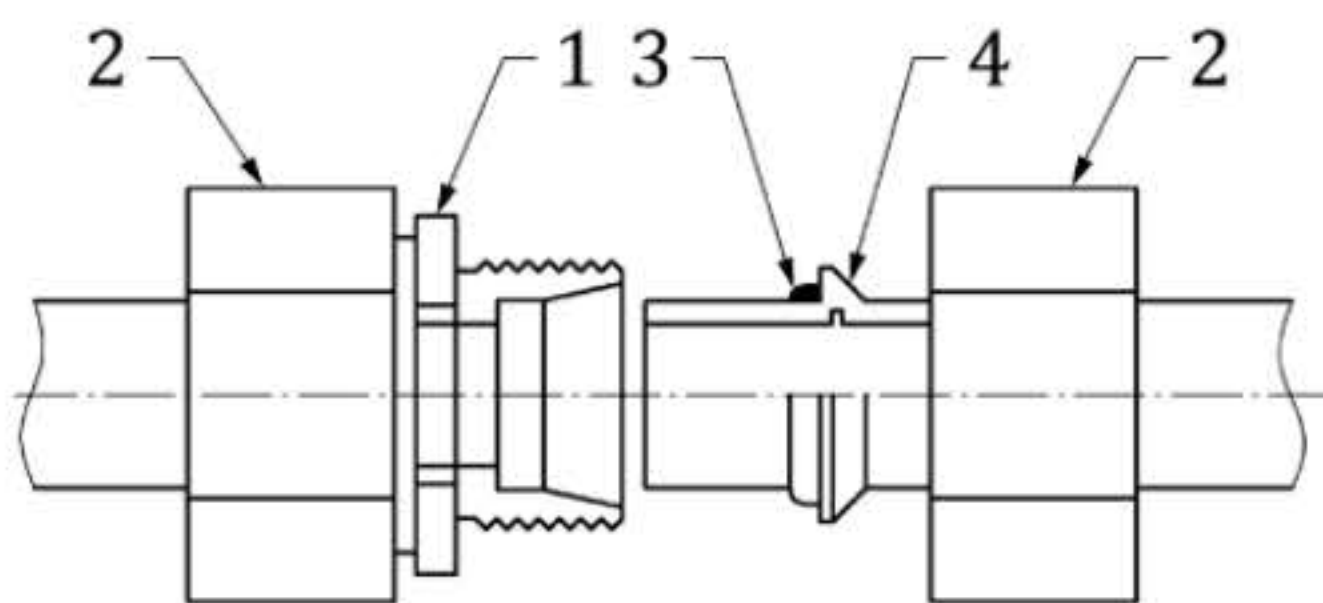
Where hydraulically-driven lifting tables are equipped with a pipe rupture protection device they shall prevent unintentional lowering of the platform within 100 mm and before the descent speed of the platform reaches the max speed defined in 5.3.3.

Where pipe rupture valves are used to stop the platform on hydraulic multi-cylinder driven lifting tables, it shall be impossible for any hydraulic cylinder to be overloaded by more than 100 % of the maximum working pressure (e.g. by use of a balance system).

This pipe rupture valve need not be fixed directly to the cylinder provided that between the valve and cylinder only rigid steel pipe with “swaged” fittings (see Figures 4a and 4b) or similar connections are used.

When the lifting table is driven by more than one cylinder, if one cylinder fails, the remaining cylinder(s) shall be able to support the lifting table with its nominal load without failure, but it is not a requirement for them to lift the platform.

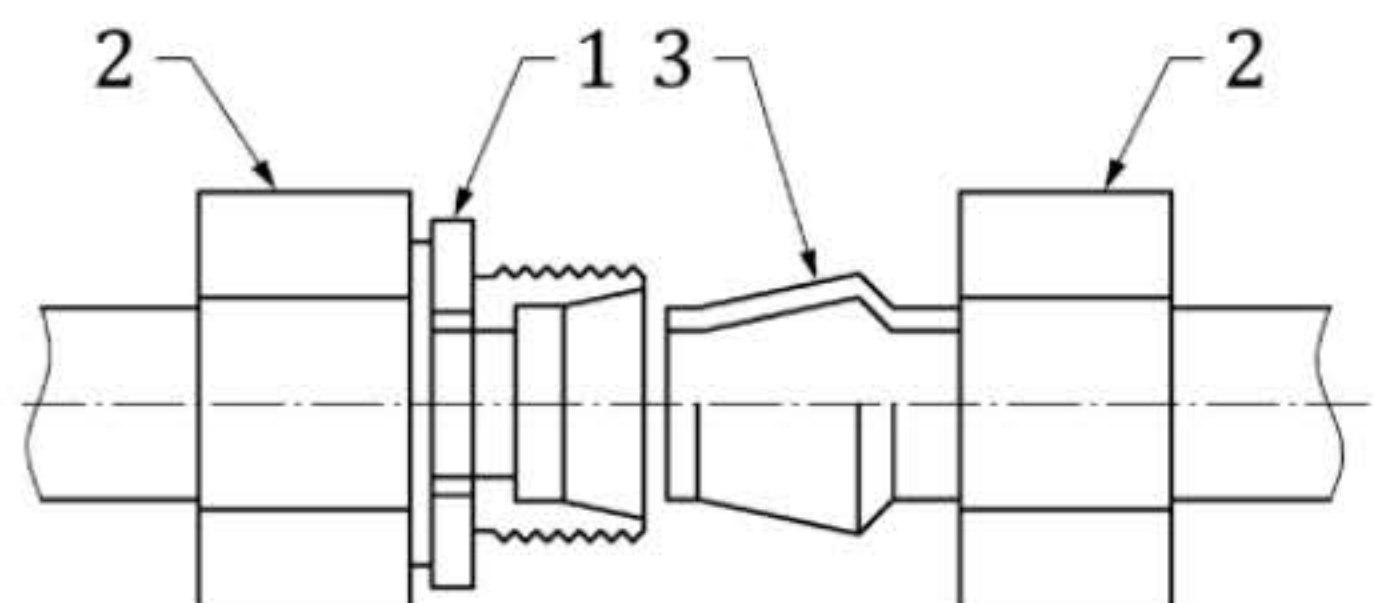
Under failure conditions the level of the platform shall be maintained to a maximum tilt of 5°.



