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**Eurocode 3: Projektiranje jeklenih konstrukcij – 6. del: Žerjavne proge  
(prevzet ENV 1993-5:1999 z metodo platnice)**

Eurocode 3: Design of steel structures - Part 6: Crane supporting structures

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Deskriptorji: jeklene konstrukcije, konstrukcijska jekla, žerjavne proge, podporne konstrukcije, žerjavi, projektiranje, računanje

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ICS 53.020.20; 91.010.30; 91.080.10

Referenčna številka  
SIST ENV 1993-6:2001 ((sl),en)

Nadaljevanje na straneh od II do V in od 1 do 54

## NACIONALNI UVOD

Predstandard SIST ENV 1993-6 ((sl),en), Eurocode 3: Projektiranje jeklenih konstrukcij – 6. del: Žerjavne proge, prva izdaja, 2001, ima status slovenskega predstandarda in je z metodo platnice prevzet evropski predstandard ENV 1993-6 (en), Eurocode 3: Design of steel structures - Part 6: Crane supporting structures, June 1999.

## NACIONALNI PREDGOVOR

Evropski predstandard ENV 1993-6:1999 je pripravil tehnični odbor Evropskega komiteja za standardizacijo CEN/TC 250 Konstrukcijski evrokodi.

Pripravo tega predstandarda sta CEN poverila Evropska komisija in Evropsko združenje za prosto trgovino.

Odločitev za prevzem tega predstandarda po metodi platnice je sprejela delovna skupina USM/TC KON/WG 3 Jeklene konstrukcije, ki je pripravila tudi nacionalni dokument za uporabo v Sloveniji, potrdil pa tehnični odbor USM/TC KON Konstrukcije.

Ta slovenski predstandard se lahko uporablja samo v skladu z nacionalnim dokumentom, ki je sestavni del SIST ENV 1993-6:2001.

Ta slovenski predstandard je dne 2000-12-04 odobril direktor USM.

Rok veljavnosti tega predstandarda je do izdaje evropskega standarda EN 1993-6.

## ZVEZE S STANDARDI

S prevzemom tega evropskega predstandarda veljajo za omejeni namen referenčnih standardov vsi standardi, navedeni v izvorniku, razen standardov, ki so že sprejeti kot nacionalni standardi:

SIST ENV 1991-1:1998	((sl),en)	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - 1. del: Osnove projektiranja
SIST ENV 1991-2-1:1998	((sl),en)	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-1: Vplivi na konstrukcije – Gostote, lastna teža in koristne obtežbe
SIST ENV 1991-2-3:1998	((sl),en)	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-3: Vplivi na konstrukcije - Obtežbe snega
SIST ENV 1991-2-4:1998	((sl),en)	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-4: Vplivi na konstrukcije - Vplivi vetra
SIST ENV 1993-1-1:1996	((sl),en)	Eurocode 3: Projektiranje jeklenih konstrukcij - Del 1-1: Splošna pravila in pravila za stavbe
SIST ENV 1993-1-1:1996/A1:1996	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-1: Splošna pravila in pravila za stavbe - Dodatka D in K
SIST ENV 1993-1-1:1996/A2:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-1: Splošna pravila in pravila za stavbe - Dodatki G, H, J, N in Z
SIST ENV 1993-1-2:1999	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-2: Splošna pravila - Projektiranje požarnovarnih konstrukcij
SIST ENV 1993-1-3:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-3: Splošna pravila - Dodatna pravila za hladno oblikovane tankostenske profile in pločevine

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SIST ENV 1993-1-4:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-4: Splošna pravila - Dodatna pravila za nerjavna jekla
SIST ENV 1993-1-5:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-5: Splošna pravila - Dodatna pravila za ravninske pločevinaste konstrukcije (ortotropne plošče) brez prečne obremenitve
SIST ENV 1993-1-6:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-6: Splošna pravila - Dodatna pravila za lupinaste konstrukcije
SIST ENV 1993-1-7:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 1-7: Splošna pravila - Dodatna pravila za ravninske pločevinaste konstrukcije (ortotropne plošče), obremenjene s prečno obtežbo
SIST ENV 1993-2:2001	((sl),en)	Projektiranje jeklenih konstrukcij – 2. del: Jekleni mostovi
SIST ENV 1993-3-1:2001	((sl),en)	Projektiranje jeklenih konstrukcij –Del 3-1: Stolpi, jambori in dimniki - Stolpi in jambori
SIST ENV 1993-3-2:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 3-2: Stolpi, jambori in dimniki - Dimniki
SIST ENV 1993-4-1:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 4-1: Silosi, rezervoarji in cevovodi - Silosi
SIST ENV 1993-4-2:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 4-2: Silosi, rezervoarji in cevovodi - Rezervoarji
SIST ENV 1993-4-3:2001	((sl),en)	Projektiranje jeklenih konstrukcij - Del 4-3: Silosi, rezervoarji in cevovodi - Cevovodi
SIST ENV 1993-5:2001	((sl),en)	Projektiranje jeklenih konstrukcij – 5. del: Piloti in zagatne stene

