International Standard

ISO 11300-2

First edition
2026-10

Piping systems for rehabilitation of underground drains, sewers and water supply networks —

Part 2: Thermoset composite materials

Systèmes de canalisations pour la réhabilitation des branchements, des collecteurs d'assainissement et des réseaux d'alimentation en eau enterrés —

Partie 2: Matériaux composites thermodurcissables

Reference number
ISO 11300-2:2026(en)

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ISO copyright office
CP 401 • CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword ..... **v**
Introduction ..... **vii**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
3.1 General terms 3
3.2 Terms related to techniques 3
3.3 Terms related to characteristics 5
3.4 Terms related to product stages 7
3.5 Terms related to materials 8
3.6 Terms related to service conditions 9
4 Symbols and abbreviated terms **9**
4.1 Symbols 9
4.2 Abbreviated terms 12
5 Pipes **12**
5.1 Materials 12
5.2 General characteristics 14
5.3 Material characteristics 15
5.3.1 Resin system 15
5.3.2 Special requirements for formulation of components in contact with drinking water 15
5.4 Geometric characteristics 15
5.4.1 General 15
5.4.2 Wall thickness at the “M” stage 16
5.4.3 Wall thickness at the “I” stage 16
5.4.4 CIPP wall structure at the “I” stage 16
5.5 Mechanical characteristics 17
5.5.1 General 17
5.5.2 Reference conditions for testing 17
5.5.3 Test requirements 17
5.6 Physical characteristics 21
5.7 Additional characteristics 21
5.8 Sampling 22
5.8.1 General 22
5.8.2 Non-pressure drains and sewers 22
5.9 Jointing 23
5.10 Marking 23
6 Fittings **23**
6.1 General 23
6.2 General characteristics 24
6.3 Material characteristics 24
6.4 Geometric characteristics 24
6.5 Mechanical characteristics 25
6.6 Physical characteristics 25
6.7 Jointing 26
6.8 Marking 26
7 Ancillary components **26**
8 Fitness for purpose **26**
8.1 Materials 26
8.2 General characteristics 27
8.3 Geometric characteristics 27
8.4 Mechanical characteristics 28

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8.5 Additional characteristics ... 28
8.6 Sampling ... 29
8.7 Regional requirements for the CIPP lining system ... 29

9 Installation practice ... 29
9.1 Preparatory work ... 29
9.2 Storage, handling and transport of lining tube components ... 29
9.3 Equipment ... 29
9.3.1 General ... 29
9.3.2 Technique-specific equipment ... 29
9.4 Installation ... 30
9.4.1 General ... 30
9.4.2 Environmental precautions ... 31
9.4.3 Safety precautions ... 31
9.4.4 Installation procedures ... 31
9.4.5 Simulated installations ... 32
9.5 Process-related inspection and testing ... 32
9.6 Lining process termination ... 32
9.7 Reconnection to the existing pipeline system ... 32
9.7.1 General ... 32
9.7.2 Non-pressure networks ... 33
9.7.3 Pressure networks ... 33
9.8 Final inspection and testing ... 33
9.9 Documentation ... 33

Annex A (informative) **CIPP liner components and their functions ... 34**

Annex B (normative) **Cured-in-place pipes — Determination of short-term flexural properties ... 35**

Annex C (normative) **Cured-in-place pipes — Determination of long-term flexural modulus under dry or wet conditions ... 46**

Annex D (normative) **Cured-in-place pipes — Determination of long-term flexural strength under dry, wet or acidic conditions (stress corrosion test) ... 50**

Annex E (informative) **Summary of required elements to be included in installation manuals ... 54**

Bibliography ... 56

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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).

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For an explanation of 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 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,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 11300-2, along with ISO 11300-1:2026, ISO 11300-3:2026 and ISO/DIS 11300-4, cancels and replaces ISO 11296-1:2018, ISO 11296-4:2018, ISO 11296-4:2018/Amd 1:2021, ISO 11297-1:2018, ISO 11297-4:2018, ISO 11298-1:2018 and ISO 11298-4:2021, which have been technically revised.

