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ISO 11299-1

Second edition
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Plastics piping systems for renovation of underground gas supply networks —

Part 1: General

Systèmes de canalisations en plastique pour la rénovation des réseaux enterrés de distribution de gaz —

Partie 1: Généralités

Reference number
ISO 11299-1:2018(E)

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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).

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).

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.

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*.

This second edition cancels and replaces the first edition (ISO 11299-1:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

Clauses 2, 3.1, 3.2, 3.3, 4.2, and 8.9, and Figures 1 and 2 have been technically revised.

A list of all parts in the ISO 11299 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.

Introduction

This document is a part of a System Standard for plastics piping systems of various materials used for the renovation of existing pipelines in a specified application area. System Standards for renovation deal with the following applications:

— 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;*

— ISO 11298, *Plastics piping systems for renovation of underground water supply networks;*

— ISO 11299, *Plastics piping systems for renovation of underground gas supply networks* (this series of standards).

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".

Each of the System Standards comprises a:

— *Part 1: General* (this document)

and all applicable renovation technique family-related parts, which for gas supply networks 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*;

— *Part 6: Lining with adhesive-backed hoses*;

— *Part 11: Lining with inserted hoses.*

The requirements for any given renovation technique family are specified in Part 1, applied in conjunction with the relevant other part. For example, this document and ISO 11299-3 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 11299, in order to facilitate direct comparisons across renovation technique families.

Figure 1 shows the common part and clause structure and the relationship between ISO 11299 and the System Standards for other application areas.

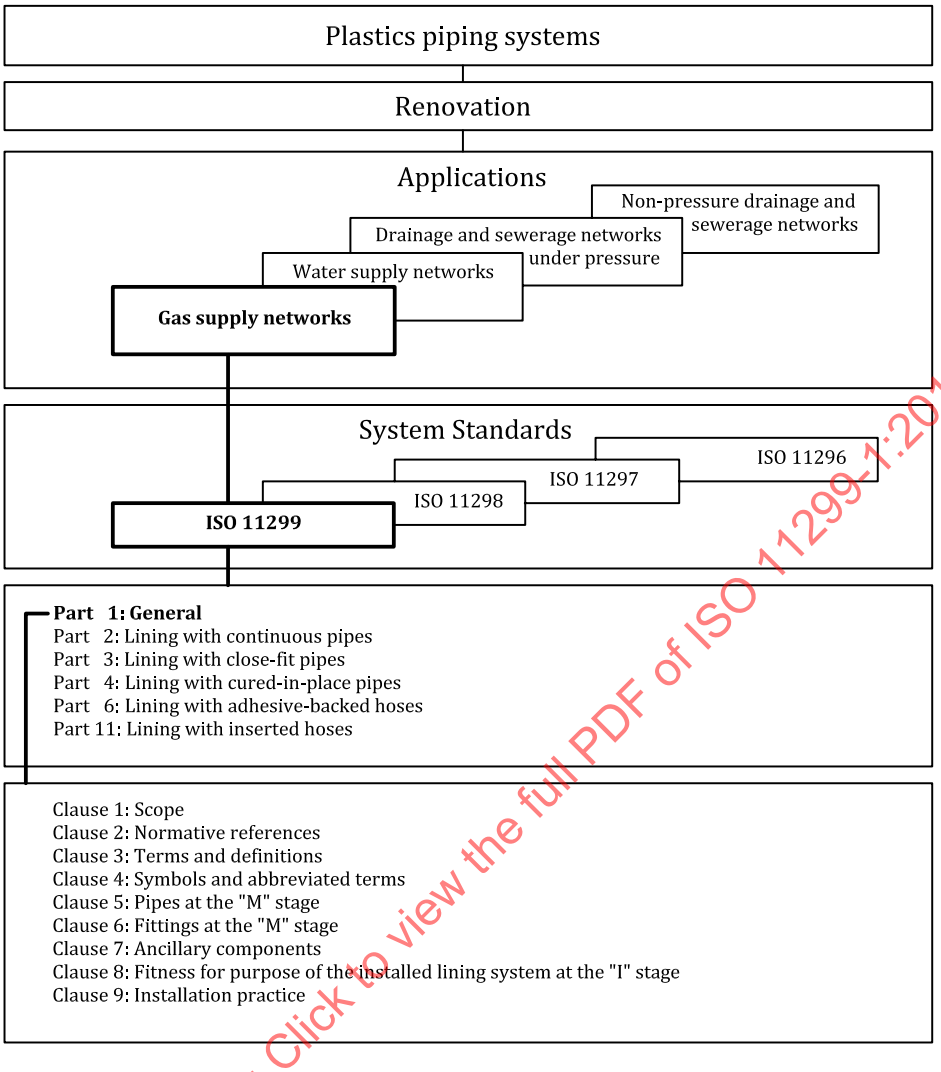


Figure 1 — Format of the Renovation System Standards

Plastics piping systems for renovation of underground gas supply networks —

Part 1: General

1 Scope

This document specifies the requirements and test methods for plastics piping systems intended to be used for the renovation of underground gas supply networks. It is applicable to pipes and fittings, as manufactured, as well as to the installed lining system. It is not applicable to the existing pipeline or any sprayed coatings or annular filler.

