TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 13001-3-1

December 2004

ICS 53.020.20

English version

Cranes - General design - Part 3-1: Limit states and proof of competence of steel structures

Appareils de levage à charge suspendue - Conception générale - Partie 3-1: Etats limites et vérification d'aptitude des structures métalliques

Krane - Konstruktion allgemein - Teil 3-1: Grenzzustände und Sicherheitsnachweis von Stahltragwerken

This Technical Specification (CEN/TS) was approved by CEN on 25 November 2003 for provisional application.

The period of validity of this CEN/TS 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 CEN/TS can be converted into a European Standard.

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

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. CEN/TS 13001-3-1:2004: E

Contents

Page

Foreword

This document (CEN/TS 13000-3.1:2004) has been prepared by Technical Committee CEN/TC 147 “Cranes — Safety”, the secretariat of which is held by BSI.

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 98/37/EC, amended by 98/79/EC.

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

This European Standard is one Part of EN 13001. The other parts are as follows:

Part 1: General principles and requirements

Part 2: Load actions

The annexes A, C and D are normative. The annexes B, E and F are informative.

Introduction

This European Standard has been prepared to be a harmonised standard to provide one means for the mechanical design and theoretical verification of cranes to conform with the essential health and safety requirements of the Machinery Directive, as amended. This standard also establishes interfaces between the user (purchaser) and the designer, as well as between the designer and the component manufacturer, in order to form a basis for selecting cranes and components.

This European Standard is a type C standard as stated in EN 1070.

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

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 are covered are indicated in the scope of this standard.

1 Scope

This European Standard is to be used together with Part 1 and Part 2 and as such they specify general conditions, requirements and methods to prevent mechanical hazards of cranes by design and theoretical verification.

NOTE Specific requirements for particular types of crane are given in the appropriate European Standard for the particular crane type.

The following is a list of significant hazardous situations and hazardous events that could result in risks to persons during normal use and foreseeable misuse. Clauses 4 to 8 of this standard are necessary to reduce or eliminate the risks associated with the following hazards:

a) Exceeding the limits of strength (yield, ultimate, fatigue);

b) Exceeding temperature limits of material or components;

c) Elastic instability of the crane or its parts (buckling, bulging).

This European Standard is applicable to cranes which are manufactured after the date of approval by CEN of this standard and serves as reference base for the European Standards for particular crane types.

NOTE prCEN/TS 13001-3-1 deals only with limit state method according to EN 13001-1.

As an alternative to the herein presented limit state method using partial safety factors, the allowable stress method using a global safety factor according to Part 1 and Part 2 may also be applied for special crane systems with linear behaviour.

As crane structures are basically dynamically loaded only the linear theory of elasticity is applicable and only limited local plasticity is allowed. The use of the theory of plasticity for calculation of ultimate load bearing capacity is not allowed.

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).

EN 1070:1998, *Safety of machinery — Terminology.*

EN 1990-1:2002, *Eurocode – Basic of structural design*

EN 1993-1-1:1992: *Eurocode 3: Design of steel structures — Part 1-1: General rules and rules for buildings.*

EN 10025:1990/A1:1993, *Hot rolled products of non-alloy structural steels — Technical delivery conditions (includes amendment A1:1993).*

EN 10045-1:1989, *Charpy impact test on metallic material — Part 1: Test method.*

EN 10113-1:1993, *Hot-rolled products in weldable fine grain structural steels — Part 1: General delivery conditions.*

EN 10113-2:1993, *Hot-rolled products in weldable fine grain structural steels — Part 2: Delivery conditions for normalized/normalized rolled steels.*

EN 10113-3:1993, *Hot-rolled products in weldable fine grain structural steels — Part 3: Delivery conditions for thermomechanical rolled steels.*

EN 10137-2:1995, *Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions — Part 2: Delivery conditions for quenched and tempered steels.*

EN 10149-1:1995, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 1: General delivery conditions.*

EN 10149-2:1995, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 2: Delivery conditions for thermomechanically rolled steels.*

EN 10149-3:1995, *Hot-rolled flat products made of high yield strength steels for cold forming — Part 3: Delivery conditions for normalized or normalized rolled steels.*

EN 10164:1993, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions.*

EN 12345:1996, *Welding — Multilingual terms for welding joints with illustrations (trilingual version).*

EN 13001-1:2004, *Cranes — General Design — Part 1:General principles and requirements.*

EN 13001-2:2004, *Cranes — General Design — Part 2: Load actions.*

EN 22553:1994, *Welded, brazed and soldered joints — Symbolic representation on drawings (ISO 2553:1992).*

EN 25817:1992, *Arc-welded joints in steel — Guidance on quality levels for imperfections (ISO 5817:1992).*

EN ISO 898-1:1999, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs (ISO 898-1:1999).*

EN ISO 9013:2002, *Thermal cutting — Classification of thermal cuts — Geometrical specification and quality tolerances (ISO 9013:2002).*

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 and specifications (ISO 12100-2:2003).

ISO 286-2:1990*, ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts.*

ISO 4306-1:1990, *Cranes — Vocabulary — Part 1: General.*

3 Terms and definitions

3.1
Terms and definitions
For the purposes of this European Standard, the terms and definitions given in EN 292-1, EN 292-2 and EN 1070 and the basic list of definitions as provided in EN 1990-1 apply. For the definitions of loads, clause 6 of ISO 4306-1:1990 applies.

3.2
Symbols and abbreviations
The symbols and abbreviations used in this Part of the EN 13001 are given in Table 1.

Table 1 — Symbols and abbrevations

Symbols, abbreviations	Description
A	cross section
A_S	stress area of a bolt
a_r	relevant weld thickness
D_o, D_i	outer, inner diameter of hollow pin
d	diameter (shank of bolt, pin)
d_o	diameter of hole
e_1, e_2	distances
F_b	tensile force in bolt
F_d	limit force
F_K	characteristic value (force)
F_p	preloading force in bolt
F_{Rd}	limit design force
F_t	external force (on bolted connection)
$F_{b,\,Rd}$	limit design bearing force
$F_{b,\,Sd}$; $F_{bi,\,Sd}$	design bearing force
$F_{p,\,d}$	design preloading force
$F_{s,\,Rd}$	limit design slip force per bolt and friction interface
$F_{t,\,Rd}$	limit design tensile force in bolt
$F_{v,\,Rd}$	limit design shear force per bolt/pin and shear plane
$F_{v,\,Sd}$	design shear force per bolt/pin and shear plane
$F_{s,t}$	acting normal/shear force
f_d	limit stress
f_K	characteristic value (stress)
f_{Rd}	limit design stress