BS EN 1451 â€“ 1 / Plastics Piping Systems for Soil and Waste Discharge (Low and High Temperature) Within the Building Structureâ€” Polypropylene / Testing Equipment

Description

4 Material

4.1 PP-compound

The compound for pipes and fittings shall be PP-base material (homopoiymer or copoiymer) to which are added those additives that are needed to facilitate the manufacture of components conforming to the requirements given in this standard.

In orderto conform to national requirements on fire regulations other additives may be used.

Fabricated fittings or parts of fabricated fittings shall be made from pipes and/or mouldings conforming to this standard, except for the requirements for the wall thickness of fabricated fittings and/or mouldings from pp which conform to material, mechanical and physical characteristics as required in this standard.

4.2 Reprocessable and recyclable material

In addition to virgin material the use of own reprocessable material obtained during the production and testing of products conforming to this standard is perrnitted. External reprocessable or recyclable material shall not be used.

4.3 Melt mass-flow rate

The MFR of the base material shall be tested in accordance with ISO 1133:1997, condition M (test temperature: 230 Â°C, loading mass: 2,16 kg).

pipes and fittings intended to be used for mechanical joints shall be made from materials with an MFR as follows:

MFR (230/2,16) 3,0 g/10 min.

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

Class A:			MFR ≤	0,3 g/10 min;
Class B:	0,3 g/10 min	<	MFR ≤	0,6 g/10 min;
Class C:	0,6 g/10 min	<	MFR ≤	0,9 g/10 min;
Class D:	0,9 g/10 min	<	MFR ≤	1,5 g/10 min.

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

4.4 Thermal stability

When tested in accordance with EN 728 using a test temperature of 200 Â°C, the oxidation induction time (OIT) of the material used for pipes and fittings intended for butt fusion shall not be less than 8 min.

7 Mechanical characteristics of pipes

7.1 General characteristics

When tested in accordance with the test method as specified in Table 9 using the indicated parameters, the pipe shall have general mechanical characteristics conforming to the requirements given in Table 9.

The mass and fall height of striker for determining the impact resistance (round-the-clock method) as specified in Table9aregiven in Table10 orTable11, as applicable.

Table 9: General mechanical characteristics of pipes

Characteristic	Requirement	Test parameters		Test method
PP-copolymer: Impact resistance [1)] (round-the-clock method)	TIR ≤ 10 %	Mass of striker Fall height of striker Type of striker for: d_n < 110 mm d_n ≥ 110 mm Conditioning medium Conditioning temperature Conditioning period Sampling procedure	Tables 10 or 11 Tables 10 or 11 d 25 d 90 Water or air (0 ± 1) °C 60 min prEN 1451-7	EN 744:1995
PP-H: Impact resistance (round-the-clock method)	TIR ≤ 10 %	Mass of striker Fall height of striker Type of striker for: d_n < 110 mm d_n ≥ 110 mm Conditioning medium Conditioning temperature Conditioning period Sampling procedure	Tables 10 or 11 Tables 10 or 11 d 25 d 90 Air (23 ± 2) °C 60 min prEN 1451-7	EN 744:1995
[1)] In case of indirect testing (see prEN 1451-7) the preferred temperature is (23 ± 2) °C.				

Table 10: Masses and fall heights of striker for impact resistance
(round-the-clock method)
(metric series)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mass of striker kg + 0,01 0	Fall height of striker + 20 0
32	32	0,5	600
40	40	0,5	800
50	50	0,5	1 000
63	63	0,8	1 000
75	75	0,8	1 000
80	80	0,8	1 000
90	90	0,8	1 200
100	100	0,8	1 200
110	110	1,0	1 600
125	125	1,25	2 000
160	160	1,6	2 000
200	200	2,0	2 000
250	250	2,5	2 000
315	315	3,2	2 000

Table 11: Masses and fall heights of striker for impact resistance
(round-the-clock method)
(series based on inch dimensions)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mass of striker kg + 0,01 0	Fall height of striker + 20 0
34	34	0,5	600
41	41	0,5	800
54	54	0,5	1000

8 Physical characteristics

8.1 Physical characteristics of pipes

When tested in accordance with the test methods as specified in Tabie 13 using the indicated parameters, the pipe shall have physical characteristics conforming to the requirements given in Table 13.

Table 13: Physical characteristics of pipes

Characteristic	Requirements	Test parameters		Test method
Longitudinal reversion	≤ 2 % The pipe shall exhibit no bubbles or cracks	Test temperature Immersion time	(150 ± 2) °C 30 min	EN 743:1994 Method A[1)] Liquid
		or		
		Test temperature Immersion time	(150 ± 2) °C 60 min	EN 743:1994 Method B[1)] Air
Melt mass-flow rate (MFR-value)	Permitted max. deviation when processing the compound into a pipe: 0,2 g/10 min	Condition 12: Test temperature Reference time Loading mass	 230 °C 10 min 2,16 kg	ISO 4440-1:1994 together with ISO 4440-2:1994
[1)] The choice of method A or method B is in the responsibility of the manufacturer.				

8.2 Physical characteristics of fittings

When tested in accordance with the test methods as specified in Table 14 and Table 15 using the indicated parameters, the fittings shall have physical characteristics conforming to the requirements given in Table 14 or Table 15, as applicable.

Table 14: Physical characteristics of fittings

Characteristic	Requirements	Test parameters		Test method
Effects of heating	[1) 2) 3)]	Test temperature Heating time	(150 ± 2) °C 30 min	EN 763: 1994 Method A Air oven
[1)] The depth of cracks, delamination or blisters shall not be more than 20 % of the wall thickness around the injection point(s). No part of the weld line shall be open to a depth of more than 20 % of the wall thickness. [2)] When fittings are manufactured from pipes, the pipes shall conform to the requirements given in Table 9 and Table 13. [3)] Mouldings that are used for fabricated fittings may be tested separately.				

