INTERNATIONAL STANDARD

ISO 11297-3

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Plastics piping systems for renovation of underground drainage and sewerage networks under pressure —

Part 3: Lining with close-fit pipes

Systèmes de canalisations en plastique pour la rénovation des réseaux de branchements et de collecteurs d'assainissement enterrés sous pression —

Partie 3: Tubage par tuyau continu sans espace annulaire

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11297-3 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*.

ISO 11297 consists of the following parts, under the general title *Plastics piping systems for renovation of underground drainage and sewerage networks under pressure*:

— *Part 1: General*

— *Part 3: Lining with close-fit pipes*

Lining with continuous pipes is to form the subject of a future part 2; lining with cured-in-place pipes is to form the subject of a future part 4; lining with discrete pipes is to form the subject of a future part 5; and lining with adhesive-backed hoses is to form the subject of a future part 6.

This corrected version of ISO 11297-3:2013 incorporates the following corrections:

— Clause 2: correction of the title of EN 12201-4.

— Table 2: addition of an explanation for table footnote “a”.

Introduction

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 drainage and sewerage networks under pressure (this application);

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

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

These System Standards are distinguished from those 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 specifying requirements for plastics piping system components as manufactured.

This System Standard ISO 11297 comprises a:

— Part 1: General

and the following technique family-related parts:

— Part 2: Lining with continuous pipes

— Part 3: Lining with close-fit pipes

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

— Part 5: Lining with discrete pipes

— Part 6: Lining with adhesive-backed hoses

The requirements for any given renovation technique family are given in part 1 applied in conjunction with the relevant other part. For example, both ISO 11297-1 and this part of ISO 11297 together specify the requirements relating to lining with close-fit pipes. For complementary information, see ISO 11295. Not all technique families are pertinent to every area of application and this is reflected in the part numbers included in each System Standard.

A consistent structure of clause headings has been adopted for all parts of ISO 11297, in order to facilitate direct comparisons across renovation technique families.

Figure 1 shows the common part and clause structure and the relationship between ISO 11297 and the system standards for other application areas.

