SLOVENSKI STANDARD
SIST EN 13480-3:2012/oprA1:2016

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Kovinski industrijski cevovodi - 3. del: Konstruiranje in izračun - Dopolnilo A1

Metallic industrial piping - Part 3: Design and calculation

Metallische industrielle Rohrleitungen - Teil 3: Konstruktion und Berechnung

Tuyauteries industrielles métalliques - Partie 3 : Conception et calcul

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Metallic industrial piping - Part3: Design and calculation

Tuyauteries industrielles métalliques - Partie 3 : Conception et calcul

Metallische industrielle Rohrleitungen - Teil 3: Konstruktion und Berechnung

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 267.

This draft amendment A1, if approved, will modify the European Standard EN 13480-3:2012. If this draft becomes an amendment, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration.

This draft amendment was established by CEN 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (EN 13480-3:2012/prA1:2016) has been prepared by Technical Committee CEN/TC 267 "Industrial piping and pipelines", the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

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 EN 13480-3:2012.

This document includes the text of the amendment itself. The amended/corrected pages of EN 13480-3:2012 will be published in the new Edition 2017 of the European Standard.

1 Modifications to Clause 2

The list of normative references shall be updated as follows:

Replace reference EN 1591-1:2001+A1:2009+AC:2011 *by* EN 1591-1:2013, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 1: Calculation*

Add reference 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*

Delete reference EN 12953-3:2002, *Shell boilers — Part 3: Design and calculation for pressure parts*

2 Modification to Clause 3

In Table 3.2-1, add the following definition at the top of the table:

Symbol	**Description**	**Unit**
P_{max}	maximum pressure obtained from the design by formulae or relevant procedures for a given component	MPa (N/mm^2)

3 Modification to 4.1

As the last paragraph of 4.1, add the new following text:

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

4 Modification to 4.2.3.4

The sub-clause 4.2.3.4 shall read as follows:

For all pressure temperature conditions (p_o, t_o) specified in 4.2.3.3 calculation pressures p_c shall be determined.

The calculation pressure p_c shall be not less than the associated operating pressure p_o, taking into account the adjustments of the safety devices. The conditions (p_o, t_o) resulting in the greatest wall thickness shall be considered.

The pressure equipment may be designed with a design pressure/temperature combination (p_c, t_c) which results in the highest calculated wall thickness or the highest stress, and which is based on the pressure/temperature combination (p_o, t_o) under normal operating conditions (see EN 764-1:2015, Figure A.1). In this case the design pressure p_c, associated with the design temperature t_c, can be lower than PS.

NOTE 1 For guidance, designation of p_c and t_c is p_d and t_d in EN 764-1:2015, Figure A.1.

The design of the pressure equipment should be consistent with PS and TS_{max}, that is:

— compatible with the combination of PS with the temperature T(p_{omax}) where p_{omax} is the maximum pressure under normal operating conditions;

— compatible with the combination of TS_{max} at the pressure P(t_{omax}) where t_{omax} is the maximum temperature under normal operating conditions.

NOTE 2 If there is a condition where $p_o = PS$ and $t_o = TS$, only this condition has to be calculated.

When the calculation temperature t_c is such that the creep rupture strength characteristics are relevant for the determination of the nominal design stress, the calculation pressure shall be considered equal to the operating pressure (p_o) which is associated with the corresponding temperature (t_o).

5 Modification to 4.3

The sub-clause 4.3 shall read as follows:

The minimum thickness shall be determined with regard to the manufacturing process for pipes and fittings.

Corrosion can be internal or external or both at the same time (the term corrosion includes erosion).

The value of the corrosion allowance c_0 (which may be zero if no corrosion is to be expected) shall be determined by the manufacturer in accordance with the nature, temperature, pressure, velocity etc. of the products in contact with the wall, only if all this information has been given by the purchaser.

Corrosion allowance should be given by the purchaser, if not, reasonable values shall be proposed by the manufacturer and stated in the documentation.

All thicknesses, the corrosion allowance c_0, the tolerance c_1 and the thinning c_2 are shown in Figures 4.3-1 and 4.3-2.

As the 6th paragraph of 4.3, add the new following text:

Piping which is subjected to external corrosive influences and is made of materials which are not sufficiently corrosion resistant shall be protected against corrosion, if no suitable corrosion allowance is provided.

