INTERNATIONAL STANDARD

ISO 11298-1

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Plastics piping systems for renovation of underground water supply networks —

Part 1: General

Systèmes de canalisations en matières plastiques pour la rénovation des réseaux enterrés d'alimentation en eau —

Partie 1: Généralités

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 11298-1 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*.

ISO 11298 consists of the following parts, under the general title *Plastics piping systems for renovation of underground water supply networks*:

— *Part 1: General*

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

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

Introduction

This part of ISO 11298 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:

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

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

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

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

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 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 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, this part of ISO 11298 and ISO 11298-3 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 11298, in order to facilitate direct comparisons across renovation technique families.

Figure 1 shows the common part and clause structure and the relationship between ISO 11298 and the System Standards for other application areas.

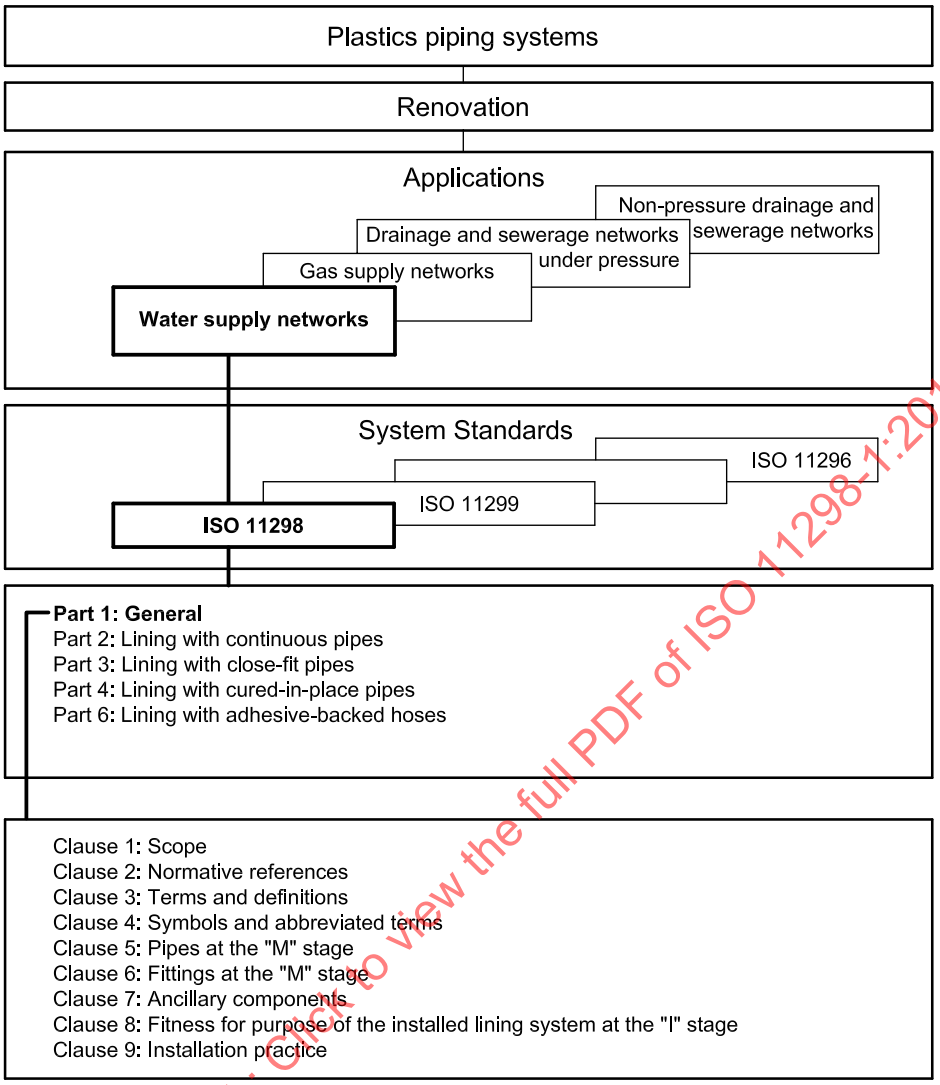


Figure 1 — Format of the renovation System Standards

Plastics piping systems for renovation of underground water supply networks —

Part 1: General

1 Scope

This part of ISO 11298 specifies the requirements and test methods for plastics piping systems intended to be used for the renovation of underground water supply networks, which transport water intended for human consumption, including raw water intake pipelines. It is applicable to pipes and fittings, as manufactured, as well as to the installed lining system. It is not applicable to cover sprayed coatings, the existing pipeline or any annular filler.

