SLOVENSKI STANDARD

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SIST ENV 1991-5:2004

Evrokod 1: Vplivi na konstrukcije – 3. del: Vpliv žerjavov in drugih strojev

Eurocode 1 - Actions on structures - Part 3: Actions induced by cranes and machinery

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 3: Einwirkungen infolge von Kranen und Maschinen

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Eurocode 1 - Actions sur les structures - Partie 3: Actions induites par les appareils de levage et les machines

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ICS:

91.010.30	Tehniļ ni vidiki	Technical aspects

SIST EN 1991-3:2006 **en**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1991-3

July 2006

ICS 91.010.30

Supersedes ENV 1991-5:1998

English Version

Eurocode 1 - Actions on structures - Part 3: Actions induced by cranes and machinery

Eurocode 1 - Actions sur les structures - Partie 3: Actions induites par les appareils de levage et les machines

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 3: Einwirkungen infolge von Kranen und Maschinen

This European Standard was approved by CEN on 9 January 2006.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard (EN 1991-3:2006) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the secretariat of which is held by BSI.

CEN/TC 250 is responsible for all Structural Eurocodes.

This European Standard supersedes ENV 1991-5:1998.

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of an identical text or by endorsement, at the latest by October 2006, and conflicting national standards shall be withdrawn at the latest by March 2010.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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.

Background of the Eurocode programme

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In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 95 of the Treaty. The objective of the programme was the elimination of technical obstacles to trade and the harmonisation of technical specifications.

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Within this action programme, the Commission took the initiative to establish a set of harmonised technical rules for the design of construction works which, in a first stage, would serve as an alternative to the national rules in force in the Member States and, ultimately, would replace them.

For fifteen years, the Commission, with the help of a Steering Committee with Representatives of Member States, conducted the development of the Eurocodes programme, which led to the first generation of European codes in the 1980s.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement[1] between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to the CEN through a series of Mandates, in order to provide them with a future status of European Standard (EN). This links *de facto* the Eurocodes with the provisions of all the Council's Directives and/or Commission's Decisions dealing with European standards (e.g. the Council Directive 89/106/EEC on construction products - CPD - and Council Directives 93/37/EEC, 92/50/EEC and 89/440/EEC on public works and services and equivalent EFTA Directives initiated in pursuit of setting up the internal market).

[1] Agreement between the Commission of the European Communities and the European Committee for Standardisation (CEN) concerning the work on EUROCODES for the design of building and civil engineering works (BC/CEN/03/89).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

EN 1990	Eurocode :	Basis of Structural Design
EN 1991	Eurocode 1:	Actions on structures
EN 1992	Eurocode 2:	Design of concrete structures
EN 1993	Eurocode 3:	Design of steel structures
EN 1994	Eurocode 4:	Design of composite steel and concrete structures
EN 1995	Eurocode 5:	Design of timber structures
EN 1996	Eurocode 6:	Design of masonry structures
EN 1997	Eurocode 7:	Geotechnical design
EN 1998	Eurocode 8:	Design of structures for earthquake resistance
EN 1999	Eurocode 9:	Design of aluminium structures

Eurocode standards recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level where these continue to vary from State to State.

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Status and field of application of Eurocodes

The Member States of the EU and EFTA recognise that Eurocodes serve as reference documents for the following purposes:

– as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly Essential Requirement N°1 – Mechanical resistance and stability – and Essential Requirement N°2 – Safety in case of fire ;

– as a basis for specifying contracts for construction works and related engineering services ;

– as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs)

The Eurocodes, as far as they concern the construction works themselves, have a direct relationship with the Interpretative Documents[2] referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards[3]. Therefore, technical aspects arising from the Eurocodes work need to be adequately considered by CEN Technical Committees and/or EOTA Working Groups working on product

[2] According to Art. 3.3 of the CPD, the essential requirements (ERs) shall be given concrete form in interpretative documents for the creation of the necessary links between the essential requirements and the mandates for harmonised ENs and ETAGs/ETAs.

[3] According to Art. 12 of the CPD the interpretative documents shall :

a) give concrete form to the essential requirements by harmonising the terminology and the technical bases and indicating classes or levels for each requirement where necessary ;

b) indicate methods of correlating these classes or levels of requirement with the technical specifications, e.g. methods of calculation and of proof, technical rules for project design, etc. ;

c) serve as a reference for the establishment of harmonised standards and guidelines for European technical approvals.

The Eurocodes, *de facto*, play a similar role in the field of the ER 1 and a part of ER 2.

standards with a view to achieving full compatibility of these technical specifications with the Eurocodes.

