SLOVENSKI STANDARD
SIST EN 14409-3:2005

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Cevni sistemi iz polimernih materialov za obnovo podzemnih omrežij za oskrbo z vodo - 3. del: Oblaganje s tesno prilagodljivimi cevmi

Plastics piping systems for renovation of underground water supply networks - Part 3: Lining with close fit-pipes

Kunststoff-Rohrleitungssysteme für die Renovierung erdverlegter Wasserversorgungsnetze - Teil 3: Close-Fit-Lining

Systemes de canalisations plastiques pour la rénovation des réseaux enterrés pour l'alimentation en eau - Partie 3 : Tubage par tuyau continu sans espace annulaire

Ta slovenski standard je istoveten z: **EN 14409-3:2004**

ICS:

23.040.20	Cevi iz polimernih materialov	Plastics pipes
93.025	Zunanji sistemi za prevajanje vode	External water conveyance systems

SIST EN 14409-3:2005 **en,fr,de**

EUROPEAN STANDARD

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Plastics piping systems for renovation of underground water supply networks - Part 3: Lining with close fit-pipes

Systèmes de canalisations plastiques pour la rénovation des réseaux enterrés pour l'alimentation en eau - Partie 3 : Tubage par tuyau continu sans espace annulaire

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This European Standard was approved by CEN on 29 July 2004.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of 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.

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Contents

Foreword

This document (EN 14409-3:2004) has been prepared by Technical Committee CEN/TC 155, "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

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 March 2005, and conflicting national standards shall be withdrawn at the latest by March 2005.

System standards dealing with the following applications are either available or in preparation:

— Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks;

— **Plastics piping systems for renovation of underground water supply networks [this application];**

— Plastics piping systems for renovation of underground gas supply networks;

— Plastics Piping Systems for Renovation of underground pressure drainage and sewerage networks;

— Plastics piping systems for renovation of industrial pipe systems.

These system standards are distinguished from system standards for conventionally installed plastics piping systems by the requirement to verify certain characteristics in the as-installed condition, after site processing. This is in addition to verification of characteristics of plastics piping systems as manufactured.

These system standards are complemented by the information contained in ISO/TR 11295 [6] and EN 13689 [1] (listed in the bibliography).

The system standard EN 14409 comprises five parts, as follows:

— Part 1: General

— Part 2: Lining with continuous pipes

— Part 3: Lining with close-fit pipes (this document)

— Part 4: Lining with cured-in-place pipes

— Part 6: Lining with inserted hoses

The requirements for any given renovation technique family are covered by *Part 1: General*, and are for use in conjunction with the relevant other part. For example, for the requirements relating to "*Lining with close-fit pipes*", it is necessary to refer to both parts 1 and 3.

A consistent structure of clause headings has been adopted for all parts to facilitate direct comparisons across renovation technique families.

Figure 1 shows the common part and clause structure and the relationship between EN 14409 and the system standards for other applications.

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.