Key

- 1 fitting body
- 2 nut
- 3 captive seal
- 4 swaged pipe

Figure 4a — Swaged fitting type 1



Key

- 1 fitting body
- 2 nut
- 3 swaged pipe

Figure 4b — Swaged fitting type 2

5.7.2.8 The minimum fluid level in the tank shall be clearly indicated for a particular platform height, e.g. this could be either a sight glass on the tank or a dip stick, with a level marked on it for the corresponding platform height.

5.7.2.9 A safety device shall be automatically deployed when the platform reaches a landing level to prevent uncontrolled platform descent in the event of a failure during power loss. It shall be able to support the platform with its rated load and withstand the masses and forces generated by the load transfer including the loading/unloading equipment. This system is not necessary when the platform is at the fully lowered position and seated on mechanical stops.

- If the safety device is mechanical, it shall keep the platform within a range of 0 to 150 mm below the landing level.
- If the safety device is not mechanical, it shall meet the requirements of performance level PLr = d according to EN ISO 13849-1.

NOTE This mechanical safety device may be used as the blocking device for maintenance purposes, and fulfils the requirement of 5.10.3, as long as the operation is described in the maintenance instructions.

The use of a relevelling system should be agreed by manufacturer and user, depending on the application. i.e. Where the safety device allows the lift to creep away from landing and this could cause operational hazards.

5.7.2.10 Load control

5.7.2.10.1 General Requirements

All hydraulic lifting tables which serve fixed landings above 1,6 m above the lowest landing, and whose rated capacity exceeds 1000 kg shall be equipped with a device i.e. a pressure switch, to prevent movement away from a fixed landing when an overload is detected. This requirement is only applicable to lift categories 1, 4 and 5. For lifts in category 2, the load is defined, so there is no risk of overloading.

It is recognized that for any installations where the operating pressure changes throughout the lift travel, the signal given by the load control device will vary at given fixed landings due to hysteresis, friction etc. As a consequence, the device shall operate when the lift is overloaded by a maximum of 40 % of the rated capacity, but not less than 10 %, at each upper fixed landing. This could mean that a device may be required at each landing, above 1,6 m of the lower landing, to monitor for an overloaded condition.

However, the platform, the supporting mechanism and the safety device defined in 5.7.2.9 etc. shall be capable of supporting the expected overload. This can either be done by:

- Increasing the dynamic factor defined in Table 1 so a higher capacity machine is installed but labelled with the lower safe working load. The increase in dynamic factor is to be determined at the design stage and is to be verified by physical testing as Annex A without failure, or
- Ensure the maximum force, applied to the lifting table when the overload device has operated, shall be supported without failure when tested as Annex A. This force is calculated by:

$$F_{lim} = (\phi_{DAL} \times m_{RC} + (m_W - m_{RC}))g$$

F_{lim} is the maximum force, N

ϕ_{DAL} is the dynamic factor determined from Table 1

m_W is the applied load, expressed in kilograms kg;

m_{RC} is the rated capacity of the lift, expressed in kilograms kg;

g is the gravity constant (9,81), expressed in meters per second squared m/s²

The overload sensing device may be deactivated during movement of the lift platform.

The operating instructions shall require that the user assess the possible hazards associated with overloading the lifting table and takes appropriate measures as 8.2.1, 3).

Any audible signal provided, indicating an overloaded condition shall not be less than 75 dB (A).

5.7.2.10.2 The design for all hydraulic lifts shall take into account the two following conditions:

Any examples given are for indicative purposes only, and any other solutions provided are to be equal or better with regards the safety levels provided.

a) Raising from the fully lowered or closed position.