The Eurocode standards provide common structural design rules for everyday use for the design of whole structures and component products of both a traditional and an innovative nature. Unusual forms of construction or design conditions are not specifically covered and additional expert consideration will be required by the designer in such cases.

National Standards implementing Eurocodes

The National Standards implementing Eurocodes will comprise the full text of the Eurocode (including any annexes), as published by CEN, which may be preceded by a National title page and National foreword, and may be followed by a National annex.

The National annex may only contain information on those parameters which are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned, i.e. :

– values and/or classes where alternatives are given in the Eurocode,

– values to be used where a symbol only is given in the Eurocode,

– country specific data (geographical, climatic, etc.), e.g. snow map,

– the procedure to be used where alternative procedures are given in the Eurocode.

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It may also contain:

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– decisions on the application of informative annexes,

– references to non-contradictory complementary information to assist the user to apply the Eurocode.

Links between Eurocodes and harmonised technical specifications (ENs and ETAs) for products

There is a need for consistency between the harmonised technical specifications for construction products and the technical rules for works[4]. Furthermore, all the information accompanying the CE Marking of the construction products which refer to Eurocodes should clearly mention which Nationally Determined Parameters have been taken into account.

Additional information specific for EN 1991-3

EN 1991-3 gives design guidance and actions for the structural design of buildings and civil engineering works, including the following aspects:

– actions induced by cranes, and

– actions induced by machinery.

EN 1991-3 is intended for clients, designers, contractors and public authorities.

[4] see Art.3.3 and Art.12 of the CPD, as well as clauses 4.2, 4.3.1, 4.3.2 and 5.2 of ID 1.

EN 1991-3 is intended to be used with EN 1990, the other Parts of EN 1991 and EN 1992 to EN 1999 for the design of structures.

National annex for EN 1991-3

This Standard gives alternative procedures, values and recommendations for classes with notes indicating where national choices have to be made. Therefore the National Standard implementing EN 1991-3 should have a National Annex containing all Nationally Determined Parameters to be used for the design of members to be constructed in the relevant country.

National choice is allowed in EN 1991-3 through the following paragraphs:

Paragraph	**Item**
2.1 (2)	Procedure when actions are given by the crane supplier
2.5.2.1 (2)	Eccentricity of wheel loads
2.5.3 (2)	Maximum number of cranes to be considered in the most unfavourable position
2.7.3 (3)	Value of friction factor
A2.2 (1)	Definition of γ-values for cases STR and GEO
A2.2 (2)	Definition of γ-values for case EQU
A2.3 (1)	Definition of ψ-values

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Section 1 General

1.1 Scope

(1) Part 3 of EN 1991 specifies imposed loads (models and representative values) associated with cranes on runway beams and stationary machines which include, when relevant, dynamic effects and braking, acceleration and accidental forces.

(2) Section 1 defines common definitions and notations.

(3) Section 2 specifies actions induced by cranes on runways.

(4) Section 3 specifies actions induced by stationary machines.

1.2 Normative References

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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ISO 3898 Basis of design of structures - Notations. General symbols

ISO 2394 General principles on reliability for structures

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ISO 8930 General principles on reliability for structures. List of equivalent terms

EN 1990	Eurocode: Basis of Structural Design
EN 13001-1	Cranes – General design – Part 1: General principles and requirements
EN 13001-2	Cranes – General design – Part 2: Load effects
EN 1993-1-9	Design of steel structures – Part 1-9: Fatigue
EN 1993-6	Design of steel structures – Part 6: Crane runway beams

1.3 Distinction between Principles and Application Rules

(1) Depending on the character of the individual clauses, distinction is made in this Part of prEN 1991 between Principles and Application Rules.

(2) The Principles comprise:

– general statements and definitions for which there is no alternative, as well as

– requirements and analytical models for which no alternative is permitted unless specifically stated.

(3) The Principles are identified by the letter P following the paragraph number.

(4) The Application Rules are generally recognised rules which comply with the Principles and satisfy their requirements.

(5) It is permissible to use alternative design rules different from the Application Rules given in EN 1991-3 for works, provided that it is shown that the alternative rules accord with the relevant Principles and are at least equivalent with regard to the structural safety, serviceability and durability that would be expected when using the Eurocodes.

NOTE: If an alternative design rule is substituted for an Application Rule, the resulting design cannot be claimed to be wholly in accordance with EN 1991-3 although the design will remain in accordance with the Principles of EN 1991-3. When EN 1991-3 is used in respect of a property listed in an Annex Z of a product standard or an ETAG, the use of an alternative design rule may not be acceptable for CE marking.