Table 15: Physical characteristics of fabricated fittings

Characteristic	Requirement	Test parameters		Test method
Watertightness[1)]	No leakage	Water pressure Duration	0,5 bar [2)] 1 min	EN 1053
[1)] Only for fabricated fittings made from more than one piece. A sealing ring retaining mean is not considered as a piece. [2)] 1 bar = 100 kPa				

9 Performance requirements

When tested in accordance with the test methods as specified in Table 16 using the indicated parameters, the joints and the system shall have fitness for purpose characteristics conforming to the requirements given in Table 16.

Table 16: Fitness for purpose characteristics of the system

Characteristic	Requirements	Test parameters		Test method
Watertightness[1)]	No leakage	Shall conform to EN 1053		EN 1053
Airtightness[1)]	No leakage	Shall conform to EN 1054		EN 1054
Application area "B": Elevated temperature cycling	No leakage before and after the test; Sagging: DN ≤ 50: ≤ 3 mm DN > 50: 0,05d_n	Shall conform to EN 1055		EN 1055:1996 Test assembly a) (Figure 1 and/or Figure 3)
Application area "BD": Elevated temperature cycling	No leakage before and after the test; Sagging: DN ≤ 50: ≤ 3 mm DN > 50: 0,05d_n	Shall conform to EN 1055		EN 1055:1996 Test assembly b) (Figure 2)
Application area "BD": Tightness of elastomeric ring seal joints		Test temperature Spigot deflection Socket deflection Difference	(23 ± 5) °C ≥ 10 % ≥ 5 % ≥ 5 %	EN 1277:1996 Method 4 Condition B
	No leakage	Water pressure	0,05 bar	
	No leakage	Water pressure	0,5 bar	
	≤ -0,27 bar	Air pressure	-0,3 bar	
		Test temperature Angular deflection	(23 ± 5) °C 2°	EN 1277:1996 Method 4 Condition C
	No leakage	Water pressure	0,05 bar	
	No leakage	Water pressure	0,5 bar	
	≤ -0,27 bar	Air pressure	-0,3 bar	
Application area "BD": Long-term performance of TPE seals	Sealing pressure: a) at 90 d ≥ 1,3 bar b) using extrapolation to 100 yr ≥ 0,6 bar	Shall conform to prEN 1989		prEN 1989

[1)] Not required for butt fusion joints.

10 Requirements for application area â€œBDâ€•

10.1 General

pipes and fittings intended to be used for application area â€œBDâ€• shall conform to the requirements for application area â€œBâ€• and additionally to the requirements given in this clause.

If national regulations require for use buried in ground within the building structure greater nominal outside diameters than 75 mm, these dimensions shall be taken into account.

For butt fusion joints, only those pipes and fittings (marked with â€œBDâ€•) shall be used which are suitable for use inside buildings and buried in ground within the building structure.

10.2 Material characteristics

The material for pipes and fittings used for application area â€œBDâ€• shall conform to the requirements for resistance to internal pressure as specified in Table 17. The material shall be tested in the form of a pipe.

Table 17: Material characteristics

Characteristic	Requirement	Material type and test designation	Test parameters		Test method
Resistance to internal pressure	No failure during the test period	PP-H: Test at 140 h at 80 °C	End caps Test temperature Orientation Sampling sizes and series Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types a or b (80 ± 1) °C free prEN 1451-7 3 6,0 MPa 60 min Water-in-water ≥ 140 h	EN 921
		PP-H: Test at 1000 h at 95 °C	End caps Test temperature Orientation Sampling sizes and series Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types a or b (95 ± 1) °C free prEN 1451-7 3 3,5 MPa 60 min Water-in-water ≥ 1000 h	
		PP-copolymer: Test at 140 h at 80 °C	End caps Test temperature Orientation Sampling sizes and series Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types a or b (80 ± 1) °C free prEN 1451-7 3 4,2 MPa 60 min Water-in-water ≥ 140 h	
		PP-copolymer: Test at 1000 h at 95 °C	End caps Test temperature Orientation Sampling sizes and series Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types a or b (95 ± 1) °C free prEN 1451-7 3 2,5 MPa 60 min Water-in-water ≥ 1000 h	

10.3 Mechanical characteristics

pipes used for application area â€œBDâ€• shall conform to the requirements for ring stiffness as specified in Table 18.

Table 18: Mechanical characteristics

Characteristic	Requirement	Test parameters		Test method
Ring stiffness	SN ≥ 4 kN/m²	Test temperature	(23 ± 2) °C	EN ISO 9969
		Deflection	3 %	
		Deflection speed for:		
		75 mm ≤ d_n ≤ 110 mm	(2 ± 0,4) mm/min	
		110 mm < d_n ≤ 200 mm	(5 ± 1,0) mm/min	
		200 mm < d_n ≤ 315 mm	(10 ± 2,0) mm/min	

Summary of Testing Equipment to Cover This Standard are As below:

- Dimensional measurement equipment for pipes and fittings
- MFI MFR Melt Flow Indexer ISO 1133
- DSC OIT Differential Scanning Calorimeter EN728
- Falling Weight Impact Tester EN 744
- Longitudinal Reversion (Hot Air Oven) EN 743
- Water Tightness Tester EN 1053
- Air Tightness Tester EN 1054
- Thermal Cycling tester EN 1055
- ISO Ring Stiffness Tester ISO 9969
- Hydrostatic Pressure Tester EN 921
- Hot Water Bath for Hydrostatic Pressure Tester EN 921
- SS304 End Caps
- Combinational Test for Seals EN 1277


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