SLOVENSKI STANDARD
oSIST prEN 15011:2007

01-april-2007

Žerjavi – Mostni in portalni žerjavi

Cranes - Bridge and gantry cranes

Krane - Brücken- und Portalkrane

Appareils de levage a charge suspendue - Ponts roulants et portiques

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53.020.20 Dvigala Cranes

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Cranes - Bridge and gantry cranes

Appareils de levage à charge suspendue - Ponts roulants et portiques

Krane - Brücken- und Portalkrane

This draft European Standard is submitted to CEN members for second enquiry. It has been drawn up by the Technical Committee CEN/TC 147.

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

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Foreword

This document (prEN 15011:2007) has been prepared by Technical Committee CEN/TC 147 “Cranes - Safety”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

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 European standard has been prepared to be a harmonised standard to provide one means for bridge and gantry cranes to conform with the essential health and safety requirements of the Machinery Directive, as mentioned in Annex ZA.

Absolute safety of cranes cannot be ensured by design alone, as their operation depends on the skill of operators, maintenance personnel and inspectors as well as on the numerous technical parameters relating to the crane and its operating environment, which may have large scatter.

As many of the hazards related to bridge and gantry cranes relate to their operating environment and use, it is assumed in the preparation of this standard that all the relevant information relating to the use and operating environment of the crane has been exchanged between the manufacturer and user (as recommended in ISO 9374, Parts 1 and 5), covering such issues as, for example:

— clearances;

— requirements concerning protection against hazardous environments;

— processed materials, such as potentially flammable or explosive material (e.g. coal, powder type materials).

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This standard is a type C standard as stated in EN ISO 12100-1

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

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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

This standard applies to bridge and gantry cranes mounted in a fixed position or free to travel either by way of metallic wheels on rails or non-metallic wheels on flat runway or roadway surfaces. This standard is not applicable to non-fixed load lifting attachments, erection and dismantling operations, runways and supporting structures nor does it cover additional loads due to the mounting of cranes on a floating or tilting base.

This standard does not include requirements for the lifting of persons.

This standard gives requirements for all significant hazards, hazardous situations and events relevant to bridge and gantry cranes when used as intended and under conditions foreseen by the manufacturer (see clause 4).

The specific hazards due to potentially explosive atmospheres, ionising radiation and operation in electromagnetic fields beyond the range of EN 61000-6-2 are not covered by this standard.

This standard is not applicable to bridge and gantry cranes manufactured before the date of it's publication as an EN.

2 Normative references

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

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

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

prEN 81-43, Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods - Part 43: Special purpose lifts for cranes

EN 294: 1992, Safety of machinery - Safety distance to prevent danger zones being reachedby the upper limbs

EN 614-1, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

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

EN 894-2, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

prEN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

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

EN 954-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

prEN 1005-3, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

prEN 1993-6, *Eurocode 3: Design of steel structures - Part 6: Crane supporting structures*

EN 10002-1:1990, *Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature)*

EN 12077-2: 1998, *Cranes safety — Requirements for health and safety — Part 2: Limiting and indicating devices*

EN 12644-1: 2001, *Cranes — Information for use and testing — Part 1: Instructions*

EN 12644-2: 2000, *Cranes — Information for use and testing — Part 2: Marking*

EN 13001-1: 2004*, Crane safety — General design — Part 1: General principles and requirements*

EN 13001-2: 2004*, Crane safety — General design — Part 2: Load effects*

CEN/TS 13001-3.1, *Cranes — General Design — Part 3.1: Limit states and proof of competence of steel structures*

EN 13135-1: 2003, *Cranes — Safety — Design — Requirements for equipment — Part 1: Electrotechnical equipment*

EN 13135-2: 2004, *Cranes — Equipment — Part 2: Non-electrotechnical equipment*

EN 13202, *Ergonomics of the thermal environment — Temperatures of touchable hot surfaces — Guidance for establishing surface temperature limit values in production standards with the aid of EN 563*

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EN 13155: 2003, *Cranes - Safety - Non-fixed load lifting attachments*

EN 13157: 2004, *Cranes - Safety - Hand powered lifting equipment*

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EN 13557: 2003, *Cranes — Controls and control stations*

EN 13586: 2004 *Cranes — Access*

prEN 14492-2 *Cranes — Power driven winches and hoists — Part 2: Power driven hoists*

EN 60073, *Basic and safety principles for man-machine interface, marking and identification — Coding principles for indication devices and actuators*

EN 60204-32: 1998, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines*

EN 60825-1, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide*

EN 61310-2, *Safety of machinery — Indicating, marking and actuation —- Part 2: Requirements for marking*