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#### OPOMBI

- Povesod, kjer se v besedilu predstandarda uporablja izraz “evropski predstandard”, v SIST ENV 1993-6:2001 to pomeni “slovenski predstandard”.
- Nacionalni uvod in nacionalni predgovor nista sestavni del predstandarda.

**VSEBINA**

**Stran**

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## Nacionalni dokument za uporabo v Sloveniji

Za vrednosti parametrov, podanih v okvirju (večinoma delni varnostni faktorji odpornosti ali zunanjih vplivov), se v SIST ENV 1993-6:2001 privzamejo priporočene vrednosti, podane v ENV 1993-6:1999.

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ICS 53.020.20; 91.010.30; 91.080.10

English version

## Eurocode 3: Design of steel structures - Part 6: Crane supporting structures

This European Prestandard (ENV) was approved by CEN on 24 April 1998 as a prospective standard for provisional application.

The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard.

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 250 "*Structural Eurocodes*", the secretariat of which is held by BSI.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Objectives of the Eurocodes

- (1) The "Structural Eurocodes" comprise a group of standards for the structural and geotechnical design of buildings and civil engineering works.
- (2) They cover execution and control only to the extent that is necessary to indicate the quality of the construction products, and the standard of the workmanship, needed to comply with the assumptions of the design rules.
- (3) Until the necessary set of harmonised technical specifications for products and for methods of testing their performance is available, some of the Structural Eurocodes cover some of these aspects in informative annexes.

## Background to the Eurocode programme

(4) The Commission of the European Communities (CEC) initiated the work of establishing a set of harmonized technical rules for the design of building and civil engineering works which would initially serve as an alternative to the different rules in force in the various member states and would ultimately replace them. These technical rules became known as the "Structural Eurocodes".

(5) In 1990, after consulting their respective member states, the CEC transferred the work of further development, issue and updating of the Structural Eurocodes to CEN, and the EFTA Secretariat agreed to support the CEN work.

(6) CEN Technical Committee CEN/TC 250 is responsible for all Structural Eurocodes.

## Eurocode programme

(7) Work is in hand on the following Structural Eurocodes, each generally consisting of a number of parts:

- EN 1991 Eurocode 1 Basis of design and 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 provisions for earthquake resistance of structures;
- EN 1999 Eurocode 9 Design of aluminium structures.

(8) Separate sub-committees have been formed by CEN/TC 250 for the various Eurocodes listed above.

(9) This Part 6 of Eurocode 3 is being published by CEN as a European Prestandard (ENV) with an initial life of three years.

- (10) This Prestandard is intended for experimental application and for the submission of comments.
- (11) After approximately two years CEN members will be invited to submit formal comments to be taken into account in determining future actions.
- (12) Meanwhile feedback and comments on this Prestandard should be sent to the Secretariat of Subcommittee CEN/TC 250/SC 3 at the following address:

BSI Standards  
British Standards House  
389 Chiswick High Road  
London W4 4AL  
England

or to your national standards organisation.

### **National Application Documents (NADs)**

(13) In view of the responsibilities of the authorities in member countries for safety, health and other matters covered by the essential requirements of the Construction Products Directive (CPD), certain safety elements in this ENV have been assigned indicative values which are identified by  ("boxed values"). The authorities in each member country are expected to review the "boxed values" and may substitute alternative definitive values for these safety elements for use in national application.

(14) Some of the supporting European or International Standards might not be available by the time this Prestandard is issued. It is therefore anticipated that a National Application Document (NAD) giving any substitute definitive values for safety elements, referencing compatible supporting standards and providing guidance on the national application of this Prestandard, will be issued by each member country or its Standards Organization.

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(15) It is intended that this Prestandard is used in conjunction with the NAD valid in the country in which the building or civil engineering works is located.