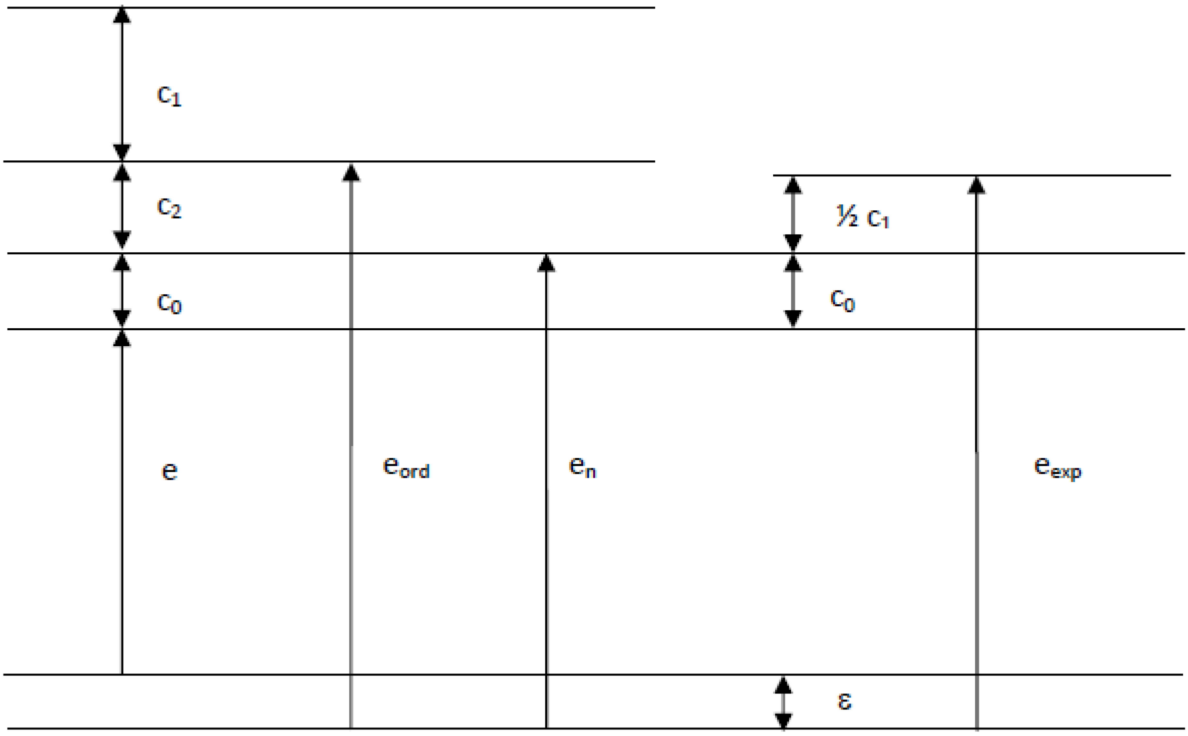
In the key, below Figure 4.3-1, c_2 shall read as follows:

c_2 is the thinning allowance for possible thinning during manufacturing process (e.g. due to bending, swaging, threading, grooving, etc);

The title of the Figure 4.3-1 shall read as follows:

Figure 4.3-1 — Thickness (applicable to straight pipes as well as bends) when ordered with mean wall thickness

After Figure 4.3-1, add a new Figure 4.3-2 and the text below Figure 4.3-2 shall read as follows:



Where

e see Figure 4.3-1;

c_0 see Figure 4.3-1;

c_1 positive tolerance given by the pipe supplier, see also EN 10216-2:2013, Table 9 or Table 10;

c_2 see Figure 4.3-1;

ε is the additional thickness resulting from the selection of the ordered thickness e_{ord};

e_{ord} see Figure 4.3-1;

e_n see Figure 4.3-1;

e_{exp} is the expected (mean) wall thickness.

Figure 4.3-2 — Thickness (applicable to straight pipes as well as bends) when ordered with minimum wall thickness and plus-tolerances only

The Figure 4.3-1 shows the situation when pipes are ordered with mean wall thickness and +/- tolerances, see also EN 10216-2:2013, Table 7 or Table 8.

For pipes, ordered with minimum wall thickness and plus-tolerances only, see Table 9 or Table 10 in EN 10216-2:2013, the Figure 4.3-2 shall be used. In this case for the flexibility and stress calculation of piping the expected wall thickness $e_{exp} = e_{ord} + ½\ c_1$ should be used instead of e_n in the Equations of Clause 12.

The analysis thickness e_a shall be the lowest thickness after corrosion and shall be given by:

$$e_a = e + \varepsilon \tag{4.3-1}$$

or

$$e_a = e_{ord} - c_0 - c_1 - c_2 \quad (4.3\text{-}2)$$

when pipes are ordered with mean wall thickness, see Figure 4.3-1.

