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Polyethylene (PE) pipes for irrigation laterals — Specifications

Tubes en polyéthylène (PE) pour branchements d'irrigation — Spécifications

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Contents

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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.

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.

International Standard ISO 8779 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Sub-Committee SC 2, *Plastics pipes and fittings for water supplies*.

Annex A forms an integral part of this International Standard.

Introduction

This International Standard has been prepared in order to define the required properties of pipes intended to be used for irrigation purposes. It is in accordance with, and based on, specific International Standards.

Polyethylene (PE) pipes for irrigation laterals — Specifications

1 Scope

This International Standard specifies the test methods and required properties for pipes made from polyethylene (i.e. PE 25, PE 32 and PE 50) to be used for irrigation laterals.

This International Standard applies to pipes intended to be used for the conveyance of water under pressure at temperatures up to 45 °C for irrigation purposes, as specified in A.1.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 161-1:1978, *Thermoplastics pipes for the transport of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series.*

ISO 1167:—[1], *Thermoplastics pipes for the transport of fluids — Resistance to internal pressure — Test method.*

ISO 2506:1981, *Polyethylene pipes (PE) — Longitudinal reversion — Test methods and specification.*

ISO 3126:1974, *Plastics pipes — Measurement of dimensions.*

ISO 3607:1977, *Polyethylene (PE) pipes — Tolerances on outside diameters and wall thicknesses.*

ISO 4056:1978, *Polyethylene (PE) pipes and fittings — Designation of polyethylene, based on nominal density and melt flow index.*

ISO 4065:1978, *Thermoplastic pipes — Universal wall thickness table.*

ISO 8796:1989, *Polyethylene (PE) 25 pipes for irrigation laterals — Susceptibility to environmental stress-cracking induced by insert-type fittings — Test method and specification.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 irrigation lateral: A branch supply line within an irrigation system on which water-distribution devices (sprinklers, emitters, drippers) are mounted directly or by means of fittings, risers or tubes.

4 Material

4.1 Extrusion compounds shall be manufactured from a mixture of the following:

a) polyethylene, which may include copolymers of ethylene and higher olefins, in which the higher-olefin constituent does not normally exceed 10 % (*m*/*m*);

b) antioxidant in an amount not exceeding 0,5 % (*m*/*m*);

c) carbon black in an amount equivalent to a content of $(2{,}5\ ^{+0{,}5}_{0})$ % (*m*/*m*) and complying with the following requirements:

— density: 1,5 g/cm^3 to 2,0 g/cm^3,

— maximum volatile matter: 9,0 % (*m*/*m*),

1) To be published. (Revision of ISO 1167:1973)

— average particle size: 0,010 µm to 0,025 µm,

— toluene extract; not more than 0,1 % (*m*/*m*).

4.2 The material in pipe form shall be tested to ensure satisfactory dispersion of the carbon black.

A test method to determine the degree of dispersion is under study (future ISO 11420). The requirement for the degree of carbon black dispersion in PE pipes for irrigation laterals will be added to the present standard, together with a reference to ISO 11420, when the latter is available.

4.3 The use of the manufacturer's own rework material produced during the manufacture and works testing of pipe complying with this International Standard is permissible. No other rework material shall be used.

4.4 The nominal density and melt flow index shall be specified in accordance with ISO 4056.

5 Dimensions and pressures (outside diameters, nominal pressures and wall thicknesses)

5.1 The nominal outside diameters and the nominal pressures shall be in accordance with ISO 161-1. The selected nominal outside diameters, and the wall thicknesses corresponding to the selected nominal pressures, are given in table 1.

5.2 The tolerances on the outside diameters and wall thicknesses shall be in accordance with ISO 3607, except for pipes of nominal diameter 12 mm, 16 mm or 20 mm, when the tolerances on wall thicknesses shall be reduced to $^{+0,2}_{0}$ mm.

5.3 The wall thicknesses in accordance with ISO 4065 correspond to the selected nominal pressures given in table 1.

NOTE 1 The values in table 1 have been selected, with certain modifications based on experimental data, on those specified in ISO 4065. Thus the wall thicknesses of some of the smaller-diameter pipes have been increased so that the pipes will meet the requirements for handling.

5.4 The maximum admissible working pressures for water temperatures up to 45 °C shall be determined as specified in A.3.

5.5 The dimensions of pipes shall be measured as described in ISO 3126.

6 Resistance to internal pressure

The pipe shall comply with the requirements of ISO 1167 for short (1 h) and long tests, using the test parameters given in table 2.

Tabie 1 — Nominal wall thicknesses, *e*, in millimetres

Nominal outside diameter, *D*	PE 25[1]			PE 32[1]			PE 50[1] [2]
	Pipe series[3]						
	S10	S6,3	S4	S12,5	S8	S5	S5
	Nominal wall thickness, *e*						
12	1	1,1	1,4	—	1	1,1	1,1
16	1,2	1,4	1,8	1	1,2	1,5	1,5
20	1,3	1,5	2,3	1,2	1,5	1,9	1,9
25	1,4	1,9	2,8	1,2	1,5	2,3	2,3
32	1,6	2,4	3,6	1,5	1,9	2,9	2,9
Nominal pressure PN	2,5	4	6	2,5	4	6	10

1) In the near future the system of designation of the various grades of PE will be based on the minimum required strength (MRS), in megapascals, multiplied by 10. The designations will therefore change as follows:

current designation: PE 25, PE 32, PE 50

new designation: PE 32, PE 40, PE 63

2) PE 50 used only occasionally.

