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

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

Auslegung und Installation von werkmäßig gedämmten Verbundmantelrohren für die Fernwärme

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

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

Conception et installation des systèmes bloqués de tuyaux préisolés pour les réseaux enterrés d'eau chaude

Auslegung und Installation von werkmäßig gedämmten Verbundmantelrohren für die Fernwärme

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

If this draft becomes a European Standard, 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.

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European foreword

This document (prEN 13941-1:2016) 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.

This document will supersede EN 13941:2009+A1:2010.

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 13941:2009+A1:2010, the following changes have been made:

- a) EN 13941 is considered to be the “system standard”, including all requirements for materials and components and where necessary referring to the related product standards EN 253, EN 448, EN 488, EN 489, EN 14419 and the EN 15698 series;
- b) chapters related to installation are removed to prEN 13941-2;
- c) the document structure is improved, giving a better balance between standard text and annexes;
- d) twin pipes are included in a new annex;
- e) Annex H: „Scope of EN 13941 in relation to Pressure Equipment Directive (PED)“ was added;
- f) requirements for horizontal and vertical stability and for parallel excavations are made more explicit;
- g) minimum free distances between parallel pipes are introduced as well as a warning to be aware of works of third parties that might endanger the integrity or the required design conditions of the district heating pipes;
- h) requirements for horizontal directional drillings are included (also in prEN 13941-2, Annex B);
- i) required properties and testing methods for expansion cushions are included;
- j) a design fatigue curve for fillet welds (e. g in single use compensators) is included;
- k) the use of stress concentration factors for butt welds in district heating pipes is, in line with present international pipeline codes, not considered necessary anymore;
- l) a great number of smaller adjustments and editorial improvements.

Introduction

This European Standard has been prepared by CEN/TC 107/WG 13 „Prefabricated district heating and district cooling pipe system”.

According to the scope of CEN/TC 107:

- the task of CEN/TC 107/WG 13 is to specify rules for design, calculation and installation for pre-insulated bonded pipe systems for underground hot water networks with pipe assemblies coordinated with EN 253, EN 448, EN 488 and EN 489;
- CEN/TC 107/WG 13 also contributes to rules for functional tests for pre-insulated bonded pipe systems for underground hot water networks;
- the basic rules for design, calculation and installation are based on functional requirements;
- the purpose of the work is to provide uniform basis for the design, construction and operation of district heating systems, to ensure that the system is reliable and efficient and safe for the surrounding area, the environment and public health;
- joint assemblies for pipe systems are coordinated with EN 489.

When use is made of the standard, the different sections of which it is made up is to be interpreted as being interdependent and, because of this, cannot be dissociated.

The revision of EN 13941:2009+A1:2010 involves the subdivision of the document in two separate volumes:

- prEN 13941-1, *Design and installation of bonded pre-insulated pipe systems for district heating — Part 1: Design*;
- prEN 13941-2, *Design and installation of bonded pre-insulated pipe systems for district heating — Part 2: Installation*.

This volume (Part 1) consists of a main part and eight annexes.

Annexes A, C and F are normative. Annexes B, D, E, G, H, I, and J are informative.

It is permissible to use alternative design rules from the notes given in this standard, provided that it is demonstrated that the alternative rule accords with the relevant principles and it is at least equivalent with regard to the resistance, serviceability and durability achieved by the system.

This European Standard contains a number of requirements aimed at ensuring the sound execution of distribution networks and transportation pipelines for district heating.

The requirements and regulations contained in this standard should be assessed and applied in compliance with the intentions of the standard and in due consideration of the development taking place in the field it concerns. It is therefore assumed that the user of the standard has the requisite technical insight and that the user of the standard has adequate knowledge of legal and other external regulations that are of consequence to the practical application of the standard.

1 Scope

This European Standard specifies requirements for design, calculation and installation of factory made thermal insulated bonded single and twin pipe systems for directly buried hot water networks for continuous operation with treated hot water at various temperatures up to 120 °C and occasionally with peak temperatures up to 140 °C and maximum internal pressure 2,5 MPa. Flexible pipe systems according to the EN 15632 series are not under the scope of this standard.

The standard EN 13941, *Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks* consists of two parts:

- a) prEN 13941-1: *Design*;
- b) prEN 13941-2: *Installation*.

The requirements and stipulations in this part: prEN 13941-1, form an unbreakable unity with those of prEN 13941-2. This part should therefore exclusively be used in combination with prEN 13941-2.

The principles of the standard may be applied to thermal insulated pipe systems with pressures higher than 2,5 MPa, provided that special attention is paid to the effects of pressure.

Adjacent pipes, not buried, but belonging to the network (e.g. pipes in ducts, valve chambers, road crossings above ground etc.) may be designed and installed according to this standard.

This standard presupposes the use of treated water, which by softening, demineralization, de-aeration, adding of chemicals, or otherwise has been treated to effectively prevent internal corrosion and deposits in the pipes.

NOTE For further information on water qualities to be used in district heating pipe systems see also [1].

