
**Polyethylene PE 32 and PE 40 pipes for
irrigation laterals — Susceptibility to
environmental stress cracking induced by
insert-type fittings — Test method and
requirements**

*Tubes en polyéthylène PE 32 et PE 40 pour branchements d'irrigation —
Sensibilité à la fissuration sous contrainte produite par les raccords à
insert — Méthode d'essai et exigences*

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 8796 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*.

This second edition cancels and replaces the first edition (ISO 8796:1989), which has been technically revised.

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Introduction

With modern methods of low-pressure irrigation (e.g. drip irrigation), a simpler and more economical type of fitting has become very popular: one that grips the pipe only from the inside, by means of several circumferential saw-teeth (see Figure 1).

This type of joint, however, exposes the pipe to the phenomenon of stress cracking, due to multi-axial stresses continuously exerted on it by the gripping teeth (in fact, this is true of any insert that increases the diameter of the pipe). The pipe may exhibit longitudinal cracks, initiated at the tips of the teeth, which can further propagate, leading to complete failure of the joint. Such cracks may develop soon after installation, but in other cases they may appear only after several weeks or even months of service (the period depending mainly on the environmental conditions).

The test method included in this International Standard was developed on the basis of long experience in several countries that are intensively involved in irrigation. The method has proven itself in practice.

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Polyethylene PE 32 and PE 40 pipes for irrigation laterals — Susceptibility to environmental stress cracking induced by insert-type fittings — Test method and requirements

1 Scope

This International Standard specifies a method of determining the susceptibility to environmental stress cracking (ESC) of polyethylene pipes intended for use with insert-type fittings.

It is applicable to pipes conforming to ISO 8779, manufactured from PE 32 and PE 40 materials and intended for use with insert-type fittings.

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.

ISO 8779, *Polyethylene (PE) pipes for irrigation laterals — Specifications*

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3 Terms and definitions

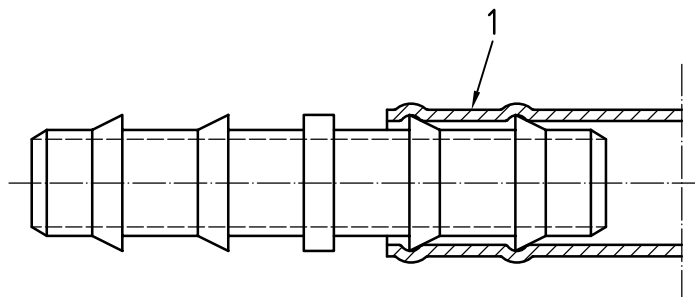
For the purposes of this document, the following terms and definitions apply.

3.1

insert-type fitting

fitting that grips the pipe only around its inner surface and which also increases the diameter of the pipe

See Figure 1.



Key

1 PE pipe

Figure 1 — Insert-type fitting in PE pipe

4 Principle

Sections of conditioned pipe are sharply bent to form two U-bends and immersed in a glass beaker containing reaction solution for one hour at $(70 \pm 2) ^\circ\text{C}$. The pipe sections are then removed, cleaned and examined for visible cracks at the area of the folds.

5 Reagent

An undiluted surface-active agent of the nonylphenoxy poly(ethyleneoxy)ethanol type¹⁾, kept in a closed container.

6 Apparatus

Use apparatus capable of maintaining a temperature of $(70 \pm 2) ^\circ\text{C}$ and capable of re-establishing that temperature within 5 min after insertion of the beaker containing the test specimens.

A forced-air-circulation oven or a hot-water bath is recommended.

7 Test specimens

Use sections of pipe about $20d$ long, where d is the nominal diameter of the pipe, preferably cut from different coils of the same batch.

Five test specimens shall be used per test. (standards.iteh.ai)

8 Test procedure

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8.1 Condition the test specimens at ambient temperature for at least 24 h.

8.2 Bend each test specimen sharply at two places, forming two U-bends in two different planes perpendicular to one other so that each bend is located at least $3d$ away from the ends of the test specimen [see Figures 2a) and 2b)]. Properly secure each bend by a piece of string or a PE ring as indicated in Figure 2b).

8.3 Prepare the reaction solution of 10 % reagent (see Clause 5) and 90 % water in a glass beaker just prior to carrying out the test by stirring with a magnetic stirrer for 1 h, and heat it to $(70 \pm 2) ^\circ\text{C}$. Use fresh solution for each test.

