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Builders' hoists for goods - Part 1: Hoists with accessible platforms

Bauaufzüge für den Materialtransport - Teil 1: Aufzüge mit betretbarer Plattform

Monte-matériaux - Partie 1: Monte-matériaux à plates-formes accessibles

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Builders' hoists for goods - Part 1: Hoists with accessible platforms

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 12158-1:2000+A1:2010) has been prepared by Technical Committee CEN/TC 10 "Lifts, escalators and moving walks", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2011, and conflicting national standards shall be withdrawn at the latest by January 2011.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 includes Amendment 1, approved by CEN on 2010-06-12.

This document supersedes EN 12158-1:2000.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ▌A1〉 〈A1▐.

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.

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Introduction

This standard is one of a series of standards produced by CEN/TC 10/SC 1 “Building hoists” as part of the CEN programme of work to produce machinery safety standards.

The standard is a Type C standard relating to safety for builders hoists for goods.

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery shall comply as appropriate with ⟦A1⟩ EN ISO 12100:2003 ⟨A1⟧ for hazards which are not covered by this standard.

⟦A1⟩ 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.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this European Standard. ⟨A1⟧

1 Scope

1.1 This standard deals with power operated temporarily installed builders hoists (referred to as “hoists“ in this standard) intended for use by persons who are permitted to enter sites of engineering and construction, serving landing levels, having a load carrying device:

— designed for the transportation of goods only;

— guided;

— travelling vertically or along a path within 15 degrees max. of the vertical;

— supported or sustained by drum driven wire rope, chain, rack and pinion, hydraulic jack (direct or indirect), or an expanding linkage mechanism;

— where masts, when erected, may or may not require support from separate structures;

— which permits the access of instructed persons during loading and unloading;

— which are driven by appointed persons;

— which permits, if necessary, during erection, dismantling, maintenance and inspection, the access and travel by persons who are competent and authorised.

1.2 The standard identifies hazards as listed in clause 4 which arise during the various phases in the life of such equipment and describes methods for the elimination or reduction of these hazards when used as intended by the manufacturer.

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

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

— lightning protection;

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

— electromagnetic compatibility (emission, immunity);

— handling of loads the nature of which could lead to dangerous situations (e.g. molten metal, acids/bases, radiating materials, fragile loads);

— the use of combustion engines;

— the use of remote controls;

— hazards occurring during manufacture;

— hazards occurring as a result of mobility;

— hazards occurring as a result of being erected over a public road;

— earthquakes;

— noise.

1.4 This standard is not applicable to

— builders hoists for persons and materials;

— lifts according to EN 81-1:1998, 81-2:1998 and [A1] EN 81-3:2000 [A1];

— inclined hoists according to [A1] EN 12158-2:2000 [A1];

— work cages suspended from lifting appliances;

— work platforms carried on the forks of fork trucks;

— work platforms;

— funiculars;

— lifts specially designed for military purposes;

— mine lifts;

— theatre elevators;

— special purpose lifts.

1.5 This standard deals with the hoist installation. It includes the base frame and base enclosure but excludes the design of any concrete, hard core, timber or other foundation arrangement. It includes the design of mast ties but excludes the design of anchorage bolts to the supporting structure. It includes the landing gates and their frames but excludes the design of any anchorage fixing bolts to the supporting structure.

2 Normative references

[A1] 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. [A1]

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

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

[A1] EN 81-3:2000, *Safety rules for the construction and installation of lifts — Part 3: Electric and hydraulic service lifts* [A1]

[A1] *deleted text* [A1]

EN 349:1993, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

[A1] *deleted text* [A1]

EN 894-1:1997, *Safety of machinery — Ergonomic requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*

[A1] *deleted text* [A1]

EN 982:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 1037:1995, *Safety of machinery — Prevention of unexpected start-up*

EN 1088:1995, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

[A1] EN 12158-2:2000, *Builders hoists for goods — Part 2: Inclined hoists with non-accessible load carrying devices* [A1]

[A1] EN 12159:2000, *Builders hoists for persons and materials with vertically guided cages* [A1]

[A1] EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)* [A1]

[A1] EN 60204-32:2008, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32:2008)* [A1]

[A1] EN 60529:1991, *Degrees of protection provided by enclosures (IP-Code) (IEC 60529:1989)* [A1]

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

[A1] EN 60947-5-1:2004, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:2003)* [A1]

EN ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

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

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

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

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

ISO 2408:2004, *Steel wire ropes for general purposes — Minimum requirements*

ISO 4302:1981, *Cranes — Wind load assessment*

ISO 4309:2004, *Cranes — Wire ropes — Care, maintenance, installation, examination and discard*