When pipes are ordered with minimum wall thickness and plus-tolerances, see Figure 4.3-2, the analysis thickness e_a shall be:

$$e_a = e_{ord} - c_0 - c_2 \quad (4.3\text{-}3)$$

The sequence of the numbering of the equations shall be updated. The current equation (4.3-3) shall be renumbered (4.3-4) and the current equation (4.3-4) shall be renumbered (4.3-5).

At the end of sub-clause 4.3, the following NOTE shall be added:

NOTE When pipes are ordered with minimum wall thickness and plus tolerance, see Figure 4.3-2, the value of the tolerance in Equation (4.3-4) needs to be set to $c_1 = 0$ or in Equation (4.3-5) $x = 0$.

6 Modification to 4.6

In 4.6, the 2nd sentence of the 1st paragraph shall read as follows:

This may be completed or replaced by a "design by analysis" as described in EN 13445-3, Annexes B and C, where applicable.

In 4.6, the following paragraph shall be deleted:

Clauses 6, 7, 8, 9, 10 and 11 describe the "design by rules" of piping components under static and cyclic loadings. The « design by rule » can be completed or replaced by a « design by analysis » as described in EN 13445-3, Annex B and Annex C, where applicable.

7 Modification to 5.2.2

At the end of the sub-clause 5.2.2.1, add the following sentence:

When different rupture elongation values for longitudinal and transverse directions are provided in the material standard, the lowest value shall be used.

8 Modification to 5.2.2.2

The sub-clause 5.2.2.2 shall read as follows:

For $A \geq 35$ %, the designer shall ensure that the stress under the proof test conditions, given in EN 13480-5, shall not exceed the greater of the two following values:

— 95 % $R_{p1,0}$ at specified test temperature;

— 45 % R_m at specified test temperature.

For $A < 35$ %, see 5.2.1.2.

9 Modification to 5.2.5.1

After the first paragraph of 5.2.5.1, the following sentence shall be added:

These steels shall be subjected to a positive material inspection prior to use, to ensure weldability.

10 Modification to 5.3.1

The sub-clause 5.3.1 shall read as follows:

For welds other than circumferential welds in welded pipes and fittings, the creep strength values of the weld shall be considered if ensured values are available. Otherwise the minimum of either the creep strength values of the base material or the filler material shall be reduced by 20 %.

For circumferential butt welds the necessity of the consideration of reduced creep strength values depends on the stress distribution in the cross section. Detailed stress analyses may be used.

11 Modification to 5.3.2.1

The sub-clause 5.3.2.1 shall read as follows:

5.3.2.1 Design conditions

The design stress in the creep range f_{cr} to be used for design under static loading shall be:

$$f_{cr} = \frac{S_{RTt}}{Sf_{cr}} \tag{5.3.2-1}$$

where

Sf_{cr} is a safety factor which depends on the design life time and shall be in accordance with Table 5.3.2-1.

Table 5.3.2-1 — Safety factor as a function of mean creep rupture strength related to time

Design lifetime[a]	Without surveillance of creep exhaustion[c]		With surveillance of creep exhaustion[c]	
t [h]	Mechanical property	$Sfcr$	Mechanical property	$Sfcr$
10 000 ≤ t ≤ 100 000	S_{RTt}	1,5	S_{RTt}	1,25
100 000 < t < 200 000	S_{RTt} [d]	1,5[d]	S_{RTt}	1,25
t = 200 000	S_{RTt} [d]	1,5[d]	S_{RT}/200 000 h S_{RT}/150 000 h [b] S_{RT}/100 000 h [b]	1,25 1,35 1,5

[a] If the design lifetime is not specified, the mean creep rupture strength at 200 000 h shall be used with the associated Sf_{cr}.

[b] Only in cases where the 200 000 h values are not specified in the material standards, the mean creep rupture strength at 150 000 h or 100 000 h shall be used for a design lifetime of 200 000 h with the associated Sf_{cr}.

[c] Surveillance by means of non-destructive testing and/or additional calculations of creep damage, D_c.

[d] Allowed only if $\frac{S_{RT/200000h}}{S_{RT/100000h}} \geq 0{,}781$ to ensure that 60% of theoretical creep damage are not exceeded at 200 000 h.

In cases where a design life shorter than 100 000 h is specified, one of the following methods shall be used:

a) If lifetime monitoring is not performed, the safety factor Sf_{cr} shall be equal to 1,5 and shall be applied to the mean creep rupture strength at the design lifetime of at least 10 000 h;

b) If lifetime monitoring is performed, a safety factor of Sf_{cr} = 1,25 may be specified with regard to the mean creep rupture strength at the design lifetime of at least 10 000 h. In no case the 1% creep strain limit (mean value) at design lifetime shall be exceeded.