This document gives the general requirements common to all relevant renovation techniques.

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 16010, *Elastomeric seals — Material requirements for seals used in pipes and fittings carrying gaseous fuels and hydrocarbon fluids*

EN 682, *Elastomeric seals — Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids*

EN 12007-1, *Gas infrastructure — Pipelines for maximum operating pressure up to and including 16 bar — General requirements*

EN 12007-2, *Gas Infrastructure — Pipelines for maximum operating pressure up to and including 16 bar — Specific functional requirements for polyethylene (MOP up to and including 10 bar)*

EN 12007-4, *Gas infrastructure — Pipelines for maximum operating pressure up to and including 16 bar — specific functional requirements for renovation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

3.1.1
pipeline system
interconnecting pipe network for the conveyance of fluids

3.1.2
rehabilitation
measures for restoring or upgrading the performance of existing systems, including renovation, repair and replacement

3.1.3
renovation
work incorporating all or part of the original fabric of the pipeline, by means of which its current performance is improved

3.1.4
replacement
construction of a new pipeline, on or off the line of an existing pipeline, where the function of the new pipeline system incorporates that of the old

3.1.5
maintenance
routine work undertaken to ensure the existing performance of an asset

3.1.6
repair
rectification of local damage

3.1.7
lining pipe
pipe inserted for renovation purposes

3.1.8
liner
lining pipe after installation

3.1.9
lining system
lining pipe and all relevant fittings for insertion into an existing pipeline for the purposes of renovation

3.1.10
renovated pipeline system
existing pipeline system plus the installed lining system used to renovate it, as well as any grout or other annular filling material used

3.1.11
characteristic
property, dimension or other feature of a material or component

3.1.12
declared value
limiting value of a characteristic declared in advance by the lining system supplier, which becomes the requirement for the purposes of assessment of conformity

3.1.13
annular filler
material for grouting annular space between existing pipeline and lining system

3.1.14
grouting
process of filling voids around the lining system

3.1.15
system test pressure
STP
hydrostatic and/or gas pressure applied to the installed pipeline system in order to ensure its integrity and leaktightness

3.1.16
simulated installation
installation of a lining system into a simulated host pipeline, using representative equipment and processes, to provide samples for testing which are representative of an actual installation

3.1.17
simulated host pipeline
section of pipeline, which is not part of an operational network, but which replicates the environment of an operational network

3.1.18
technique family
group of renovation techniques which are considered to have common characteristics for standardization purposes

3.1.19
independent pressure pipe liner
liner capable on its own of resisting without failure all applicable internal loads throughout its design life

3.1.20
interactive pressure pipe liner
liner which relies on the existing pipeline for some measure of radial support in order to resist without failure all applicable internal loads throughout its design life

3.1.21
fully structural renovation
use of an independent pressure pipe liner, which is capable of resisting all external loads irrespective of the condition of the existing pipeline