ISO 1680: 1999, *Acoustics — Test code for the measurement of airborne noise emitted by rotating electrical machines*

ISO 2631-1: *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

ISO 3864, *Safety colours and safety signs*

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

ISO 7752-5, *Lifting appliances — Controls — Layout and characteristics — Part 5: Overhead travelling cranes and portal bridge cranes*

ISO 8566-5, *Lifting appliances — Cabin — Part 5: Overhead travelling cranes and portal bridge cranes*

ISO 10245-5, *Cranes — Limiting and indicating devices — Part 5: Overhead travelling and portal bridge cranes*

ISO 11660-5, *Cranes — Access, guards and restraints — Part 5: Bridge and Gantry Cranes*

ISO 12488-1: 2005, *Cranes — Tolerances of cranes and tracks — Travel and Traverse — Part 1: General*

EN ISO 3744: 1995, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*

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

EN ISO 11202: 1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Survey method in situ*

EN ISO 11203: 1995, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level*

EN ISO 11204: 1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental*

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3 Terms and definitions

For the purposes of this standard, the terms and definitions of EN ISO 12100-1, EN ISO 3744, EN ISO 11202, EN ISO 11203 and EN ISO 11204 apply together with the following:

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3.1
bridge crane
a crane, having at least one primarily horizontal girder moving along tracks on which is mounted at least one lifting assembly.

3.2
gantry crane
a crane, having at least one primarily horizontal girder supported by at least one leg, mounted on wheels. and equipped with at least one lifting assembly.

3.3
rated capacity : m_{RC}
maximum net load (the sum of the payload and non-fixed load-lifting attachment) that the crane is designed to lift for a given crane configuration and load location during normal operation

3.4
hoist load: m_H
sum of the masses of the load equal to the rated capacity, the fixed lifting attachment and the hoist medium.

4 List of significant hazards

Table 1 of this clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

Table 1 — List of significant hazards and associated requirements

No.	Hazard (as listed in EN 1050:1997)	Other EN-standards and ISO-standards	Relevant clause(s) in this standard
1	Mechanical hazards		
1.1	Generated by machine parts or workpieces, e.g. by:		
1.1.2	relative location		5.6.2
1.1.3	mass and stability	EN 13001	5.2
1.1.4	mass and velocity	EN 13135-2	5.4.4, 5.6.1
1.1.5	inadequacy of mechanical strength	EN 13001	5.2
1.2	Accumulation of energy inside the machinery, e.g. by:		
1.2.2	fluids under pressure	EN 13135-2 5.7	5.4.1
1.3	Elementary forms of mechanical hazards		
1.3.1	Crushing	EN 294, EN 349	5.1, 5.6.2, 7.2.
1.3.2	Shearing	EN 13586	5.6.2.4
1.3.3	Cutting or severing	ISO 8566-1 6.3, EN 13557	
1.3.5	Drawing-in or trapping hazard - moving transmission parts	EN 953 EN 294	5.6.2.5 to 5.6.2.7
1.3.6	Impact		5.5.3.1, 7.2
1.3.9	High pressure fluid injection or ejection hazard	EN13135-2	7.3.3
2	**Electrical hazards** due to:	EN13135-1	5.3
2.1	Contact of persons with live parts (direct contact)	EN 60204-32	5.3.2, 5.3.5.1, 5.3.10
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	EN 60204-32	5.3.5.2
2.3	Approach to live parts under high voltage	EN 60204-32	5.3
2.4	Electrostatic phenomena	EN 60204-32	5.3.1
2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short-circuits, overloads, etc.	EN 60204-32	5.3.6

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Table 1 — List of significant hazards and associated requirements (Continued)

No.	Hazard (as listed in EN 1050:1997)	Other EN-standards and ISO-standards	Relevant clause(s) in this standard
3	**Thermal hazards,** resulting in:		
3.1	burns and scalds, by possible contact of persons with objects or materials with an extreme temperature, by flames, by radiation, etc.	EN 563, EN 13135-2	5.4.8.1, 7.3.3
3.2	Hot or cold working environment.	EN 13557	5.6.1
4	**Hazards generated by noise,** resulting in:		
4.1	Hearing losses		5.6.4
4.2	Interference with speech communication, signals,..		5.6.4, 7.3.1
5	**Hazards generated by vibration**		
5.2	Whole body vibration, particularly when combined with poor postures		5.2.2.6, 5.6.1
6	**Radiation**		
6.0	External radiation		See introduction
6.1	Low frequency , radio frequency radiation, micro waves		5.4.8.2
6.2	Infrared, visible, UV-light		5.4.8.3
6.5	Lasers	EN 60825-1	5.4.8.4
7	**Processed materials and substances, used materials, fuels**		
7.1	Hazards from contact with harmful fluids, gases, mists, fumes and dusts	EN 60204-1: cl. 12.3	5.4.8.6 See Introduction
7.2	Fire or explosion hazard		5.4.8.5 See Introduction
8	**Neglected ergonomic principles in machine design** e.g. hazards from:		
8.1	Unhealthy postures or excessive efforts		5.6.1
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	EN 614-1	
8.3	Neglected use of personal protection equipment		7.3.3
8.4	Inadequate local lighting		5.6.3
8.6	Human errors, human behaviour		5.5.2.1
8.7	Inadequate design, location or identification of manual controls	ISO 7752-5	
8.8	Inadequate design or location of visual display units	EN 894-1, -2, -3	5.7.5