The main changes are as follows:

— for piping systems made from thermoset composite materials, this document replaces the related content, including requirements, of the documents listed above;

— definitions in Clause 3 have been amended and new definitions have been added;

— a new material classification of thermoplastics membranes has been added (see Table 1);

— the material classification of resin systems has been expanded (see Table 2);

— additional requirements for declaration of short-term mechanical characteristics have been included (see Table 5);

— the classification of lateral connections has been extended (new class D connection added in Table 8 and Figure 6);

— in Annex B all references to ISO 178 have been removed and replaced by references to ISO 14125 only;

— in B.5.4, the procedure for determining apparent flexural modulus of curved samples has been amended and the formula for associated curvature correction factor modified to take account of large, geometry-changing deformations of the test pieces and friction at the supports. The previous curvature correction factor for stress has been deleted;

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— in B.5.5, the correction for curvature of the apparent section bending modulus has been similarly updated.

A list of all parts in the ISO 11300 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document is a part of a series of International Standards concerning piping systems of various materials used for the rehabilitation of existing pipelines in a specified application area. System Standards for rehabilitation deal with the following applications:

— ISO 11300 series: *Piping systems for rehabilitation of underground drains, sewers and water supply networks*;

— ISO 11301 series: *Piping systems for rehabilitation of underground gas supply networks*.

The ISO 11300 and ISO 11301 series are subdivided into parts each covering a specific material or class of material of the piping system.

ISO 11300 series is subdivided into four parts:

— Part 1: Polyethylene (PE) material;

— Part 2: Thermoset composite materials (this document);

— Part 3: PVC-U material;

— Part 4: Thermoplastic composite materials.

These documents cover various techniques for renovation and trenchless replacement. Furthermore, they 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 piping system components "as manufactured".

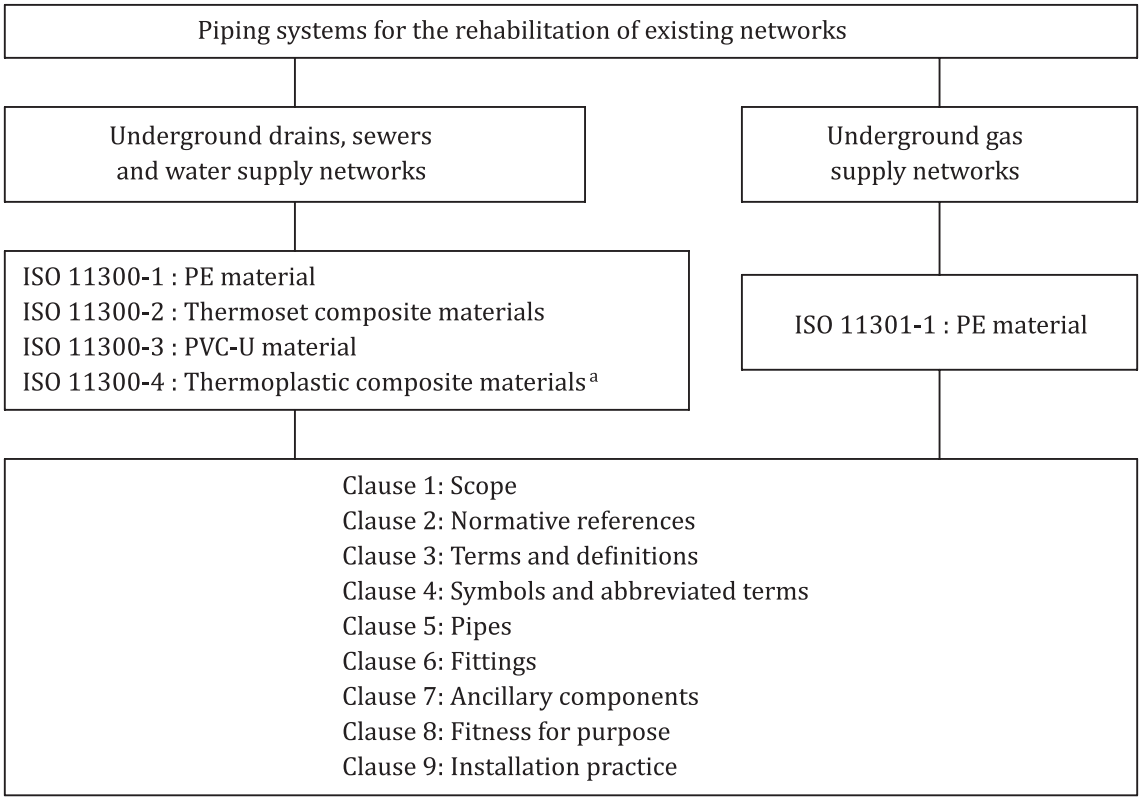
A consistent structure of clause headings has been adopted for all parts of the ISO 11300 series and the ISO 11301 series, in order to facilitate direct comparisons across rehabilitation technique families.

