SVENSK STANDARD
SS-EN 13480-3:2017

Fastställd/Approved: 2017-08-24
Publicerad/Published: 2017-09-18
Utgåva/Edition: 3
Språk/Language: engelska/English
ICS: 23.040.01; 23.040.09

Industriella rörledningar av metalliska material – Del 3: Konstruktion och beräkning

Metallic industrial piping – Part 3: Design and calculation

Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka
Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet
Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standard-paket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete
Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.

Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence
As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

Get to know the finished work
We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception
With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00

Europastandarden EN 13480-3:2017 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 13480-3:2017.

Denna standard ersätter SS-EN 13480-3:2012/A1:2017, utgåva 1 och SS-EN 13480-3:2012+C4:2016, utgåva 1.

The European Standard EN 13480-3:2017 has the status of a Swedish Standard. This document contains the official version of EN 13480-3:2017.

This standard supersedes the Swedish Standard SS-EN 13480-3:2012/A1:2017, edition 1 and SS-EN 13480-3:2012+C4:2016, edition 1.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Konstruktion, tillverkning och kontroll av tryckbärande anordningar, SIS/TK 298.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13480-3

June 2017

ICS 23.040.01

Supersedes EN 13480-3:2012

English Version

Metallic industrial piping - Part 3: Design and calculation

Tuyauteries industrielles métalliques - Partie 3 : Conception et calcul

Industrielle metallische Rohrleitungen - Teil 3: Konstruktion und Berechnung

This European Standard was approved by CEN on 21 June 2017.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13480-3:2017 E

Contents

Page

European foreword

This document (EN 13480-3:2017) has been prepared by Technical Committee CEN/TC 267 “Industrial piping and pipelines”, the secretariat of which is held by AFNOR.

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 December 2017, and conflicting national standards shall be withdrawn at the latest by December 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This European Standard EN 13480 for metallic industrial piping consists of eight interdependent and not dissociable Parts which are:

— *Part 1: General;*

— *Part 2: Materials;*

— *Part 3: Design and calculation;*

— *Part 4: Fabrication and installation;*

— *Part 5: Inspection and testing;*

— *Part 6: Additional requirements for buried piping;*

— *CEN/TR 13480-7, Guidance on the use of conformity assessment procedures;*

— *Part 8: Additional requirements for aluminium and aluminium alloy piping.*

Although these Parts may be obtained separately, it should be recognised that the Parts are inter-dependant. As such the manufacture of metallic industrial piping requires the application of all the relevant Parts in order for the requirements of the Standard to be satisfactorily fulfilled.

This European Standard will be maintained by a Maintenance MHD working group whose scope of working is limited to corrections and interpretations related to EN 13480.

The contact to submit queries can be found at http://www.unm.fr (en13480@unm.fr). A form for submitting questions can be downloaded from the link to the MHD website. After subject experts have agreed an answer, the answer will be communicated to the questioner. Corrected pages will be given specific issue number and issued by CEN according to CEN Rules. Interpretation sheets will be posted on the website of the MHD.

This document supersedes EN 13480-3:2012. This new edition incorporates the Amendments which have been approved previously by CEN members, and the corrected pages up to Issue 5 without any further technical change. Annex Y provides details of significant technical changes between this European Standard and the previous edition.

Amendments to this new edition may be issued from time to time and then used immediately as alternatives to rules contained herein.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This Part of this European Standard specifies the design and calculation of industrial metallic piping systems, including supports, covered by EN 13480.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1515-2:2001, *Flanges and their joints — Bolting — Part 2: Combination of flange and bolting materials for steel flanges PN designated*

EN 1515-3:2005, *Flanges and their joints — Bolting — Part 3: Classification of bolt materials for steel flanges, Class designated*

EN 1515-4:2010, *Flanges and their joints — Bolting — Part 4: Selection of bolting for equipment subject to the Pressure Equipment Directive 97/23/EC*

EN 1591-1:2013, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 1: Calculation method*

EN 1591-2:2008, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 2: Gasket parameters*

EN 1993 (all parts), *Eurocode 3: Design of steel structures*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 10216-2:2013, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 13445-3:2014, *Unfired pressure vessels — Part 3: Design*

EN 13480-1:2017, *Metallic industrial piping — Part 1: General*

EN 13480-2:2017, *Metallic industrial piping — Part 2: Materials*

EN 13480-4:2017, *Metallic industrial piping — Part 4: Fabrication and installation*

EN 13480-5:2017, *Metallic industrial piping — Part 5: Inspection and testing*

EN ISO 5817:2007, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections* (ISO 5817:2003, corrected version:2005, including Technical Corrigendum 1:2006)

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this Part of this European Standard, the terms and definitions given in EN 13480-1 apply.

