

First edition  
2009-11-01

Corrected version  
2010-06-01

---

---

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

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

*Systèmes de canalisations en matières plastiques pour la rénovation  
des réseaux d'assainissement gravitaires enterrés —*

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



Reference number  
ISO 11296-4:2009(E)

© ISO 2009

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2009

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword .....	v
Introduction .....	vi
1 Scope .....	1
2 Normative references .....	1
3 Terms and definitions .....	2
3.1 General terms .....	2
3.2 Techniques .....	3
4 Symbols and abbreviated terms .....	4
4.1 Symbols .....	4
4.2 Abbreviated terms .....	5
5 Pipes at the “M” stage .....	5
5.1 Materials .....	6
5.2 General characteristics .....	7
5.3 Material characteristics .....	7
5.4 Geometric characteristics .....	8
5.5 Mechanical characteristics .....	8
5.6 Physical characteristics .....	8
5.7 Jointing .....	8
5.8 Marking .....	8
6 Fittings at the “M” stage .....	8
6.1 Materials .....	8
6.2 General characteristics .....	9
6.3 Material characteristics .....	9
6.4 Geometric characteristics .....	9
6.5 Mechanical characteristics .....	10
6.6 Physical characteristics .....	10
6.7 Jointing .....	10
6.8 Marking .....	10
7 Ancillary components .....	10
8 Fitness for purpose of the installed lining system at the “I” stage .....	10
8.1 Materials .....	10
8.2 General characteristics .....	10
8.3 Material characteristics .....	11
8.4 Geometric characteristics .....	11
8.5 Mechanical characteristics .....	11
8.6 Physical characteristics .....	13
8.7 Additional characteristics .....	13
8.8 Sampling .....	13
9 Installation practice .....	14
9.1 Preparatory work .....	14
9.2 Storage, handling and transport of pipe components .....	14
9.3 Equipment .....	14
9.4 Installation .....	15
9.5 Process-related inspection and testing .....	16
9.6 Lining termination .....	16
9.7 Reconnecting to existing manholes and laterals .....	16
9.8 Final inspection and testing .....	16

<b>9.9</b>	<b>Documentation</b> .....	<b>16</b>
<b>Annex A</b>	<b>(informative) CIPP components and their functions</b> .....	<b>17</b>
<b>Annex B</b>	<b>(normative) Cured-in-place pipes — Modifications to ISO 178 for flexural testing</b> .....	<b>18</b>
<b>Annex C</b>	<b>(normative) Cured-in-place pipes — Test method for the determination of long-term flexural modulus under wet conditions</b> .....	<b>25</b>
<b>Annex D</b>	<b>(normative) Cured-in-place pipes — Determination of the creep factor under dry conditions from a three-point flexural test</b> .....	<b>29</b>
	<b>Bibliography</b> .....	<b>32</b>

This document is a preview generated by EVS

## 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 11296-4 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*.

ISO 11296 consists of the following parts, under the general title *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks*:

- *Part 1: General*
- *Part 3: Lining with close-fit pipes*
- *Part 4: Lining with cured-in-place pipes*

Lining with continuous pipes is to form the subject of a part 2, lining with discrete pipes is to form the subject of a part 5 and lining with spirally-wound pipes is to form the subject of a part 7.

This corrected version of ISO 11296-4:2009 incorporates the replacement of “ISO 178” with “ISO 178 as modified by Annex B” in the fourth row and fifth column of Table 5.

## Introduction

The System Standard, of which this is part 4, specifies the requirements for plastics piping systems of various materials used for renovation of existing pipelines in a specified application area. System Standards for renovation specify procedures for the following applications:

- 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;
- 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 because they set requirements for certain characteristics in the as-installed condition, after site processing. This is in addition to specifying requirements for plastics piping system components, as manufactured.

Each of the System Standards comprises a part 1 (general) and all applicable renovation technique family-related parts from the following:

- 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 7: lining with spirally-wound pipes.

The requirements for any given renovation technique family are given in part 1, applied in conjunction with the other relevant part. For example, parts 1 and 2 specify the requirements relating to lining with continuous pipes. For complementary information, see ISO 11295. Not all technique families are applicable 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 gives the common structure and the relationship between ISO 11296 and the System Standards for other application areas.