Figure 1 shows the clause structure and the relationship between the ISO 11300 series and the ISO 11301 series.

For complementary information, see ISO 11295.

For assessment of conformity to the requirements of this document, see ISO/TS 23818-2.

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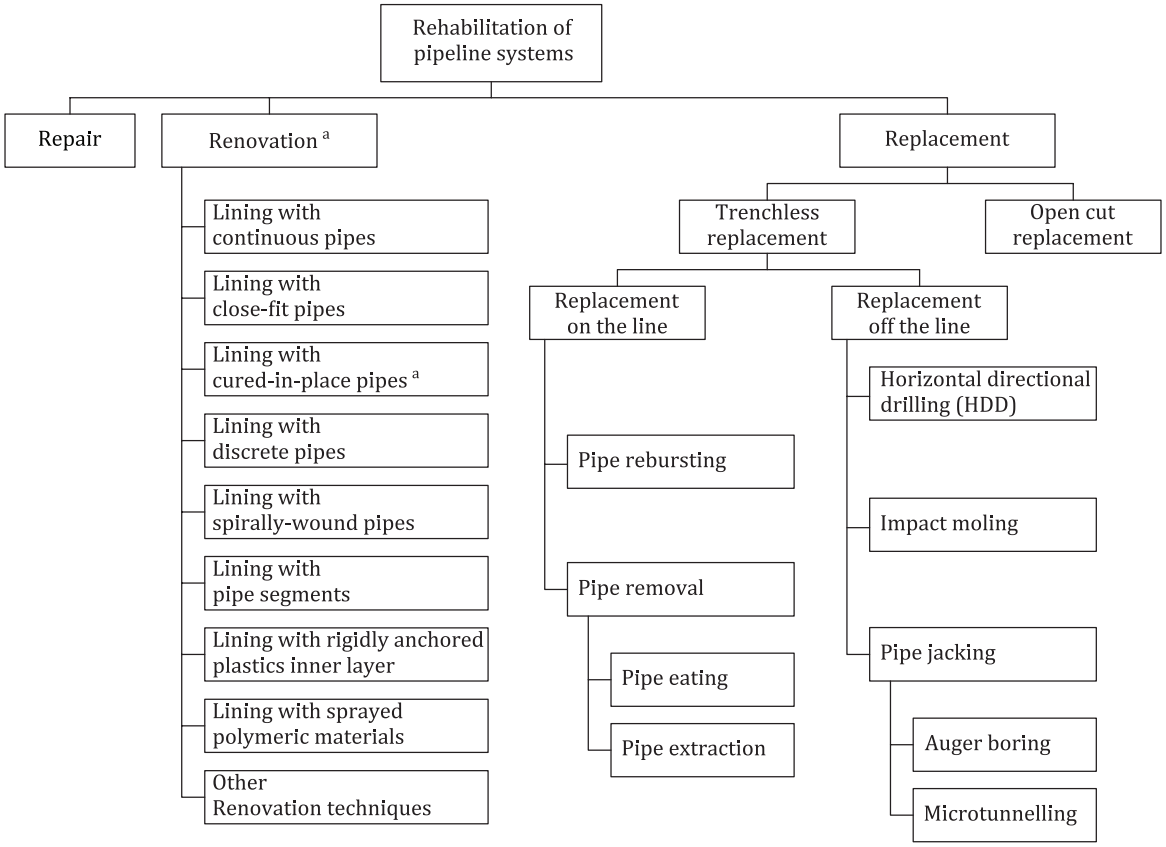


[a] In preparation.