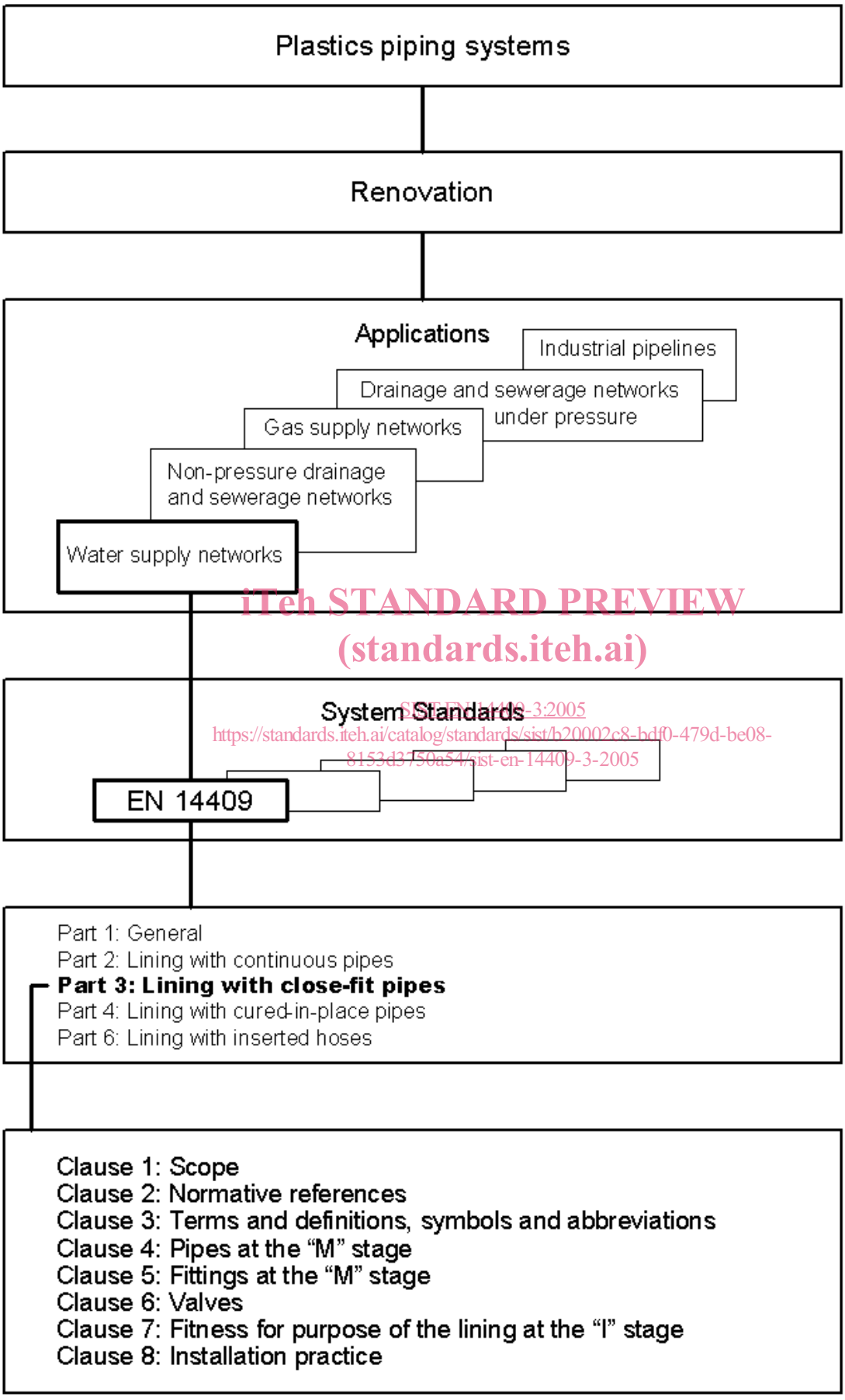

Figure 1 — Format of the renovation system standards

1 Scope

This part 3 of EN 14409, in conjunction with EN 14409-1 specifies requirements and test methods for close-fit lining systems intended to be used for the renovation of water supply networks of water intended for human consumption, including raw water intake pipelines

It covers polyethylene (PE) pipe for both independent and interactive pressure pipe liners and associated fittings and joints for the construction of the lining system.

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 921, *Plastics piping systems — Thermoplastics pipes — Determination of resistance to internal pressure at constant temperature*

EN 12201-1:2003, *Plastics piping systems for water supply — Polyethylene (PE) — Part 1: General*

EN 12201-2:2003, *Plastics piping systems for water supply — Polyethylene (PE) — Part 2: Pipes*

EN 12201-3, *Plastics piping systems for water supply — Polyethylene (PE) — Part 3: Fittings*

EN 12201-4, *Plastics piping systems for water supply — Polyethylene (PE) — Part 4: Valves*

EN 12201-5:2003, *Plastics piping systems for water supply — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 14409-1, *Plastics piping systems for renovation of underground water supply networks — Part 1: General*

prEN ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions (ISO 3126:2004)*

ISO 12176-1, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 1: Butt fusion.*

ISO 12176-2, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 2: Electro fusion.*

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms, definitions, symbols and abbreviations given in EN 14409-1:2004, and the following apply.

3.1 General terms and definitions

3.1.1
close fit
situation of the outside of the installed liner relative to the inside of the existing pipeline, which may either be an interference fit or include a small annular gap resulting from shrinkage and tolerances only.

3.1.2
close-fit pipe
continuous lining pipe of thermoplastic material reshaped or otherwise expanded after insertion to achieve a close fit to the existing pipeline

3.2 Terms and definitions related to techniques

No definitions apply.

3.3 Geometrical definitions

3.3.1
outside diameter at any point
d_e
value of the measurement of the outside diameter through its cross section at any point of the pipe, rounded to the next greater 0,1 mm

3.3.2
minimum mean outside diameter
$d_{em,min}$
minimum value of the outside diameter as specified for a given nominal size

3.3.3
maximum mean outside diameter
$d_{em,max}$
maximum value of the outside diameter as specified for a given nominal size

3.3.4
out-of-roundness (ovality)
difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross section of the pipe or spigot end of a fitting

3.3.5
nominal wall thickness
e_n
numerical designation of the wall thickness of a component, which is a convenient round number, approximately equal to the manufacturing dimension in millimetres

NOTE For thermoplastics components conforming to EN 12201, the value of the nominal wall thickness, e_n, is identical to the specified minimum wall thickness at any point, e_{min}.

3.3.6
minimum wall thickness at any point
e_{min}
minimum value of the wall thickness at any point around the circumference of a component as specified

3.3.7
maximum mean wall thickness at any point
$e_{m,max}$
maximum mean value of the wall thickness at any point around the circumference of a component as specified

3.3.8
tolerance
permissible variation of the specified value of a quantity expressed as the difference between the permissible maximum and permissible minimum values

3.4 Material definitions

3.4.1
compound
homogenous mixture of base polymer (PE) and additives, i.e. anti-oxidants, pigments, UV-stabilisers and others, at a dosage level necessary for the processing and use of components conforming to the requirements of this document

3.5 Definitions related to material characteristics

3.5.1
lower confidence limit of the predicted hydrostatic strength at 20 °C for 50 years
σ_{LPL}
quantity with the dimensions of stress, expressed in megapascals (MPa), which can be considered as a property of the material, and represents the 97,5 % lower confidence limit of the mean predicted long-term hydrostatic strength for water at 20 °C for 50 years with internal water pressure

3.5.2
minimum required strength (MRS)
value of σ_{LPL}, rounded to the next lower value of the R10 series or of the R20 –series, depending on the value of σ_{LPL}

NOTE R10- and R20-series are the Renard number series conforming to ISO 3 [3] and ISO 497 [4].