This part of ISO 11298 gives the general requirements common to all relevant renovation techniques.

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.

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

3 Terms and definitions

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

3.1 General

3.1.1
pipeline system
interconnecting pipe network for the conveyance of fluids

3.1.2
rehabilitation
all measures for restoring or upgrading the performance of an existing pipeline system

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
rehabilitation of an existing pipeline system by the installation of a new pipeline system, without incorporating the original fabric

3.1.5
maintenance
keeping an existing pipeline system operational without the installation of additional fabric

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
hydrostatic 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

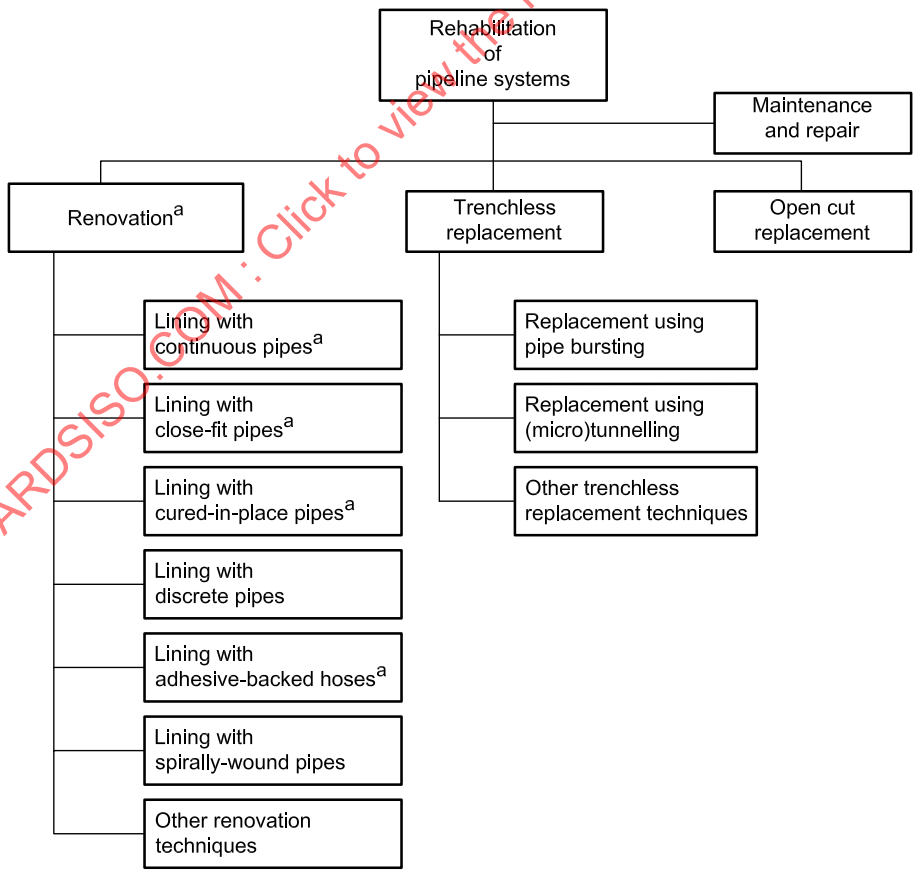
3.1.18
technique family
group of renovation techniques which are considered to have common characteristics for standardization purposes

3.1.19
independent pressure pipe liner
liner which is 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 host pipe for some measure of radial support in order to resist without failure all applicable internal loads throughout its design life

3.2 Techniques

The various techniques for renovation of underground water supply networks, 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 part of ISO 11298, see ISO 11295.



[a] This part of ISO 11298 is applicable.

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

The technique families within the scope of this part of ISO 11298 are defined as follows.

3.2.1
lining with continuous pipes
lining with pipe made continuous prior to insertion and which is not shaped to give it a cross-sectional diameter smaller than its final diameter after installation

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

NOTE For the reduction in cross-section, the following are the two options:

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

b) 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 host pipe to provide resistance to collapse

3.3 Geometrics

3.3.1
nominal size
DN
numerical designation of the size of a component, which is a convenient round number approximately equal to the manufacturing dimension in millimetres

3.3.2
nominal size
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 The nominal outside diameter, expressed in millimetres, is the minimum mean outside diameter, $d_{em,min}$, defined in 3.3.5.

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

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

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 of the wall thickness at any point around the circumference of a component as specified

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

NOTE 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}.

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 hydrostatic pressurization

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 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 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 For pipes and fittings at the "I" stage, see Clause 8.

