

Geregistreeerde Belgische norm

NBN EN 1993-3-2

2e uitg., mei 2007

Normklasse: B 51

Eurocode 3 - Ontwerp en berekening van staalconstructies - Deel 3-2: Torens, masten en schoorstenen - Schoorstenen

Eurocode 3 - Calcul des structures en acier - Partie 3-2: Tours, mâts et cheminées - Cheminées

Eurocode 3 - Design of steel structures - Part 3-2: Towers, masts and chimneys - Chimneys

Toelating tot publicatie: 19 december 2006

Vervangt NBN ENV 1993-3-2 (1998).

Deze Europese norm EN 1993-3-2:2006 heeft de status van een Belgische norm.

Deze Europese norm bestaat in drie officiële versies (Duits, Engels, Frans).

Er is bij het NBN ook een Nederlandstalige versie beschikbaar, die dezelfde status heeft als de officiële versies.

Deze norm mag in België slechts samen met zijn nationale bijlage (ANB) worden toegepast. Deze laatste legt hoofdzakelijk de waarden van de parameters vast die op nationaal vlak worden bepaald.



Bureau voor Normalisatie - Birminghamstraat 131 - 1070 Brussel - België

Tel: +32 2 738 01 12 - Fax: +32 2 733 42 64 - E-mail: info@nbn.be - NBN Online: www.nbn.be
Bank 000-3255621-10 IBAN BE41 0003 2556 2110 BIC BPOTBEB1 BTW BE0880857592

***norme belge
enregistrée***

NBN EN 1993-3-2

2e éd., mai 2007

Indice de classement: B 51

Eurocode 3 - Calcul des structures en acier - Partie 3-2: Tours, mâts et cheminées - Cheminées

Eurocode 3 - Ontwerp en berekening van staalconstructies - Deel 3-2: Torens, masten en schoorstenen - Schoorstenen

Eurocode 3 - Design of steel structures - Part 3-2: Towers, masts and chimneys - Chimneys

Autorisation de publication: 19 décembre 2006

Remplace NBN ENV 1993-3-2 (1998).

La présente norme européenne EN 1993-3-2:2006 a le statut d'une norme belge.

La présente norme européenne existe en trois versions officielles (allemand, anglais, français).

Une version en néerlandais, ayant le même statut que les versions officielles, est également disponible au NBN.

Cette norme ne peut être utilisée en Belgique qu'en combinaison avec son annexe nationale (ANB) qui fixe principalement la valeur des paramètres à déterminer au niveau national.



Bureau de Normalisation - Rue de Birmingham 131 - 1070 Bruxelles - Belgique

Tél: +32 2 738 01 12 - Fax: +32 2 733 42 64 - E-mail: info@nbn.be - NBN Online: www.nbn.be

Banque 000-3255621-10 IBAN BE41 0003 2556 2110 BIC BPOTBEB1 TVA BE0880857592

NATIONAAL VOORWOORD VAN NBN EN 1993-3-2:2007

1. De norm NBN EN 1993-3-2:2007 «Eurocode 3 – Ontwerp en berekening van staalconstructies – Deel 3-2: Torens, masten en schoorstenen – Schoorstenen» omvat de nationale bijlage NBN EN 1993-3-2 ANB:2011 met een normatief karakter in België. Hij vervangt vanaf de datum van de publicatie in het Belgische Staatsblad van de bekrachtiging van de norm NBN EN 1993-3-2 ANB:2011 de volgende norm:

NBN ENV 1993-3-2:1998 Eurocode 3 – Ontwerp van stalen draagsystemen - Deel 3-2: Torens, masten en schoorstenen – Schoorstenen

2. De Europese normen (EN) waarnaar de tekst van deze norm met hun Engelse titel verwijst, dragen in België de volgende Nederlandstalige titels:

Vermelde norm	Nederlandstalige titel (NBN)
EN 1090 Execution of steel structures and aluminium structures	NBN EN 1090 Uitvoering van staalconstructies en aluminiumconstructies
EN 10025 Hot rolled products of non-alloy structural steels. Technical delivery conditions	NBN EN 10025 Warmgewalste producten van constructiestaal
EN 10088 Stainless steels	NBN EN 10088 Corrosievaste staalsoorten
EN 13084-1 Free standing industrial chimneys Part 1: General requirements	NBN EN 13084-1 Vrijstaande schoorstenen Deel 1: Algemene eisen
EN ISO 5817 Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections	NBN EN ISO 5817 Lassen - Smeltlasverbindingen in staal, nikkel, titanium en hun legeringen (laserlassen en elektronenbundellassen uitgezonderd) - Kwaliteitsniveaus voor onvolkomenheden

AVANT-PROPOS NATIONAL À LA NBN EN 1993-3-2:2007

1. La norme NBN EN 1993-3-2:2007 "Eurocode 3 – Calcul des structures en acier – Partie 3-2 : Tours, mâts et cheminées - Cheminées" comprend l'annexe nationale NBN EN 1993-3-2 ANB:2011 qui a un caractère normatif en Belgique. Elle remplace à partir de la date de publication au Moniteur Belge de l'homologation de la norme NBN EN 1993-3-2 ANB:2011 la norme suivante :

NBN ENV 1993-3-2:1998 Eurocode 3 - Calcul des structures en acier –
Partie 3-2 : Tours, mâts et cheminées –
Cheminées".

2. La version en langue française de l'EN 1993-3-2:2006 a été rédigée en France par l'AFNOR.
En conséquence, on y rencontre certaines expressions d'usage moins courant en Belgique.