3) The pipe series (S) is defined as the ratio σ/PN, where σ is the recommended induced stress at 20 °C and PN is the nominal pressure rating of the pipe at 20 °C (see also ISO 4065).

Table 2 — Resistance to internal pressure — Test parameters

Material of pipe (designation)	Short test			Long test		
	Temperature	Time	Induced stress	Temperature	Time	Induced stress
	°C	h	MPa	°C	h	MPa
PE 32	20	1	7,8	70	100	2,9
PE 25			6,9		100	2,5
PE 50			12	80	170	3,9
NOTE — The figures in the table are provisional and under discussion.						

7 Other physical characteristics

7.1 Longitudinal reversion

The determination of longitudinal reversion shall be by either the liquid bath test or the oven test described in ISO 2506. Whichever test is used, the value of the longitudinal reversion shall be no greater than 3 %.

7.2 Susceptibility to environmental stress-cracking

The susceptibility of PE 25 pipe to environmental stress-cracking shall be tested in accordance with the test method specified in ISO 8796 and the test results shall comply with the requirements of that document.

The test methods for PE 32 and PE 50 pipes are under study.

8 Marking

All pipes shall be indelibly marked at intervals not exceeding 1 m. The required marking shall include:

— the manufacturer's name or trademark;

— the pipe material (PE 25, PE 32, PE 50);

— the nominal outside diameter (D) and nominal wall thickness (e);

— the nominal pressure (PN);

— the year of production;

— the word "IRRIG".

EXAMPLE

(Name) - PE 32 - 25 × 2,3 - PN 6 - 92 - IRRIG

Annex A
(normative)

Principles for the selection of irrigation laterals

A.1 General working conditions

The normal working conditions of the pipes shall be:

— Operation for a maximum of 1 500 h per year at pressures up to the nominal pressure of the pipe and at a water temperature up to 45 °C. To provide additional safety when these working conditions are exceeded, the next-lower pipe series, i.e. pipe with a greater wall thickness, shall be chosen.

— When pipe is not in use, the pressure shall be released.

NOTE 2 Under these working conditions, the life expectancy of the pipe is 10 years or less, depending on the mechanical stresses and abrasion to which the pipe is subjected (not 50 years, as is customary for water supply pipes).

A.2 Factors affecting choice of pipe

In addition to working pressures, the following factors affect the choice of pipe wall thickness.

A.2.1 The type of connection between the pipe and its various fittings, and between the pipe and the various distribution devices.

A.2.1.1 The type of connection does not affect the choice of pipe in the following cases:

a) When the connecting fitting or the distribution device is of the insert type (serrated insert with or without outside reinforcing clamps).

b) When a distribution device inserted into the pipe is used, whether it is secured by a clamp or not.

A.2.1.2 The type of connection does affect the choice of pipe in the following cases:

a) When the distribution device is inserted into a non-threaded hole in the wall of the pipe and not secured by means of clamps. In this case, the wall thickness of the pipe shall be not less than 1,2 mm for PE 25 pipes.

NOTE 3 For greater accuracy, a relationship must be found between nominal wall thickness, the hole diameter and inside diameter of the pipe.

b) When the distribution device is threaded from the side into the pipe wall. In this case, the wall thickness shall be not less than 1,5 mm.

NOTE 4 For greater accuracy, a relationship must be found between minimum wall thickness and diameter of the thread.

c) When the connecting fitting is a compression fitting (external grip fitting). In this case, the wall thickness of the pipe shall be not less than 1,4 mm for PE 25 pipes and not less than 1,2 mm for PE 32 and PE 50 pipes.

This limitation does not apply when the pipe is reinforced in the gripping zone with a suitable insert.

A.2.2 The way in which the lateral is linked to the rest of a fixed or mobile system.

A.2.2.1 In a semi-mobile sprinkler system, the lateral shall be not less than a PN 6 pipe.

A.2.2.2 In a trailer-type drip irrigation system, the lateral shall be not less than a PN 4 pipe.

A.3 Effect of water temperature on choice of nominal pressure (PN) of pipe

At temperatures up to 35 °C, the nominal pressure of the pipe is determined by the maximum working pressure required of the pipe (see A.1).

At temperatures of 36 °C to 45 °C, the pipe shall be selected from the next-lower pipe series (i.e. the next-higher PN) listed in table 1, so as to obtain a pipe with greater wall thickness [thus if the maximum working pressure is 2,5 bar (0,25 MPa), use a PN 4 pipe].

EXAMPLE

For PE 32 pipe:

Temperature range, °C	up to 35	36 to 45
Pipe series selected	S8	S5
Nominal pressure PN (as marked)	4	6
Max. working pressure, bar	4	4