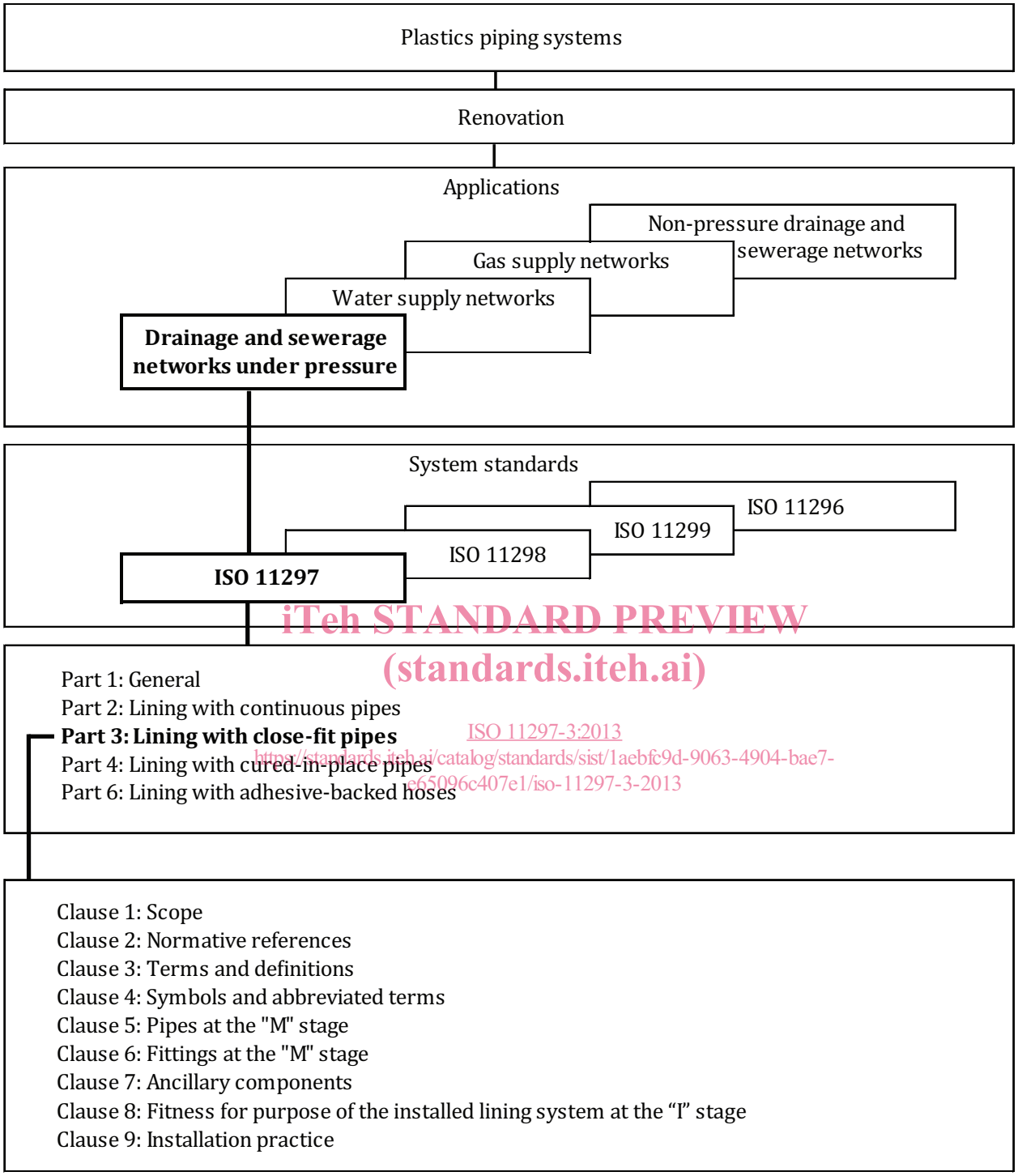

Figure 1 — Format of the renovation system standards

Plastics piping systems for renovation of underground drainage and sewerage networks under pressure —

Part 3:
Lining with close-fit pipes

1 Scope

This part of ISO 11297, in conjunction with ISO 11297-1, specifies requirements and test methods for close-fit lining systems intended to be used for the renovation of underground drainage and sewerage networks under pressure. It is applicable to pipes and fittings, as manufactured, as well as to the installed lining system. It is applicable to polyethylene (PE) pipe for both independent and interactive pressure pipe liners as well as associated fittings and joints for the construction of the lining system.

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.

ISO 3, *Preferred numbers — Series of preferred numbers*

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 4427-1:2007, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General*

ISO 4427-2, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 2: Pipes*

ISO 4427-3, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 3: Fittings*

ISO 4427-5:2007, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 5: Fitness for purpose of the system*

ISO 8772, *Plastics piping systems for non-pressure underground drainage and sewerage — Polyethylene (PE)*

ISO 9967, *Thermoplastics pipes — Determination of creep ratio*

ISO 11297-1:2013, *Plastics piping systems for renovation of underground drainage and sewerage networks under pressure — Part 1: General*

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: Electrofusion*

EN 12201-2:2011, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11297-1 and the following apply.

3.1 General

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 Techniques

No additional definitions apply.

3.3 Characteristics

3.3.1
maximum mean outside diameter
$d_{em,max}$
maximum value of the outside diameter as specified for a given nominal size

3.3.2
minimum required strength
MRS
value of σ_{LPL} rounded down to the next smaller value of the R10 series or R20 series, depending on the value of σ_{LPL}

Note 1 to entry: R10 and R20 series are the Renard number series according to ISO 3 and ISO 497.

3.3.3
melt mass-flow rate
MFR
value relating to the viscosity of the molten material at a specified temperature and rate of shear

3.4 Materials

3.4.1
crazing
microstructural phenomenon associated with the short-term application of tensile bending strain exceeding the material-related critical yield strain

3.5 Product stages

No additional definitions apply.