ISO 6336-1:2006, *Calculation of load capacity of spur and helical gears — Part 1: Basic principles, introduction and general influence factors*

ISO 6336-2:2006, *Calculation of load capacity of spur and helical gears — Part 2: Calculation of surface durability (pitting)*

ISO 6336-3:2006, *Calculation of load capacity of spur and helical gears — Part 3: Calculation of tooth bending strength*

ISO 6336-5:2003, *Calculation of load capacity of spur and helical gears — Part 5: Strength and quality of materials*

3 Terms and definitions

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

3.1
builder's hoist
a temporary lifting machine serving landing levels on sites of engineering and construction with a platform, cage or other load carrying device, which is guided

3.2
working load/rated load
the maximum load which the hoist has been designed to carry in service

3.3
rated speed
the speed of the platform for which the equipment has been designed

3.4
wire rope hoist
a hoist which uses wire rope as the load suspension system

3.5
positive drive
a drive using means other than friction

3.6
hydraulic hoist
a hoist which uses a hydraulic cylinder to directly or indirectly carry the load

3.7
rack and pinion hoist
a hoist which uses a toothed rack and pinion as the load suspension system

3.8
expanding linkage mechanism
a mechanical linkage system (e.g. scissors) which supports and guides the platform by means of expansion or contraction under the control of an actuator

3.9
base frame
the lowest framework of the hoist, upon which all other components are mounted

3.10
guides
rigid elements which determine the travel way of the platform

3.11
mast
structure that supports and guides the platform

3.12
mast section
indivisible piece of mast, between two adjacent mast joints

3.13
mast tie
a connection system between the mast and any building structure, providing lateral support for the mast

3.14
hoistway
the total space which is travelled by the platform and its load

3.15
platform
the load carrying device including the floor, walls and entrances

3.16
stopping distance
the distance the platform moves from the moment, when the control or safety circuit is broken until the platform has come to a full stop

3.17
overspeed safety device
a mechanical device for stopping and maintaining stationary the platform in the event of overspeed in down direction

3.18
slack rope
a rope, normally under tension, from which all external loads have been removed

3.19
wire rope termination
the adaptation at the end of a wire rope permitting attachment

3.20
landing
a level in a building or construction intended for loading and unloading the platform

3.21
safety distance
a minimum acceptable distance between any moving part of a hoist and any point of access

3.22
guard rail
fixed equipment, other than gates, which is used to prevent people from falling or from reaching hazardous areas

3.23
normal operation
the usual operating conditions for the equipment when in use for carrying loads but excluding routine maintenance, erection, dismantling etc

3.24
in service
a condition during use of the hoist when the platform is in any position, laden or unladen, moving or stationary

3.25
out of service
an installed condition when the platform is positioned such that it is provided with the most shelter from the wind. This is normally, but not necessarily, ground level. The platform is unladen

3.26
competent person
a designated person, suitably trained, qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required procedures to be carried out

4 List of hazards

The list of hazards according to the following tables are based on [A1] EN ISO 12100-1:2003 and EN ISO 12100-2:2003 ⟨A1⟩.

Tables 1.1 and 1.2 show the hazards which have been identified and where the corresponding requirements have been formulated in this standard, in order to limit the risk or reduce these hazards in each situation.

A hazard which is not applicable or is not significant and for which, therefore, no requirements are formulated, is shown in the relevant clauses column as n.a. (not applicable).

Table 1 — Hazards relating to the general design and construction of hoists

	Hazards	**Relevant clauses in this standard**
1	**Mechanical hazards**	
1.1	Crushing	5.5.2, 5.5.3, 5.5.6, 5.7.2, 7.1.2.7, 7.1.2.8
1.2	Shearing	5.5, 5.6.1.2, 5.7.2, 7.1.2.7, 7.1.2.8