Une liste de termes équivalents est donnée ci-après :

Terme de l'EN 1993-3-2	Terme équivalent en Belgique
Attache	Assemblage

English Version

**Eurocode 3 - Design of steel structures - Part 3-2: Towers,
masts and chimneys - Chimneys**

Eurocode 3 - Calcul des structures en acier - Partie 3-2:
Tours, mâts et cheminées - Cheminées

Eurocode 3 - Bemessung und Konstruktion von
Stahlbauten - Teil 3-2: Türme, Maste und Schornsteine -
Schornsteine

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

Contents

1	General	5
1.1	Scope	5
1.2	Normative references	6
1.3	Assumptions	6
1.4	Distinction between principles and application rules	6
1.5	Terms and definitions	6
1.6	Symbols used in Part 3.2 of Eurocode 3	9
2	Basis of design	9
2.1	Requirements	9
2.2	Principles of limit state design	10
2.3	Actions and environmental influences	10
2.4	Ultimate limit state verifications	12
2.5	Geometrical data	12
2.6	Durability	12
3	Materials	12
3.1	General	12
3.2	Structural steels	12
3.3	Connections	12
4	Durability	13
4.1	Allowance for corrosion	13
4.2	External corrosion allowance	13
4.3	Internal corrosion allowance	13
5	Structural analysis	14
5.1	Modelling of the chimney for determining action effects	14
5.2	Calculation of internal stress resultants and stresses	14
6	Ultimate limit states	16
6.1	General	16
6.2	Structural shells	17
6.3	Safety assessment of other structural elements of the chimney	18
6.4	Joints and connections	18
6.5	Welded connections	19
7	Serviceability limit states	19
7.1	Basis	19
7.2	Deflections	19
8	Design assisted by testing	20
9	Fatigue	20
9.1	General	20
9.2	Fatigue loading	21
9.3	High cycle fatigue resistances	21
9.4	Safety assessment	21
9.5	Partial factors for fatigue	22
Annex A [normative]	– Reliability differentiation and partial factors for actions	23
A.1	Reliability differentiation for steel chimneys	23
A.2	Partial factors for actions	23

Annex B [informative] – Aerodynamic and damping measures	24
B.1 General	24
B.2 Aerodynamic measures	24
B.3 Dynamic vibration absorber	25
B.4 Cables with damping devices	25
B.5 Direct damping	25
Annex C [informative] – Fatigue resistances and quality requirements	26
C.1 General	26
C.2 Enhancement of fatigue strength for special quality requirements	26
Annex D [informative] – Design assisted by testing	29
D.1 General	29
D.2 Definition of the logarithmic damping decrement	29
D.3 Procedure for measuring the logarithmic damping decrement.....	29
Annex E [informative] – Execution.....	30
E.1 General	30
E.2 Execution tolerances	30
E.3 Quality of welds and fatigue	30

Foreword

This European Standard EN 1993-3-2, Eurocode 3: Design of steel structures: Part 3-2 Towers, masts and chimneys – Chimneys, 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 supersedes ENV 1993-3-2.

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 1993-3-2

This standard gives alternative procedures, values and recommendations for classes with notes indicating where national choices may have to be made. Therefore the National Standard implementing EN 1993-3-2 should have a National Annex containing all Nationally Determined Parameters to be used for the design of steel structures to be constructed in the relevant country.

National choice is allowed in EN 1993-3-2 through paragraphs:

- 2.3.3.1(1)
- 2.3.3.5(1)
- 2.6(1)
- 4.2(1)
- 5.1(1)
- 5.2.1(3)
- 6.1(1)P
- 6.2.1(6)
- 6.4.1(1)
- 6.4.2(1)
- 6.4.3(2)
- 7.2(1)
- 7.2(2)
- 9.1(3)
- 9.1(4)
- 9.5(1)
- A.1(1)
- A.2(1) (2 places)
- C.2(1)

1 General

1.1 Scope

- (1) This Part 3.2 of EN 1993 applies to the structural design of vertical steel chimneys of circular or conical section. It covers chimneys that are cantilevered, supported at intermediate levels or guyed.
- (2) The provisions in this Part supplement those given in Part 1.1 of EN 1993.
- (3) This Part 3.2 is concerned only with the requirement for resistance (strength, stability and fatigue) of steel chimneys.

NOTE: In this context (i.e. resistance) the term chimney refers to:

- a) chimney structures
- b) the steel cylindrical elements of towers
- c) the steel cylindrical shafts of guyed masts

- (4) For provisions concerning aspects, such as chemical attack, thermo-dynamical performance or thermal insulation see EN 13084-1. For the design of liners see EN 13084-6.
- (5) Foundations in reinforced concrete for steel chimneys are covered in EN 1992 and EN 1997. See also 4.7 and 5.4 of EN 13084-1.
- (6) Wind loads are specified in EN 1991-1-4.

NOTE: Procedures for the wind response of guyed chimneys are given in annex B of EN 1993-3-1.

- (7) This Part does not cover special provisions for seismic design, which are given in EN 1998-6. See also 5.2.4.1 of EN 13084-1.
- (8) Provisions for the guys and their attachments are given in EN 1993-3-1 and EN 1993-1-11.
- (9) For the execution of steel chimneys, reference should be made to EN 1090, Part 2 and EN 13084-1.

NOTE: Execution is covered to the extent that is necessary to indicate the quality of the construction materials and products that should be used and the standard of workmanship on site needed to comply with the assumptions of the design rules.

- (10) The following subjects are dealt with in EN 1993-3-2:

Section 1: General

Section 2: Basis of design

Section 3: Materials

Section 4: Durability

Section 5: Structural analysis

Section 6: Ultimate limit states

Section 7: Serviceability limit states

Section 8: Design assisted by testing

Section 9: Fatigue