This standard is not applicable for such units as:

- a) pumps;
- b) heat exchangers;
- c) boilers, tanks;
- d) systems behind domestic substations.

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 253:2009+A2:2015, *District heating pipes — Preinsulated bonded pipe systems for directly buried hot water networks — Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene*

EN 448, *District heating pipes — Preinsulated bonded pipe systems for directly buried hot water networks — Fitting assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene*

EN 488:2015, *District heating pipes — Preinsulated bonded pipe systems for directly buried hot water networks — Fitting assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene*

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EN 489, *District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks - Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene*

EN 10204, *Metallic products - Types of inspection documents*

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

EN 10217-2, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10217-5, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10253-2, *Butt-welding pipe fittings - Part 2: Non alloy and ferritic alloy steels with specific inspection requirements*

EN 13480-3:2012, *Metallic industrial piping — Part 3: Design and calculation*

prEN 13941-2:2016, *Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks — Part 2: Installation*

EN 14419, *District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks - Surveillance systems*

EN 15698 (all parts), *District heating pipes - Preinsulated bonded twin pipe systems for directly buried hot water networks*

EN ISO 1856, *Flexible cellular polymeric materials — Determination of compression set (ISO 1856)*

3 Terms and definitions, units and symbols

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 253:2009+A2:2015 and the following apply.

3.1.1

action

set of concentrated or distributed forces acting on the pipe system (force-controlled action), or cause of imposed or constrained deformations in the system (displacement-controlled action)

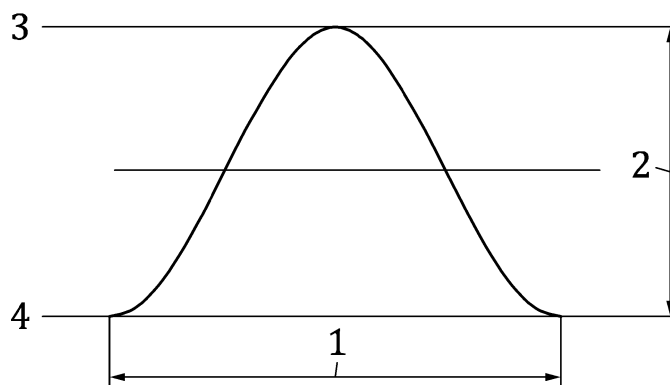
Note 1 to entry: Actions are in the text of this standard also referred to as “loads”.

3.1.2

action cycle

impact with a given stress range comprising of one full action course, ranging from a minimum (maximum) level through an average value to a maximum (minimum) level and back

Note 1 to entry: See Figure 1.

**Key**

- 1 one action cycle
- 2 action (or stress or deformation) range
- 3 maximum level of the action, stress or deformation
- 4 minimum level of the action, stress or deformation

Figure 1 — Action cycle**3.1.3****anchor**

construction used to transfer the loads from the steel service pipe through the insulation and the casing to a fixed point

3.1.4**bonded system**

system consisting of one or two service pipes, insulating material and casing, which are bonded by the insulating material

3.1.5**butt welded bend**

bend manufactured either by hot bending of steel pipe or by hot forming of steel plates which are subsequently welded together

3.1.6**characteristic value**

<of a stochastic variable action> action value which, at a probability of 95 %, will not be exceeded

3.1.7**cold formed bend**

bend manufactured by cold bending of steel pipe

3.1.8**cold laying**

method of pipeline laying where the pipes are installed and taken into operation without pre-stressing by pre-heating

3.1.9**creep**

slow progressive strain under the influence of stresses

prEN 13941-1:2016 (E)**3.1.10****design pressure**

internal pressure equal to or greater than the maximum operating pressure at any point of the pipeline acting in a component or pipe section

3.1.11**design temperature**

maximum temperature used for the design of a pipe component or pipe section

3.1.12**directly welded T-piece**

T-piece manufactured by welding a branch pipe directly onto a run pipe, with or without reinforcement

Note 1 to entry: See Figure 2. In other standards the directly welded T-piece may also be referred to as „fabricated T-piece“.

3.1.13**dished head****cap**

not pre-insulated butt welded fitting to be welded on the end of a pipe or fitting

3.1.14**deformation-controlled action**

action called forth by enforced deformation or movement

Note 1 to entry: Examples of displacement controlled actions are thermal expansion or displacement differences, caused by soil settling.

3.1.15**distribution pipeline**

<district heating> pipeline leading from place of production, transmission line or substation to house connections

Note 1 to entry: See Figure 3.

3.1.16**ductile material**

material which with good approximation are linearly elastic up to the yield stress or to the 0,2 % proof stress, and which has a minimum elongation at rupture of 14 %

3.1.17**fatigue strength**

stress range of constant magnitude which, under given circumstances, just causes fatigue failure

3.1.18**force-controlled action**

action which maintains its magnitude irrespectively of the deformation of the structure

Note 1 to entry: Examples of force-controlled action are internal pressure, pipe-weight and top load from soil and traffic.