### **Matters specific to this Prestandard**

(16) The list of parts of ENV 1993 that are currently envisaged is:

- ENV 1993-1-1 General rules and rules for buildings;
- ENV 1993-1-2 Supplementary rules for structural fire design;
- ENV 1993-1-3 Supplementary rules for cold formed thin gauge members and sheeting;
- ENV 1993-1-4 Supplementary rules for stainless steels;
- ENV 1993-1-5 Supplementary rules for planar plated structures without transverse loading;
- ENV 1993-1-6 Supplementary rules for shell structures;
- ENV 1993-1-7 Supplementary rules for planar plated structures loaded transversely;
- ENV 1993-2 Steel bridges;
- ENV 1993-3-1 Towers and masts;
- ENV 1993-3-2 Chimneys;
- ENV 1993-4-1 Silos;
- ENV 1993-4-2 Tanks;
- ENV 1993-4-3 Pipelines;
- ENV 1993-5 Piling;
- ENV 1993-6 Crane supporting structures;

ENV 1993-7 Marine and maritime structures;

ENV 1993-8 Agricultural structures.

(17) This document extends the scope of Eurocode 3 to steel structures supporting overhead travelling cranes and monorail hoist blocks.

(18) Reference is made from this Part 6 to Part 1 of Eurocode 3, and exceptionally to Part 2, see (21). Matters that are already covered in those documents are in general not repeated here.

(19) Similarly, reference is also made to Eurocode 1: Part 1 for matters concerning the basis of design, instead of repeating them in this document.

(20) In each section of the main portion of the text, the extent to which it modifies, supplements, or supersedes the corresponding elements of Part 1 of Eurocode 3 is specifically indicated.

(21) As a provisional expedient, reference is made to Part 2 of Eurocode 3, rather than Part 1, in cases where the treatment in Part 2 is more relevant or has otherwise been updated. This usage is not intended to be retained in the future EN version of this document.

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## 1 General

### 1.1 Scope

(1)P Part 6 of ENV 1993 provides principles and application rules for the structural design of crane runway beams and other crane supporting structures, including columns and other members made of steel.

(2)P The provisions given in Part 6 supplement, modify or supersede the equivalent provisions given in ENV 1993-1-1, to which reference also needs to be made.

(3)P It covers overhead crane runways inside buildings and outdoor overhead crane runways.

(4)P Crane runways for stacker cranes in high-bay warehouses are not covered in this document, even though some of its provisions might be adopted for such runways.

(5)P It covers crane runway beams for:

a) overhead travelling cranes, either:

- supported on top of the runway beams;
- underslung below the runway beams;

b) monorail hoist blocks.

(6)P Ancillary items including crane rails, structural end stops, support brackets, surge connectors and surge girders are also covered. However, crane rails not mounted on steel structures, and rails for other purposes, are excluded.

(7)P Cranes and all other moving parts are excluded. Provisions for cranes are given in EN 13001.

(8)P Runway beams for window cleaning gantries, bridge access gantries or used for other purposes are not covered in this document, even though some of its provisions might be adopted for such structures.

(9)P Provisions are also given for anchors and connections of static cranes to buildings.

(10) This Part does not cover special provisions for seismic design, which are given in ENV 1998.

(11) Special measures that might be necessary to limit the consequences of accidents are not covered in this Part. For resistance to fire, reference should be made to ENV 1993-1-2.

### 1.2 Distinction between principles and application rules

(1)P Depending on the character of the individual paragraphs, a distinction is made in this Part between principles and application rules.

(2)P The principles comprise:

- general or definitive statements for which there is no alternative;
- 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)P The application rules are generally recognised rules that follow the principles and satisfy their requirements. Alternative design rules different from the application rules given in the Eurocode may be used, provided that it is shown that the alternative rule accords with the relevant principles and has at least the same reliability.

(5) In this Part the application rules are identified by a number in brackets, as in this paragraph.

