
Varnostna pravila za konstruiranje in vgradnjo dvigal (liftov) - Dvigala za prevoz oseb in blaga - 21. del: Nova osebna in tovorno-osebna dvigala v obstoječih stavbah

Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 21: New passenger and goods passenger lifts in existing building

Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen - Aufzüge für den Personen- und Gütertransport - Teil 21: Neue Personen- und Lastenaufzüge in bestehenden Gebäuden

Règles de sécurité pour la construction et l'installation des ascenseurs - Elévateur pour le transport de personnes et d'objets - Partie 21: Ascenseurs et ascenseurs de charge neufs dans les bâtiments existants

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**Safety rules for the construction and installation of lifts - Lifts for
the transport of persons and goods - Part 21: New passenger
and goods passenger lifts in existing building**

Règles de sécurité pour la construction et l'installation des
élévateurs - Elévateurs pour le transport de personnes et
d'objets - Partie 21 : Ascenseurs de personnes et
ascenseurs de charge neufs dans les bâtiments existants

Sicherheitsregeln für die Konstruktion und den Einbau von
Aufzügen - Aufzüge für den Personen- und Gütertransport -
Teil 21: Neue Personen- und Lastenaufzüge in
bestehenden Gebäuden

This European Standard was approved by CEN on 16 July 2009.

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Foreword

This document (EN 81-21:2009) has been prepared by Technical Committee CEN/TC 10 “Passenger 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of an identical text or by endorsement, at the latest by March 2010, and conflicting national standards shall be withdrawn at the latest by March 2011.

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

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

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

This standard is part of the EN 81 series of standards “*Safety rules for the construction and installation of lifts*”. This is the first edition.

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

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Introduction

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

When provisions of this type C standard are different from those 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.

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

Where one or several requirements in EN 81-1 or EN 81-2, and their amendments A1:2005 and A2:2004, cannot be fulfilled, due to reasons such as the constraints of the structure of the existing building, the corresponding requirements in this European Standard apply. According to section 2.2 of Annex I to the Lifts Directive, the application of alternative measures to prevent the risk of crushing above and underneath the lift car is restricted to installations where the requirement for free space or refuge is impossible to fulfil and may be subject to prior approval by national authorities.

The main concern dealt with in this standard is the reduction of top and pit clearances that may be required due to site conditions. The adopted principle of safety is based on two levels of achievement: first by means of an electrical stopping of the lift car, then by means of a mechanical stopping of the lift car.

When drafting this standard, it has been considered for reduced overhead and pit the following:

- a) Risk reduction measures that rely solely on operations in compliance with procedures are considered as not acceptable, except in a few situations in which mistake-proof solutions are not available (e.g. some activities in repair and installation in which safety devices cannot be operational);
- b) The risk reduction measures shall be automatically (without any intervention) activated, or may be manually activated if mistake-proof-by-design, or a combination of both is used.

1 Scope

This European Standard specifies the safety rules related to new passenger and goods/passenger lifts permanently installed in existing buildings where in some circumstances due to limitations enforced by building constraints, some requirements of EN 81-1 and EN 81-2 cannot be met (see also **4th sentence of Introduction**).

This European Standard addresses a number of these constraints and gives requirements for alternative solutions. It shall be read and applied in conjunction with the European Standards EN 81-1 or EN 81-2 and their amendments A1:2005 and A2:2004, including their Clause 0.

This European Standard covers:

- Either the construction and installation of one or more complete new lift(s) including new well and machinery spaces in an existing building; or
- The replacement of one or more existing lift(s) by new ones in existing well(s) and machinery spaces.

This European Standard does not cover:

- Replacement or modifications of some parts to a lift already installed;
- Other applications outside of the scope of EN 81-1 or EN 81-2.

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2 Normative references (standards.iteh.ai)

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 81-1/A1:2005, *Safety rules for the construction and installation of lifts — Part 1: Electric lifts*

EN 81-1/A2:2004, *Safety rules for the construction and installation of lifts — Part 1: Electric lifts — A2: Machinery and pulley spaces*

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

EN 81-2/A1:2005, *Safety rules for the construction and installation of lifts — Part 2: Hydraulic lifts*

EN 81-2/A2:2004, *Safety rules for the construction and installation of lifts — Part 2: Hydraulic lifts — A2: Machinery and pulley spaces*

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)*

ISO 3864-1:2002, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and EN 81-1:1998 and EN 81-2:1998 and the following apply.

3.1

existing building

building, which is used or was already used before the order for the lift was placed

NOTE A building whose internal structure is completely renewed is considered as a new building.

3.2

movable stop

mechanical device that under normal operation allows the free movement of the lift between normal terminal stops

NOTE Where a person enters on the car roof or in the pit, the device limits the travel of the car to ensure sufficient safety space in the headroom or in the pit.

3.3

triggering device

device for operating a stopping gear by a mechanical linkage when the lift car passes a predetermined position in the well

NOTE This device is actuated when a door/trap door giving access to the lift well is open by means of a key.

