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**Plastics piping systems for  
the trenchless replacement of  
underground pipeline networks —**

**Part 1:  
Replacement on the line by pipe  
bursting and pipe extraction**

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*Systèmes de canalisations en plastique pour le remplacement sans  
tranchée des réseaux de canalisations enterrés —*

*Partie 1: Remplacement sur ligne par éclatement de tuyau et  
extraction de tuyau*

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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](http://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](http://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](http://www.iso.org/iso/foreword.html). (standards.iteh.ai)

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*.

A list of all the parts in the ISO 21225 series can be found on the ISO website.

## Introduction

System standards dealing with the following applications are either available or in preparation for pipeline renovation:

- The ISO 11296 series: *Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks*;
- The ISO 11297 series: *Plastics piping systems for renovation of underground drainage and sewerage networks under pressure*;
- The ISO 11298 series: *Plastics piping systems for renovation of underground water supply networks*;
- The ISO 11299 series: *Plastics piping systems for renovation of underground gas supply networks*.

System standards dealing with all application areas are either available or in preparation for trenchless pipeline replacement:

- The ISO 21225 series: *Plastics piping systems for the trenchless replacement of underground pipeline networks*.

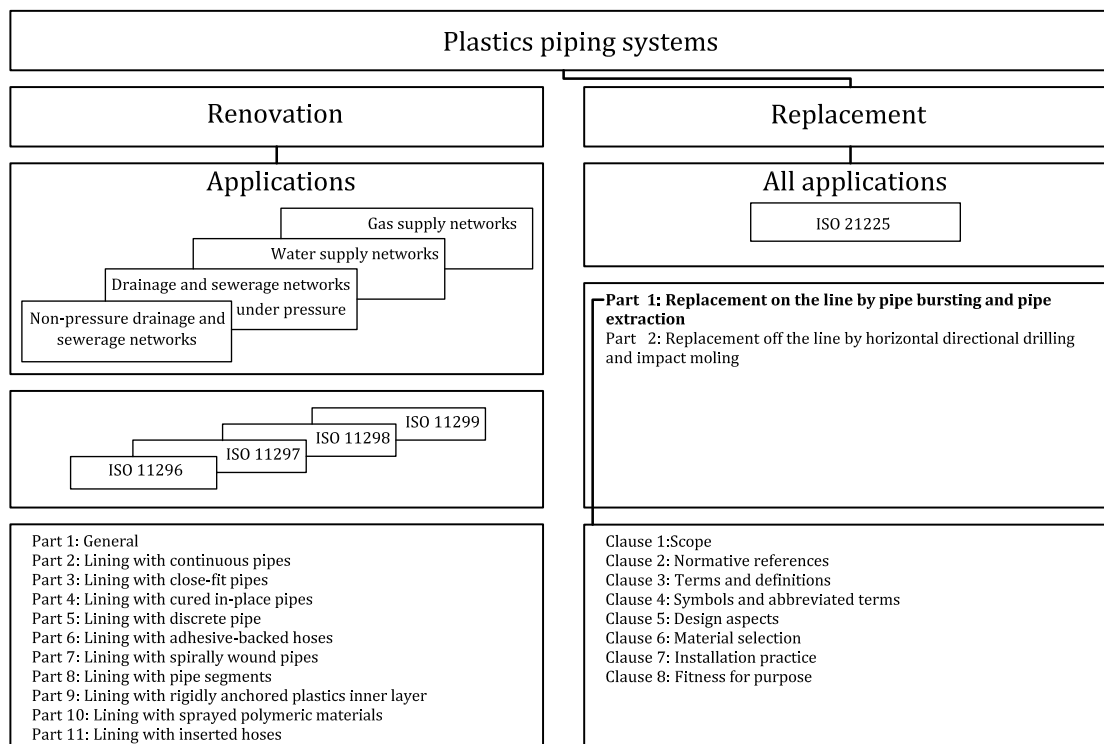
The system standard ISO 21225 comprises:

- *Part 1: Replacement on the line by pipe bursting and pipe extraction* (this document);
- *Part 2: Replacement off the line by horizontal directional drilling and impact moling*.

The requirements for technique families are given in ISO 21225-1 and ISO 21225-2 respectively. For complimentary information, see ISO 11295<sup>1</sup>.

A consistent structure of clause headings has been adopted for all parts to facilitate direct comparisons across replacement standards.

[Figure 1](#) shows the common part and clause structure and the relationship between ISO 21255 and the system standards for the renovation application areas.