Figure 1 — Clause structure of the ISO 11300 series and the ISO 11301 series

The various techniques for rehabilitation of underground drains and sewers and water supply networks, within the scope of pipeline rehabilitation techniques generally, are shown schematically in Figure 2. For definitions of standardized renovation and replacement techniques shown in Figure 2, but outside the scope of this document, see ISO 11295.

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a This document is applicable, for piping systems made from thermoset composite materials.

Figure 2 — Technique families for renovation of underground drains, sewers and water supply networks using plastics pipes, within the scope of pipeline rehabilitation techniques

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Piping systems for rehabilitation of underground drains, sewers and water supply networks —

Part 2: Thermoset composite materials

1 Scope

This document specifies requirements and test methods for pipes and fittings which are part of piping systems for the rehabilitation of underground non-pressure and pressure drains and sewers, and of water supply networks which transport water intended for human consumption, including raw water intake pipelines.

This document is applicable to the renovation technique family "lining with cured-in-place pipes (CIPP)". It is not applicable to lining with discrete pipes or lining with pipe segments using glass-reinforced thermosetting plastics (GRP) material, as defined by ISO 11295.

It is not applicable to short lengths of CIPP used for patch repair only of local pipe defects.

It applies to the use of thermoset composite materials with various thermosetting resin systems, in combination with compatible fibrous carrier materials, reinforcement, and thermoplastics membranes (see 5.1).

It is applicable to pipes and fittings, as manufactured, as well as to the installed system. It applies for service temperatures up to 50 °C for drains and sewers and up to 25 °C for water supply networks.

For pressurised networks, this document 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 does not include requirements or test methods for resistance to abrasion, jetting, 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 75-2:2013, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite*

ISO 899-2:2024, *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 4633, *Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials*

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*

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

ISO 7685:2026, *Glass-reinforced thermosetting plastics (GRP) pipes — Determination of initial ring stiffness*

ISO 8513:2023, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Test methods for the determination of the initial longitudinal tensile strength*

ISO 8521:2020, *Glass-reinforced thermosetting plastic (GRP) pipes — Test methods for the determination of the initial circumferential tensile wall strength*

ISO 8533, *Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods to prove the design of cemented or wrapped joints*

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

ISO 10468:2023, *Glass-reinforced thermosetting plastics (GRP) pipes — Determination of the ring creep properties under wet or dry conditions*

ISO 10928:2024, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Methods for regression analysis and their use*

ISO 10952, *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 11295:2026, *Plastics piping systems used for the rehabilitation of pipelines — Classification and overview of strategic, tactical and operational activities*

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

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

ISO 23856:2021, *Plastics piping systems for pressure and non-pressure water supply, drainage or sewerage — Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin*

EN 681-1, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 681-2, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

EN 681-3, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 3: Cellular materials of vulcanized rubber*

EN 681-4, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 4: Cast polyurethane sealing elements*

EN 1610:2015, *Construction and testing of drains and sewers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11295 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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3.1 General terms

3.1.1
characteristic
property, dimension or other feature of a material or component

[SOURCE: ISO 11300-1:2026, 3.1.1]

3.1.2
declared value
limiting value of a *characteristic* (3.1.1) declared in advance by the *rehabilitation system supplier* (3.1.3) supplier, which becomes the requirement for the purposes of assessment of conformity

[SOURCE: ISO 11300-1:2026, 3.1.2]

3.1.3
rehabilitation system supplier
entity that specifies the field and range of application and brings together the components of a rehabilitation system to meet the requirements of the product standard at the *"M" stage* (3.4.1), so that when installed in accordance with the installation manual they meet the requirements of the product standard at the *"I" stage* (3.4.2)

[SOURCE: ISO 11300-1:2026, 3.1.5]

3.1.4
system installer
entity that prepares the host pipe, takes the rehabilitation system at the *"M" stage* (3.4.1) and installs it so that it is at the *"I" stage* (3.4.2)

[SOURCE: ISO 11300-1:2026, 3.1.6]

3.1.5
type testing
testing performed to prove that a material, component, joint or assembly is capable of conforming to the requirements given in the applicable standard

[SOURCE: ISO 11300-1:2026, 3.1.7]