8.4 Place five test specimens in the glass beaker containing the reaction solution; all bends shall be fully immersed.

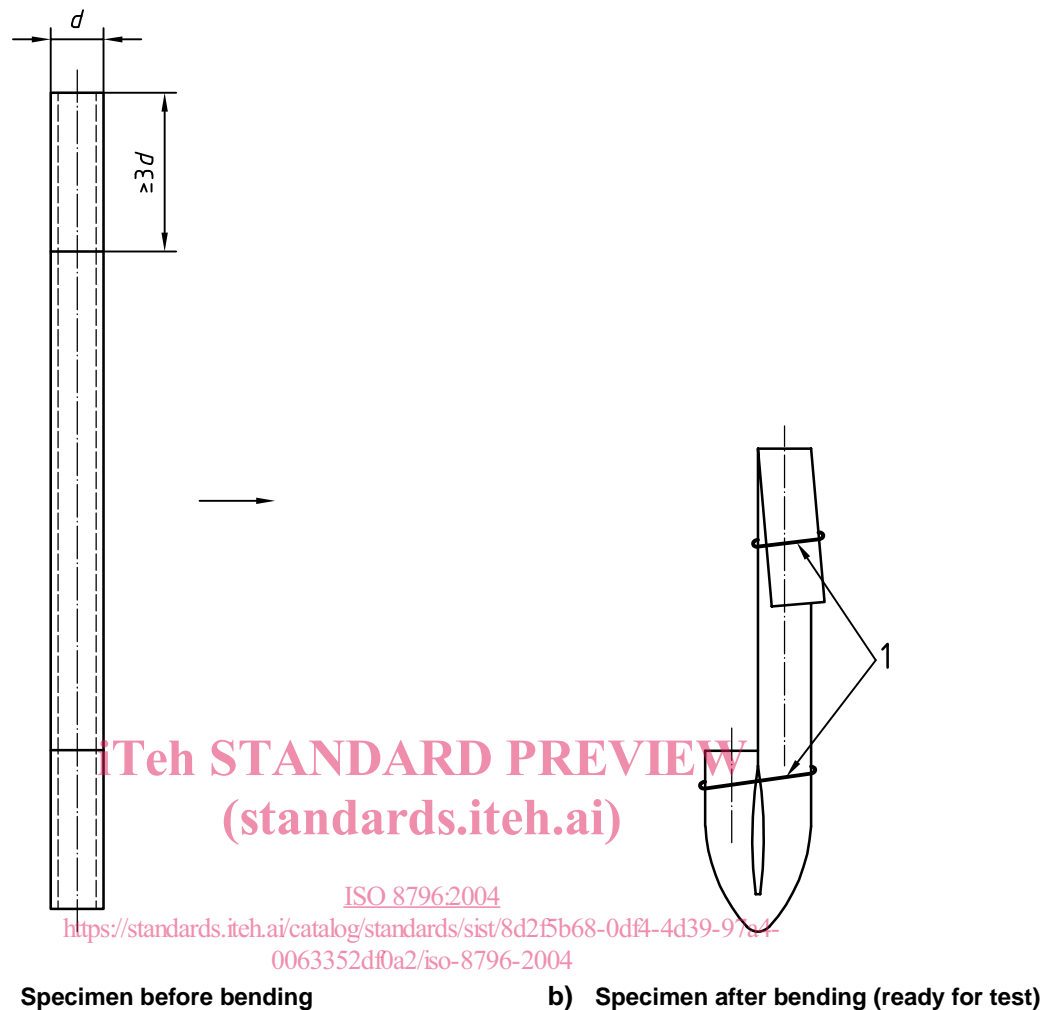
8.5 Place the beaker in the apparatus (see Clause 6) and maintain the temperature at $(70 \pm 2) ^\circ\text{C}$.

8.6 After 1 h, remove the beaker from the apparatus.

8.7 Take all the test specimens out of the beaker and wipe them free of the reagent.

8.8 Thoroughly inspect each bend by eye, without using magnification, for any visible cracks originating at the area of the fold.

1) Antarox CO-630 is the trade name of a product supplied by GAF Corp. and Arkopal N 110 is the trade name of a product supplied by Clariant. Both products may be used for referee purposes. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the products named. Equivalent products may be used if they can be shown to lead to the same results.

**Key**

1 string or PE ring

Figure 2 — Preparing the U-bends**9 Expression of results**

Express the results as follows:

- a) Classify as “failed” each bend that exhibits at least one visible crack (excluding any cracks induced by the object used to secure the bend).
- b) Whitening around specimen bends shall not be assessed as a failure.
- c) Record the total number of bends that failed according to the criteria given in a), evaluating and counting the two bends of each test piece independently.

10 Retest

If one bend failed while nine others did not, repeat the whole procedure with another five test specimens.

11 Requirements

The pipe is considered to have passed the test if not more than 10 % of the bends tested failed.

12 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all details necessary for the complete identification of the sample;
- c) the nominal dimensions of the pipe;
- d) the number of specimens tested;
- e) the total number of bends that failed;
- f) a statement that the pipe did or did not pass the test;
- g) the date of the test or the dates between which testing was conducted.

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