	Hazards	Relevant clauses in this standard
1.3	Cutting or severing	5.5, 5.6.1.2, 5.7.2, 7.1.2.7, 7.1.2.8
1.4	Entanglement	5.7.2
1.5	Drawing-in or trapping	5.5.2, 5.5.3, 5.6.1.2, 5.7.2, 7.1.2.7
1.6	Impact	5.4.3, 5.6.2, 7.1.2.7, 7.1.2.8
1.7	Stabbing or puncture	n.a.
1.8	Friction or abrasion	5.5.2, 5.5.3, 7.1.2
1.9	High pressure fluid ejection	5.7.3.3, 5.8
1.10	Ejection of parts	5.6.1.2
1.11	Loss of stability	5.2, 5.3, 5.4.1, 5.4.2, 5.6.3, 7.1.2.7.3
1.12	Slip, trip and fall	5.5, 5.6.1, 5.6.2, 5.7.3.3.8, 7.1.2.7.3
2	**Electrical hazards**	
2.1	Electrical contact	5.9, 7.1.2.7.3
2.2	Electrostatic phenomena	n.a.
2.3	Thermal radiation	n.a.
2.4	External influences	5.7.4.11, 5.9.3
3	**Thermal hazards**	
3.1	Burns and scalds	n.a.
3.2	Health-damaging effects	n.a.
4	**Hazards generated by noise**	
4.1	Hearing losses	not dealt with, see 1.3
4.2	Interference with speech	not dealt with, see 1.3
5	**Hazards generated by vibration**	n.a.
6	**Hazards generated by radiation**	
6.1	Electrical arcs	n.a.
6.2	Lasers	n.a.
6.3	Ionising radiation sources	n.a.
6.4	Use of H F electromagnetic fields	not dealt with
7	**Hazards generated by materials and substances processed, used or exhausted by machinery**	
7.1	Contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	n.a.
7.2	Fire or explosion	n.a.
7.3	Biological and microbiological	n.a.
8	**Hazards generated by neglecting ergonomic principles in machine design**	
8.1	Unhealthy postures or excessive effort	5.1, 5.5.3.1.6, 7.1.2.7.3
8.2	Inadequate consideration of human hand/arm or foot/leg anatomy	5.5, 5.7.2, 7.1.2.7
8.3	Neglected use of personal protection equipment	n.a.
8.4	Inadequate area lighting	7.1.2.7.3
8.5	Mental overload or underload, stress	5.10
8.6	Human error	5.6.3, 5.10, 7.1.2.7, 7.1.2.8, 7.2, 7.3
9	**Hazard combinations**	not dealt with
10	**Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders**	
10.1	Failure of energy supply	5.7.4.1, 5.9.2, 5.11, 7.1.2.4.1, 7.1.2.5
10.2	Unexpected ejection of machine parts or fluids	5.7.2.3, 5.7.3.3, 5.8

	Hazards	Relevant clauses in this standard
10.3	Failure or malfunction of control system	5.10.2.2, 5.10.3, 5.10.6
10.4	Errors of fitting	5.4.1, 7.1.2.7
10.5	Overturn, unexpected loss of machine stability	5.2, 5.3, 5.4, 7.1.2.7
11	**Hazards caused by missing and / or incorrectly positioned safety related measures / means**	
11.1	Guards	5.5, 5.6.1.2, 7.1.2.7
11.2	Safety related (protection) devices	5.5.1, 7.1.2.7, 7.1.2.10
11.3	Starting and stopping devices	5.10.5, 5.10.7, 7.1.2.7, 7.1.2.8
11.4	Safety signs and signals	7.2
11.5	Information or warning devices	5.6.3, 7.2
11.6	Energy supply disconnecting devices	5.10.6
11.7	Emergency devices	5.6.2, 5.11, 7.1.2.5, 7.1.2.7, 7.1.2.10
11.8	Feeding/removal means of work pieces	n.a.
11.9	Essential equipment and accessories for safe adjusting and/or maintaining	7.1.2.5, 7.1.2.7, 7.1.2.10
11.10	Equipment evacuating gases	n.a. see 1.3

Table 1.2 — Particular hazards involving the mobility and/or load lifting ability of hoists

	Hazards	Relevant clauses in this standard
	Hazards due to mobility	
12	**Inadequate lighting of moving / working area**	Not dealt with, see 1.3
13	**Hazards due to sudden movement instability etc. during handling**	Not dealt with, see 1.3
14	**Inadequate/non-ergonomic design of operating position**	Not dealt with, see 1.3
15	**Mechanical hazards**	Not dealt with, see 1.3
16	**Hazards due to lifting operations**	
16.1	Lack of stability	5.2.5, 5.3, 5.4.1, 5.4.2, 7.1.2.7
16.2	Derailment of the platform	5.4.1, 5.6.1, 5.10.7.2.2
16.3	Loss of mechanical strength of machinery and lifting accessories	5.2, 5.3, 5.5.4, 5.6, 5.7, 7.1.2.10
16.4	Hazards caused by uncontrolled movement	5.5.3, 5.6.2, 7.1.2.8
17	**Inadequate view of trajectories of the moving parts**	5.5.2.2, 7.1.2.8
18	**Hazards caused by lightning**	not dealt with, see 1.3
19	**Hazards due to loading / overloading**	5.2, 5.6, 7.1.2.8

5 Safety requirements and/or measures

5.1 General

The design of the hoist shall consider safe use, erection, dismantling and maintenance. It shall be possible to erect the hoist using safe access methods such as those offered by the platform or equivalent facilities.

