Irish Standard
I.S. EN 1993-1-11:2006+NA:2010

Eurocode 3 - Design of steel structures - Part 1-11: Design of structures with tension components (Including Irish National Annex)

I.S. EN 1993-1-11:2006+NA:2010

Incorporating amendments/corrigenda issued since publication:

EN 1993-1-11:2006/AC:2009
NA to I.S. EN 1993-1-11:2006

This document replaces:	*This document is based on:*	*Published:*
ENV 1993-2:1997	EN 1993-1-11:2006+NA:2010 ENV 1993-2:1997	25 October, 2006 22 October, 1997

This document was published
under the authority of the NSAI
and comes into effect on:
25 March, 2010

ICS number:
91.010.30
91.080.10
93.040

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

I.S. EN 1993-1-11:2006

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1993-1-11:2006/AC

April 2009
Avril 2009
April 2009

ICS 91.010.30; 91.080.10; 93.040

English version
Version Française
Deutsche Fassung

Eurocode 3 - Design of steel structures - Part 1-11: Design of structures with tension components

Eurocode 3 - Calcul des structures en acier - Partie 1-11: Calcul des structures à câbles ou éléments tendus

Eurocode 3 - Bemessung und Konstruktion von Stahlbauten - Teil 1-11: Bemessung und Konstruktion von Tragwerken mit Zuggliedern aus Stahl

This corrigendum becomes effective on 29 April 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 29 avril 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 29.April 2009 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No.:EN 1993-1-11:2006/AC:2009 D/E/F

1) Modification to Foreword

3rd paragraph, replace "supersedes ENV 1993-2" *with* "supersedes ENV 1993-2, Annex A".

2) Modification to 2.3.1

Paragraph "(2)"*, replace* "spiral strands, locked coil strands or structural wire ropes" *with:* "spiral strand ropes, fully locked coil ropes or circular wire strand ropes".

3) Modification to 2.3.6

Paragraph "(2)"*, Equation* "(2.4)"*, replace equation with:* "$E_d = k(E_{d2} - E_{d1})$".

4) Modification to 2.4.2

Subclause Title, replace "Persistent situations during service" *with:* "Persistent design situations during service".

5) Modifications to 3.2.2

Paragraph "(3)"*,* "Figure 3.1"*, shift to the right-hand side of the Figure:*

"- - - - limiting value

mean value".

Paragraph "(3)"*,* "Figure 3.1"*, key elements, delete:*

"σ_A stress for cutting to length".

6) Modification to 4.5

Paragraph "(3)"*, replace* "impermeable" *with:* "impermeable to water".

7) Modifications to 6.2

Paragraph "(2)"*,* "Table 6.1"*, replace in Title* "Proof strength" *with:* "Characteristic value of the proof strength F_k".

Paragraph "(2)"*,* "Table 6.1"*, 1st row, 3rd column, delete:* "Proof strength".

Paragraph "(2)"*,* "NOTE 4"*, replace* "7.1(4)" *with:* "7.1(2)".

8) Modification to 6.3.2

Paragraph "(1)"*, replace* "respectively on either side of the cable" *with:* "respectively on either side of the saddle".

9) Modifications to 6.4.3

Paragraph "(1)"*, replace* "proof force" *with:* "characteristic value of the proof strength".

Paragraph "(1)"*,* "NOTE"*, replace* "capacity design" *with:* "capacity design (see EN 1993-1-1, 1.5.8)".

10) Modification to 7.2

Paragraph "(2)"*,* "NOTE 2"*,* "Table 7.2"*, last row, replace* "7.1(4)" *with:* "7.1(2)"*.*

11) Modifications to 8.3

Paragraph "(2)"*, replace* "(less than about 70 m….)" *with:* "(less than 70 m….)"*.*

Paragraph "(4)"*, replace* "buckling modes" *with:* "eigen modes"*.*

National Foreword

This Irish Standard is the official English language version of EN 1993-1-11:2006, prepared by Technical Committee CEN TC 250 "Structural Eurocodes". This document supersedes ENV 1993-2:1997.

This standard forms part of a package of 58 Eurocodes, which covers the basis of structural design, actions (loadings), the main structural materials, geotechnical design and design provisions for earthquakes. The European Commission document – Guidance Paper L – Application and Use of Eurocodes provides guidance on the elaboration, implementation and use of Eurocodes.

Where a normative part of this EN allows for a choice to be made at the national level the range, possible choices are given in the normative text, and a Note will qualify it as a Nationally Determined Parameter (NDP).
To enable EN 1993-1-11:2006 to be used in Ireland the Nationally Determined Parameters will be published in a National Annex after public consultation has taken place.

Until the National Annex is available, publication of this European Standard is solely for education/training purposes and this standard should not be used in project design until the relevant National Annex is available.

Note: For Use of this European Standard after publication of the Irish National Annex

I.S. EN 1993-1-11:2006 may now be used in Ireland. The Nationally Determined Parameters, which have been prepared by the NSAI National Eurocode Advisory Committee, are included as an informative annex to the standard.

The National Annex to I.S. EN 1993-1-11:2006 is also available as a separate publication as recommended in Guidance Paper L.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document

I.S. EN 1993-1-11:2006

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1993-1-11

October 2006

ICS 91.010.30; 91.080.10; 93.040

Supersedes ENV 1993-2:1997

English Version

Eurocode 3 - Design of steel structures - Part 1-11: Design of structures with tension components

Eurocode 3 - Calcul des structures en acier - Partie 1-11: Calcul des structures à câbles ou éléments tendus

Eurocode 3 - Bemessung und Konstruktion von Stahlbauten - Teil 1-11: Bemessung und Konstruktion von Tragwerken mit Zuggliedern aus Stahl

This European Standard was approved by CEN on 13 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.

