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## **EAST AFRICAN STANDARD**

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**Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks — Part 1: General**

**EAST AFRICAN COMMUNITY**

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## Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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## Introduction

In the preparation of this East African Standard, the following source was consulted extensively:

ISO 11296-1:2009, *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks — Part 1: General*

Assistance derived from this source and others inadvertently not mentioned is hereby acknowledged.

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

**Part 1:  
General**

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

*Partie 1: Généralités*



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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 11296-1 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.

## Introduction

The System Standard, of which this is part 1, specifies the requirements for plastics piping systems of various materials used for the 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 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.

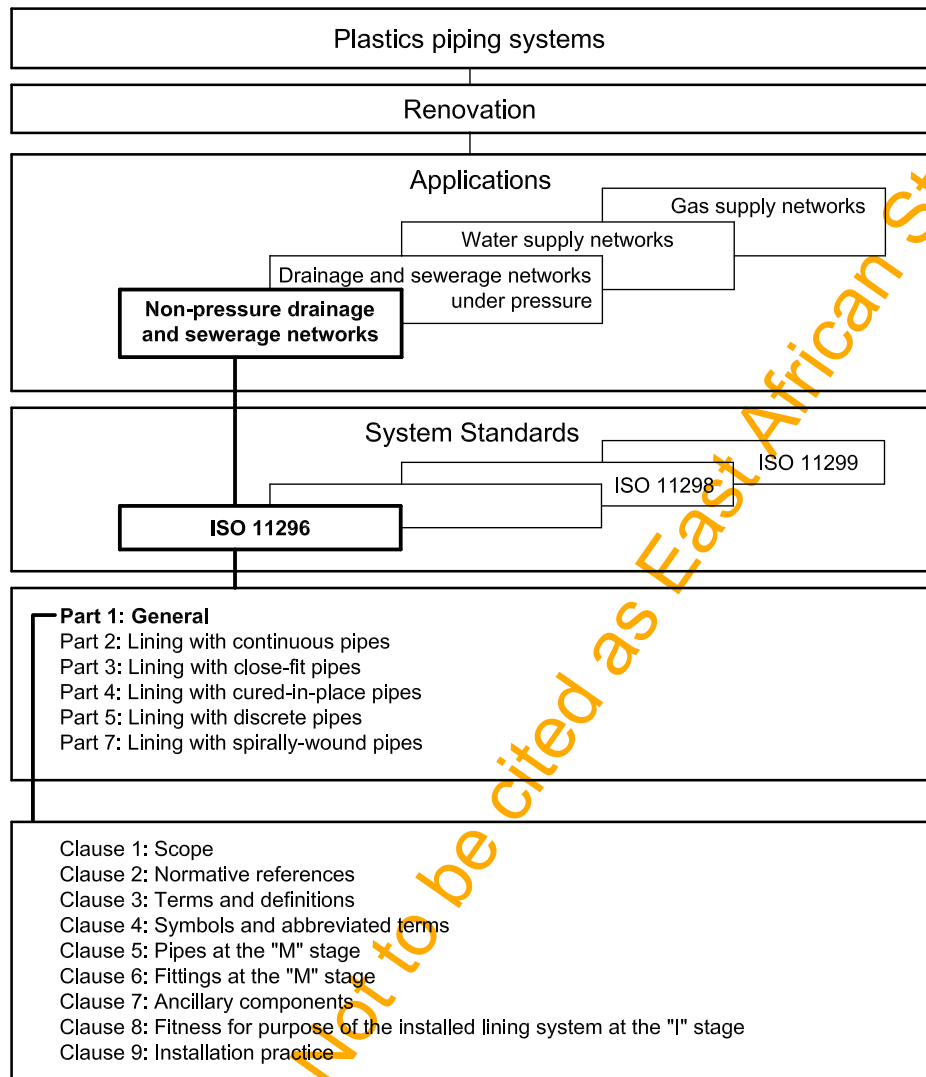


Figure 1 — Format of the renovation System Standards

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

## Part 1: General

### 1 Scope

This part of ISO 11296 specifies the requirements and test methods for plastics piping systems intended to be used for the renovation of underground non-pressure drainage and sewerage networks, which are operated as gravity systems and subjected to a maximum surcharge pressure of 0,5 bar<sup>1)</sup>. It is applicable to pipes and fittings as manufactured, as well as to the installed plastics lining system; it is not applicable to the existing pipeline or any annular filler.