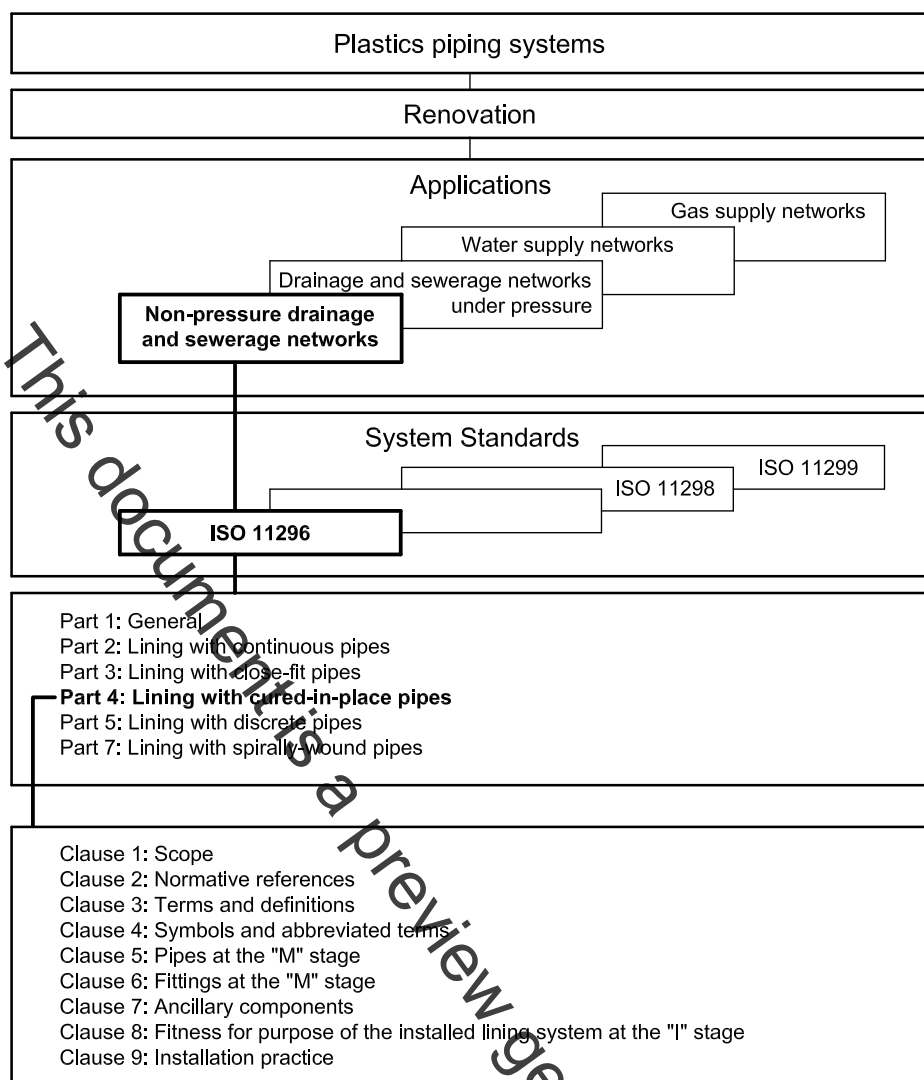


Figure 1 — Format of the renovation System Standards

This document is a preview generated by EVS



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

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

### 1 Scope

This part of ISO 11296, in conjunction with ISO 11296-1, specifies requirements and test methods for cured-in-place pipes and fittings used for the renovation of underground non-pressure drainage and sewerage networks.

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

### 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.

ISO 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite*

ISO 178:2001, *Plastics — Determination of flexural properties*

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

ISO 899-2:2003, *Plastics — Determination of creep behaviour — Part 2: Flexural creep by three-point loading*

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

ISO 4435, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U)*

ISO 7684, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Determination of the creep factor under dry conditions*

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

ISO 8513, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Determination of longitudinal tensile properties*

ISO 8773, *Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP)*

ISO 10928<sup>1)</sup>, *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 11296-1:—<sup>2)</sup>, *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks — Part 1: General*

ISO 13002, *Carbon fibre — Designation system for filament yarns*

ISO 25780:—<sup>3)</sup>, *Plastics piping systems for pressure and non-pressure water supply, irrigation, drainage or sewerage — Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin — Pipes with flexible joints intended to be installed using jacking techniques*

EN 14364:2006, *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*

### 3 Terms and definitions

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

#### 3.1 General terms

##### 3.1.1

##### **carrier material**

porous component of the liner, which carries the liquid resin system during insertion into the pipe being renovated and forms part of the installed lining system once the resin has been cured

##### 3.1.2

##### **CIPP product**

##### **cured-in-place pipe product**

cured-in-place pipe of a particular design, produced from a liner of specified materials, with a wall structure which is uniquely defined for each diameter/wall thickness combination, and which is impregnated with a specific resin system and installed by a specific process

##### 3.1.3

##### **CIPP unit**

specific cured-in-place pipe produced from a continuous liner, which has been impregnated in one process and installed as a single length

##### 3.1.4

##### **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

##### 3.1.5

##### **composite**

combination of cured resin system, carrier material and/or reinforcement, excluding any internal or external membranes or any layer of excess neat resin

---

1) To be published.

2) To be published.

3) To be published.