The requirements of 5.7.2.4 shall be met to protect the system in this situation i.e. a pressure relief valve.

Where there is no lift movement from the lowered position, an audible and visual signal is to be provided, only if the lift is installed for public use. This can be provided for lifts in non-public areas on agreement by the manufacturer and user.

NOTE A possible solution is to check if the lift is not reaching a lower intermediate limit switch within a defined period of time.

b) Lift movement from an upper fixed landing above 1,6 m.

At each upper fixed landing above 1,6 m, a safety device shall be automatically deployed, to prevent uncontrolled platform descent due to hydraulic fluid leakage, as defined in 5.7.2.9 and taking into account the dynamic load or maximum force in 5.7.2.10.1

When a call for the platform is placed into the system, the lift is allowed to raise for a few seconds to develop hydraulic pressure. There it will stop and the hydraulic pressure is to be checked.

If an overloaded condition of more than 110 %, of the maximum working pressure associated with that landing is detected, an audible-visual signal at each operating control panel / station shall give warning to the user of an overload condition and it shall only be possible to return the platform back to that level of the fixed landing.

If no overload is detected, the safety device is to be removed and the lift table can continue with normal movement. During normal movement, the overload device can be disabled.

5.8 Controls

5.8.1 Controls shall be located adjacent to the travel zone and shall not be accessible from the platform.

5.8.2 Unless access to the travel zone is enclosed according to EN ISO 13857, all platform movement controls shall be hold-to-run.

5.8.3 All controls, except emergency stops shall be designed to prevent unintentional operation.

5.8.4 Each control station shall be fitted with an emergency stop button compliant with EN ISO 13850:2015, category 0.

5.8.5 All lifting tables shall be fitted with a device preventing unauthorized use.

5.8.6 In normal operation, it shall not be possible to enter the danger zone of a lifting table before switching off the control system. To fulfil the needs of repair and service, such lifting tables may be fitted with a switch to select a "maintenance mode". This switch shall be protected with a safety relay which is actuated by, e.g. a code, a key to prevent persons who are not in possession of this device selecting the maintenance mode position. The selection of this maintenance mode shall render all

normal controls ineffective, other than emergency stop buttons, and shall give full control to the maintenance operator control panel/station. This control panel/station shall be fitted with both:

- hold to run controls only;
- an emergency stop complying with EN ISO 13850.

5.9 Electrical system

5.9.1 General requirements

The electrical equipment associated with the lifting tables and installation shall conform to the requirements of EN 60204-1.

5.9.2 Protection rating

The IP code according to EN 60529, shall be at least IP54. Components in systems less than 48 V do not need to meet this specification if disconnection or malfunction does not lead to an unsafe situation.

5.10 Safety devices

5.10.1 General requirements

All safety devices shall be designed so that they cannot be rendered inoperative by simple means, (e.g. insertion of a wedge or block).

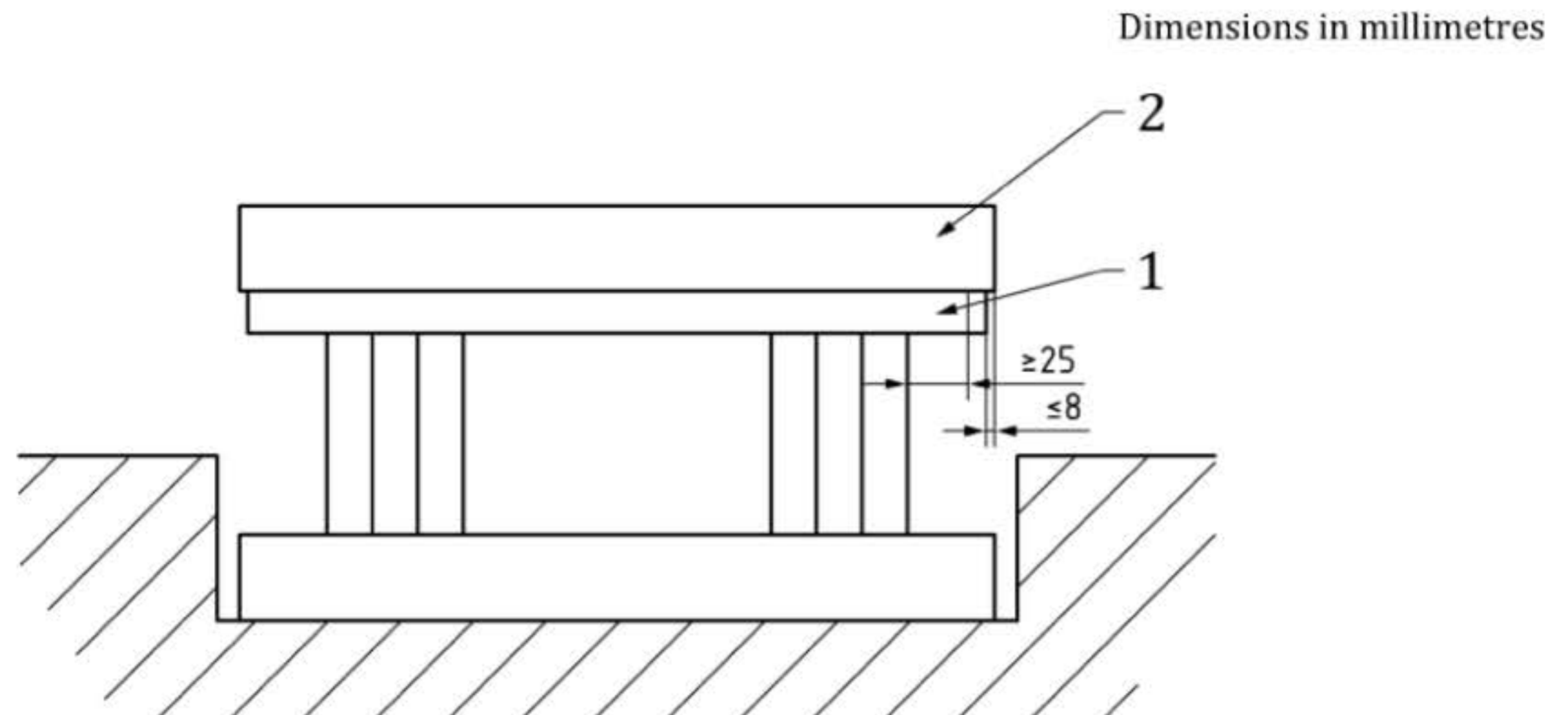
For drives other than hydraulic, end of travel limit switches shall be provided at the upper end of the platform travel and shall be set to operate as close as possible to the upper terminal stop.