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Table 1 — List of significant hazards and associated requirements (Continued)

No.	Hazard (as listed in EN 1050:1997)	Other EN-standards and ISO-standards	Relevant clause(s) in this standard
10	**Unexpected start-up, unexpected overrun/overspeed** (or any similar malfunction) from:		
10.1	Failure/ disorder of control systems	EN 60204-32 EN 954, EN 418	5.3.4, 5.3.9, 5.6.1
10.3	External influences on electrical equipment		5.3.8.4, 5.3.10, 5.4.2
10.4	Other external influences (gravity, wind, etc.)		5.3.8.4, 5.4.2, 5.5.2.2, 5.5.4 b) and c)
10.5	Errors in the software		5.3.8.4, 5.3.9, 5.4.2
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see No. 8.6)		5.3.8.4, 5.4.2
11	**Impossibility of stopping the machine in the best possible conditions**		5.4.4.1, 5.4.5.1, 5.5.2.2
13	**Failure of the power supply**	EN 60204-32	5.3, 5.4.2
14	**Failure of the control circuit**	EN 60204-32	5.3, 5.6.1, 5.4.2
16	**Break-up during operation**		5.2, 5.4.3.2.1, 7.3.3
16.1	Thermal effect on the crane		5.3
17	**Falling or ejected object. or fluid**	EN 13135-2	5.4.1, 7.3.3
18	**Loss of stability / overturning of machinery**		
	Loss of rigid body stability	EN13001-2	5.2.3
19	**Slip, trip and falling of persons** (related to machinery)	EN 13586	5.6.2
20	**Relating to the travelling function**		
20.2	Movement without a operator at the driving position		5.6.1
20.4	Excessive speed of pedestrian controlled machinery	EN 13557	5.6.1
20.5	Excessive oscillations when moving		5.4.4.3, 5.5.4e) 7.2
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilized		5.4.3.2.1, 5.4.4.1 to 5.4.4.4, 5.5.2.2, 7.2
20.7	From derailment due to travelling		5.4.4.5

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Table 1 — List of significant hazards and associated requirements (Continued)

No.	Hazard (as listed in EN 1050:1997)	Other EN-standards and ISO-standards	Relevant clause(s) in this standard
21	**Linked to the work position** (including driving station) on the machine		
21.1	Fall of persons during access to (or at/from) the work position	EN 13586, ISO 11660-5	5.6.2
21.2	Exhaust gases / lack of oxygen at the work position		5.4.8.6.1
21.3	Fire (flammability of the cab, lack of extinguishing means)	EN 13557	5.4.8.5, 5.6.1
21.4	Mechanical hazards at the work position - contact with the wheels - fall of objects, penetration by object - contact of persons with machine parts or tools (pedestrian control.)		5.6.2.5, 5.6.1
21.5	Insufficient visibility from the working position	EN 13557	5.6.1,
21.6	Inadequate lighting		5.6.3
21.7	Inadequate seating	EN 13557, ISO 8566-5	5.6.1
21.8	Noise at the driving position		5.6.4
21.9	Vibration at the driving position		5.6.1
21.10	Insufficient means of evacuation/emergency exit	EN 13586, EN 60204-32	5.6.2, 5.4.8.5
22	**Due to the control system**		5.6.1
22.1	Inadequate location of controls /control devices		5.6.1
22.2	Inadequate design of the actuation mode and/or action mode of controls	ISO 7752-1, -5	5.6.1
23	**From handling the machine** (lack of stability)		5.4.4.3
25	**From/to third persons**		
25.1	Unauthorized start-up/use	EN 60204-32 5.4	
25.2	Drift of a part away from its stopping position		5.4.5.2
25.3	Lack or inadequacy of visual or acoustic warning means		5.7
26	**Insufficient instructions for the driver / operator**		
26.1	Movement into prohibited area		5.5.3.1, 7.2
26.2	Tipping - Swinging		7.2
26.3	Collision: machines-machine.	ISO 10245-5	5.5.3.1, 5.5.3.3, 5.5.4e), 7.2
26.4	Collision: machines-persons		5.5.3.1, 5.5.4e) 7.2
26.5	Ground conditions		7.3.1
26.6	Supporting conditions		7.3.1