3.2 Terms related to techniques

3.2.1
inversion
process of turning a flexible tube or hose inside out by the use of fluid (water or air) pressure

3.2.2
inverted-in-place insertion
method whereby the *lining tube* (3.2.11) is installed by *inversion* (3.2.1) to achieve simultaneous insertion and inflation

3.2.3
inflation
process of expanding a *lining tube* (3.2.11) to achieve a *close fit* (3.2.5) to the existing pipeline by the use of fluid (water or air) pressure

3.2.4
winched-in-place insertion
method whereby the flat *lining tube* (3.2.11) is first pulled into the pipe to be lined and then inflated to bring it up to size

Note 1 to entry: With some techniques, *inflation* (3.2.3) is achieved by *inversion* (3.2.1) through the pulled-in *lining tube* (3.2.11) of a separate impregnated tube or dry tube or hose. Hoses can either be withdrawn after resin cure or left in place as a permanent or semi-permanent internal membrane.

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3.2.5
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

[SOURCE: ISO 11300-1:2026, 3.2.1]

3.2.6
CIPP liner
cured-in-place pipe liner
lining tube (3.2.11) after installation and resin cure

3.2.7
CIPP lining system
lining tube (3.2.11) and all relevant fittings for insertion into an existing pipeline for the purposes of renovation

3.2.8
CIPP product
cured-in-place pipe product
cured-in-place pipe liner (3.2.6) of a particular design, produced from a *lining tube* (3.2.11) 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* (3.5.6) and installed by a specific process

3.2.9
composite design thickness
$e_{c,d}$
required wall thickness of the *composite* (3.5.3), excluding any *abrasion layer* (3.5.1), as determined by structural design

Note 1 to entry: in practice for multi-layer composites $e_{c,d}$ can be calculated as the design value of the thickness e_{psl} of the *primary structural layer* (3.5.7), to which the thicknesses of any internal and external *resin-rich layers* (3.5.8), excluding any abrasion layer, are then added.

3.2.10
lateral connection collar
fitting for reconnecting a lined main pipe to an existing or renovated lateral pipe

3.2.11
lining tube
flexible tube, consisting of *resin system* (3.5.6), *carrier material* (3.5.2) and either *reinforcement* (3.5.5) or membranes or both, as combined prior to insertion in the pipe to be lined

3.2.12
permanent membrane
internal or external membrane designed to retain its integrity through the processes of transportation and storage, *lining tube* (3.2.11) insertion and *resin system* (3.5.6) cure, and to provide functions for the operational life of the *cured-in-place pipe liner* (3.2.6)

3.2.13
semi-permanent membrane
internal or external membrane designed to provide protection during transportation and storage and to remain functional through the processes of *lining tube* (3.2.11) insertion and *resin system* (3.5.6) cure, but not relied on to retain its integrity at the “I” stage

3.2.14
temporary membrane
membrane forming the internal or external surface of the *lining tube* (3.2.11) for the purposes of protection during transportation and storage and with process-related functions only during installation

Note 1 to entry: Internal temporary membranes are removed during or after the installation.

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3.2.15
preliner
permanent or semi-permanent external membrane which is installed separately before the insertion of the *lining tube* (3.2.11)

3.2.16
nominal CIPP "M" stage wall thickness
nominal cured-in-place pipe "M" stage wall thickness
$e_{n,M}$
one of a range of discrete wall thicknesses of the dry fibre components of the *lining tube* (3.2.11) dictated by the sum of the thicknesses of the individual layers of *carrier material* (3.5.2) and *reinforcement* (3.5.5) used for tube construction at the "M" stage, prior to their impregnation with the *resin system* (3.5.6) and excluding any internal or external membranes

Note 1 to entry: Applicable only where dry tube manufacture and resin impregnation undertaken as separate processes.