This part of ISO 11296 establishes the general requirements common to all relevant renovation techniques (see 3.1.2).

### 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 1610:1997, *Construction and testing of drains and sewers*

EN 13508-2, *Conditions of drain and sewer systems outside buildings — Part 2: Visual inspection coding system*

### 3 Terms and definitions

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

#### 3.1 General terms

##### 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

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1) 1 bar = 0,1 MPa = 0,1 N/mm<sup>2</sup> = 10<sup>5</sup> N/m<sup>2</sup>.

**3.1.3**

**renovation**

work incorporating all or part of the original fabric of the pipeline by means of which its 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, along with 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 the lining system

**3.1.14**

**grouting**

process of filling voids around the lining system

**3.1.15**

**simulated installation**

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

**3.1.16****simulated host pipeline**

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

**3.1.17****technique family**

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

**3.2 Techniques**

The various techniques for renovation of underground non-pressure drainage and sewerage networks, within the scope of pipeline rehabilitation techniques generally, are shown schematically in Figure 2. For definitions of standardized renovation techniques given in Figure 2, but outside the scope of this part of ISO 11296, see ISO 11295.

This part of ISO 11296 is applicable to the following technique families.

**3.2.1****lining with continuous pipes**

lining with pipe made continuous prior to insertion, and which has not been 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 There are two options for achieving the reduction in cross-section:

- 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**

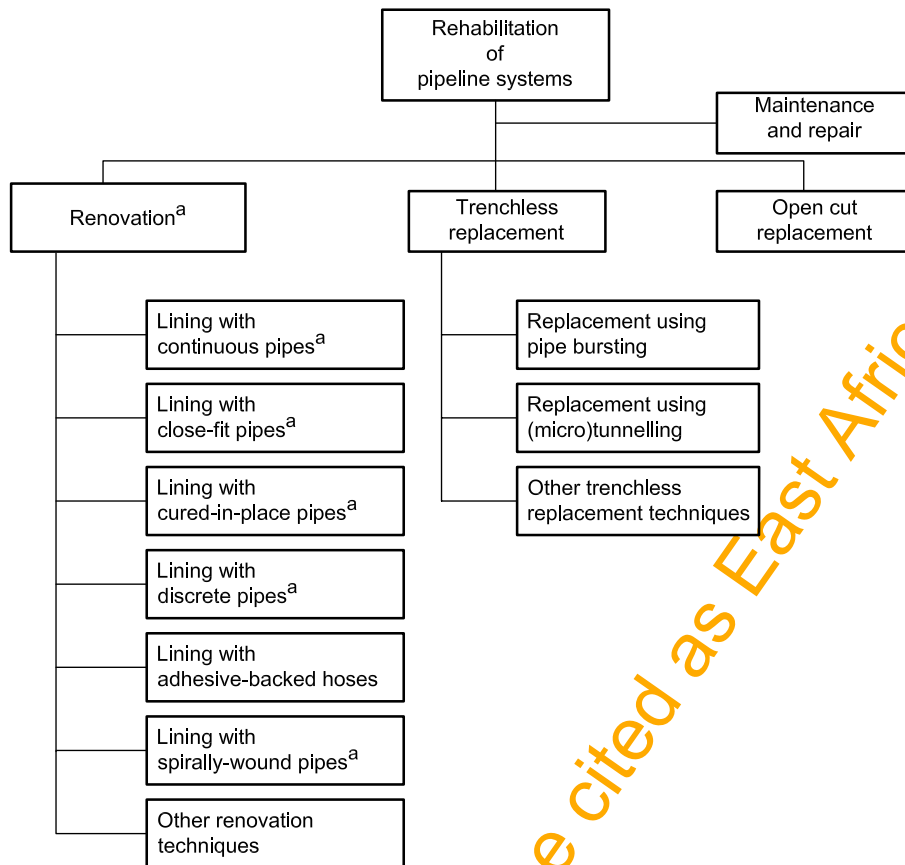
lining with a flexible tube impregnated with a thermosetting resin, which produces a pipe after resin cure

**3.2.4****lining with discrete pipes**

lining with pipes shorter than the section to be renovated, which are jointed to form a continuous pipe only during insertion, the cross-section of the lining pipe remaining unchanged

**3.2.5****lining with spirally-wound pipes**

lining with a profiled strip, spirally wound to form a continuous pipe after installation



<sup>a</sup> This part of ISO 11296 applies.