**Figure 1 — Technique families and clause structure**  
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# Plastics piping systems for the trenchless replacement of underground pipeline networks —

## Part 1: Replacement on the line by pipe bursting and pipe extraction

### 1 Scope

This document specifies requirements and test methods for pipes and fittings which are part of plastics piping systems for the trenchless replacement of underground non-pressure and pressure drainage and sewerage networks and underground water and gas supply networks, by means of pipe bursting and pipe extraction.

It is applicable to polyethylene (PE) pipes and fittings, as manufactured, as well as to the installed replacement system.

This document is intended to be used in conjunction with standards applicable for the construction of PE pipeline systems where available.

Regarding manufactured pipes it is applicable to three different PE pipe types:

- PE solid wall single layered pipes (nominal outside diameter,  $d_n$ ), including any identification stripes;
- PE pipes with co-extruded layers on either or both the outside and inside of the pipe (total outside diameter,  $d_n$ ), as specified in [Annex A](#), where all layers have the same MRS rating;
- PE pipes (outside diameter,  $d_n$ ) having a peelable, contiguous, thermoplastics additional layer on the outside of the pipe (“coated pipe”), see [Annex A](#).

In addition it is applicable to:

- jointing of pipe lengths by means of butt fusion joint;
- jointing of pipe lengths by means of electrofusion joint;
- fabricated and injection-moulded fittings made of PE.

Pipes made from other plastics, e.g. glass reinforced plastics (GRP), 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 4427 (all parts), *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply*

ISO 4437 (all parts), *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE)*

ISO 4633, *Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials*

## ISO 21225-1:2018(E)

ISO 8772, *Plastics piping systems for non-pressure underground drainage and sewerage — Polyethylene (PE)*

ISO 12176-1, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 1: Butt fusion*

ISO 12176-2, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 2: Electrofusion*

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

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

EN 1555-1, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

EN 1555-2, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

EN 1555-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

EN 1555-5, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 12201-1, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 1: General*

EN 12201-2, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 2: Pipes*

EN 12201-3, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 3: Fittings*

EN 12201-5, *Plastics piping systems for water supply, and for drainage and sewerage under pressure — Polyethylene (PE) — Part 5: Fitness for purpose of the system*

EN 12666-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Polyethylene (PE) — Part 1: Specifications for pipes, fittings and the system*

### 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 <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1 General



**3.1.1****CCTV system**

system comprised of cameras, recorders, interconnections and displays that are used to inspect pipelines

**3.1.2****characteristic**

property, dimension or other feature of a material or component

**3.1.3****coated pipe**

pipe with a peelable, contiguous thermoplastic additional layer on the outside of the pipe

**3.1.4****installed pipe**

replacement pipe after installation

**3.1.5****maintenance**

routine work undertaken to ensure the continuing performance of an asset

**3.1.6****pipe with co-extruded layers**

pipe with smooth internal and external surface, having co-extruded layers on either or both the outside and inside of the pipe, where all layers have the same MRS rating

**3.1.7****pipeline system**

interconnecting pipe network for the conveyance of fluids

**3.1.8****rehabilitation**

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

**3.1.9****renovation**

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

**3.1.10****repair**

rectification of local damage

**3.1.11****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

**3.1.12****replacement pipe**

new pipe installed for rehabilitation purposes

**3.1.13****replacement system**

replacement pipe and all relevant fittings for trenchless replacement on or off an existing pipeline for the purposes of rehabilitation

**3.1.14**

**solid wall single layered pipe**

pipe with smooth internal and external surface, extruded from the same compound/formulation throughout the wall

**3.1.15**

**system test pressure**

**STP**

pressure applied to the installed pipeline system in order to ensure its integrity and leaktightness

**3.1.16**

**technique family**

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

**3.1.17**

**trenchless replacement**

replacement without opening trenches other than small excavations to provide access for the particular technique

**3.2 Techniques**

The various techniques for trenchless replacement of underground networks, within the scope of pipeline rehabilitation techniques generally, are shown schematically in [Figure 2](#).

Definitions of technique families outside the scope of this document are given in ISO 11295.

The technique families within the scope of this document are defined as follows.

**3.2.1**

**bursting head**

tool that can crack or split the existing pipe material

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Note 1 to entry: Brittle pipe materials such as clay or grey cast iron crack. Ductile pipe materials such as ductile iron, steel or PVC-U split.