3.2.17
nominal CIPP "I" stage wall thickness
nominal cured-in-place pipe "I" stage wall thickness
$e_{n,I}$
one of a range of discrete *CIPP liner* (3.2.6) wall thicknesses at the "I" stage, dictated by the sum of the thicknesses of the individual layers of materials used for *lining tube* (3.2.11) construction, excluding any internal or external membranes

3.3 Terms related to characteristics

3.3.1
nominal outside diameter
d_n
outside diameter of *cured-in-place pipe liner* (3.2.6) specified as the inside diameter of the pipe to be lined

3.3.2
mean diameter
d_m
diameter of the circle corresponding to the middle of the pipe wall cross-section

Note 1 to entry: In the case of a *cured-in-place pipe liner* (3.2.6), measured to mid-thickness of the *composite* (3.5.3)

[SOURCE: ISO 23856:2021, 3.3 — modified]

3.3.3
wall thickness
e
value of the measurement of the wall thickness at any point around the circumference of a component

[SOURCE: ISO 11300-1:2026, 3.3.6]

3.3.4
mean wall thickness
e_m
arithmetic mean of a number of measurements of the wall thickness regularly spaced around the circumference and in the same cross-section of a component, including the measured minimum and the measured maximum values of the wall thickness in that cross-section

[SOURCE: ISO 11300-1:2026, 3.3.7]

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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 (mm)

[SOURCE: ISO 11300-1: 2026, 3.3.9 — modified by removal of Note 1 to entry which is not relevant to this document]

3.3.6
total thickness
e_{tot}
thickness of *cured-in-place pipe liner* (3.2.6) comprising the *composite* (3.5.3) and any *semi-permanent* (3.2.13) and *permanent membranes* (3.2.12)

3.3.7
composite thickness
e_c
thickness of *composite* (3.5.3) at the *"I" stage* (3.4.2).

3.3.8
LCL
lower confidence limit
lower fractile of distribution of test results

3.3.9
first break
first major discontinuity of the stress-strain curve characterized by a sudden drop in stress associated with local failure of the *composite* (3.5.3)

Note 1 to entry: It is also generally accompanied by an audible crack.

3.3.10
ring stiffness
measure of the resistance per unit length of a pipe to diametric deflection in response to external loading applied along one longitudinal diametric plane, as defined by the formula:

$$S = \frac{E_S \cdot I}{d_m^3}$$

where

E_S is the apparent modulus of elasticity as determined in a ring stiffness test

d_m is the mean diameter of the pipe (see 3.3.5)

I is the second moment of area of the pipe wall per unit length, i.e.:

$$I = \frac{e^3}{12}$$

where e is the wall thickness (in this document *composite thickness* e_c (3.3.7))

Note 1 to entry: This definition applies to both long and short-term values.

[SOURCE: ISO 23856:2021, 3.17.3 — modified by designating composite thickness as the relevant wall thickness]

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3.3.11
initial ring stiffness
S_0
value of *ring stiffness* (3.3.10) obtained when determined in accordance with ISO 7685

[SOURCE: ISO 23856:2021, 3.17.1 — modified, Note 1 to entry omitted]

3.3.12
long-term creep ring stiffness
S_x
value of *ring stiffness* (3.3.10) at *x* years, determined in accordance with ISO 10468

[SOURCE: ISO 23856:2021, 3.17.2 — modified, different symbol and Note 1 to entry omitted]

3.3.13
long-term flexural modulus
E_x
value representing the projected long-term creep behaviour of the *composite* (3.5.3) in bending, expressed as an applied stress divided by extrapolated long-term strain after elapsed time of *x* years

3.3.14
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 23856:2021, 3.12.10]

3.3.15
minimum long-term failure pressure
least value for long-term burst failure pressure, which is evaluated in accordance with the procedures described in ISO 10928 and includes a factor of safety, FS_{min}

Note 1 to entry: This term is expressed using the symbol $p_{x,min}$, where *x* denotes the elapsed time in years at which the long-term failure pressure is determined (see 4.1).

[SOURCE: ISO 23856:2021, 3.12.5 — modified Note to entry.]

3.4 Terms related to product stages

3.4.1
“M” stage
stage as manufactured, before any subsequent site processing of components associated with the particular renovation technique

Note 1 to entry: For pipes and fittings at the “M” stage, see Clause 5 and Clause 6, respectively.

[SOURCE: ISO 11300-1:2026, 3.4.1]

3.4.2
“I” stage
stage as installed, i.e. in final configuration after any site processing of components associated with the particular renovation technique

Note 1 to entry: For pipes and fittings at the “I” stage, see Clause 8.