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Table 1 — List of significant hazards and associated requirements (Continued)

No.	Hazard (as listed in EN 1050:1997)	Other EN-standards and ISO-standards	Relevant clause(s) in this standard
27	**Mechanical hazards and events**		
27.1	from load falls, collision, machine tipping caused by:		
27.1.1	lack of stability		5.2.3
27.1.2	Uncontrolled loading -overloading – overturning moment exceeded		5.2.1.8, 5.2.1.9, 5.4.3.1, 5.5.1, 5.5.2.1, 5.5.4a)
27.1.3	Uncontrolled amplitude of movements		5.5.3.3, 7.2
27.1.4	Unexpected/unintended movement of loads	EN 13135-1, -2	5.3.7, 5.3.11, 5.4.1, 5.4.2, 5.6, 7.2
27.1.5	Inadequate holding devices / accessories	EN 13135-2, EN 13155	5.4.1, 7.2
27.1.6	Collision of more than one machine		5.5.3.1, 5.5.3.3
27.1.7	Two-block of hook to hoist		5.5.3.2
27.2	From access of persons to load support		7.2
27.3	From derailment	EN 13135-2	5.4.4.5, 5.4.4.6
27.4	From insufficient mechanical strength of parts Loss of mechanical strength, or inadequate mechanical strength		5.2, 5.4.3.2.1, 5.4.5.3, 5.4.6, 5.4.7, 7.3.3
27.5	From inadequate design of pulleys, drums	EN 13135-2	5.2, 5.4.1
27.6	From inadequate selection/ integration into the machine of chains, ropes, lifting accessories	EN 13135-2, EN 13155	5.2, 5.4.1, 7.2
27.7	From lowering of the load by friction brake	EN 13135-2	5.4.1
27.8	From abnormal conditions of assembly/ testing/ use/ maintenance		5.4.3.2.2, 5.5.4d)
27.9	Load-person interference (impact by load)		5.6.1, 7.2, 7.3.1
28	**Electrical hazard**		
28.1	from lightning	EN 13135-1	7.3.3
29	**Hazards generated by neglecting ergonomic principles**		
29.1	insufficient visibility from the driving position	EN 13557	5.6.1, 5.6.3

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5 Safety requirements and/or protective measures

5.1 General

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

Bridge and gantry cranes shall be in accordance with the following standards as amended by this standard:

— EN 13001-1, *Crane safety — General design — Part 1: General principles and requirements*;

— EN 13001-2, *Crane safety — General design — Part 2: Load actions*;

— CEN/TS 13001-3-1, *Cranes — General design — Part 3.1: Limit states and proof of competence of steel structures*;

— CEN/TS 13001-3-2, *Cranes — General design — Part 3.2: Limit states and proof of competence of wire ropes;*

— EN 13135-1, *Cranes — Safety — Design — Requirements for equipment — Part 1: Electrotechnical equipment;*

— EN 13135-2, *Cranes — Equipment — Part 2: Non-electrotechnical equipment;*

— EN 13157, *Cranes – Hand powered cranes*

— EN 13557, *Cranes — Controls and control stations;*

— EN 12077-2, *Cranes safety — Requirements for health and safety — Part 2: Limiting and indicating devices;*

— EN 13586, *Cranes — Access;*

— EN 12644-1, *Cranes — Information for use and testing — Part 1: Instructions;*

— EN 12644-2, *Cranes — Information for use and testing — Part 2: Marking;*

— prEN 14492-2, *Cranes — Power driven winches and hoists — Part 2: Power driven hoists*

— EN 60204-32, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines*

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5.2 Requirements for strength and stability

5.2.1 Load actions

5.2.1.1 Selection of service conditions

The service conditions that are selected and used as the basis of design, in accordance with EN 13001-1 and -2, shall be specified in the technical file of the crane.

For cranes located outdoor, the recurrence period according to EN 13001-2 clause 4.2.4.2 for out of service wind shall be a minimum

- 25 years for cranes located in coastal areas
- 10 years for cranes located inland
- 5 years for indoor cranes working outdoor occasionally with outdoor parking facilities