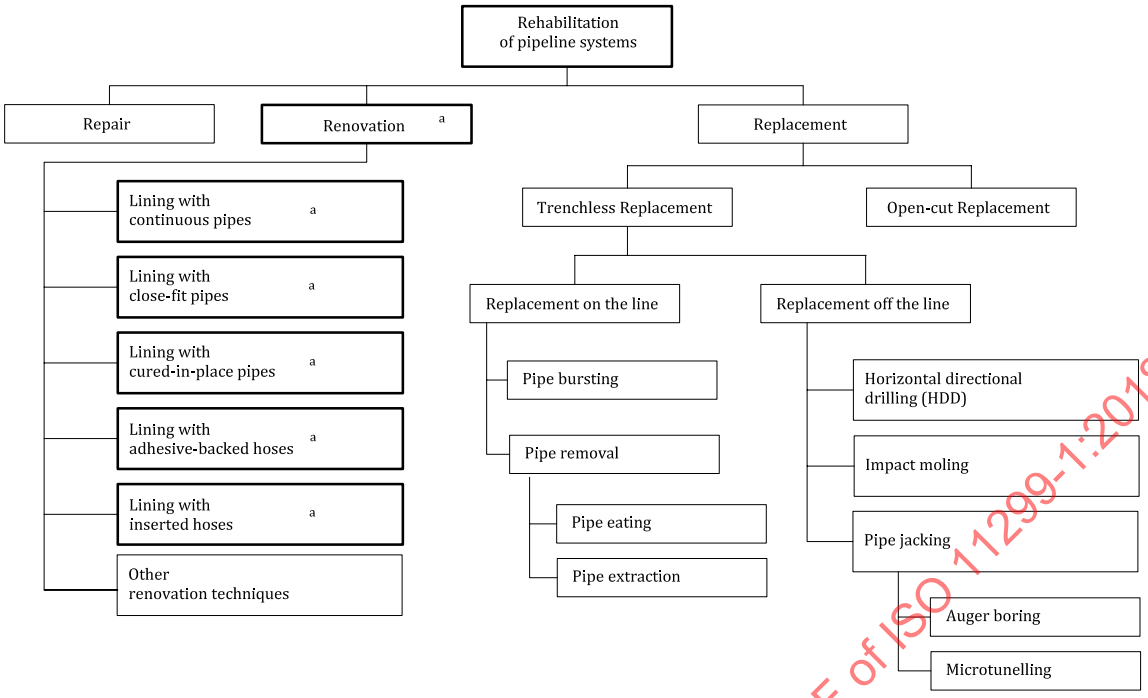
3.1.22
semi-structural renovation
use of an interactive pressure pipe liner which is capable of long-term hole and gap spanning at operational pressure

3.1.23
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

3.1.24
closed-circuit television
CCTV
system comprised of cameras, recorders, interconnections and displays that are used to inspect pipelines

3.2 Techniques

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



a This document is applicable.

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

3.2.1
lining with continuous pipes
lining with pipe made continuous prior to insertion, where the diameter of the lining pipe remains unchanged

3.2.2
lining with close-fit pipes
lining with a continuous pipe, of which the cross-section is reduced to facilitate installation and reverted after installation to provide a close fit to the existing pipe

Note 1 to entry: For the reduction in cross-section, the following are the two options:

— reduction in the pipe manufacturing plant: the pipe is usually supplied coiled on a reel, from which it is directly inserted;

— reduction on site: the pipe is usually fed through the reduction equipment and simultaneously inserted in one continuous string.

3.2.3
lining with cured-in-place pipes
lining with a flexible tube impregnated with a thermosetting resin, which produces a pipe after resin cure

3.2.4
lining with adhesive-backed hoses
lining with a reinforced hose which relies on an adhesive bond to the existing pipeline to provide resistance to collapse

3.2.5
lining with inserted hoses
lining with a reinforced hose which is either permanently shaped or re-rounded after installation by the application of an internal pressure

3.3 Characteristics

3.3.1
nominal size
DN
numerical designation of the size of a component, which is a convenient round number approximately equal to the inside or outside diameter in millimetres

3.3.2
nominal size DN/OD
DN/OD
nominal size, related to the outside diameter

3.3.3
nominal outside diameter
d_n
specified outside diameter, in millimetres, assigned to a nominal size DN/OD

Note 1 to entry: For thermoplastics solid-wall components, the value of nominal outside diameter is identical to the minimum mean outside diameter, $d_{em,min}$.

[SOURCE: ISO 4437-1:2014, 3.1.2 modified by addition of Note 1 to entry]

3.3.4
mean outside diameter
d_{em}
value of the measurement of the outer circumference of the pipe or spigot end of a fitting in any cross-section, divided by π (≈ 3,142), rounded to the next greater 0,1 mm

[SOURCE: ISO 4437-1:2014, 3.1. modified by "≈ 3,142" replaces "= 3,142"]

3.3.5
minimum mean outside diameter
$d_{em,min}$
minimum value of the mean outside diameter as specified for a given nominal size

[SOURCE: ISO 4437-1:2014, 3.1.5]

3.3.6
wall thickness
e
value of the measurement of the wall thickness at any point around the circumference of a component

3.3.7
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

3.3.8
minimum wall thickness at any point
e_{min}
minimum value for the wall thickness at any point around the circumference of a component as specified

[SOURCE: ISO 4437-1:2014, 3.1.10]

3.3.9
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)

Note 1 to entry: For thermoplastics solid-wall components, the value of nominal wall thickness, e_n, is identical to the specified minimum wall thickness at any point, e_{min}.