### 1.3 References

This European Prestandard 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 Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- ENV 1090      *Execution of steel structures:*
- Part 1          *General rules and rules for buildings;*
  - Part 3          *Supplementary rules for high yield strength steels;*
  - Part 5          *Bridges;*
- ENV 1991      *Eurocode 1: Basis of design and actions on structures:*
- Part 1          *Basis of design;*
  - Part 2.4        *Actions on structures - Wind actions;*
  - Part 5          *Actions induced by cranes and machinery;*
- ENV 1993      *Eurocode 3: Design of steel structures:*
- Part 1.1        *General rules: General rules and rules for buildings;*
  - Part 1.2        *General rules: Supplementary rules for structural fire design;*
  - Part 1.3        *General rules: Supplementary rules for cold formed thin gauge members and sheeting;*
  - Part 1.4        *General rules: Supplementary rules for stainless steels;*
  - Part 1.5        *General rules: Supplementary rules for the strength and stability of planar plated structures without transverse loading;*
  - Part 2          *Steel bridges;* SIST ENV 1993-6:2001  
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- ENV 1998      *Eurocode 8: Design provisions for earthquake resistance of structures;*
- EN 13001      *Crane safety - General design;*
- Part 1          *General principles and requirements;*
  - Part 2          *Load effects;*
  - Part 3          *Limit states and proof of competence;*
- EN 10025      *Hot rolled products of non alloy structural steels - Technical delivery conditions*
- EN 10113      *Hot rolled products in weldable fine grain structural steels;*
- EN 10137      *Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions:*
- Part 1          *General delivery conditions;*
  - Part 2          *Delivery conditions for quenched and tempered steels;*
- EN 10210      *Hot finished structural hollow sections of non-alloy and fine grain structural steels;*
- EN 10219      *Cold formed welded structural hollow sections of non-alloy and fine grain structural steels;*
- EN 20286      *ISO system of limits and fits:*
- Part 2          *Tables of standard tolerance grades and limit deviations for holes and shafts;*
- prEN .....      [Rail steels]
- ISO 3898      *Bases for design of structures - Notations - General symbols;*
- ISO 8930      *General principles on reliability for structures - List of equivalent terms;*
- ISO/DIS 11660 *Cranes - Access, guards and restraints:*
- Part 5          *Overhead travelling and portal bridge cranes.*

## 1.4 Definitions

- (1) The terms that are defined in ENV 1991-1 for common use in the Structural Eurocodes apply to this Part 6 of ENV 1993.
- (2) Unless otherwise stated, the definitions given in ISO 8930 also apply to this Part 6.
- (3) Supplementary to Part 1 of ENV 1993, for the purposes of this Part 6, the following definitions apply:

**1.4.1 design working life.** The assumed period for which the structure is to be used for its intended purpose, with anticipated maintenance but without major repair being necessary.

**1.4.2 global analysis.** The determination of a consistent set of internal forces and moments in a structure, that are in equilibrium with a particular set of actions on the structure.

## 1.5 Symbols

- (1) In addition to those given in ENV 1993-1-1, the following major symbol is used:

$\phi_i$  dynamic amplification factor (with subscripts  $i = 1$  to 8).

- (2) Further symbols are defined where they first occur.

**NOTE:** The symbols used are based on ISO 3898: 1987.

## 1.6 Terminology

Supplementary to Part 1 of ENV 1993 (and Part 5 of ENV 1991), for the purposes of this Part 6 the following terminology applies:

**1.6.1 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, see figure 1.1.

**1.6.2 crane bridge.** Part of an overhead travelling crane that spans between the crane runway beams and supports the crab or hoist block, see figures 1.1 to 1.3.

**1.6.3 crane runway beam.** Beam along which an overhead travelling crane can move.

**1.6.4 crane surge.** Horizontal dynamic actions due to crane operation, acting longitudinally and/or transverse to the crane runway beams.

**1.6.5 guidance means.** System used to keep a crane aligned on a runway, through horizontal reactions between the crane and the runway beams. 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.

**1.6.6 hoist.** A machine for lifting loads.

**1.6.7 hoist block.** An 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 1.4) or under the bridge of an overhead travelling crane (as shown in figures 1.2 and 1.3).

**1.6.8 monorail hoist block.** A hoist block that is supported on a fixed runway, see figure 1.4.

**1.6.9 overhead travelling crane.** A machine for lifting and moving loads, that moves on wheels along overhead crane runway beams (also called a bridge crane). It incorporates one or more hoists mounted on crabs or underslung trolleys.

**1.6.10 resilient pad.** Proprietary reinforced elastomeric pad that can be used under crane rails.

**1.6.11 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 1.4.

**1.6.12 structural end stop.** Component intended to stop a crane or hoist reaching the end of a runway.

**1.6.13 surge connector.** Connection that transmits crane surge from a crane runway beam, or a surge girder, to a support.