**Figure 2 — Technique families for renovation of underground non-pressure drainage and sewerage networks using plastics pipes, within the scope of pipeline rehabilitation techniques**

### 3.3 Characteristics

#### 3.3.1

##### **nominal size**

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

NOTE This is expressed in millimetres.

#### 3.3.3

##### **nominal outside diameter**

$d_n$

specified outside diameter assigned to a nominal size DN/OD

NOTE 1 The nominal outside diameter is the minimum mean outside diameter,  $d_{em, min}$  (see 3.3.5).

NOTE 2 This is expressed in millimetres.

**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  $\pi$  ( $\approx 3,142$ ), 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****ring stiffness**

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

NOTE This definition applies to both short-term and long-term values.

**3.4 Origin of 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 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 the following two distinct stages.

### 3.5.1

#### **“M” stage**

stage as manufactured, i.e. 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

See Clause 8.

## 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

### 4.2 Abbreviated terms

DN/OD nominal size, related to the outside diameter

“I” as installed

“M” as manufactured

SDR standard dimension ratio

## 5 Pipes at the “M” stage

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

### 5.1 Materials

No general requirements regarding choice of material apply.

### 5.2 General characteristics

No general requirements apply.

The choice of colour should follow national identification requirements. Colours used nationally for gas and/or water supply pipes should not be used for sewers within that nation and vice versa.

### 5.3 Material characteristics

No general material requirements 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 of the jointing techniques used to attach and/or assemble components, the part of ISO 11296 relevant to each technique family applies.

NOTE Integral joints are considered as part of the pipe.

### 5.8 Marking

Pipes specified in detail in other parts of ISO 11296 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.

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

- a) a reference to this part of ISO 11296, i.e. ISO 11296-1:2009;
- b) the manufacturer's name and/or trademark;
- c) the nominal size or other dimension (e.g.  $d_n$ );
- d) the SDR or 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 the month), and the production site if the manufacturer is producing at several sites;
- g) the approval mark, if applicable.

## 6 Fittings at the "M" stage

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

### 6.1 Materials

No general requirements regarding choice of material apply.

### 6.2 General characteristics

No general requirements apply.

The choice of colour should follow national identification requirements. Colours used nationally for gas and/or water supply pipes should not be used for sewers 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 of the jointing techniques used to attach and/or assemble components, the part of ISO 11296 relevant to each technique family applies.

NOTE Integral joints are considered as part of the fitting.

### 6.8 Marking

If 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 11296 shall be marked with at least the following information:

- a) a reference to this part of ISO 11296, i.e. ISO 11296-1:2009;
- b) the manufacturer's name and/or trademark;

- c) the nominal size or other dimension (e.g.  $d_n$ );
- d) the SDR or 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 the month), and the production site if the manufacturer is producing at several sites;
- g) the approval mark, if applicable.

## 7 Ancillary components

This part of ISO 11296 is not applicable to any ancillary components.

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

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

### 8.1 Materials

The pipes and fittings may be made of different materials, provided these conform to ISO 11296-3:2009, 5.1 and Clause 6, and ISO 11296-4:2009, 5.1 and 6.1, respectively.

### 8.2 General characteristics

The installed lining system shall conform to the leaktightness requirements of EN 1610:1997, Clause 13.

This part of ISO 11296 is not applicable to any requirements for chemical, abrasion and jetting resistance.

**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

No general material requirements apply.

### 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 and structural stability. The second (dimensional) free bore is to ensure that adequate width and height are 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 pipeline system, which will generally vary according to the renovation technique used. For guidance on design aspects, see ISO 11295.

## 8.5 Mechanical characteristics

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

- a) the external loading throughout the specified design life;
- b) any residual stresses caused by the installation or thermal effects.

NOTE 1 For guidance on structural design aspects of renovation, see ISO 11295.

NOTE 2 Minimum short-term ring stiffnesses of pipes are specified as a function of pipe material in the technique-related parts of ISO 11296, to provide comparable minimum levels of long-term external load-bearing capacity for all renovation technique families.

## 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 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 information, see ISO 11295—, A.1.

### 9.2 Storage, handling and transport of pipe 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. Each shall conform to the applicable construction and safety standards.

NOTE For further details of equipment specific to individual renovation techniques or technique families, see the related parts of ISO 11296, as applicable.

### 9.3.2 Inspection equipment

Inspection equipment (closed-circuit television) 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 in accordance with EN 13508-2.

All equipment introduced into the installed pipe shall be constructed and maintained with the aim of preventing any damage or contamination to the installed pipe.

