PD CEN/TR 1295-4:2015

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Structural design of buried pipelines under various conditions of loading

Part 4: Parameters for reliability of the design

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National foreword

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English Version

Structural design of buried pipelines under various conditions of loading - Part 4: Parameters for reliability of the design

Calcul de résistance mécanique des canalisations enterrées sous diverses conditions de charge - Partie 4 : Paramètres pour la fiabilité de la conception

Statische Berechnung von erdverlegten Rohrleitungen unter verschiedenen Belastungsbedingungen - Teil 4: Parameter für die Zuverlässigkeit der Auslegung

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European foreword

This document (CEN/TR 1295-4:2015) has been prepared by Technical Committee CEN/TC 165 "Wastewater engineering", the secretariat of which is held by DIN.

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, EN 1295: "*Structural design of buried pipelines under various conditions of loading*", consists of the following parts:

— Part 1: General requirements (EN);

— Part 2: Summary of nationally established methods of design (CEN/TR);

— Part 3: Common method (CEN/TR);

— Part 4: Parameters for reliability of the design (CEN/TR).

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Introduction

The structural design of buried pipelines constitutes a wide ranging and complex field of engineering, which has been the subject of extensive study and research, in many countries over a period of very many years.

While many common features exist between the design methods, which have been developed and established in the various member countries of CEN, there are also differences reflecting such matters as geological and climatic variations, as well as different installation and working practices.

In view of these differences, and of the time required to develop a common design method that would fully reflect the various considerations identified in particular national methods, a multiple stage approach has been adopted for the development of a European Standard.

In accordance with this approach, a Joint Working Group, at its initial meeting, resolved "first to produce an EN giving guidance on the application of nationally established methods of structural design of buried pipelines under various conditions of loading, whilst working towards a common method of structural design".

EN 1295-1, "*Structural design of buried pipelines under various conditions of loading — Part 1: General requirements*" represents the implementation of the first part of that resolution, and CEN/TR 1295-2 "*Structural design of buried pipelines under various conditions of loading — Part 2: Summary of nationally established methods of design*" represents the full implementation of the first part of that resolution.

In 2003, CEN/TC 164 and CEN/TC 165 accepted a recommendation from JWG1 that the two structural design options should be published as CEN/TR 1295-3 "*Structural design of buried pipelines under various conditions of loading — Part 3: Common method*", because there was no prospect of the group reaching agreement on a "Common Method", and the human and financial resources needed to continue were, in any case, no longer available.

In 2011, CEN/TC 165 has decided to complete this approach to list the parameters for the reliability of the structural design of buried water and wastewater pressure pipelines, drains and sewers in relation with the installation conditions.

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1 Scope

This Technical Report lists the parameters for the reliability of the structural design of buried water and wastewater pressure pipelines, drains and sewers.

The reliability of the design of buried pipelines is based on the selection of appropriate design parameters for a chosen design method. This document identifies the parameters appropriate to the chosen design method, which should all be clearly stated.

This Technical Report does not aim to specify the requirements for the structural design of water and wastewater pressure pipelines, drains and sewers. These requirements are defined in EN 1295-1.

This Technical Report does not apply for offshore laying, pipes supported on piles, no dig pipelines, or laid above ground. Supplementary considerations need to be taken into account for these specific installations.

Special situations (e.g. landslide, earthquake, fire) are outside the scope of this document.

Design parameters for calculation of longitudinal effects (including bending moments, shear forces and tensile forces resulting for example from non-uniform bedding and thermal movements and, in the case of pressure pipelines, from Poisson's contraction and thrust at change of direction or cross-section) are not covered in this document.

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 1295-1, *Structural design of buried pipelines under various conditions of loading - Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Installation terms

Installation terms are given in Figure 1. The same terms apply for embankment installations and for trenches with sloping sides.

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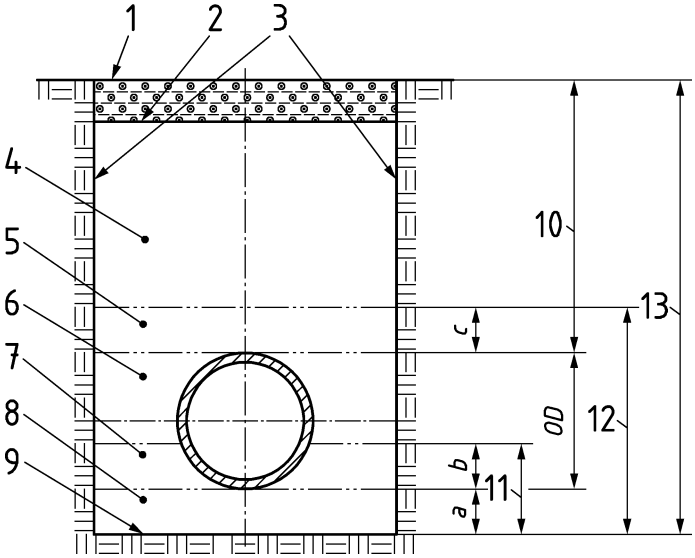

Key

1	surface	9	trench bottom
2	bottom of road or railway construction, if any	10	depth of cover
3	trench walls	11	depth of bedding
4	main backfill	12	depth of embedment
5	initial backfill	13	trench depth
6	sidefill	a	thickness of lower bedding
7	upper bedding	b	thickness of upper bedding
8	lower bedding	c	thickness of initial backfill

NOTE The terms in Figure 1 are the same as in EN 1610.

Figure 1 — Trench installation

3.1.1
compaction
deliberate densification of soil during the construction process

[SOURCE: EN 1295-1:1997, 3.1.1]

3.1.2
consolidation
time-dependent densification of soil by processes other than those deliberately applied during construction

[SOURCE: EN 1295-1:1997, 3.1.2]

3.1.3
embedment
arrangement and type(s) of material(s) around a buried pipeline which contribute to its structural performance

[SOURCE: EN 1295-1:1997, 3.1.3]

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3.2 Design terms

3.2.1
allowable maximum operating pressure (PMA)
maximum pressure occurring from time to time, including surge, that a component is capable of withstanding in service

[SOURCE: EN 805:2000, 3.1.1]

3.2.2
allowable operating pressure (PFA)
maximum hydrostatic pressure that a component is capable of withstanding continuously in service

[SOURCE: EN 805:2000, 3.1.2]

3.2.3
allowable site test pressure (PEA)
maximum hydrostatic pressure that a newly installed component is capable of withstanding for a relatively short duration, in order to ensure the integrity and tightness of the pipeline

[SOURCE: EN 805:2000, 3.1.3]

3.2.4
bedding factor
ratio of the maximum design load for the pipe, when installed with a particular embedment, to the test load which produces the same maximum bending moment

[SOURCE: EN 1295-1:1997, 3.2.1]

3.2.5
design pressure (DP)
maximum operating internal pressure of the system or of the pressure zone fixed by the designer considering future developments but excluding surge

[SOURCE: EN 805:2000, 3.1.4]

3.2.6
limit states
states beyond which the structure no longer fulfils the relevant design criteria

[SOURCE: EN 1990:2002, 1.5.2.12]

3.2.7
load bearing capacity
load per unit length that a particular combination of pipe and embedment can sustain without exceeding a limit state

[SOURCE: EN 1295-1:1997, 3.2.3]

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