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Kovinski industrijski cevovodi - 6. del: Dodatne zahteve za vkopane cevovode

Metallic industrial piping - Part 6: Additional requirements for buried piping

Metallische industrielle Rohrleitungen - Teil 6: Zusätzliche Anforderungen an erdgedeckte Rohrleitungen

Tuyauteries industrielles métalliques - Partie 6: Exigences complémentaires relatives aux tuyauteries enterrées

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 13480-6:2004) 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of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

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 seven 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.

According to the CEN/CENELEC Internal Regulations, the national standards 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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This document specifies requirements for industrial piping either totally buried or partly buried and partly run in sleeves or similar protection. It is used in conjunction with the other six parts of EN 13480.

Where buried piping subject to this standard connects to piping installed under other jurisdiction such as pipelines, the transition should be made at a closing element e.g. an isolating or regulating valve separating the two sections. This should be close to the boundary of the industrial site, but may be inside or outside the boundary.

Operating temperature up to 75 °C.

NOTE For higher temperatures reference should be made to EN 13941, but it should be kept in mind, that CEN/TC 107 only deals with pre-insulated piping with temperatures up to 140 °C and diameters up to 800 mm, which is state of the art for these products.

2 Normative references

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

EN 13480-1, *Metallic industrial piping – Part 1: General.*

EN 13480-2:2002, *Metallic industrial piping – Part 2: Materials.*

EN 13480-3, *Metallic industrial piping – Part 3: Design and calculation.*

EN 13480-5, *Metallic industrial piping – Part 5: Inspection and testing.*

3 General

3.1 Safety

a) Buried piping within an industrial site presents a potential hazard to site personal, equipment and environment. The sections set out in this document provide guidance as to how the hazard presented by the piping may be assessed, and the integrity of the piping system maintained.

NOTE 1 Attention is drawn to appropriate National or Local regulations.

b) The main factors to be considered are:

— Design including Routing, Layout, Interaction with connecting systems;

— Materials and Construction Specification and Quality Control;

— Operating Procedures and Control;

— Corrosion protection;

— External Impact Protection and Mitigation.

All of these factors interact.

NOTE 2 It is recommended that all buried piping be subjected to a formal hazard analysis procedure.

NOTE 3 Attention is drawn to appropriate National or Local regulations.

c) Additional safety requirements may be specified for group 1 fluids according to EN 13480-1, including automated means of isolating buried sections of piping.

3.2 Routes

All routes for buried piping shall be agreed with the owner and operator of the site. The site owner shall be required to furnish details of all other actual or planned buried services (including cables) and all roadways or other surface loads within the construction working width or zone of the proposed pipe.

Piping in class III according to EN 13480-1 shall be separated from any other pipe or service by a minimum distance of 0,25 m unless it can be demonstrated that a smaller distance is acceptable.

3.3 Depth of installation

In the absence of special protection (e.g. concrete slabs) buried piping shall be provided with a minimum cover of 0,8 m.

The designer shall consider increasing the extent of cover above the minimum where penetrating cold or frost heave of the ground is likely, or where damage from excavation activities is a possibility.

3.4 Pipes marking and recording

Buried pipes shall be marked by a continuous tape or other agreed means placed directly above the pipe and no closer than 0,3 m.

All buried pipes shall be identified on as-installed drawings which accurately locate the route relative to structures or other permanent features. The site owner may require the route to be physically marked by the use of identification posts or cover slabs at appropriate intervals.

3.5 Internal inspection provisions

Where periodic internal inspection of buried piping is anticipated, and the specification identifies the method proposed, the designer shall incorporate appropriate means of introducing and removing the inspection devices. Such closures, and openings for inspection shall be designed in accordance with EN 13480-3.

3.6 Contents removal

The design of the piping system shall make allowance for the safe filling and removal of the contents. This shall include vent and drain points or falls as required, and the selection of appropriate bends and fittings.

3.7 Trench drainage

The designer shall recognize that pipe trenches for buried piping can act as channels for ground water. Appropriate means shall be employed to ensure that the bottom of the trench has sufficient slope to soak-aways or sumps to prevent accumulation of water around the piping. Where such measures are not possible, the designer shall include the possibility of flotation in the design calculations.

In addition, the drainage arrangements shall dispose of the hydrostatic test water. Care shall be exercised during this operation to ensure that washout of bedding material does not occur.

