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

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

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

*Partie 4: Tubage continu par tubes polymérisés sur place*



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 8, *Rehabilitation of pipeline systems*.

A list of all the parts in the ISO 11297 series can be found on the ISO website.

## Introduction

This document is a part of a system standard for plastics piping systems of various materials used for renovation of existing pipelines in a specified application area. System standards for renovation dealing with the following applications are either available or in preparation:

- ISO 11296: *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks*;
- ISO 11297: *Plastics piping systems for renovation of underground drainage and sewerage networks under pressure* (this document);
- ISO 11298: *Plastics piping systems for renovation of underground water supply networks*;
- ISO 11299: *Plastics piping systems for renovation of underground gas supply networks*;

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”.

Each of the system standards comprises a

- *Part 1: General*

and all applicable renovation technique family-related parts, which for drainage and sewerage networks under pressure include or potentially include the following:

- *Part 2: Lining with continuous pipes*;
- *Part 3: Lining with close-fit pipes*;
- *Part 4: Lining with cured-in-place pipes* (this document);
- *Part 5: Lining with discrete pipes*;
- *Part 6: Lining with adhesive-backed hoses*.

The requirements for any given renovation technique family are specified in ISO 11297-1, applied in conjunction with the other relevant part. For example, both ISO 11297-1 and this document together specify the requirements relating to lining with cured-in place 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 to facilitate direct comparisons across renovation technique families.

[Figure 1](#) shows the common part and clause structure and the relationship between the ISO 11297 series and system standards for other applications.

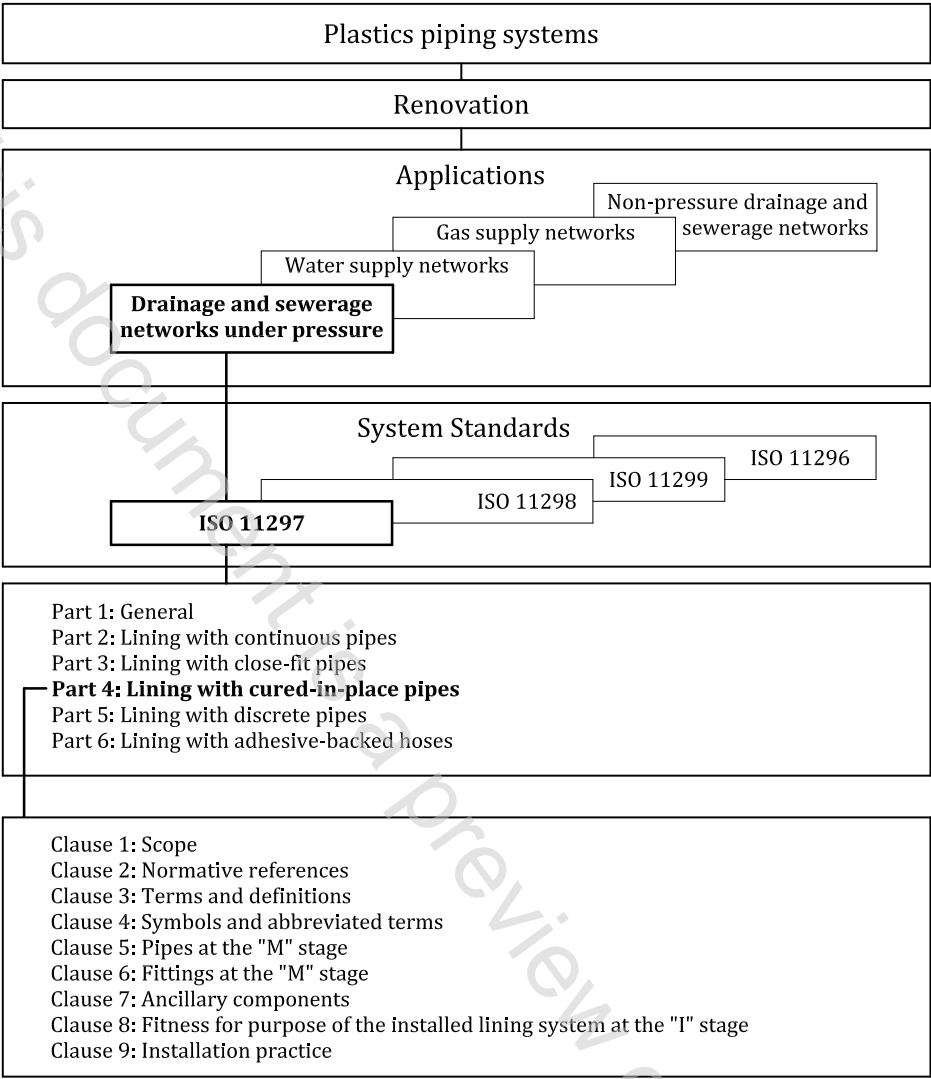


Figure 1 — Format of the renovation system standards

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

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

### 1 Scope

This document, in conjunction with ISO 11297-1 and ISO 11296-4, specifies requirements and test methods for cured-in-place pipes and fittings used for the renovation of hydraulically and pneumatically pressurized underground drainage and sewerage networks with service temperatures up to 50 °C.

It applies to independent (fully structural, class A) and interactive (semi structural, class B) pressure pipe liners, as defined in ISO 11295, which do not rely on adhesion to the existing pipeline.

It applies to the use of various thermosetting resin systems, in combination with compatible fibrous carrier materials, reinforcement, and other process-related plastics components (see [5.1](#)).

It does not include requirements or test methods for resistance to abrasion, cyclic loading or impact, which are outside the scope of this document.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 7432, *Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals*

ISO 7509, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Determination of time to failure under sustained internal pressure*

ISO 8521:2009, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Test methods for the determination of the apparent initial circumferential tensile strength*

ISO 8533, *Plastics piping systems for pressure and non-pressure drainage and sewerage — Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin — Test methods to prove the design of cemented or wrapped joints*

ISO 10467:—<sup>1)</sup>, *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 10928, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Methods for regression analysis and their use*

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*

ISO 11295:2017, *Classification and information on design and applications of plastics piping systems used for renovation and replacement*

1) To be published. (Revises ISO 10467:2004)

ISO 11296-4:2018, *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks — Part 4: Lining with cured-in-place pipes*

ISO 11297-1:2018, *Plastics piping systems for renovation of underground drainage and sewerage networks under pressure — Part 1: General*

ISO 14125:1998, *Fibre-reinforced plastic composites — Determination of flexural properties*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11297-1 and ISO 11296-4 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1 General

No additional definitions apply.

#### 3.2 Techniques

No additional definitions apply.

#### 3.3 Characteristics

##### 3.3.1

##### **projected failure pressure at 50 years**

$p_{50}$

value at 50 years derived from the pressure regression line obtained from long-term pressure tests performed in accordance with ISO 7509 and analysed in accordance with ISO 10928

[SOURCE: ISO 10467:—, 3.12.10]

##### 3.3.2

##### **minimum failure pressure at 50 years**

$p_{50,min}$

95% lower confidence level (LCL) of the failure pressure at 50 years

[SOURCE: ISO 10467:—, 3.12.7]

#### 3.4 Materials

No additional definitions apply.

#### 3.5 Product stages

No additional definitions apply.

#### 3.6 Service conditions