SLOVENSKI STANDARD
SIST EN 13941-1:2019/oprA1:2021

01-junij-2021

Cevi za daljinsko ogrevanje - Projektiranje in vgradnja toplotno izoliranih spojenih eno- in dvocevnih sistemov za neposredno zakopana vročevodna omrežja - 1. del: Projektiranje - Dopolnilo A1

District heating pipes - Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - Part 1: Design

Fernwärmerohre - Auslegung und Bauausführung von gedämmten Ein- und Doppelrohr-Verbundsystemen für direkt erdverlegte Fernwärmenetze - Teil 1: Auslegung

Tuyaux de chauffage urbain - Conception et installation des systèmes bloqués de monotubes ou bitubes isolés thermiquement pour les réseaux d'eau chaude enterrés directement - Partie 1 : Conception

Ta slovenski standard je istoveten z: **EN 13941-1:2019/prA1**

ICS:

23.040.07	Cevovodi za daljinsko ogrevanje in njihovi deli	Pipeline and its parts for district heat
91.140.10	Sistemi centralnega ogrevanja	Central heating systems

SIST EN 13941-1:2019/oprA1:2021 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT EN 13941-1:2019

prA1

April 2021

ICS 23.040.07; 23.040.10; 91.140.10

English Version

District heating pipes - Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - Part 1: Design

Tuyaux de chauffage urbain - Conception et installation des systèmes bloqués de monotubes ou bitubes isolés thermiquement pour les réseaux d'eau chaude enterrés directement - Partie 1 : Conception

Fernwärmerohre - Auslegung und Bauausführung von gedämmten Ein- und Doppelrohr-Verbundsystemen für direkt erdverlegte Fernwärmenetze - Teil 1: Auslegung

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 107.

This draft amendment A1, if approved, will modify the European Standard EN 13941-1:2019. 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.

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

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.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword

This document (EN 13941-1:2019/prA1:2021) has been prepared by Technical Committee CEN/TC 107 “Prefabricated district heating and district cooling pipe system”, the secretariat of which is held by DS.

This document is currently submitted to the CEN Enquiry.

EN 13941, *District heating pipes — Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks* consists of the following parts:

— *Part 1: Design*;

— *Part 2:* Installation.

In comparison to EN 13941:2019, the following changes have been made:

a) minor corrections throughout the document.

1 Modification to Clause 2 "Normative references"

Delete footnote 1 "Under preparation. Stage at time of publication: prEN 17248:2018." *at the entry of* "EN 17248,[1] *District heating and district cooling pipe systems - Terms and definitions*".

2 Modifications to Table 1 of Clause 3 "Terms and definitions, units and symbols"

In Table 1, these modifications are to be applied for the following symbols:

— D_C/D_i *delete* "or m" *in the Unit column;*

— K_c *add* "for cohesive soil and mixed soils" *at the end of column* "Name"*;*

— K_q *add* "for granular soil and mixed soils" *at the end of column* "Name"*;*

— "t_s" *is to be replaced by* "T_g"*;*

— Z_c *replace the unit* "m" *with* "mm"*.*

Insert the following row between the rows of "L" *and* "L_p": "

L_{all}	allowable length between the single use compensators	m

".

Insert the following two rows between the rows of "q" and "q_u": "

q_f	Flow line	W/m
q_r	Return line	W/m

".

Replace the following rows: "

σ_d	Design stress (allowable)	MPa
σ_{dp}	Design stress (allowable) of the compensating plate material	MPa
σ_{dp}	Calculated hoop stress from internal (design) pressure	MPa

" *with:* "

σ_d	Design stress ($R_e\left(T\right)/\gamma_m$)	MPa
σ_{dp}	Design stress (allowable) of the compensating plate material	MPa
σ_{pd}	Calculated hoop stress from internal (design) pressure	MPa

".

And delete the following row: "

σ_p	Hoop stress from internal (over)pressure	MPa

".

3 Modifications to Table 9 of subclause 6.4.2 "Classification of actions and load combinations"

In Table 9, replace "safety" *with* "load" *changing the title to read* "Classification of actions, partial load factor and Load Combinations (LC)" *and the first heading to* "PARTIAL LOAD FACTORS γ_a".

Delete the term "(Max foam compression)" *in the cell for operational phase LC 3* "Force controlled and deformation controlled actions"

Replace the load factor "Operating pressure" *from LC 2, LC 3 and LC 4* "1,2" *with* "1,25".

4 Modification to subclause 6.5.5 "Combined lateral stiffness of steel service pipe, PUR, expansion cushions and soil"

To change "D_0" *in Formula (20b) to* "D_c" *replace the formula with*

"$k_2 = k_{h,2} \cdot D_c$ (20b)"

and insert "for D_{cu}" *at Formula (21b) in front of* "see Figure 13" *resulting in*

"$k_3 = k_{h,3} \cdot D_{cu}$ for D_{cu} see Figure 13 (21b)".