**3.2.2**

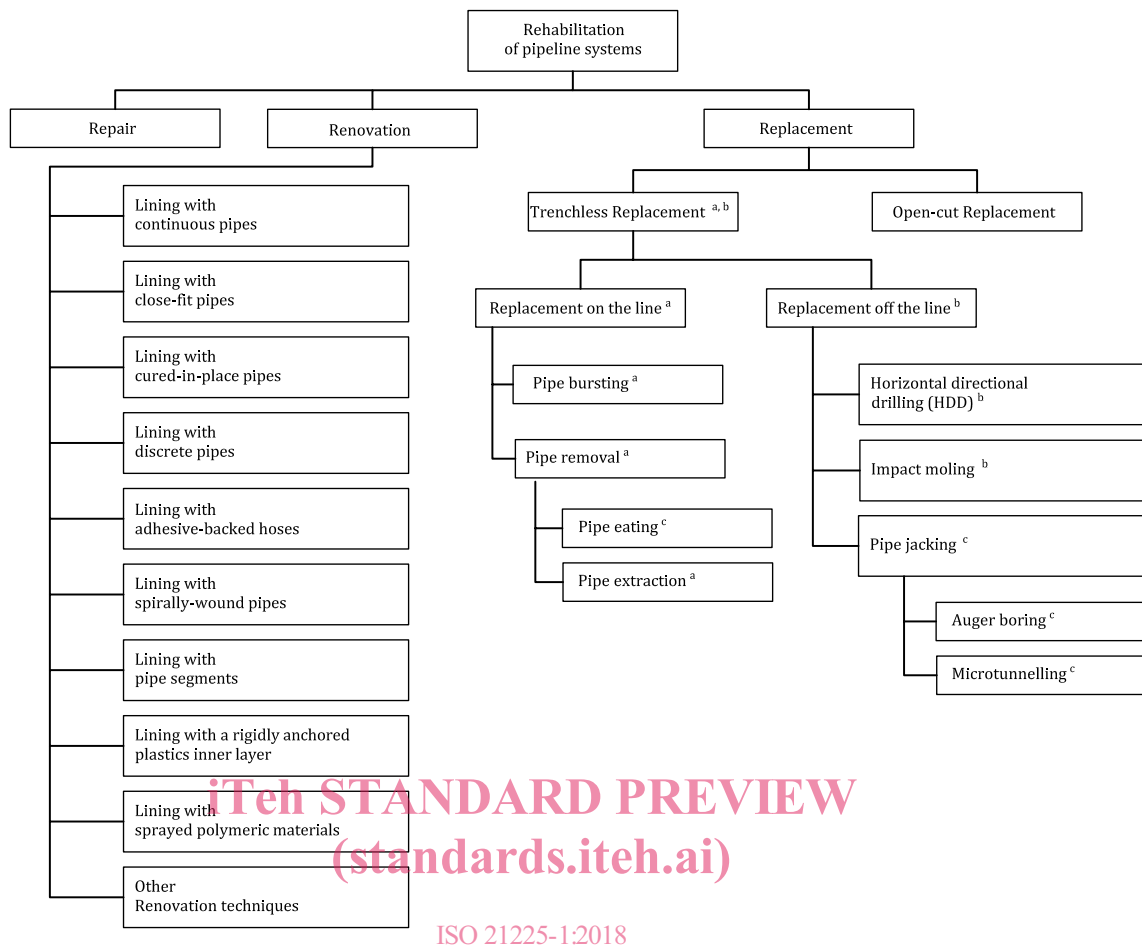
**pipe bursting**

on the line replacement method in which an existing pipe is broken by longitudinal splitting or brittle fracture, using a mechanically applied force from within, where the pipe fragments are forced into the surrounding ground and a new pipe of the same, smaller or larger diameter, is simultaneously pulled in

**3.2.3**

**pipe extraction**

on the line replacement method in which an existing pipeline is extracted by pulling or pushing and replaced with a new pipe of the same, smaller or larger diameter, is simultaneously pulled or pushed in



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- a This document is applicable.
- b In scope of ISO 21225-2.
- c Outside scope of ISO 21225, see ISO 11295[1].

**Figure 2 — Technique families for trenchless replacement of underground pipeline networks using plastics pipes, within the scope of pipeline rehabilitation techniques**

### 3.3 Geometrics

#### 3.3.1

##### minimum bending radius

minimum radius at any point throughout the length of the pipeline, measured to the longitudinal axis of the pipe

Note 1 to entry: This is usually expressed as a multiple of the pipe diameter.

#### 3.3.2

##### minimum mean outside diameter

$d_{em,min}$

minimum value of the mean outside diameter as specified for a given nominal size

[SOURCE: ISO 4427-1:2007, 3.1.1.6]