End of travel limit switches shall either be mechanically actuated with positive opening contacts (see EN 60947-5-1), or proximity switches with a defined behaviour under fault conditions (see EN 60947-5-3). They shall, when operated, cause the lifting table to stop and remain stopped.

5.10.2 Trip devices

Where trip devices are fitted to the outer edges of the underside of the platform they, if mechanically actuated, shall provide PLr = c performance to EN ISO 13849-1. If non-mechanically actuated, the trip devices shall comply with EN 61496-1 and type 2 of EN 61496-2:2013.

It is only necessary to maintain a clearance of 25 mm (for fingers) between elements of the platform and the lifting mechanism within the area protected by the device. The outer surface of the device shall not be more than 8 mm from the outer edge of the platform as shown in Figure 5.



Key

- 1 Trip device
- 2 Load platform

Figure 5 — Configuration of a trip device

The device shall operate so that the moving part causing the hazard comes to a stop before injury is caused. It shall not create another hazard.

The trip-device, when operated, shall stop all platform movement downward and hold it stopped until the down-control has been released, the obstruction removed, the device reset (either manually or automatically) and the down-control re-operated.

5.10.3 Safety devices for maintenance

A blocking device shall be fitted to all lifting tables to allow maintenance and repair work to be carried out below the platform safely. This device shall be capable of supporting the platform with its rated load and of being operated by one person from a safe position. The blocking device shall be easily accessible and permanently fitted to the equipment or installation.

It shall not be possible to remove the blocking device unless the platform is supported by the lifting mechanism or by other means (e.g. a crane).

For powered blocking devices, it is required to clearly indicate that the blocking device is correctly positioned.

6 Verification of the safety requirements and/or measures

6.1 General requirements

Table 3 indicates the method(s) by which the safety requirements and measures described in Clause 5 shall be verified, together with a reference to the corresponding subclauses in this European Standard.

The result of the examinations and tests shall be documented in a report.

Table 3 — Means of verification of the safety requirements and measures

Subclause	Safety requirements and measures	Inspection	Function test	Measurement
5.2.2	Deflection		X	
5.2.4	Stability		X	
5.3.2	High temperatures	X		
5.3.1	Crushing and shearing	X		
5.3.3	Speed			X
5.3.3.2	Overspeed protection		X	
5.4.4.1	Falling of persons	X		X
5.4.4.2	Falling objects	X		X
5.4.5	Guard-rails	X		X
5.4.6	Gates and doors on the platform	X	X	X
5.4.6.2 or 5.4.6.3	Power-driven gates	X	X	
5.4.7	Flexible guards	X		X
5.4.8	Screens	X	X	
5.5	Anti slip platform	X		
5.5	Entrance of platform	X		
5.7.1	Chain drives	X		X
5.7.2	Hydraulic system	X		
5.7.2.5	Anti-drain	X		
5.7.2.7	Pipe rupture protection	X	X	
5.7.2.8	Fluid level in tank	X		
5.7.2.9	Safety device blocking	X	X	
5.7.2.10	Load security	X	X	
5.7.2.10	Load control	X	X	
5.7.2.10	Pressure measurement	X		
5.8.3	Unintentional operation	X	X	
5.8.4	Emergency stop controls	X	X	
5.8.5	Unauthorized use	X	X	
5.8.6	Operators position	X		
5.8.6	Hold to run controls		X	
5.9	Electrical system	X		
5.9.2	Electrical protection rating	X		
5.10.1	Protection of safety devices	X		
5.10.1	End limit switch	X	X	
5.10.2	Trip device		X	X
5.10.3	Blocking device	X	X	

