SLOVENSKI STANDARD
SIST-TS CEN/TS 14807:2014

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Nadomešča:
SIST-TS CEN/TS 14807:2005

Cevni sistemi iz polimernih materialov - S steklenimi vlakni ojačeni duromerni materiali (GRP), ki temeljijo na nenasičeni poliestrski smoli (UP) - Navodilo za statični račun vkopanih cevovodov iz GRP-UP

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Guidance for the structural analysis of buried GRP-UP pipelines

Kunststoff-Rohrleitungssysteme - Glasfaserverstärkte duroplastische Kunststoffe (GFK) auf der Basis von ungesättigtem Polyesterharz (UP) - Anleitung für die statische Berechnung von erdverlegten GFK-UP-Rohrleitungen

Systèmes de canalisations en plastiques - Plastiques thermodurcissables renforcés de verre (PRV) à base de résine polyester non saturé (UP) - Guide pour l'analyse structurale de conduites PRV-UP enterrées

Ta slovenski standard je istoveten z: **CEN/TS 14807:2013**

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English Version

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Guidance for the structural analysis of buried GRP-UP pipelines

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This Technical Specification (CEN/TS) was approved by CEN on 10 September 2013 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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

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Foreword

This document (CEN/TS 14807:2013) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

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 supersedes CEN/TS 14807:2004.

The following is a list of the major technical changes that have been made since the previous edition:

a) revised wording to reflect the revisions to GRP product standards EN 1796 and EN 14364;

b) revised wording to improve clarity of presentation.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The purpose of this document is to provide guidance for the selection of a suitable structural analysis procedure for buried glass-reinforced thermosetting plastics (GRP) pipes. The design approach should be founded on accepted engineering principles and have been demonstrated through field experience. The procedure should satisfy the requirements of GRP pipes and should provide dependable long-term performance.

The limiting performance criteria for buried glass-reinforced thermosetting plastics (GRP) pipes are different than other pipe products, including thermoplastics pipes. Consequently, any recommendations on the use of GRP products should take these differences into consideration. Additionally, the method of structural analysis should accommodate these limiting performance criteria, so guidance on suitable design limits are given. Any structural analysis procedure may be used provided it includes the assessment of short and long-term deflection and buckling resistance. Established structural analysis procedures, although found satisfactory for other materials, may not meet the needs of GRP.

1 Scope

This Technical Specification, which is a guidance document for use with a structural analysis procedure for below ground installations, covers limits applicable to glass-reinforced thermosetting plastics (GRP) pipes used for the conveyance of liquids under pressure or gravity conditions.

This document does not specify a particular structural analysis procedure but gives guidance on the selection of a structural analysis procedure. It concludes that any established structural analysis procedure may be used provided it includes the assessment of short and long-term deflection and buckling resistance.

Products complying to the applicable GRP product standards EN 1796 or EN 14364, which are not subject to internal pressure, are suitable as long as the analysis shows that the long-term deflection of the installed pipes is limited to 6 %, which is the basic assumption of the GRP pipe product standards. Products complying with the applicable system standards (EN 1796 or EN 14364), which are subject to internal pressure, are suitable as long as the analysis shows that the initial deflection of the installed pipes does not exceed 3 %.

NOTE The approach followed when preparing a general structural analysis procedure does not depend on the nominal size(s) of the pipe(s).

A suitable structural analysis procedure should normally be capable of being used for pipes operating at different temperatures provided that the corresponding temperature re-rating factors for the relevant pipe properties are applied, as specified in the referring standard(s). Nevertheless, high service temperatures may require an additional analysis of the longitudinal stresses and strains and/or a special design of the joints.

Normal structural analysis procedures are intended to cover normal soil installation conditions. Pipes to be designed for installations in abnormal or unusual conditions, e.g. in quick soils or a marine sea-bed, may require special engineering. Some structural analysis procedures may include axial effects depending upon the type of joint used.

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 805, *Water supply - Requirements for systems and components outside buildings*

EN 1610, *Construction and testing of drains and sewers*

EN 1796:2013, *Plastics piping systems for water supply with or without pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP)*

EN 14364:2013, *Plastics piping systems for drainage and sewerage with or without pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Specifications for pipes, fittings and joints*

ISO 7685, *Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness*

ISO 10928, *Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Methods for regression analysis and their use*

ISO 10466, *Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test method to prove the resistance to initial ring deflection*

ISO 10471, *Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the long-term ultimate bending strain and the long-term ultimate relative ring deflection under wet conditions*

ISO 10952, *Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Determination of the resistance to chemical attack for the inside of a section in a deflected condition*

3 Terms and definitions

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

NOTE For a more complete listing of terms and definitions for GRP pipes, see EN 1796:2013 and EN 14364:2013.

3.1
nominal pressure
PN
alphanumerical designation for pressure classification purposes, which has a numerical value equal to the resistance of a component of a piping system to internal pressure, when expressed in bars

Note 1 to entry: The designation for reference or marking purposes consists of the letters PN plus a number.

3.2
nominal size
DN
alphanumerical designation of size of component, which is a convenient integer approximately equal to a manufacturing dimension in millimetres and which can apply to either the internal diameter (DN-ID) or the external diameter (DN-OD)

Note 1 to entry: The designation for reference or marking purposes consists of the letters DN-ID or DN-OD plus a number.

3.3
nominal stiffness
SN
alphanumerical designation for stiffness classification purposes, which has the same numerical value as the minimum initial value required, when expressed in newtons per square metre (N/m^2)

Note 1 to entry: The designation for reference or marking purposes consists of the letters SN plus a number.

3.4
specific ring stiffness
S
physical characteristic of the pipe, expressed in newtons per square metre

Note 1 to entry: It is a measure of the resistance to ring deflection per metre length under external load and is defined by Formula (1):

$$S = \frac{E \times I}{d_m^{\,3}} \tag{1}$$

where

E is the apparent modulus of elasticity as determined in a ring stiffness test, in newtons per square metre (N/m^2);

I is the second moment of area in the longitudinal direction per metre length, in metres to the fourth power per metre, (m^4/m) i.e.

$$I = \frac{e^3}{12} \quad (2)$$

where

e is the wall thickness, in metres (m);

d_m is the mean diameter of the pipe, in metres (m).

3.5
initial specific ring stiffness
S_0
value of S obtained when tested in accordance with ISO 7685, in newtons per square metre (N/m^2)

3.6
re-rating factor
R_{RF}
multiplication factor that quantifies the relation between a mechanical, physical or chemical property at the service condition compared to the respective value at 23 °C and 50 % relative humidity (R.H.)

3.7
non-pressure pipe or fitting
pipe or fitting subject to an internal pressure not greater than 1 bar

3.8
pressure pipe or fitting
pipe or fitting having a nominal pressure classification which is greater than 1 bar and which is intended to be used with the internal pressure equal to or less than its nominal pressure when expressed in bars

3.9
buried pipeline
pipeline which is subjected to the external pressure transmitted from soil loading, including traffic and superimposed loads and, possibly, the pressure of a head of water

3.10
non-buried pipeline
pipeline which is subjected to negative and positive pressure, forces resulting from its supports, environmental conditions, e.g. snow and wind, and possibly pressure of a head of water

3.11
design service temperature
maximum sustained temperature at which the system is expected to operate, expressed in degrees Celsius (°C)

3.12
minimum long-term design pressure
$P_{x,d}$
least value for mean long-term burst failure pressure, expressed in bars, which is evaluated in accordance with the procedures described in ISO 10928 and includes a design factor of safety, FS_d

Note 1 to entry: It is one of the parameters used to determine the minimum initial design pressure.