3.2 Symbols and units

For the purposes of this Part of this European Standard, the symbols and units given in EN 13480-1 and in Table 3.2-1 apply.

Specific symbols are defined in the relevant sub-clauses.

Table 3.2-1 — General symbols and units

Symbol	Description	Unit
P_{max}	maximum pressure obtained from the design by formulae or relevant procedures for a given component	MPa (N/mm^2)
PS[a]	maximum allowable pressure	bar
R, r [b]	radii	mm
$R_{eH\,t}$	minimum specified value of upper yield strength at calculation temperature when this temperature is greater than the room temperature	MPa (N/mm^2)
S_1	mean value of the stress which leads to a 1 % creep elongation in 100 000 h	MPa (N/mm^2)
S_2	mean value of the stress which leads to a 1 % creep elongation in 200 000 h	MPa (N/mm^2)
$S_{R\,T\,t}$	mean value of creep rupture strength as indicated by the standards, for the material in question at the considered temperature, t, and for the considered lifetime T (in hours) whereby the dispersion band of the results does not deviate by more than 20 % from the mean value.	MPa (N/mm^2)
TS	maximum allowable temperature	°C
Z	section modulus for a pipe	mm^3
c_0	corrosion or erosion allowance (see Figure 4.3-1)	mm
c_1	absolute value of the negative tolerance taken from the material standard (see Figure 4.3-1)	mm
c_2	thinning allowance for possible thinning during manufacturing process (see Figure 4.3-1)	mm
e_a	analysis thickness of a component used for the check of the strength (see Figure 4.3-1)	mm
e_n	nominal thickness on drawings (see Figure 4.3-1)	mm
e_{ord}	ordered thickness (see Figure 4.3-1)	mm
e_r	minimum required thickness with allowances and tolerances (see Figure 4.3-1)	mm
f	design stress (see clause 5)	MPa (N/mm^2)
f_{cr}	Design stress in the creep range	MPa (N/mm^2)
f_f	Design stress for flexibility analysis	MPa (N/mm^2)
p_c	calculation pressure (see 4.2.3.4)	MPa (N/mm^2)
p_o	operating pressure (see 4.2.3.1)	MPa (N/mm^2)
t_c	calculation temperature (see 4.2.3.5)	°C
t_o	operating temperature (see 4.2.3.2)	°C
z	joint coefficient (see 4.5)	-
ε	additional thickness resulting from the selection of the ordered thickness (see Figure 4.3-1)	mm

[a] All pressures for calculation purposes are in MPa (N/mm^2) and *PS* is in bar.

[b] The following subscripts apply :

i inside

m mean

o outside

4 Basic design criteria

4.1 General

The calculation rules in this Part shall apply for operating and testing conditions as well as preset, cold pull conditions, flushing and cleaning conditions.

The scope of each of the calculation rules is limited on a case by case basis by geometrical characteristics which shall be taken into account for each component, loading, failure mode and material property.

NOTE Where this European Standard does not indicate a calculation rule, it is the designer's responsibility to use widely acknowledged calculation rules, or experimental methods to justify the dimensions and thicknesses selected.

Elastic calculation methods shall be used in this Part, although some components might exhibit plastic behaviour.

If shaping and assembly techniques specific to the pressure vessel industry are used for large diameter pipes, the rules applicable to such techniques shall be those relating to the design of shells for pressure vessels. For the general stability, the requirements of EN 13480 remain applicable if the structure, as a whole, behaves according to the beam theory.

For temporary piping, e.g. flushing, cleaning and blow-through systems, the nominal design stress for the design conditions shall be used.

Piping for fluids which are likely to cause condensation shall be installed with adequate slopes and traps.

4.2 Loadings

4.2.1 General

Any piping system is subjected to a number of loadings during its lifetime. These loadings can be one or a combination of the following loads:

— internal and/or external pressure;

— temperature;

— weight of piping and contents;

— climatic loads;

— dynamic effects of the fluid;

— movements of the ground and buildings;