6.2 Design check

The design check shall verify that the lifting table has been designed in accordance with this European Standard. It shall be checked that:

- 1) the drawings give the main dimensions of the lifting table;
- 2) there is a description of the lifting table, including necessary information on its capabilities;
- 3) where appropriate, hydraulic and electrical circuit diagrams are available;
- 4) the instruction manual is complete according to Clause 8.

6.3 Manufacturing check

The manufacturing check shall verify that:

- 1) the lift table has been manufactured in accordance with the checked documents and drawings;
- 2) the required test certificates are available (e.g. for chains);
- 3) all welding has been carried out by a qualified welder according to the drawings and specifications.

6.4 Visual inspection

It shall be visually checked that:

- 1) all the labels and information specified in Clause 7 have been affixed to the lifting table;
- 2) the lifting table is in accordance with all the documentation provided by the manufacturer.

6.5 Electrical tests

The electrical tests shall be carried out in accordance with EN 60204-1, where applicable.

6.6 Individual final verification before putting into service (fitness for purpose)

Where the lifting table is assembled on site, verification shall show that the lifting table satisfies the safety requirements of this standard. This verification shall be made in accordance with Annex A, at the place of use before the lifting table is put into service, and a record made of the results.

7 Marking

7.1 All lifting tables shall be marked with the following information in an official EU language, but not necessarily in the local language of the country where the lifting table is to be installed:

- 1) rated load and distribution;
- 2) name of the machinery (e.g. lifting table);
- 3) full name and address of the manufacturer;
- 4) type or series;
- 5) serial number;

- 6) IP-code;
- 7) lift category according to Table 1 of 5.2.1.4;
- 8) year of construction (the year in which the manufacturing process is completed).

7.2 Each fixed landing shall be marked with the following information:

- 1) rated load;
- 2) persons prohibited from riding on the platform;
- 3) forbidden from use by unauthorized persons;
- 4) special instructions for use (e.g. distribution and nature of the load, tripping hazard...);
- 5) persons prohibited from staying inside the danger zone in normal operation.

7.3 All lifting tables shall be marked according to EN 61310-2

7.4 All lifting tables shall have a warning notice permanently fixed, in letters at least 15 mm high, as follows:

DO NOT ENTER UNDER THIS PLATFORM UNLESS IT IS MECHANICALLY LOCKED

in the language of the country where the lifting table is to be installed together with the pictogram as shown in Figure B.2 (see Annex B).

7.5 The direction of movement (or set fixed landing) shall be marked with pictograms or other easily recognizable signs on, or alongside, all control buttons.

7.6 Each lifting table shall be provided with clear instructions on the method necessary to safely isolate all the power sources to the lifting table.

7.7 Lifting tables operated by an external hydraulic supply shall be marked with the maximum operating pressure.

7.8 All electrically operated lifting tables shall be clearly and permanently marked with the permissible supply voltage and the nominal power in kW.

7.9 When the lifting table is designed for a known specific loading, there shall be a sign or instruction on the lifting table, clearly readable from the control position(s), indicating the safe intended load distribution.

8 Instructions for the user

8.1 General requirements

Information for use shall comply with EN ISO 12100:2010, 6.4.

Each lifting table shall be accompanied by an instruction manual in the language(s) of the country in which it is placed on the market.

The instruction manual accompanying the lifting table shall be either the 'Original instruction manual' or a 'Translation of the original instruction manual', in which case the translation shall be accompanied by the original instruction manual.

Each instruction manual shall include, as a minimum the following information:

- 1) the business name and full address of the manufacturer and where applicable, of his authorized representative;
- 2) the designation of the lifting table as marked on the machinery itself;

NOTE 1 The serial number is not compulsory.

- 3) either the EC declaration of conformity, or a document setting out the contents of the EC declaration of conformity, showing the particulars of the machinery, not necessarily including the serial number and the signature;
- 4) a general description of the machinery;
- 5) the drawings, diagrams, descriptions and explanations necessary for the use, maintenance and repair of the machinery and for checking its correct functioning;

NOTE 2 The Instruction manual could be one document or may be split as follows:

- 1) Instructions for use;
- 2) Instructions for installation;
- 3) Instructions for maintenance and inspection.