3.4

stopping gear

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

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3.5

pre-triggered stopping system

system including the triggering device, the mechanical stopping gear and a mechanical linkage in between

NOTE Under normal operation of the lift the system allows the free movement of the lift between normal terminal stops. Where a person enters on the car roof or in the pit the system ensures sufficient safety space in the headroom or in the pit

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 (See **Table 1**).

Table 1 — List of significant hazards

No	Hazards as listed in Annex A of EN ISO 14121-1	Relevant clauses
1	Mechanical hazards due to:	
	- Machine parts or work pieces, e.g.:	
	- Accumulation of energy inside the machinery, e.g.:	
	.	
	Crushing hazard	5.5, 5.7
	Shearing hazard	5.1 a), 5.3.1
	Entanglement hazard	5.4 a)
	Drawing-in or trapping hazard	5.5.3, 5.7.3
	Impact hazard	5.2, 5.3.2, 5.4 b), 5.9, 5.10, 5.11, 5.12, 5.13, 5.14
	Slip, trip and fall of persons (related to machinery)	5.1 b), 5.3.1, 5.8
8	- Uncontrolled amplitude of movements	5.2, 5.3.2
	- From insufficient mechanical strength of parts	5.4 b), 5.5.2.2.2 d), 5.6.2 a), 5.7.2.2.3 d), 5.8.1 c)
	- From inadequate design of pulleys, drums	5.4 b)
	- Falling of person from person carrier	5.4 c), 5.6, 5.8 a) 2), 5.8 b) 2)
	Hazards generated by neglecting ergonomic principles in machinery design as, e.g. hazards from:	
	Access	5.3.1 d), 5.4 c), 5.9, 5.10, 5.11, 5.12, 5.13, 5.14
9	Inadequate local lighting	5.3.1 h), 5.3.1 i)
	Unhealthy postures	5.5
	Human error, human behaviour	5.5.4, 5.7.4, 7.2
	From abnormal conditions of assembly / testing / use / maintenance	5.3, 5.5, 5.6, 5.7, 5.8
	Hazards associated with the environment in which the machine is used	
	Failure of the power supply	5.5.2.4.1, 5.5.3.1, 5.5.3.2.2, 5.7.2.4.1, 5.7.3.1, 5.7.3.2.2
	Failure of the control circuit	5.5, 5.7
	Unexpected start-up, unexpected overrun / overspeed (or any similar malfunction) from;	
	- Restoration of energy supply after an interruption	5.5.4, 5.7.4

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5 Safety requirements and/or protective measures

Lifts within the scope of this standard shall comply with the relevant safety requirements and/or protective measures of this clause where one or several requirements in EN 81-1 or EN 81-2, and their amendments A1:2005 and A2:2004, cannot be fulfilled. In addition, the lift shall be designed according to the principles of EN ISO 12100 for relevant but not significant hazards, which are not dealt with by this standard.

5.1 Perforate wall of the lift well

The requirements of EN 81-1:1998 and EN 81-2, 5.2.1 are completed by the following:

Any existing well enclosure may be perforate provided that:

- a) EN ISO 13857, clause 4.2.4.2 is fulfilled; and
- b) A protective imperforate screen shall be provided around the landing door locking devices in order to prevent any manipulation of the locking devices by means of a rigid rod 0,30 m long.

NOTE 1 National regulations for the preservation of historical buildings may require the retention of an existing perforate enclosure.

NOTE 2 For lifts, which might be subject to vandalism, see EN 81-71, 5.1.1.

5.2 Clearances between car, counterweight or balancing weight

The requirements of EN 81-1:1998 and EN 81-2, 11.3 may be replaced by the following:

The car and its associated components shall be at a distance of at least 25 mm from the counterweight or balancing weight (if there is one) and its associated components.

To avoid any impact between the car (and its associated components) and the counterweight or balancing weight (and its associated components), in case of failure of normal guidance, emergency guidance on the car and counterweight shall be provided to maintain the car and the counterweight in their horizontal position.

5.3 Counterweight or balancing weight in a separate well

The counterweight or the balancing weight may be installed in a separate well than the car, provided that the configuration on site does not permit the installation of a lift having an available car area sufficient to fulfil the transport needs.

NOTE The standard covers only the installation of one counterweight (or balancing weight) in its own well.

The following shall be met.