5 Modifications to subclause 6.5.7 " Thermal expansion of buried pipe sections:"

In the last line of the key to Figure 16 "Partly and fully restrained pipe sections" replace "NR" with "N_R".

Replace the undefined "N_r" in Formula (24) with "N_R" changing it from

"$N_x = N_p + N_r = A \cdot \frac{\sigma_p}{2} + N_R$" *to* "$N_x = N_p + N_R = A \cdot \frac{\sigma_p}{2} + N_R$".

In the paragraph above Formula (27) and the one which follows, increment the numbering of "Figure 16" *and* "Figure 15" *by one to read as:*

"For systems as Figure 17 where fixed points or other methods ensure that the distance *l* from the fixed point to an expansion facility is shorter than or equal to the friction length *L*, or where the distance between two expansion facilities is less than *2L*, the axial stresses in the steel service pipe are calculated as:

$$\sigma_x = -\left(\frac{F}{A} l - \frac{1}{2}\sigma_p - \frac{N_R}{A}\right) \quad (27)$$

Expansion at the free pipe end from the partly restrained pipe (see Figure 16) is calculated as:".

6 Modification to subclause 6.5.9.2.4 "Excavations over the pipes"

To replace the "≤" sign from Formula (44) with "·"replace theformula "$L = \sqrt{\frac{\pi^2 \cdot E \leq \cdot I}{\gamma_a \cdot \gamma_M \cdot N}}$" *with* "$L = \sqrt{\frac{\pi^2 \cdot E \cdot I}{\gamma_a \cdot \gamma_M \cdot N}}$".

7 Modifications to subclause 6.6.2 "Cross section analyses, steel"

Replace "Figure 20" *with* "Figure 21" *in the sentence* "Stresses and internal forces are illustrated in Figure 20." *resulting in* "Stresses and internal forces are illustrated in Figure 21.".

*Replace "*t-pieces*" with "*T-pieces*" in the sentence after Formula (46), so that it reads* "For T-pieces the outside diameters d_{ro} and d_{bo} and the thickness t_r and t_b for run pipe and branch, respectively, are inserted.*".*

Delete "normally" *in the following note:*

"NOTE The effect of vertical top load from soil pressure and traffic actions can normally be ignored for pipe dimensions DN ≤ 300.".

8 Modification to subclause 6.6.3 "Assessment on the basis of a resultant (equivalent) stress"

From the two sentences above Formula (47), delete the last one, thus replace

"The equivalent stress can be calculated both with the minimum distortion energy hypothesis (by von Mises´ equation), or with the shear-stress hypothesis (by Tresca equation):

The equivalent stress is calculated from the axial and tangential stress components (calculated with sign) by Tresca or by von Mises' equation:" *with*

"The equivalent stress can be calculated both with the minimum distortion energy hypothesis (by von Mises´ equation), or with the shear-stress hypothesis (by Tresca equation):".

9 Modification to subclause 6.6.5 "Deflection"

Between Formula (53) and (54) replace "(see Figure D.2)" *with* "(see Figure 22)".

10 Modification to subclause 6.6.6 "Bends"

In the first paragraph replace "(see Figure 22)" *with* "(see Figure 23)".

11 Modifications to subclause 6.6.7 "T-pieces"

In the first and in the second paragraph replace "Figure 23" *with* "Figure 24".

In the second indent in the list below Figure 24, replace "Figure 23" *with* "Figure 24".

In the sentence above Formula (65), replace "(see Figure 24)" *with* "(see Figure 25)".

12 Modifications to subclause 6.7.1 "Action cycles"

Add the sentence "See also [43]." *right above Table 16, resulting in* "In Table 16, the flow for fatigue analysis is exemplified. See also [43].".

13 Modifications to subclause 7.2.2.2 "Limit state A1: Ultimate limit state for force controlled actions (load bearing capacity)"

Add ", see Figure 27" *at the end of the sentence above Formula (75) and replace the following*

$$\text{"} \left.\begin{matrix}\sigma_m \\ \sigma_{j,m}\end{matrix}\right\} \leq \frac{R_e(T)}{\gamma_m} \qquad (75)$$

$$\sigma_{res};\sigma_{j,res} \le \begin{cases} 1,5 \cdot \dfrac{R_{e(T)}}{\gamma_m} & \text{for} \quad \sigma_m;\sigma_{j,res} \le 0,67\dfrac{R_{e(T)}}{\gamma_m} \end{cases} \tag{76}$$

and

$$\sigma_{res};\sigma_{j,res} \le \begin{cases} 2,5 \cdot \dfrac{R_{e(T)}}{\gamma_m} - 1,5\sigma_m & \text{for} \quad \sigma_m;\sigma_{jm} \le 0,67\dfrac{R_{e(T)}}{\gamma_m} \end{cases} \tag{77}"$$

with

$$" \left.\begin{matrix}\sigma_m \\ \sigma_{j,m}\end{matrix}\right\} \le \frac{R_e(T)}{\gamma_m} = \sigma_d \tag{75}$$

$$\sigma_{res};\sigma_{j,res} \le 1,5 \cdot \sigma_d \quad \text{for} \quad \sigma_m;\sigma_{j,m} \le 0,67 \cdot \sigma_d \tag{76}$$