8.2 Instructions for use

8.2.1 These instructions for use shall include:

- 1) all signs, labels and notices affixed to, or alongside, the lifting table, and at each fixed landing;
- 2) the intended use of the lifting table together with a warning against common misuses;
- 3) loading conditions and distribution, the user shall assess the possible hazards of overloading the lifting table and takes appropriate measures;
- 4) operation of the control devices and the emergency stop device, with a statement that after an emergency stop device has been operated the reason for the operation shall be investigated before continuing to operate the lifting table;
- 5) the safe conditions for the opening of protective doors and gates where applicable;
- 6) the lift category according to 5.2.1.4, Table 1;
- 7) loading and securing the load, including possible misuses;
- 8) details of the safety devices;
- 9) the procedure in the event of a malfunction;
- 10) the intended environment of use;
- 11) a warning of the risk of tripping at landings if determined in 5.5 a).

8.2.2 These instructions shall mention the residual hazards present during use of the lifting table e.g. risks when handling heavy loads.

8.2.3 A statement that only authorized operators are allowed to operate the lifting table.

8.2.4 The instructions shall state that after the overspeed device has operated, the reason for the operation shall be investigated before continuing to operate the lifting table.

8.2.5 These instructions shall include a list of the excluded environments, etc. as given in 1.3 and 1.4.

8.2.6 The instructions for hydraulically-actuated lifting tables shall include a warning against the possible leakage of hydraulic fluid and the possible consequences if the lift is not locked at fixed landings.

8.3 Instructions for installation

8.3.1 The manufacturer shall supply with each lifting table a set of instructions for the safe assembly, installation and dismantling of the lifting table.

8.3.2 The manufacturer shall supply all information about where and how to fix additional markings.

8.3.3 The installation instructions shall state that, during installation, care should be taken to avoid mounting the lifting table in a position where the noise of the lift is magnified.

8.3.4 The installation instructions shall specify the safety clearances needed between the moving parts of the lifting table and any adjacent walls or other objects, either fixed or movable.

8.3.5 The installation instruction shall state the forces imposed on the construction structure by the lifting table – See 5.2.3.

8.3.6 The installation instructions shall state where the control stations (including emergency stops) have to be fixed.

8.3.7 The manufacturer shall indicate that the push button(s) shall be located in such a way that the operator has a direct view of the travel zone and /or landing entrances.

8.3.8 Commissioning and de-commissioning instructions.

8.4 Instructions for maintenance and inspection

8.4.1 The manufacturer shall supply with each lifting table a set of instructions sufficient to inspect, maintain and repair the lifting table safely, including access methods and the replacement periods of parts.

The instructions for maintenance shall include a logbook, if not supplied separately, in which is contained the preventive maintenance operations required to be carried out by the user and their periodicity.

8.4.2 Full instructions shall be given as to the measures to be taken if permanent deformation occurs in a safety gear (if fitted) after operation, e.g. replacement of the part, removal of burr, etc.

8.4.3 These instructions shall state that any replacement parts required for the lifting table shall be obtained from the original manufacturer of the lift, or be at least of equivalent quality and safety if original parts are not available.

8.4.4 The maintenance instructions for hydraulically-actuated lifting tables shall include the specifications of the replacement hydraulic hoses used on the lifting tables and the periodicity of replacement.

8.4.5 The maintenance instructions for hydraulically-actuated lifting tables shall include the type and characteristics of the hydraulic fluid recommended for the system (not solely by the manufacturer's trade name).

8.4.6 The maintenance instructions for hydraulically-actuated lifting tables shall include the method of installing a pressure gauge.

8.4.7 The maintenance instructions shall include a statement that when a major repair or replacement to a load-supporting member of the lifting table has been carried out, it shall be re-tested according to Annex A. The dynamic factor to be used for dynamic test shall be given.

8.4.8 The maintenance instructions shall include a recommended lubrication schedule and drawing showing lubrication points.

8.4.9 The maintenance instructions should include a recommended list of items and areas to be examined during the periodic inspection.

8.4.10 Electrical and hydraulic circuit diagrams required for safe maintenance shall be supplied where applicable.

Annex A **(normative)**

Test procedures

The following tests shall be carried out on each and every lifting table:

- a) Check the correct operation of the control devices.
- b) Check that the emergency stop and other safety devices (if fitted) function as intended.
- c) Operate the unloaded lifting table through one complete cycle.
- d) Check that all access door and gate locks and interlock systems are functionally operational.
- e) When the lifting table is not designed for a specific loading, the requirements of 5.2.2 shall be verified.
- f) Place the rated load distributed as specified by the manufacturer, on the lifting platform and operate the lifting table through one complete cycle (where applicable record the maximum operating pressure).
- g) Record the time taken to raise and to lower the platform through its full travel while carrying the rated load.
- h) Leave the platform, still carrying the rated load, fully raised for 10 min. Measure and record the vertical creep of the platform in this time. This creep shall not exceed 5 mm.
- i) Lower the platform, with the rated load, on to the maintenance blocking device and check satisfactory operation.
- j) Increase the rated load by a dynamic test coefficient of 1.1 and operate through one complete cycle and check that no patent defect or permanent deformation occurs.
- k) Place the platform in the position of maximum stress on the structure and further increase the rated load to produce a static test coefficient of 1,25. Leave the lifting table in this position for 10 min and check that no patent defect or permanent deformation occurs.