[SOURCE: ISO 4437-1:2014, 3.1.8]

3.3.10
standard dimension ratio
SDR
ratio of the nominal outside diameter, d_n, to its nominal wall thickness, e_n

3.3.11
internal pressure resistance
capability to withstand internal pressurization by water or gas

3.3.12
ring stiffness
resistance of a pipe to diametric deflection in response to external loading applied along one longitudinal diametric plane

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

3.4 Materials

3.4.1
virgin material
material in a form such as granules, powder or liquid, which has not been subjected to use or processing other than that required for its manufacture and to which no reprocessable or recyclable material has been added

3.4.2
own reprocessable material
material prepared from unused pipes and fittings, including trimmings from the production of pipes and fittings, which will be reprocessed in a manufacturer's plant after having previously been processed by the same manufacturer by a process such as moulding or extrusion and for which the complete formulation is known

3.4.3
external reprocessable material
material from unused products or trimmings which will be reprocessed and which were originally processed by another manufacturer

Note 1 to entry: If a manufacturer has a production of products other than pipes and fittings, reprocessable material from that production is considered as external reprocessable material when used for pipes or fittings production.

3.4.4
recyclable material
material prepared from used products which have been cleaned and crushed or ground

3.5 Product stages

The characteristics of components used for renovation and the materials from which they are made can be considered at two distinct stages as follows.

3.5.1
"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 Clauses 5 and 6, respectively.

3.5.2
"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.

3.6 Service conditions

3.6.1
maximum operating pressure
MOP
maximum effective pressure of gas in a piping system, expressed in bar[1)], which is allowed in continuous use

Note 1 to entry: It takes into account the physical and mechanical characteristics of the components of the piping system and the influence of the gas on these characteristics.

Note 2 to entry: Extended definitions of MOP applicable to thermoplastics and thermosetting piping systems respectively are given in the relevant other parts of ISO 11299.

[SOURCE: ISO 17885:2015, 3.1.11, modified: Note 1 to entry abbreviated, Note 2 to entry added.]

3.6.2
nominal pressure
PN
numerical designation, which is a convenient rounded number for reference purposes

Note 1 to entry: Extended definitions of PN applicable to thermoplastics and thermosetting piping systems respectively are given in the relevant other parts of ISO 11299.

[SOURCE: ISO 17885:2015, 3.1.12 modified: New Note 1 to entry.]

4 Symbols and abbreviated terms

4.1 Symbols

d_{em} mean outside diameter

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

d_n nominal outside diameter

e wall thickness

e_m mean wall thickness

e_{min} minimum wall thickness at any point

e_n nominal wall thickness

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

4.2 Abbreviated terms

CCTV closed circuit television

DN nominal size

DN/OD nominal size, related to the outside diameter

"I" as installed

"M" as manufactured

MOP maximum operating pressure

PN nominal pressure

SDR standard dimension ratio

STP system test pressure

5 Pipes at the "M" stage

5.1 Materials

No general requirements regarding choice of material apply.

5.2 General characteristics

The choice of colour shall follow national identification requirements.

Colours used nationally for sewers and/or water supply pipes should not be used for gas supply pipes within that nation and vice versa.

5.3 Material characteristics

No general requirements on material characteristics apply.

5.4 Geometric characteristics

No general geometric requirements apply.

5.5 Mechanical characteristics

No general mechanical requirements apply.

5.6 Physical characteristics

No general physical requirements apply.

5.7 Jointing

For the requirements for jointing techniques used to attach and/or assemble components, the applicable part of ISO 11299 for each technique family applies.

NOTE Integral joints are considered to be part of the pipe.

5.8 Marking

Where pipes are specified by normative reference to another plastics piping System Standard, no marking additional to that specified in the referenced standard shall be required.

Pipes specified in detail in other parts of ISO 11299 shall be permanently and legibly marked in such a way that the marking does not initiate cracks or other types of premature failure and that storage, weathering, handling and installation (see Clause 9) do not affect the legibility of the marking.

The pipes shall be marked with at least the following information:

a) reference to the relevant part of ISO 11299 or another standard as specified in that part;

b) manufacturer's name and/or trademark;

c) nominal size or other dimension (e.g. d_n);

d) SDR or wall thickness or ring stiffness as applicable;

e) material;

f) manufacturer's information in clear figures or in code, providing traceability to the production period (specified by at least year and month) and production site, if manufacturer is producing at several sites;

g) approval mark (if applicable);

h) GAS.

6 Fittings at the "M" stage

6.1 Materials

No general requirements regarding choice of material apply.

6.2 General characteristics

The choice of colour shall follow national identification requirements.