3.6 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

Note 1 to entry: For thermoplastics piping systems conveying water or sewage, it corresponds to the allowable operating pressure (PFA) in bar[1)], which can be sustained with water at 20 °C with a design basis of 50 years, and based on the minimum design coefficient:

$$PN = \frac{20 \times (MRS)}{C \times (SDR - 1)}$$

3.6.2
design coefficient
C
coefficient with a value greater than 1, 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

3.7 Joints

3.7.1
electrofusion joint
joint between a PE socket or saddle electrofusion fitting and a pipe or fitting with spigotted ends, made by heating the electrofusion fittings by the Joule effect of the heating element incorporated at their jointing surfaces, causing the material adjacent to them to melt and pipe and fitting surfaces to fuse

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

3.7.3
mechanical joint
joint made by assembling a PE pipe to another PE pipe or any other element of the piping system, using a fitting that generally includes a compression part to provide for pressure integrity and leaktightness and a gripping part to provide resistance to end loads

Note 1 to entry: A support sleeve inserted into the pipe bore can be used to provide a permanent support for the PE pipe to prevent creep in the pipe wall under radial compressive forces.

3.7.4
fusion compatibility
ability of two similar or dissimilar PE materials to be fused together to form a joint which conforms to the performance requirements of this part of ISO 11297

1) 1 bar =0,1 MPa = 0,1 N/mm^2 = 10^5·N/m^2.

4 Symbols and abbreviated terms

4.1 Symbols

For the purpose of this document, the symbols given in ISO 11297-1 and the following apply.

C	overall service (design) coefficient
d_e	outside diameter (at any point)
$d_{em,max}$	maximum mean outside diameter
d_{manuf}	original circular outside diameter of the pipe (before processing for insertion)
$e_{m,max}$	maximum mean wall thickness
T	temperature at which stress rupture data have been determined
t	time to occurrence of a leak in the pipe
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

4.2 Abbreviated terms

LPL	lower confidence limit of the predicted hydrostatic strength
MFR	melt mass-flow rate
MRS	minimum required strength
PE	polyethylene
R	series of preferred numbers, conforming to the Renard series

5 Pipes at the “M” stage

5.1 Materials

5.1.1 Virgin material

The virgin material used shall be in accordance with one of the PE compound designations given in Table 1.

Table 1 — PE compound designations

Designation	Classification by MRS MPa
PE 80	8
PE 100	10

The compound shall conform to ISO 4427-1.

5.1.2 Reprocessable and recyclable material

In accordance with ISO 4427-1, own reprocessable material may be used, provided that it is derived from the same compound as used for the relevant production.

Reprocessable material obtained from external sources and recyclable material shall not be used.

5.2 General characteristics

5.2.1 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 part of ISO 11297.

5.2.2 Colour

No additional requirements apply

5.3 Material characteristics

The material from which the pipes are made shall conform to the requirements specified in Tables 1 and 2 of ISO 4427-1:2007 with the exception of the requirement regarding effect on water quality.

5.4 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 8.4), 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 8.4 when installation is complete.

5.5 Mechanical characteristics

When tested in accordance with the method given in Table 2, the pipe shall conform to the requirements in the table.

Table 2 — Mechanical characteristics of pipes

Characteristic	Requirement	Test parameters Parameter, Value	Test method
Hydrostatic strength at 80°C (165 h)	ISO 4427-2 [a]		

[a] The pipe shall be reverted in the case of factory-folded pipes.

5.6 Physical characteristics

Physical characteristics shall conform to those specified in ISO 4427-2, with the exception of the requirement regarding effect on water quality.

In the case of factory-folded heat-reverted pipes, the pipe shall additionally conform to the requirement for memory ability specified in Annex A.

5.7 Jointing

Butt fusion joints shall conform to ISO 4427-2 and ISO 4427-5.

Butt fusion joints shall not be made between folded pipes prior to reversion.

NOTE The joining of circular pipes to form a string prior to site processing is considered as part of the "M"-stage.

5.8 Marking

Pipes shall be marked in accordance with ISO 11297-1:2013, 5.8.