If the 1,25 test coefficient is less than that protected by the overload device in 5.7.2.10 i.e. where the dynamic factor has been increased or the maximum force was calculated, then the test coefficient shall be increased accordingly and recorded.

- l) Test the load limiting device.
- m) Check satisfactory operation of braking or holding devices, according to the design, where fitted.
- n) Check all ancillary equipment for satisfactory operation, including any locking devices or load blocking systems where fitted.
- o) For each upper fixed landing, the lift overloaded device shall be tested for satisfactory operation.

If tested on site, the allowable overload should be applied and the device set. All loads and settings are to be recorded.

If it is impractical to test on site and it is necessary to factory set the device(s), then for each landing the predicted pressure / setting for the allowable overload shall be calculated at the design stage. These settings are to be applied to the equipment and simulated by using a shut-off valve on the main pressure outlet from the hydraulic power unit. The results, loads and settings are to be recorded on the factory test certificate.

Once factory or site set, the overload devices are to be locked off.

Annex B
(informative)

Safety signs



Figure B.1 — Forbidden to put hands or feet under the platform



Figure B.2 — Access prohibited



Figure B.3 — Persons prohibited from riding on platform

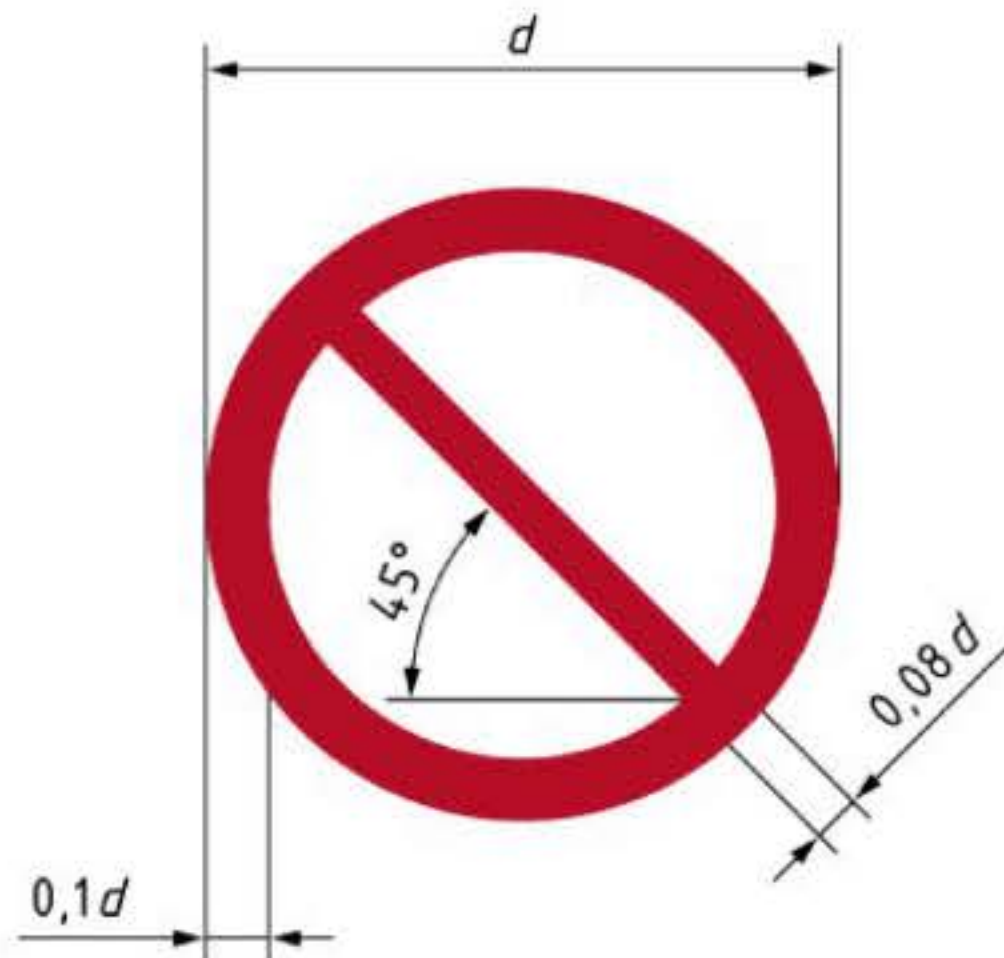


Figure B.4 — Layout for prohibition sign



Figure B.5 – Floor-level obstacle

Annex C (informative)

Table with the list of hazards

The list of hazards given in the following table is based on EN ISO 12100.

