INTERNATIONAL STANDARD

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Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP)

Systèmes de canalisations en plastique pour les branchements et les collecteurs d'assainissement enterrés sans pression — Polypropylène (PP)

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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 8773 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

This second edition cancels and replaces the first edition (ISO 8773:1991), which has been technically revised.

Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP)

1 Scope

This International Standard specifies the requirements for polypropylene (PP) pipes, fittings and piping systems intended for use for non-pressure underground drainage and sewerage for the conveyance of soil and waste discharge of domestic and industrial origin, as well as surface water.

It covers buried pipework, as well as piping systems buried within the building structure.

In the case of industrial discharge, it is necessary that the chemical and temperature resistance be taken into account, but this will need to be done separately.

This International Standard is applicable to PP pipes with or without an integral socket and to jointing by means of push-fit joints with sealing rings or butt-fused joints.

NOTE 1 Fittings can be manufactured by injection-moulding or fabricated from pipes and/or mouldings.

This International Standard covers PP materials with normal E moduli and with higher E moduli, designated as HM (higher modulus), and gives a range of nominal sizes and pipe series, as well as recommendations concerning colours.

This International Standard also specifies the test parameters for the test methods referred to herein.

NOTE 2 PP materials with normal E moduli have an E modulus of between 1 250 MPa and 1 700 MPa. PP materials with higher E moduli (PP-HM materials) have an E modulus greater than or equal to 1 700 MPa.

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 580:2005, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating*

ISO 1133:2005, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces*

ISO 2505:2005, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters*

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*

ISO 4065, *Thermoplastics pipes — Universal wall thickness table*

ISO 4435, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U)*

ISO 9969, *Thermoplastics pipes — Determination of ring stiffness*

ISO 11173, *Thermoplastics pipes — Determination of resistance to external blows — Staircase method*

EN 1277:2003, *Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test method for leaktightness of elastomeric sealing ring type joints*

EN 1401-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chlorine) (PVC-U) — Part 1: Specifications for pipes, fittings and the system*

EN 12061, *Plastics piping systems — Thermoplastics fittings — Test method for impact resistance*

EN 12256, *Plastics piping systems — Thermoplastics fittings — Test method for mechanical strength or flexibility of fabricated fittings*

3 Symbols and abbreviated terms

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

NOTE The symbols are illustrated in Figures 1 to 21.

3.1 Symbols

A length of engagement

B length of lead-in

C depth of sealing zone

d_{em} mean outside diameter

d_n nominal outside diameter

d_{sm} mean inside diameter of socket

d_3 internal diameter of groove

e wall thickness

e_m mean wall thickness

e_2 wall thickness of socket

e_3 wall thickness in groove area

f groove width

H length of chamfer

L axial cover of saddle branch

L_1 length of spigot

l effective length of pipe

M length of plug spigot

R radius of swept fittings

Z_d design length (Z_d length)

α nominal angle of fitting

3.2 Abbreviated terms

CT close tolerance

DN nominal size

DN/OD nominal size, outside diameter-related

MFR melt mass-flow rate

PP polypropylene

PP-HM polypropylene with high E modulus

S pipe series S

SDR standard dimension ratio

SN nominal ring stiffness

TIR true impact rate

4 Material

4.1 Base material

The base material shall be polypropylene (PP), to which are added those additives needed to facilitate the manufacture of components conforming to the requirements of this International Standard.

4.2 Reprocessable and recyclable material

In addition to virgin material, the use of reprocessable material obtained during the production and testing of products conforming to this International Standard is permitted. External reprocessable material and recyclable material shall not be used.

4.3 Melt mass-flow rate

Pipes and fittings shall be made from PP materials with an MFR of

MFR (230/2,16) $\leqslant$ 1,5 g/10 min

when tested in accordance with ISO 1133:2005, using conditions M (temperature: 230 °C; loading mass: 2,16 kg).

Materials for pipes and fittings for butt-fusion joints shall be designated by the following classes with regard to the MFR:

Class A: MFR $\leqslant$ 0,3 g/10 min

Class B: 0,3 g/10 min $<$ MFR $\leqslant$ 0,6 g/10 min

Class C: 0,6 g/10 min $<$ MFR $\leqslant$ 0,9 g/10 min

Class D: 0,9 g/10 min $<$ MFR $\leqslant$ 1,5 g/10 min

Only pipes and fittings made from materials of the same or an adjacent MFR class may be fused together.