5.3.1 Counterweight or balancing weight well provisions

The requirements of EN 81-1:1998, and EN 81-2, 5.1.2 are supplemented as follows:

In case of a separate well for the counterweight/balancing weight the following applies:

- a) All requirements related to the totally enclosed well (EN 81-1:1998 and EN 81-2, 5.2 and 5.3) shall be fulfilled for the well of the counterweight/balancing weight;
- b) Inspection traps shall be provided at both ends of the separate well and between them where they are necessary to allow safe maintenance and examinations of the well equipment; they shall comply with EN 81-1:1998 and EN 81-2, 5.2.2;

- c) The distance between inspection traps and equipment requiring maintenance or inspection shall not exceed 0,7 m;
- d) Where a safety gear is installed at the counterweight/balancing weight, inspection traps shall be provided for the full length of the travel path;
- e) Stopping device(s) accessible on opening the inspection traps at both ends of the separate well shall be provided, in conformity with the requirements of EN 81-1:1998 and EN 81-2, 14.2.2 and 15.7;
- f) Electric socket outlet as defined in EN 81-1:1998 and EN 81-2, 13.6.2 shall be provided at the opening of the inspection trap on both ends of the separate well, inside the well;
- g) The separate well shall be exclusively used for the lift in compliance with EN 81-1:1998 and EN 81-2, 5.8;
- h) The separate well shall be provided with permanently installed electric lighting, giving an intensity of at least 50 lux on the equipment requiring maintenance/inspection;
- i) Means to switch the separate well lighting shall be provided on opening the inspection trap on the lower end of the well.

5.3.2 Guiding of the counterweight or balancing weight

The requirements of EN 81-1:1998 and EN 81-2, 10.2 are supplemented as follows:

When travelling in a separate well, the counterweight or the balancing weight may be guided by ropes or by the shape of the counterweight or the balancing weight and its well enclosure.

If the counterweight or balancing weight is resting on its buffers it shall be kept in a substantially upright position by the use of a small distance to the well enclosure or an emergency guiding.

Provisions shall be made so as to avoid the counterweight or the balancing weight to rotate, e.g. by using equal number of left and right twisted suspension ropes.

Where its shape guides the counterweight or balancing weight, the enclosure of the well shall be continuous and flush without any protrusion from which the counterweight or the balancing weight can be blocked. The well enclosure shall be covered by durable material.

In case of ropes as guiding elements a minimum number of 4 ropes shall be used. Springs or weights shall tighten the ropes. The horizontal free distance between the counterweight or the balancing weight and the well enclosure shall be at least 50 mm if the enclosure of the well is continuous and flush otherwise it shall be increased by 2 mm for each meter of distance between the fixations of the ropes.

5.4 Pulleys in the well

The requirements of EN 81-1:1998/A2:2004 and EN 81-2/A2:2004, 6.7.2 may be replaced by the following:

Diverter pulleys may be installed in the headroom of the well within the projection of the car roof provided that:

- a) The diverter pulleys shall be protected according to EN 81-1:1998, 9.7 or EN 81-2, 9.4;
- b) Retaining devices shall prevent diverter pulleys from falling in the event of a mechanical failure of the pulley, shaft or bearings. The devices shall be able to support the weight of the pulley and the suspended loads;
- c) Examinations and tests and maintenance operations can be carried out in complete safety from the car roof, from inside the car, from a platform or from outside of the well;
- d) Clearances in the headroom shall comply with EN 81-1:1998 or EN 81-2, 5.7 or the requirements of 5.5.

EN 81-21:2009 (E)**5.5 Reduced top clearances**

EN 81-1:1998, Annex K does not apply.

The requirements of EN 81-1:1998, 5.7.1.1 b), c) and d), EN 81-1:1998, 5.7.2.2 and EN 81-2, 5.7.1.1 b), c) and d) may be replaced by the following:

5.5.1 General

The lift shall be equipped with devices providing safety spaces in the headroom (**5.5.2**) and a safety system (**5.5.3**) controlling the operation of the lift.

5.5.2 Devices providing safety spaces in the headroom

The devices providing safety spaces in the headroom shall be:

- a) Either movable stops; or
- b) A pre-triggered stopping system.

5.5.2.1 Movable stops

Automatically operated movable stops shall be designed to prevent damage due to any collision when they are moved between the fully retracted and extended position.

5.5.2.1.1 Arrangement

5.5.2.1.1.1 In the case of traction drive lifts the movable stops shall be installed under the counterweight to mechanically stop the car.

5.5.2.1.1.2 In the case of positive drive lifts the movable stops shall be installed above the car to mechanically stop the car.

5.5.2.1.1.3 In the case of hydraulic lifts the movable stops shall consist of one or more devices external to the jack situated outside of the car projection, the resultant force of which is exerted on the centre line of the jack.

5.5.2.1.2 Buffering of movable stops

5.5.2.1.2.1 In the case of traction and positive drive lifts the movable stops shall be fitted with buffers complying with EN 81-1:1998, 10.3 and 10.4.

5.5.2.1.2.2 In the case of hydraulic lifts the design of the movable stops shall be such that the average retardation of the car does not exceed $1 g_n$ and that in case of an indirect acting lift the retardation does not result in slack rope or chain.

5.5.2.2 Pre-triggered stopping system

The pre-triggered stopping system shall include a triggering device with its actuation means for tripping a mechanical stopping gear by a linkage when the car reaches a fixed tripping point in the up direction.

5.5.2.2.1 The triggering device shall be easily accessible so that examinations and maintenance operations can be carried out in complete safety from the pit, or from the car roof or from outside of the well.

5.5.2.2.2 The pre-triggered stopping system shall comply with the following:

- a) The stopping gear shall be fixed on the car and act on the guide rails of the car;