Colours used nationally for sewers and/or water supply pipes should not be used for gas supply pipes within that nation, and vice versa.

6.3 Material characteristics

No general material requirements apply.

6.4 Geometric characteristics

No general geometric requirements apply.

6.5 Mechanical characteristics

No general mechanical requirements apply.

6.6 Physical characteristics

No general physical requirements apply.

6.7 Jointing

For the requirements for jointing techniques used to attach and/or assemble components, the applicable Part of ISO 11299 for the relevant technique family applies.

NOTE Integral joints are considered to be part of the fitting.

6.8 Marking

Where fittings are specified by normative reference to another plastics piping System Standard, no marking additional to that specified in the referenced standard shall be required.

Fittings specified in detail in other parts of ISO 11299 shall be marked with at least the following information:

a) reference to the relevant part of ISO 11299 or another standard as specified in that part;

b) manufacturer's name and/or trademark;

c) nominal size or other dimension (e.g. d_n);

d) SDR or wall thickness or ring stiffness as applicable;

e) pressure rating as PN or bar;

f) material;

g) manufacturer's information in clear figures or in code, providing traceability to production period (specified by at least year and month), and production site if manufacturer is producing at several sites;

h) approval mark (if applicable);

i) GAS.

7 Ancillary components

For valves the relevant pressure capability shall be specified in the open position and in the closed position so that the valve function and its tightness are ensured under this pressure.

Certain liner pipe systems require mechanical, end-load-bearing fittings for liner terminations. Full details of these shall be included in the installation manual, if applicable.

8 Fitness for purpose of the installed lining system at the "I" stage

8.1 Materials

The pipe and any fittings may be made of different materials, provided these conform to 5.1 and 6.1, respectively of the relevant part of ISO 11299.

For pipes and fittings at the "M" stage, see Clauses 5 and 6, respectively.

8.2 General characteristics

The installed lining system shall meet a water pressure test and/or a gas pressure test to ensure the integrity of pipes, joints, fittings and other components, such as anchor blocks and the fitness for purpose requirements in the technique-related parts of ISO 11299, as applicable.

The system test pressure (STP) methodology and the pass/fail criteria shall be agreed on between the client and the system installer and documented in the installation manual.

NOTE Because of the interaction between the liner and the host pipe upon pressurization when some techniques are utilized, it is possible for conventional plastics pipe testing methodologies to not apply in these instances.

Under normal circumstances, the installation point for the testing equipment shall be the lowest point of the test section.

IMPORTANT — Attention is drawn to the need for care in respect of the potential for any residues of materials, lubricants or other chemical agents from the installation process to damage the surrounding environment.

8.3 Material characteristics

Elastomeric sealing rings shall conform to the performance requirements of ISO 16010.

8.4 Geometric characteristics

The installed lining system shall have a minimum free bore in accordance with the design requirements (e.g. flow capacity, structural stability and routine maintenance).

NOTE 1 Free bore has two aspects. The first (cross-sectional) free bore is to ensure that adequate cross-section is retained for flow capacity. The second (dimensional) free bore is to ensure that adequate clearance is retained for routine maintenance equipment to be used or for access to be maintained in the installed pipeline system.

NOTE 2 The maximum free bore of a renovated pipeline system is limited by the internal dimensions of the existing pipeline at the time of lining and also by the wall thickness and closeness of fit of the installed lining system, which generally varies according to the renovation technique used. For design aspects, see ISO 11295.

8.5 Mechanical characteristics

All elements of the installed lining system shall be able to withstand without leakage, and for the full design life, all stresses arising from operation within the system parameters and any residual stresses caused by the installation or thermal effects.

The installed system shall have sufficient stiffness and strength to resist:

a) the external loading throughout the specified design life;

b) the internal loading throughout the specified design life;

c) any residual stresses caused by the installation or thermal effects.

NOTE 1 ISO 11295 provides guidance on structural design aspects of renovation.

NOTE 2 Minimum short-term ring stiffnesses of pipes are specified as a function of pipe material in the technique-related parts of ISO 11299, to provide comparable minimum levels of long-term external load-bearing capacity for all renovation technique families.

NOTE 3 This document is not applicable to the design issues of the calculation of any residual stresses.

For interactive liners, the lining system shall be capable of spanning holes and gaps in the wall of the existing pipeline at the rated pressure and for the design life of the system.

NOTE 4 This document is not applicable to the design issues of hole and gap spanning. For additional information, including assessment of the effects of interactive liners on the host pipe, see ISO 11295.

The system supplier shall document compliance with all relevant mechanical requirements.