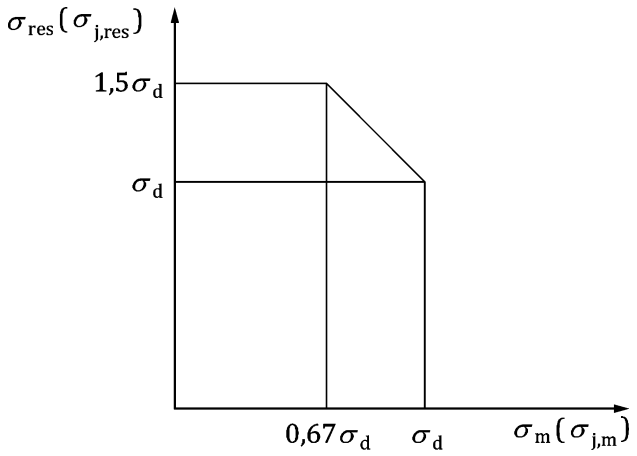
and

$$\sigma_{res} \le 2,5 \cdot \sigma_d - 1,5 \cdot \sigma_m \quad \text{for} \quad \sigma_m > 0,67 \cdot \sigma_d \tag{77a}$$

$$\sigma_{j,res} \le 2,5 \cdot \sigma_d - 1,5\sigma_{j,m} \quad \text{for} \quad \sigma_{j,m} > 0,67 \cdot \sigma_d \tag{77b)".}$$

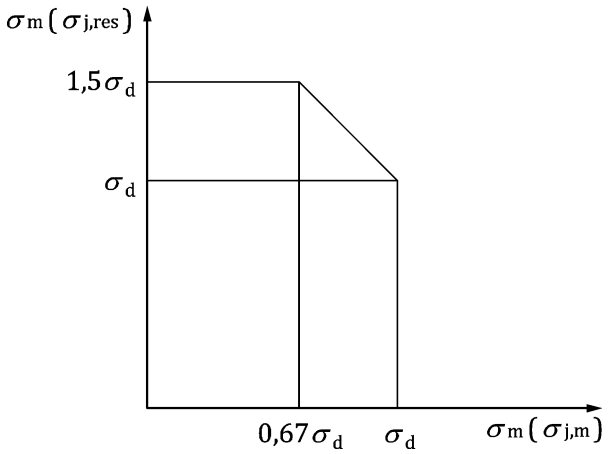
Replace Figure 27 with the newly provided, which corrects the y-axis variable as shown below.

New Figure 27: "



".

Old Figure 27: "



".

After "Bending stresses from top load (soil + traffic) shall be calculated in accordance with 6.6.4.

When combining the membrane stresses from internal pressure with the bending stresses from top load, rerounding in accordance with 6.6.4.2 can be taken into account." *delete the following:*

"Partial safety factors for steel where the material standards for unalloyed and low alloyed steels show values for yield strength at elevated temperatures:

— Yielding of base material, yielding of weld seam, γ_m = 1,25.".

14 Modifications to subclause 7.2.2.3 "Limit state A2: Ultimate limit state reached by stepwise plastic deformation caused by cyclical actions"

Replace "2) The limit state for strain in straight pipes in C1 is fulfilled;

3) $P \leq 20$ MPa.

" *with* "2) The limit state for strain in straight pipes in C1 of Table 17 is fulfilled;

3) p ≤ 2,0 MPa." *below Formula (79).*

Replace in the Key of Figure 28 "

2 ratcheting 25 MPa, 130°C
3 ratcheting 25 MPa, 140°C

" *with* "

2 ratcheting at pressure 2,5 MPa, 130 °C
3 ratcheting at pressure 2,5 MPa, 140 °C

" *and treplace the title of Figure 28* "Limit states for axial strain for steel quality with R_e approximately 235 MPa" *with* "Limit states for axial strain for steel qualities P235GH".

15 Modifications to subclause 7.2.3.2 "Limit state B1:SN curves for low cycle fatigue (repeated yielding)"

In Note 1, replace "Formula (75)" *with* "Formula (81)".

In Note 2, replace "Figure 28" *with* "Figure 29".