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 For plastics piping systems conveying water, it corresponds to the maximum continuous operating pressure, expressed in bar[1)], which can be sustained with water at 20 °C, based on the minimum design coefficient.

3.7 Joints

No general definitions apply.

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 = 10^5 Pa; 1 MPa = 1 N/mm^2.

4.2 Abbreviated terms

DN/OD nominal size, related to the outside diameter

"I" as installed

"M" as manufactured

PN nominal pressure rating

SDR standard dimension ratio

STP system test pressure

5 Pipes at the "M" stage

NOTE For pipes at the "I" stage, see Clause 8.

5.1 Materials

Only the use of virgin and own reprocessable materials shall be permitted.

5.2 General characteristics

No general requirements apply.

The choice of colour shall follow national identification requirements.

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

5.3 Material characteristics

Pipes in contact with potable water shall be designed and constructed using components and materials which meet the appropriate requirements such that there is no unacceptable deterioration of water quality.

NOTE Attention is drawn to any national requirements which can be applicable.

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 11298 for each technique family applies.

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

5.8 Marking

Pipes specified in detail in other parts of ISO 11298 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 at intervals of not greater than 1 m along the pipe length, with at least the following information:

a) a reference to the relevant part of ISO 11298;

b) the manufacturer's name and/or trademark;

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

d) the SDR, wall thickness or PN, as applicable;

e) the material;

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

g) the approval mark, if applicable;

h) Water or W.

6 Fittings at the “M” stage

6.1 Materials

Only the use of virgin and own reprocessable materials shall be permitted.

6.2 General characteristics

No general requirements apply.

The choice of colour shall follow national identification requirements.

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

6.3 Material characteristics

Fittings in contact with potable water shall be designed and constructed using components and materials which meet the appropriate requirements such that there is no unacceptable deterioration of water quality.

NOTE Attention is drawn to any national requirements which can be applicable.

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 11298 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 11298 shall be marked with at least the following information:

a) a reference to the relevant part of ISO 11298;

b) the manufacturer's name and/or trademark;

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

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

e) the material;

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

g) the approval mark, if applicable.

7 Ancillary components

All materials used for ancillary components intended for water supply systems shall be suitable for such an application. They shall not cause any unacceptable deterioration of the quality of water with which they come into contact.

NOTE Attention is drawn to any national requirements which can be applicable.

For valves including hydrants, 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 assured under this pressure.

Certain liner pipe systems require mechanical, end-load-bearing fittings for service connections and 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 11298.

NOTE 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 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 11298, as applicable.

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

NOTE 1 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.

NOTE 2 In the case of interactive linings, the effects on the host pipe can be assessed (see ISO 11295).

The system test pressure, STP, shall be calculated from the nominal pressure rating, PN, as follows:

$$\left.\begin{array}{l} STP = PN \times 1{,}5 \\ \text{or} \\ STP = PN + 5 \text{ bar} \end{array}\right\} \text{ whichever is the lowest}$$

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

8.3.1 Effect on water quality

The installed lining system shall not cause any unacceptable deterioration of water quality when the water is intended for human consumption.

NOTE Attention is drawn to any national requirements which can be applicable.

8.3.2 Sealing rings

Elastomeric sealing rings shall conform to the performance requirements of EN 681-1.

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.

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 1 This part of ISO 11298 does not cover the design issues of the calculation of any residual stresses.

NOTE 2 This part of ISO 11298 does not cover 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.

8.6 Physical characteristics

No general requirements for physical characteristics apply to the installed lining system.

8.7 Additional characteristics

No general requirements for additional characteristics apply to the installed lining system.

8.8 Sampling

For the purposes of type testing, samples shall be taken either from actual installations or from simulated installations.

NOTE It is possible for a single installation operation to include some parts which constitute actual installations and some which constitute simulated installations.

9 Installation practice

9.1 Preparatory work

No general requirements apply.

NOTE For relevant information, see ISO 11295:—, A.1.

9.2 Storage, handling and transport of pipes and fittings

The manufacturer's prescribed procedures for storage, handling and transport of all lining system components shall be adhered to.

9.3 Equipment

9.3.1 General

Installation, inspection and lifting equipment shall be as specified by the system designer and/or installer. It shall conform to the relevant construction and safety standards.

NOTE For further details of equipment specific to individual renovation techniques or technique families, see the relevant parts of ISO 11298.

9.3.2 Inspection equipment

Inspection equipment [closed-circuit television (CCTV)] shall provide a full colour picture and recording/replay facilities complete with slow motion and frame by frame replay and shall provide a clear picture of all parts of the installed pipe. The recording shall be labelled on screen with full location, lining type and size and date information.