4.4 Resistance to internal pressure of pipe material (long-term behaviour)

When determined in accordance with the test method as specified in Table 1, using the indicated parameters, the pipe material shall have the characteristic conforming to the requirement given in Table 1.

The material shall be tested in the form of a pipe.

Table 1 — Material characteristics (long-term behaviour)

Characteristic	Requirement	Test parameters		Test methods
Resistance to internal pressure	No failure during the test period	End caps Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Type a or b 95 °C Free 3 2,5 MPa 1 h Water-in-water 1 000 h	ISO 1167-1 ISO 1167-2

4.5 Resistance to internal pressure of fitting material (long-term behaviour)

When determined in accordance with the test method as specified in Table 1, using the indicated parameters, the fitting material shall have characteristic conforming to the requirement given in Table 1.

The fitting material shall be tested, in its actual formulation, in the form of an extruded or injection-moulded pipe.

Fabricated fittings or parts of fabricated fittings shall be made from pipes conforming to this International Standard, except for requirements relating to wall thickness, and/or from mouldings of PP conforming to the material, mechanical and physical characteristics specified in this International Standard.

4.6 Sealing ring retaining means

Sealing rings may be retained using means made from polymers other than PP.

5 General characteristics

5.1 Appearance

When viewed without magnification, pipes and fittings shall meet the following requirements:

— the internal and external surfaces shall be smooth, clean and free from grooving, blistering, impurities, pores and any other surface irregularity likely to prevent conformity with this International Standard;

— pipe ends and fittings shall be cleanly cut and their ends shall be square to their axis.

5.2 Colour

The pipes and fittings shall be coloured through the whole wall.

The colour should preferably be orange-brown (approximately matching RAL 8023), black or dusty grey (approximately matching RAL 7037), see reference [1].

6 Geometrical characteristics

6.1 General

All dimensions shall be measured in accordance with ISO 3126.

The figures given in this International Standard are schematic sketches only, indicating the relevant dimensions. They do not necessarily represent manufactured components. The dimensions given shall be conformed with, however.

6.2 Dimensions of pipes

6.2.1 Outside diameter

The mean outside diameter, d_{em}, shall be in accordance with Table 2.