The equipment shall conform to all applicable safety standards.

### 9.3.3 Lifting equipment

All lifting equipment shall be covered by current test certification and shall be operated only by trained personnel.

NOTE Attention is drawn to any legislation applicable to lifting equipment.

## 9.4 Installation

### 9.4.1 General

The installer shall follow an installation manual, which details all of the procedures required to carry out the installation. The manual shall specify all key process parameters, declaring relevant values and tolerances.

The installation shall be carried out by staff trained in the relevant technique and fully conversant with the procedures documented in the installation manual.

NOTE The installation manual is the responsibility of the installer, but can be written by the technique owner, designer or manufacturer.

### 9.4.2 Safety precautions

All applicable national health and safety regulations shall be taken into account. Safety requirements shall be identified for all stages of the installation procedure, from preparing the access through to the completion of the work.

### 9.4.3 Simulated installations

Simulated installations shall be conducted under representative environmental and processing conditions for the installation site and technique. Figure 3 gives the relationship between samples taken from simulated and actual installations.

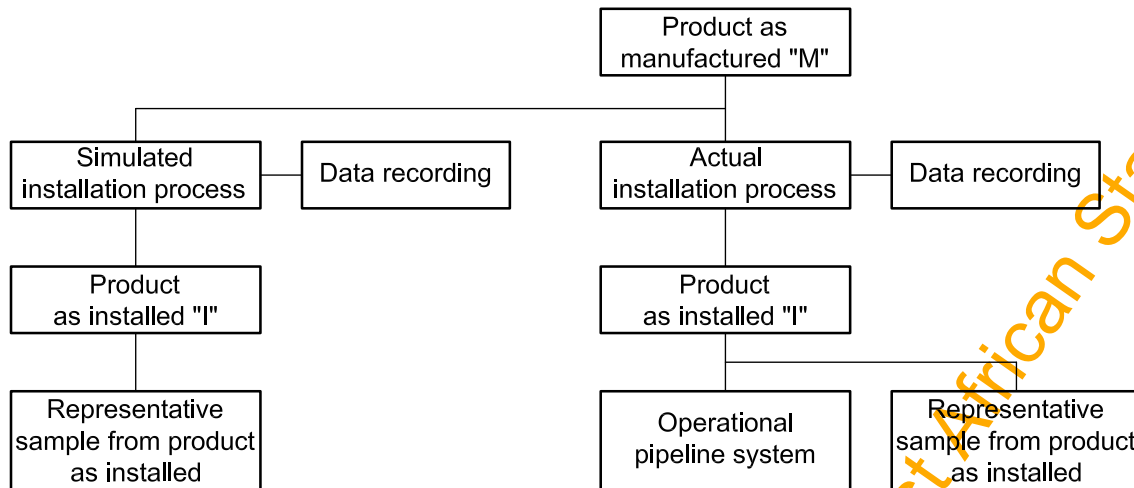


Figure 3 — Relationship between samples taken from simulated installations and actual installations

### 9.5 Process-related inspection and testing

The required measurements and other tests relating to the installation process and the methods by which the measurements shall be taken or the tests conducted, shall be documented in the installation manual.

### 9.6 Lining termination

Lining termination shall include operations such as dismantling of the installation equipment and preparing the ends of the installed lining system for subsequent reconnection.

### 9.7 Reconnection to existing manholes and laterals

Side connections may be reopened using either man-entry or robotic techniques.

The opening in the lining shall be formed to restore the flow of the lateral without irregularities, steps or burrs, which could trap debris causing blockages in either the main pipe or the lateral.

The methods of connecting the installed lining system to existing manholes and laterals and the recommended method of making subsequent lateral connections shall be documented in the installation manual.

### 9.8 Final inspection and testing

The installed lining system shall be subject to a recorded internal visual examination, either by walk-through or closed-circuit television, throughout its length on completion.

Where specified, testing to verify leaktightness of the installed lining system in accordance with 8.2 may take place in stages. For example, in order to verify leaktightness of the installed pipe including any integral joints only, it should be permissible to carry out testing before the re-opening of any lateral connections.

### 9.9 Documentation

The values of the installation parameters achieved shall be documented, together with all written, photographic and/or electronic records of the renovation required by the installation manual (see 9.5).

## Bibliography

- [1] ISO 11295:—<sup>2)</sup>, *Classification and information on design of plastics piping systems used for renovation*

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<sup>2)</sup> To be published.

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