[SOURCE: ISO 11300-1:2026, 3.4.2]

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3.5 Terms related to materials

3.5.1
abrasion layer
inner layer of *composite* (3.5.3) of declared thickness or internal membrane provided as a sacrificial layer for abrasion of the *cured-in-place pipe liner* (3.2.6) in service

Note 1 to entry: Where the abrasion layer is part of the composite, its thickness is expressed using the symbol $e_{c,a}$ (see 4.1).

3.5.2
carrier material
porous component of the *lining tube* (3.2.11), which carries the liquid *resin system* (3.5.6) during insertion into the pipe being renovated and forms part of the *cured-in-place pipe liner* (3.2.6) once the resin has been cured

3.5.3
composite
combination of cured *resin system* (3.5.6), *carrier material* (3.5.2) and any *reinforcement* (3.5.5), excluding any internal or external membranes

Note 1 to entry: Cured resin not wholly contained within the carrier material or any separate reinforcement layer is nevertheless part of the composite.

3.5.4
curing
process of resin polymerization, which can occur at ambient temperature or be initiated or accelerated by the use of heat or exposure to light

3.5.5
reinforcement
fibres incorporated in the *lining tube* (3.2.11) which enhance its dimensional stability and the structural properties of the *cured-in-place pipe liner* (3.2.6)

Note 1 to entry: The reinforcement can be incorporated in the *carrier material* (3.5.2), constitute the carrier material, or can be a separate layer.

3.5.6
resin system
thermosetting resin including either the *curing* (3.5.4) agent(s) or initiators, or both and any fillers or other additives in specified proportions

3.5.7
primary structural layer
composite excluding any internal or external *resin-rich layers* (3.5.8)

3.5.8
resin-rich layer
surface layer of *composite* (3.5.3) comprising resin with or without non-reinforcing fabric veil provided for protection of reinforcing fibres in the *primary structural layer* (3.5.7)

Note 1 to entry: A resin-rich layer forming the internal surface of a *cured-in-place pipe liner* (3.2.6) can comprise or include an *abrasion layer* (3.5.1).

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3.6 Terms related to service conditions

3.6.1
PN
nominal pressure
alphanumeric designation for a pressure, which is the maximum sustained hydraulic internal pressure for which a pipe is designed in the absence of other loading conditions than internal pressure

Note 1 to entry: Nominal pressure is expressed in bars (1 bar = 0,1 MPa = 0,1 N/mm^2 = $10^5 \cdot N/m^2$).

Note 2 to entry: The designation for reference or marking purposes consists of the letters PN plus a number.

[SOURCE: ISO 23856:2021, 3.12.2, modified by addition of Note 1 to entry.]

3.6.2
allowable operating pressure
PFA
maximum internal hydrostatic pressure that a component is capable of withstanding continuously in service,

Note 1 to entry: It is expressed in bars (1 bar = 0,1 MPa = 0,1 N/mm^2 = $10^5 \cdot N/m^2$).

Note 2 to entry: It includes a safety factor, see Table 6.

[SOURCE: ISO 11295:2026, 3.3.2, modified by addition of Note 2 to entry.]

3.6.3
surge
rapid fluctuations of pressure, either positive or negative, caused by flow alterations over short periods of time e.g. due to the switching on or off of pumps or the opening or closing of valves

[SOURCE: ISO 11300-1:2026, 3.6.4]

3.6.4
service temperature
maximum sustained temperature at which a system is expected to operate

Note 1 to entry: Service temperature is expressed in degrees Celsius (°C)

4 Symbols and abbreviated terms

4.1 Symbols

b width of test piece

C_E correction factor on 3-point flexural modulus for curvature of test piece

d_m mean diameter of pipe sample at mid-thickness of the composite (= $2R_2$)

d_n nominal outside diameter

$E_{f,0}$ short-term flexural modulus

$E_{f,0}I$ section bending stiffness

E_c apparent flexural modulus of curved 3-point bend test piece, before correction for curvature

E_cI apparent section bending stiffness

E_f flexural modulus as determined in a 3-point bend test of an initially flat test piece

E_x long-term flexural modulus at x years

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