The design of all components that have to be handled during erection e.g. mast sections, shall have their weight assessed against manual handling. Where the permissible weight for manual handling is exceeded, the manufacturer shall make available suitable lifting equipment. [A1] All removable and detachable covers shall be retained by captive fastenings. [A1]

5.2 Load combinations and calculations

5.2.1 The structure of the hoist shall be designed and constructed in such a way that its strength is satisfactory under all intended operating conditions, including erection and dismantling and e.g. low temperature environments.

The design of the structure as a whole and each part of it shall be based on the effects of any possible combination of loads as specified in this subclause 5.2. The load combinations shall consider the least favourable locations of the platform and load relative to the mast and its ties, both during the vertical passage of the platform and any horizontal movement, e.g. swivelling of the platform. Ties between the mast and the supporting structure are considered to be part of the hoist structure.

5.2.2 When calculating the hoist structure and every related component, the following forces and loads shall be taken into account:

5.2.2.1 All dead weights with the exception of the platform and equipment which moves together with the platform.

5.2.2.2 Dead weights of the unladen platform and all equipment which moves together with the platform.

5.2.2.3 Dead weight of landing platforms and gates if supported by the hoist.

5.2.2.4 Rated load on the platform

The effect of the forces on the platform and mast resulting from the application of the rated load shall be allowed for in one of the two following ways, which reflect the chosen density of loading on the platform:

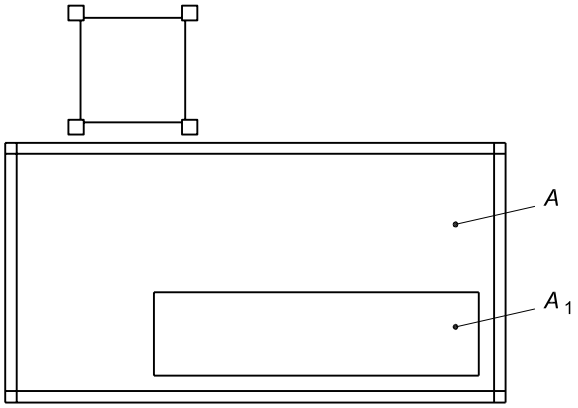
a) If $\frac{F}{A \text{ x } 0{,}75} < 3{,}0 \text{ kN / m}^2$

where

F = rated load [kN] and

A = total floor area [m²]

then the rated load shall be assumed to be distributed over a reduced area (A_1) which results in a distribution of 3,0 kN/m². The format and the location of this area shall be taken as that which gives the least favourable stress for the mast and also for the platform. One example is shown in figure 1.



Key

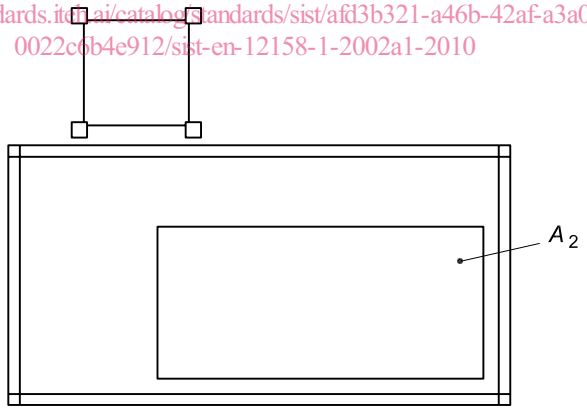
A total floor area[m²]

A_1 = F[kN]/3[kN/m²]

Figure 1 — One example of loading according to 5.2.2.4 a

b) if $\frac{F}{A \times 0,75} \geq 3,0\ kN/m^2$

then the rated load shall be assumed to be distributed over an area (A_2) equivalent to 75 % of the total floor area of the platform. The format and the location of this area shall be taken as that which gives the least favourable stress for the mast and also for the platform. One example is shown in figure 2.



Key

A_2 = 0,75 A

Figure 2 — One example of loading according to 5.2.2.4 b

5.2.2.5 Where the uniform distribution of the rated load over the full area of the platform is less than 2,5 kN/m² then, for calculation purposes a minimum of 2,5 kN/m² shall be placed over the whole area (A_3) of the platform. See figure 3.