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, Romania, 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. EN 1993-1-11:2006: E

Contents

Page

Foreword

This European Standard EN 1993-1-11, Eurocode 3: Design of steel structures: Part 1-11 Design of structures with tension components, has been prepared by Technical Committee CEN/TC250 « Structural Eurocodes », the Secretariat of which is held by BSI. CEN/TC250 is responsible for all Structural Eurocodes.

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 April 2007 and conflicting National Standards shall be withdrawn at latest by March 2010.

This Eurocode partially supersedes ENV 1993-2.

According to the CEN-CENELEC Internal Regulations, the National Standard 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 United Kingdom.

National annex for EN 1993-1-11

This standard gives alternative procedures, values and recommendations with notes indicating where national choices may have to be made. The National Standard implementing EN 1993-1-11 should have a National Annex containing all Nationally Determined Parameters to be used for the design of tension components to be constructed in the relevant country.

National choice is allowed in EN 1993-1-11 through:

- 2.3.6(1)
- 2.3.6(2)
- 2.4.1(1)
- 3.1(1)
- 4.4(2)
- 4.5(4)
- 5.2(3)
- 5.3(2)
- 6.2(2)
- 6.3.2(1)
- 6.3.4(1)
- 6.4.1(1)P
- 7.2(2)
- A.4.5.1(1)
- A.4.5.2(1)
- B(6)

1 General

1.1 Scope

(1) prEN1993-1-11 gives design rules for structures with tension components made of steel, which, due to their connections with the structure, are adjustable and replaceable see Table 1.1.

NOTE: Due to the requirement of adjustability and replaceability such tension components are generally prefabricated products delivered to site and installed into the structure. Tension components that are not adjustable or replaceable, e.g. air spun cables of suspension bridges, or for externally post-tensioned bridges, are outside the scope of this part. However, rules of this standard may be applicable.

(2) This standard also gives rules for determining the technical requirements for prefabricated tension components for assessing their safety, serviceability and durability.

Table 1.1: Groups of tension components

Group	Main tension element	Component
A	rod (bar)	tension rod (bar) system, prestressing bar
B	circular wire	spiral strand rope
	circular and Z-wires	fully locked coil rope
	circular wire and stranded wire	strand rope
C	circular wire	parallel wire strand (PWS)
	circular wire	bundle of parallel wires
	seven wire (prestressing) strand	bundle of parallel strands

NOTE 1: Group A products in general have a single solid round cross section connected to end terminations by threads. They are mainly used as

- bracings for roofs, walls, girders
- stays for roof elements, pylons
- tensioning systems for steel-wooden truss and steel structures, space frames

NOTE 2: Group B products are composed of wires which are anchored in sockets or other end terminations and are fabricated primarily in the diameter range of 5 mm to 160 mm, see EN 12385-2.

Spiral strand ropes are mainly used as

- stay cables for aerials, smoke stacks, masts and bridges
- carrying cables and edge cables for light weight structures
- hangers or suspenders for suspension bridges
- stabilizing cables for cable nets and wood and steel trusses
- hand-rail cables for banisters, balconies, bridge rails and guardrails

Fully locked coil ropes are fabricated in the diameter range of 20 mm to 180 mm and are mainly used as

- stay cables, suspension cables and hangers for bridge construction
- suspension cables and stabilizing cables in cable trusses
- edge cables for cable nets
- stay cables for pylons, masts, aerials

Structural strand ropes are mainly used as

- stay cables for masts, aerials
- hangers for suspension bridges
- damper / spacer tie cables between stay cables
- edge cables for fabric membranes
- rail cables for banister, balcony, bridge and guide rails.

NOTE 3: Group C products need individual or collective anchoring and appropriate protection.

Bundles of parallel wires are mainly used as stay cables, main cables for suspension bridges and external tendons.

Bundles of parallel strands are mainly used as stay cables for composite and steel bridges.

(4) The types of termination dealt with in this part for Group B and C products are

- metal and resin sockets, see EN 13411-4
- sockets with cement grout
- ferrules and ferrule securing, see EN 13411-3
- swaged sockets and swaged fitting
- U-bolt wire rope grips, see EN 13411-5
- anchoring for bundles with wedges, cold formed button heads for wires and nuts for bars.

NOTE: For terminology see Annex C.

1.2 Normative references

(1) This European Standard incorporates dated and undated reference to 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 or revisions to 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.

EN 10138 *Prestressing steels*

Part 1 General requirements

Part 2 Wires

Part 3 Strands

Part 4 Bars

EN 10244 *Steel wire and wire products – Non-ferrous metallic coatings on steel wire*

Part 1 General requirements

Part 2 Zinc and zinc alloy coatings

Part 3 Aluminium coatings

EN 10264 *Steel wire and wire products – Steel wire for ropes*

Part 1 General requirements

Part 2 Cold drawn non-alloyed steel wire for ropes for general applications

Part 3 Cold drawn and cold profiled non alloyed steel wire for high tensile applications

Part 4 Stainless steel wires

EN 12385 *Steel wire ropes – safety*

Part 1 General requirements

Part 2 Definitions, designation and classification