(6) In this Part the Application Rules are identified by a number in brackets, e.g. as this clause.

1.4 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in ISO 2394, ISO 3898, ISO 8930 and the following apply. Additionally for the purposes of this standard a basic list of terms and definitions is provided in EN 1990, 1.5.

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1.4.1 Terms and definitions specifically for hoists and cranes on runway beams

1.4.1.1
dynamic factor
factor that represents the ratio of the dynamic response to the static one

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1.4.1.2
self-weight Q_c of the crane
self-weight of all fixed and movable elements including the mechanical and electrical equipment of a crane structure, however without the lifting attachment and a portion of the suspended hoist ropes or chains moved by the crane structure, see 1.4.1.3

1.4.1.3
hoist load Q_h
load including the masses of the payload, the lifting attachment and a portion of the suspended hoist ropes or chains moved by the crane structure, see Figure 1.1

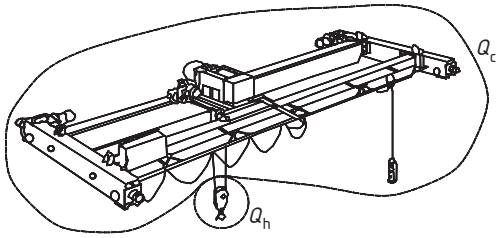

Figure 1.1 — Definition of the hoist load and the self-weight of a crane

1.4.1.4
crab
part of an overhead travelling crane that incorporates a hoist and is able to travel on rails on the top of the crane bridge

1.4.1.5
crane bridge
part of an overhead travelling crane that spans the crane runway beams and supports the crab or hoist block

1.4.1.6
guidance means
system used to keep a crane aligned on a runway, through horizontal reactions between the crane and the runway beams

NOTE The guidance means can consist of flanges on the crane wheels or a separate system of guide rollers operating on the side of the crane rails or the side of the runway beams

1.4.1.7
hoist
machine for lifting loads

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1.4.1.8
hoist block
underslung trolley that incorporates a hoist and is able to travel on the bottom flange of a beam, either on a fixed runway (as shown in Figure 1.2) or under the bridge of an overhead travelling crane (as shown in Figures 1.3 and 1.4)

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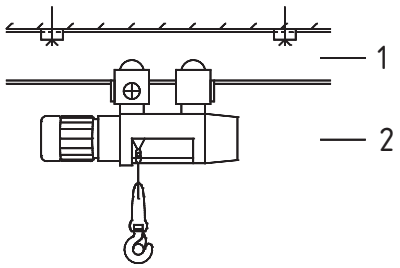
1.4.1.9
monorail hoist block
hoist block that is supported on a fixed runway, see Figure 1.2

1.4.1.10
crane runway beam
beam along which an overhead travelling crane can move

1.4.1.11
overhead travelling crane
a machine for lifting and moving loads, that moves on wheels along overhead crane runway beams. It incorporates one or more hoists mounted on crabs or underslung trolleys

1.4.1.12
runway beam for hoist block
crane runway beam provided to support a monorail hoist block that is able to travel on its bottom flange, see Figure 1.2



Key

1 Runway beam
2 Hoist block

Figure 1.2 — Runway beam with hoist block

1.4.1.13
underslung crane
overhead travelling crane that is supported on the bottom flanges of the crane runway beams, see Figure 1.3

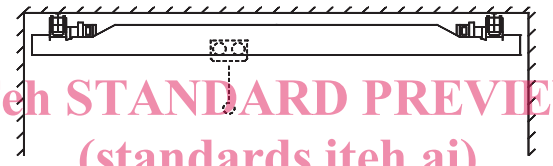


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Figure 1.3 — Underslung crane with hoist block

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1.4.1.14
top-mounted crane
overhead travelling crane that is supported on the top of the crane runway beam

NOTE It usually travels on rails, but sometimes travels directly on the top of the beams, see Figure 1.4

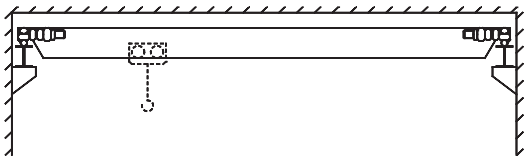

Figure 1.4 — Top mounted crane with hoist block

1.4.2 Terms and definitions specifically for actions induced by machines

1.4.2.1
natural frequency
frequency of free vibration on a system

NOTE For a multiple degree-of-freedom system, the natural frequencies are the frequencies of the normal modes of vibrations