Table C.1 — List of hazards

Hazard reference no.	Hazards, hazardous situations and hazardous incidents	Subclause no. in this Standard
1	Mechanical hazards due to machine parts or work pieces, e.g.:	
1 a)	sharp edges	5.4
1 b)	relative location	5.4
1 c)	mass and stability (potential energy of elements which may move under the effect of gravity)	5.2.1 and 5.2.4 and 5.5 and 5.10.3
1 d)	mass and velocity (kinetic energy of elements in controlled and uncontrolled motion)	5.2.1 and 5.3.3 and 5.7
1 e)	insufficient mechanical strength	5.2.1 and 5.2.2 and 5.2.3 and 5.7.1.3
1.1	Crushing hazards	5.3.1 and 5.4 and 5.10.2
1.2	Shearing hazards	5.3.1 and 5.4 and 5.10.2
1.3	Cutting or severing hazards	5.4 and 5.10.2
1.4	Entanglement hazards	5.3.1 and 5.4
1.5	Drawing-in or trapping hazards	5.4 and 5.6
1.6	Impact hazards	5.4
1.9	High pressure fluid injection or ejection hazards	5.7.2
2	Electrical hazards due to:	
2.1	Contact of persons with live parts (direct contact)	5.9
2.2	Contact of persons with parts which have been become live under fault condition (indirect contact)	5.9
2.3	Approach to live parts under high voltage	5.9
3	Thermal hazards , resulting for example in:	
3.1	Burns, scolds and other lesions from people making contact with objects or materials at extremely high or low temperature, by flames or by explosions, or by heat radiation sources	5.3.2

Hazard reference no.	Hazards, hazardous situations and hazardous incidents	Subclause no. in this Standard
7	Hazards generated by materials and substances (and their component materials) handled or used by the machine:	
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	5.7.2
8	Hazards generated by neglecting ergonomic principles in machinery design as, e.g. hazards from:	
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	5.4.5 and 5.6 and 5.10.2
8.6	Human error, human behaviour	5.4.6.3 and 5.8 and Clause 8
8.7	Inadequate design, location or identification of manual controls	5.4.6.3 and 5.8 and Clause 8
10	Unexpected start-up, unexpected overrun/overspeed (or any similar malfunction) from:	
10.1	Failure/disorder of the control system	5.4.6 and 5.8
10.2	Restoration of energy supply after an interruption	5.4.6
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and ability, see 8.6)	5.8 and Clause 7 and Clause 8
11	Impossibility of stopping the machine in a safe conditions	5.7.2.7
13	Failure of the power supply	5.9 and 5.10
14	Failure of the control circuit	5.8 and 5.9 and 5.10
15	Errors of fitting	5.10.3
16	Break-up during operation	5.7
17	Falling or ejected objects or fluid	5.7
19	Slip, trip and fall of persons (related to machinery)	5.4 and 5.5
Additional hazards and hazardous events due to mobility:		
21	Linked to work position (including driving station) on the machine	
21.1	Fall of persons during access to the work position	5.6
21.4 c)	Mechanical hazards at the work position: fall of objects, penetration by objects	5.4.4.2
21.5	Insufficient visibility from the work positions	5.4.3
22	Due to the control system	
22.1	Inadequate location of the control	5.4.3 and 5.8
22.2	Inadequate design of manual controls and their mode of	5.4.3 and 5.8

Hazard reference no.	Hazards, hazardous situations and hazardous incidents	Subclause no. in this Standard
	operation	
25	From/to third persons	
25.1	Unauthorised start-up/use	5.7.2.10
25.3	Lack or inadequacy of visual or acoustic warning means	7 and 8
26	Insufficient instructions for the driver/operator	8
Additional hazards and hazardous events due to lifting:		
27	Mechanical hazards and hazardous events:	
27.1	from load falls, collisions, machine tipping caused by:	
27.1.1	lack of stability	5.2.1.4 and 5.2.1.5 and 5.2.4
27.1.2	uncontrolled loading - overload - overturning moment exceeded	5.7
27.1.3	uncontrolled amplitude of movements	5.8.6
27.1.4	unexpected/unintended movement of loads	5.7.2.7
27.2	from access of persons to load support	5.4.4.1 and 5.7.2.9
27.4	from insufficient mechanical strength of parts	5.2 and 5.7
27.6	from inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	5.7
27.7	from lowering of the load under the control of friction brake	5.7
27.8	from abnormal conditions of assembly/testing use/maintenance	8
29	Hazards generated by neglecting ergonomic principles:	
29.1	Insufficient visibility from the driving position	5.4.3

Annex ZA
(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] [CENELEC] 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/CE

Once this standard is cited in the Official Journal of the European Union 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 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant 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

- [1] EN ISO 14120:2015, *Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*
- [2] EN ISO 11161:2007⁴, *Safety of machinery - Integrated manufacturing systems - Basic requirements (ISO 11161:2007)*

⁴ As impacted by EN 11161:2007/A1:2010

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