3.5.3
overall service (design) coefficient
C
overall coefficient with a value greater than one, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower confidence limit

NOTE The minimum overall design coefficient for water is 1,25.

3.5.4
design stress
σ_S
allowable stress, in megapascals, for a given application.
It is derived by dividing the MRS it by the coefficient *C*, then rouding to the next lower value in the R20 series, i.e.:

$$\sigma_S = \left[\frac{[MRS]}{C}\right]$$

3.5.5
melt-mass flow rate (MFR)
value relating to the viscosity of the molten material at a specified temperature and rate of shear, expressed in grams per 10 min (g/10 min)

3.6 Definitions related to service conditions

3.6.1
nominal pressure (PN)
numerical designation used for reference purposes related to the mechanical characteristics of the component of a piping system. For plastic piping systems conveying water it corresponds to the maximum continuous operating pressure in bar, which can be sustained with water at 20 °C, based on the minimum design coefficient

3.6.2
maximum operating pressure (MOP)
maximum effective pressure of the fluid in the piping system, expressed in bar, which is allowed in continuous use. It takes into account the physical and the mechanical characteristics of the components of a piping system

NOTE It is calculated using the following equation:

$$[MOP] = \frac{20 \times [MRS]}{C \times ([SDR] - 1)}$$

3.7 Definitions related to joints

3.7.1
electrofusion joint
joint between a PE electrofusion socket or saddle fitting and a pipe or a spigot end fitting. The electrofusion fittings are heated by the Joule effect of the heating element incorporated at their jointing surfaces, causing the material adjacent to them to melt and the pipe and fitting surfaces to fuse

3.7.2
butt fusion joint (using heated tool)
joint made by heating the planed ends the surfaces of which match by holding them against a flat heating plate until the PE material reaches fusion temperature, removing the heating plate quickly and pushing the two softened ends against one another

3.7.3
mechanical joint
joint made by assembling a PE pipe with a fitting that generally includes a compression part to provide for pressure integrity, leaktightness and resistance to end loads.

3.7.4
fusion compatibility
ability of two similar or dissimilar polyethylene materials to be fused together to form a joint which conforms to the performance requirements of this document

3.8 Definitions related to assessment of conformity

No definitions apply.

3.9 Symbols and abbreviations

3.9.1 Symbols

For the purpose of this document, the symbols given in EN 14409-1:2004 apply, together with the following:

C : overall service (design) coefficient

d_e : outside diameter (at any point)

d_{em} : mean outside diameter

$d_{em,max}$: maximum mean outside diameter

$d_{em,min}$: minimum mean outside diameter

d_{manuf} : the original circular diameter of the pipe (before folding)

e_{max} : maximum wall thickness (at any point)

T : temperature at which stress rupture data have been determined

t : time to occurrence of a leak in the pipe

t_y : wall thickness tolerance

σ_{LPL} : quantity with the dimensions of stress, which represents the 97,5 % lower confidence limit of the predicted hydrostatic strength at a temperature T and time t

σ_s : design stress

3.10 Abbreviations

DN : nominal size

LPL : lower confidence limit of the predicted hydrostatic strength

MFR : melt mass-flow rate

MOP : maximum operating pressure

MRS : minimum required strength

PE : polyethylene

R : series of preferred numbers, conforming to the Renard series

4 Pipes at the “M” stage

4.1 Materials

4.1.1 Virgin material

The virgin material used shall be one in accordance with the following designation of the PE compounds.

Designation	Classification by MRS (MPa)
PE 80	8
PE 100	10

The compound shall conform to EN 12201-1.

4.1.2 Reprocessable material and recyclable material

Own reprocessable material may be used, provided that it is derived from the same compound, as used for the relevant production.

External reprocessable material shall not be used.

Recyclable material shall not be used.

4.2 General characteristics

4.2.1 Appearance

When viewed without magnification, the internal and external surfaces of the pipe shall be smooth, clean and free from scoring, cavities and other defects which would prevent conformity to this document.

4.2.2 Colour

The pipes shall be blue or black with blue identification stripes

4.3 Material characteristics

The material from which the pipes are made shall conform to the requirements as specified in Table 1 of EN 12201-1:2003.

4.4 Geometric characteristics

The pipe diameter, wall thickness and shape in the "M" stage depend on the specific close-fit lining technique. "M" stage dimensions needed to obtain "I" stage dimensions (see 7.4), shall be declared, with their tolerances, by the manufacturer.

NOTE In the case of factory folded pipes variations in wall thickness in one cross-section can be present. This is acceptable as long as the folded pipe has the property to obtain a wall thickness in accordance with 7.4 during/after the reversion process.