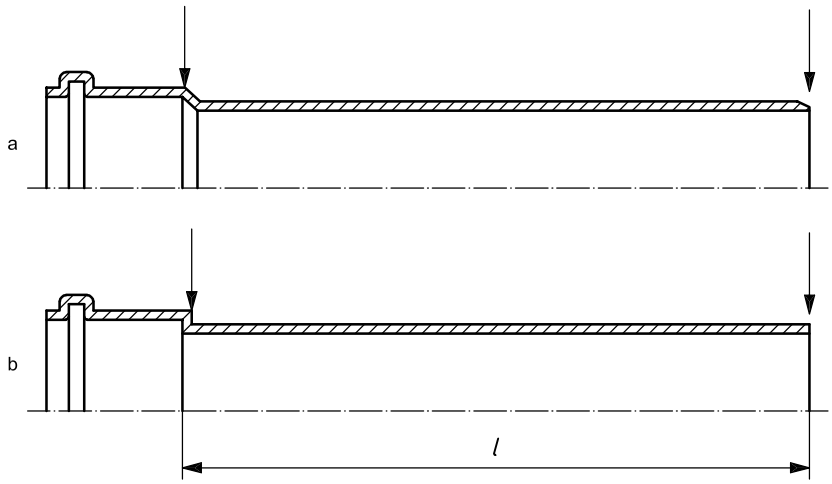
Table 2 — Mean outside diameters

Dimensions in millimetres

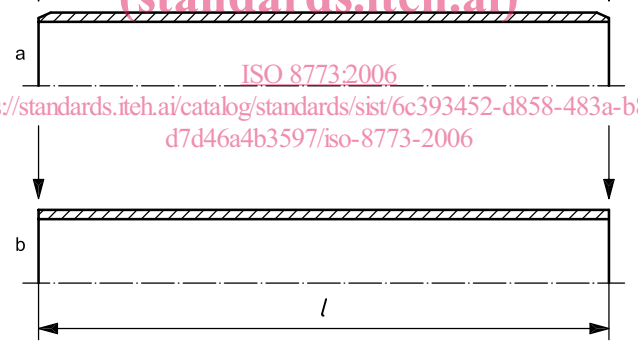
Nominal size DN/OD	Nominal outside diameter	Mean outside diameter	
	d_n	$d_{em,min}$	$d_{em,max}$
110	110	110,0	110,4
125	125	125,0	125,4
160	160	160,0	160,5
200	200	200,0	200,6
250	250	250,0	250,8
315	315	315,0	316,0
355	355	355,0	358,2
400	400	400,0	403,6
450	450	450,0	454,1
500	500	500,0	504,5
630	630	630,0	635,6
800	800	800,0	807,2
1 000	1 000	1 000,0	1 009,0
1 200	1 200	1 200,0	1 210,0
1 400	1 400	1 400,0	1 410,0
1 600	1 600	1 600,0	1 610,0

6.2.2 Effective length of pipes

The effective length, l, of a pipe, shall be not less than that declared by the manufacturer when measured as shown in Figure 1.



a) Single-socket pipe with ring seal



b) Plain-ended pipe

Key

l effective length of pipe

a With chamfer.

b Without chamfer.

Figure 1 — Effective length of pipes

6.2.3 Chamfering

If a chamfer is applied, the angle of chamfering shall be between 15° and 45° to the axis of the pipe (see Figure 1 or Figure 2, as applicable).

The remaining wall thickness of the end of the pipe shall be at least one-third of e_{min}.

6.2.4 Wall thicknesses

The wall thickness, e, shall be in accordance with Table 3, where a maximum wall thickness at any point of 1,25e_{min} is permitted, provided that the mean wall thickness, e_m, is less than or equal to the specified $e_{m,max}$.

Table 3 — Wall thicknesses

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter	Wall thickness							
		PP with normal E modulus						PP-HM	
		SN 2 [a] SDR 41 [c]		SN 4 SDR 33 [c]		SN 8 SDR 23,4 [c]		SN 8 SDR 27,6 [c]	
	d_n	e_{min} [b]	$e_{m,max}$	e_{min} [b]	$e_{m,max}$	e_{min} [b]	$e_{m,max}$	e_{min} [b]	$e_{m,max}$
110	110	—	—	3,4	4,0	4,7	5,4	4,0	4,6
125	125	—	—	3,9	4,5	5,4	6,2	4,6	5,3
160	160	3,9	4,5	4,9	5,6	6,9	7,8	5,8	6,6
200	200	4,9	5,6	6,2	7,1	8,6	9,7	7,3	8,3
250	250	6,2	7,1	7,7	8,7	10,7	12,0	9,1	10,3
315	315	7,7	8,7	9,7	10,9	13,5	15,1	11,4	12,8
355	355	8,7	9,8	10,9	12,3	15,2	17,0	12,9	14,4
400	400	9,8	11,0	12,3	13,8	17,1	19,1	14,5	16,2
450	450	11,0	12,3	13,8	15,4	19,2	21,4	16,3	18,2
500	500	12,3	13,8	15,3	17,1	21,4	23,8	18,1	20,3
630	630	15,4	17,2	19,3	21,5	26,9	29,8	22,8	25,3
800	800	19,6	21,8	24,5	27,2	34,2	37,9	29,0	32,1
1 000	1 000	24,5	27,2	30,6	33,9	42,7	47,9	36,2	40,0
1 200	1 200	29,4	32,6	36,7	40,6	51,2	56,6	43,4	47,8
1 400	1 400	34,3	38,0	42,9	47,4	59,8	66,0	50,6	55,8
1 600	1 600	39,2	43,4	49,0	54,1	68,3	75,4	57,9	62,8

NOTE For components conforming to this International Standard, the standard dimension ratio, SDR, and the values of the pipe series S specified in this table are calculated from the equation SDR = 2S + 1 and are related as follows:

SDR 41 corresponds to S 20;

SDR 33 corresponds to S 16;

SDR 27,6 corresponds to S 13,3;

SDR 23,4 corresponds to S 11,2.

[a] SN 2 is applicable for buried installations outside the building structure only. Respect the verifications to be carried out for the structural design of the piping and the installation conditions.

[b] The e_{min} values are according to ISO 4065.

[c] The standard dimension ratios (SDR) are defined in ISO 4065.