4 Materials

Materials shall conform to the requirements of EN 13480-2 except that the value for the specified minimum elongation after fracture for the longitudinal direction (see EN 13480-2:2002, 4.1.4.) shall be 20 %.

Materials with elongation values less than 20 % shall be avoided, and shall only be used subject to agreement between the purchaser and the designer.

5 Design and calculation

5.1 Minimum wall thickness for buried piping

Unless the pressure design calculations lead to a greater thickness, the wall thickness of the pipe shall not be lower than the value given in Table 1.

Table 1 — Minimum wall thickness for buried piping

Nominal size (DN)	Minimum thickness mm
DN ≤ 80	3,2
80 < DN ≤ 150	4,7
150 < DN ≤ 450	6,35
450 < DN ≤ 600	7,9
600 < DN ≤ 950	9,5
950 < DN	1 % DN

5.2 Design loads

5.2.1 A simple single dimensional model linking buried pipes and the surrounding ground may be sufficient for piping designed in accordance with EN 13480-3. More complex analysis of pipe to soil interaction may be used where sufficient accurate geo-mechanical data is available, or where the conditions of this annex cannot be met.

NOTE It is assumed that the loads imposed by the piping on the soil do not exceed its load bearing capacity.

5.2.2 The designer shall include in the calculations the weight of soil or backfill above the pipe and the maximum predicted value of traffic or other static and dynamic loads imposed on the ground above the pipe. With a minimum immediate (first) cover to the pipe of 150 mm of sand, or similar free-flowing material, the forces may be considered as acting over the entire 180° of the upper pipe surface.

5.2.3 In addition to calculations at the design pressure, the loadings on the unpressurized system shall be calculated.

5.2.4 Pipe movement will be significantly restrained by the frictional force at the interface with the surrounding soil, and may be effectively prevented at buried bends and large branches. Unless specific measures are incorporated to permit relative movement, buried pipes shall be considered as fully restrained axially for calculation purposes.

The axial stress due to combined pressure and temperature change effects shall be calculated as follows:

$$S_L = \nu\, S_p - E_\alpha\, (\Delta T) \qquad (1)$$

where

— S_L is the longitudinal stress ≤ 0,90 x yield strength at design temperature;

— S_p is the circumferential stress due to pressure alone;

— ΔT is the maximum temperature range;

— ν is Poisson's ratio.

5.2.5 Where no detailed analysis is undertaken, the maximum temperature range (including the installation temperature) shall not exceed 35 °C, and restraining features such as buried bends and tees shall have a separation of not less than 5 DN. Where detailed analysis is necessary, it shall be in accordance with EN 13480-3.

5.2.6 Where seismic events are to be considered, the pipe shall be treated as if rigidly connected to the ground and following the imposed displacements. Dynamic amplification may be ignored.

NOTE The surrounding soil can be considered to effectively dampen all harmonic excitations of the pipe.

5.2.7 The designer shall consider the interface between buried and above ground sections of the piping for all design conditions.

For the static analysis, the buried part shall be considered as clamped for thermal expansion, and it shall be ensured that the flexibility of the above ground part is sufficient in order to limit the loads at the connection of the two parts to acceptable values.

The designer shall analyse the effects of any anticipated settlement of the buried piping relative to the connected piping overground or in ducts, and shall ensure compliance with the requirements of this document.

NOTE When gaseous fluids are carried by the piping, the designer should note the likely rise in temperature in the discharge lines of a compressor and corresponding reduction at the outflow from pressure reducing equipment.

Where such in-line items are close to a buried section, the designer shall consider the effects of the temperature change.

6 Installation

6.1 Trenches

6.1.1 The normal method of installation shall be by the excavation of trenches. Alternatively, sections of underground pipe installed by thrust boring or similar trenchless methods shall be set in casings.

6.1.2 The bottom of the trench shall be consolidated and free from sharp objects, rocks or stones. The trench shall be made with sufficient slope to provide drainage for the pipe to minimise flotation and corrosion. Where necessary, soak-aways or sumps shall be provided.

The piping shall be laid on an even bed of sand or similar material and consequently the longitudinal bending stress due to weight may be discounted.

6.1.3 A bedding base of free-flowing material such as rounded sand or fine gravel shall be provided with sufficient depth to support the pipe and assist drainage.