The creep rupture strength associated to the specified lifetime shall be interpolated based on a logarithmic time axis as well as a logarithmic stress axis (double logarithmic interpolation scheme).

12 Modification to 6.2.3.2

The existing sub-clause 6.2.3.2 "Alternative route" shall be deleted, the current sub-clause 6.2.3.3 "More accurate route" shall be renumbered 6.2.3.2 and the Table 6.2.3-1 shall be modified as follows:

Table 6.2.3-1 — Minimum pipe wall thickness before bending by induction

Radius	Normal route 6.2.3.1
10 D_o	1,02 e
8 D_o	1,03 e
6 D_o	1,04 e
5 D_o	1,04 e
4 D_o	1,05 e
3 D_o	1,06 e
2,5 D_o	1,08 e
2 D_o	1,10 e
1,5 D_o	1,15 e

13 Modification to 6.3.1

The sub-clause 6.3.1 shall read as follows:

6.3.1 General

The following rules for mitre bends (see Figure 6.3.2-1) shall only be used if the following conditions are met:

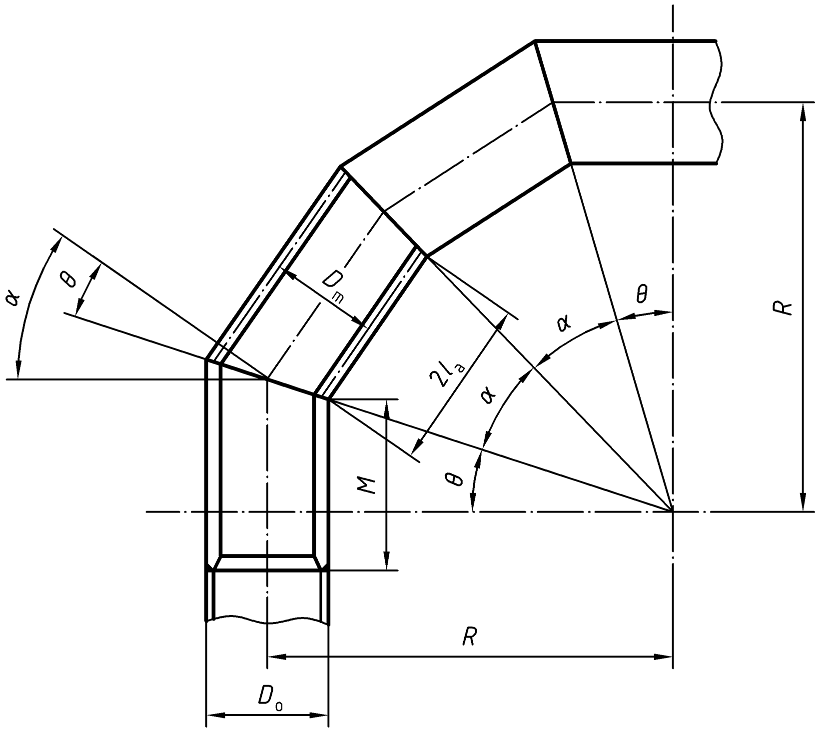
A mitre bend with an angle of change in direction at a single joint greater than 22,5 ° (see angle α in Figure 6.3.2-1) shall not be used under cyclic loadings (> 7 000 cycles).

In addition, for time dependent design stress, consideration of high temperature cycling should be given.

NOTE For an angle of change in direction of 3 ° or less at a single joint, the calculation method given in 6.1 may be used.

14 Modification to 6.3.2

The revised Figure 6.3.2-1 shall read as follows:



NOTE α = 2 θ

Figure 6.3.2-1 — Scheme for a mitre bend

15 Modification to 6.4.1

The first indent of sub-clause 6.4.1 shall read as follows:

— cones for which the half angle at the apex of the cone is greater than 60°;

16 Modification to 6.4.4

Equation (6.4.4-1) shall read as follows:

$$e_{con} = \frac{p_c \, D_i}{2f \, z - p_c} \frac{1}{\cos\alpha} \qquad (6.4.4\text{-}1)$$

Equation (6.4.4-2) shall read as follows:

$$e_{con} = \frac{p_c \, D_e}{2f \, z + p_c} \frac{1}{\cos\alpha} \qquad (6.4.4\text{-}2)$$

where D_i and D_e are the inner or outer diameter respectively at the point under consideration.

Equation (6.4.4-3) shall read as follows:

For a given geometry: