

Specification for

Unplasticized PVC pipe and fittings for gravity sewers

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	Water Research centre

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Contents

	Page
Cooperating organizations	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 Material	1
4 Colour	1
5 Dimensions and construction	1
6 Fittings	2
7 Marking	3
8 Testing	3
9 Sealing components	4
Appendix A Heat reversion test for pipe	9
Appendix B Stress relief test for injection mouldings	9
Appendix C Stress rupture test for pipe	10
Appendix D Drop test for fabricated fittings	10
Appendix E Negative pressure test for ring seal joints	10
Appendix F Hydrostatic pressure test for solvent cement joints	11
Appendix G Test for impact resistance at 20 °C	11
Appendix H Explanation of symbols used in tables and figures	12
Figure 1 — Effective length of pipe	5
Figure 2 — Socket dimensions	6
Figure 2a — Positions for measurement of snap cap wall thicknesses	5
Figure 3 — Schematic illustrations of typical fittings (including saddles)	7
Figure 4 — Spigot length of fitting	8
Figure 5 — Essential features of apparatus for diameter distortion test with negative pressure	11
Figure 6 — Suitable type of impact testing machine	14
Figure 7 — Chart for true impact rate (TIR) for test at 20 °C	15
Table 1 — Dimensions of pipe and fittings	1
Table 2 — Dimensions of spigot ends and sockets with sealing rings	2
Table 3 — Dimensions of solvent cement sockets	2
Table 4 — Minimum radius (R) for long bends made from extruded pipe	2
Table 5 — Type tests	3
Table 6 — Test parameters for impact resistance requirements	3
Table 7 — Test parameters for stress rupture requirement for pipe	4
Table 8 — Quality control tests	5
Table 9 — Number of equally spaced lines to be drawn on test specimens	12
Publications referred to	Inside back cover

Foreword

This British Standard has been prepared under the authority of the Plastics Standards Committee. Requirements are specified for unplasticized PVC pipe and fittings for underground sewers of either the combined or separate pipe systems intended for the disposal of surface water, domestic effluent and such effluent as is permitted by the statutory drainage authorities to be discharged into public sewers by the Public Health Act 1936, and of surface water and sewage as is permitted and defined by the Sewerage (Scotland) Act 1968. This standard covers pipe and fittings with nominal diameters in the range 200 mm to 630 mm inclusive. For sizes below 200 mm, see BS 4660.

Outside diameters included in this standard are in accordance with Table 2 of BS 3867:1969 and are in technical agreement with ISO 161-1. In the preparation of this standard attention has been given to the work of ISO/TC 138, Plastics pipes and fittings for the transport of fluids. In particular, the symbols used in tables and figures (see Appendix H) are in accordance with the ISO standards prepared by this committee.

The preliminary document of similar scope under international study includes pipe with four different values of the standard dimension ratio (SDR), which is the ratio of the outside diameter of the pipe to its minimum wall thickness. In this standard only pipe with an SDR of 41 is specified; the thinner walled pipe of SDR 65 and SDR 51 is intended for specialized application, e.g. the relining of existing sewers whilst the thicker walled pipe of SDR 34 is intended for the particularly onerous duty found in some countries.

Pipe and fittings complying with the requirements of this standard and made in accordance with good commercial practice are clean, smooth and reasonably free from grooving and other defects likely to impair their performance. Furthermore, the ends of pipes and fittings made in accordance with good commercial practice are cleanly cut and square with the axis of the component and the pipes are reasonably straight.

Certification. It is strongly recommended that in view of the nature of this specification manufacturers and purchasers should make use of the certification facilities described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for unplasticized PVC pipe, fittings and accessories suitable for the construction of drains including foul and surface water sewers. The standard covers pipe and fittings with nominal diameters in the range 200 mm to 630 mm together with necessary joints and accessories. If it is proposed to use these pipes and fittings with untreated trade waste or with discharges at elevated temperatures, reference should be made to CP 312-1 and/or to the manufacturer concerning the suitability of the material for the intended service.

2 References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3 Material

3.1 Except as provided for in clause 9, the material from which the pipe and fittings are produced shall consist substantially of polyvinyl chloride. Only those additives may be used that are needed for the manufacture of the polymer and for its subsequent conversion into sound, durable extrusions or mouldings of good surface finish and mechanical strength, together with such pigments as are necessary to meet the requirements of clause 4.

3.2 The use of the manufacturer's own clean rework material, complying with the requirements of this standard, is permissible. No other rework material shall be used.

4 Colour

Pipe and fittings made from unplasticized PVC shall be golden brown approximating to colour 414 of BS 381C:1980 or colour 06 D 45 of BS 4901:1976. The colour known as RAL 8023 is also acceptable. The requirements of this clause need not apply to snap caps (see clause 9) which may be supplied alternatively in black or grey as agreed between the purchaser and the supplier.

5 Dimensions and construction

5.1 Pipe

5.1.1 Pipe dimensions shall be in accordance with Table 1.

5.1.2 Pipe shall normally be delivered in effective lengths (see Figure 1) of 3 m, 6 m and 9 m. Other lengths may be supplied as agreed between the purchaser and the vendor.

5.1.3 The basic dimensions of integral sockets with sealing rings shall be in accordance with Table 2 and Figure 2.

5.1.4 The basic dimensions of integral solvent cement sockets shall be in accordance with Table 3 and Figure 2.

Table 1 — Dimensions of pipe and fittings

All dimensions are in millimetres

Nominal size ^a	Mean outside diameter ^b of pipe and spigots		Extreme individual outside diameter of pipes and spigots		Wall thickness "e" of pipes and of bodies and spigots of fittings ^c
	Min.	Max.	Min.	Max.	Min.
200	200.0	200.6	196.3	204.3	4.9
250	250.0	250.7	245.4	255.4	6.1
315	315.0	315.9	309.2	321.8	7.7
(355)	355.0	356.0	348.4	362.6	8.7
400	400.0	401.0	392.5	408.5	9.8
(450)	450.0	451.0	441.5	459.5	11.0
500	500.0	501.0	490.5	510.5	12.2
(560)	560.0	561.0	549.3	571.7	13.7
630	630.0	631.0	617.9	643.1	15.4

^a Non-preferred sizes are indicated in parentheses
^b Mean outside diameter is defined as the arithmetic mean of any two diameters at right angles to each other.
^c These values of wall thickness are for a standard dimension ratio (SDR) of 41 (see foreword).

5.2 Fittings

5.2.1 Injection moulded fittings

5.2.1.1 Fittings having sockets with sealing rings shall conform to the relevant dimensions given in Table 1 and Table 2 and Figure 2, except that fittings or those parts of fittings not intended to come into contact with the fluid being transported are not required to comply with the wall thicknesses given in Table 2. Typical fittings are schematically illustrated in Figure 3.

The positions for measuring the wall thickness dimensions of a typical snap cap shall be as illustrated in Figure 2a.

5.2.1.2 Fittings having solvent cement sockets shall be in accordance with Table 1 and Table 3 and Figure 2. Typical fittings are schematically illustrated in Figure 3.

5.2.2 *Fabricated fittings manufactured from pipe complying with this standard.* Sockets and spigot ends shall meet the requirements laid down for injection moulded fittings. In the case of long bends, fabricated by drawing pipe, minimum radii shall be in accordance with Table 4 (see also Figure 3). The wall thickness of such bends may be reduced to the values given for e_2 in Table 2.

Table 2 — Dimensions of spigot ends and sockets with sealing rings (see Figure 2)

All dimensions are in millimetres

Nominal size (outside diameter d_e) (see note 1)	Socket							Spigot end
	d_1 min.	A min.	B min.	C max.	e min.	e_2 min.	e_3 min.	(see Figure 4) min. E
200	200.7	50	12	40	4.9	4.4	3.7	99
250	250.8	55	18	70	6.1	5.5	4.6	134
315	316.0	62	20	70	7.7	6.9	5.8	144
(355)	356.1	66	22	70	8.7	7.8	6.5	149
400	401.1	70	24	70	9.8	8.8	7.3	155
(455)	451.1	75	26	75	11.0	9.9	8.2	166
500	501.1	80	28	80	12.2	11.0	9.1	178
(560)	561.1	86	31	86	13.7	12.3	10.3	192
630	631.1	93	34	93	15.4	13.9	11.5	209

NOTE 1 Non-preferred sizes are indicated in parentheses.

NOTE 2 d_1 maximum depends on the shape, the dimensions and the hardness of the rubber rings, which are designed and fixed by the manufacturer.NOTE 3 For constructions in which the rubber ring is firmly fixed in the groove of the socket the requirement for a minimum value for dimension B shall not apply.**Table 3 — Dimensions of solvent cement sockets** (see Figure 2)

All dimensions are in millimetres

Nominal size (outside diameter d_e)	d_2 min.	d_2 max.	A_1 min.	e min.	e_2 min.	Spigot end (see Figure 4) E min.
200	200.1	200.6	76	4.9	4.4	99
250	250.1	250.7	94	6.1	5.5	134
315	315.3	315.9	116	7.7	6.9	134

NOTE It is possible for the solvent weld technique to be used on larger diameters of pipes and fittings but it is essential that the manufacturer's special jointing instructions are strictly adhered to during construction.

5.3 Chamfer. Spigot ends of pipes and fittings shall be chamfered.**Table 4 — Minimum radius (R) for long bends made from extruded pipe**

All dimensions are in millimetres

Nominal size (see note)	Minimum radius (R) (measured to the centre line)
200	905
250	1 130
315	1 425
(355)	1 605
400	1 805
(450)	2 030
500	2 255
(560)	2 525
630	2 840

NOTE Non-preferred sizes are indicated in parentheses.

6 Fittings

6.1 Range of fittings. Fittings covered by this standard include bends, sockets, reducers and branches. They shall comply with the relevant requirements given in clause 5 and Table 1, Table 2, Table 3 and Table 4. Examples of fittings are illustrated in Figure 3. Other fittings complying with the relevant requirements of this standard are permitted, whether they are illustrated or not.

6.2 Swept fittings. Fittings such as bends, branches or saddles for angles greater than 45° may be swept and in this case shall have a throat radius of not less than 60 mm (see Figure 4).

6.3 Unequal fittings and adaptors

6.3.1 Where a fitting or adaptor provides for a transition between pipes and/or fittings of two nominal sizes of this standard, the wall thickness of each part of the fitting or adaptor shall comply with the requirements for the nominal size for that part.

6.3.2 Where a fitting or adaptor provides a transition between pipes and/or fittings complying with the requirements of this standard and pipes and/or fittings complying with the requirements of BS 4660, the wall thickness of each part of the fitting or adaptor shall comply with the requirements of the relevant standard.

6.3.3 The minimum wall thickness of the transition shall be $0.9 \times e$ of the larger diameter end of the fitting or adaptor.

7 Marking

Each length of pipe and every fitting shall be clearly and durably marked to show the manufacturer's identification, the number of this British Standard (i.e., BS 5481), the nominal size and the reference SDR 41¹⁾.

8 Testing

8.1 Type tests

8.1.1 General. Type tests are intended to prove the suitability and performance of a new composition, a new compounding or processing technique or a new design or size of pipe, joint or fittings. Such tests are required when a change is made in polymer composition or method of manufacture and in any case on a continuing basis to such a schedule as will ensure that each size and design of pipe, fittings and joint assembly is tested at least once in every five year period. A summary of the type tests is given in Table 5.

8.1.2 Vicat softening point

8.1.2.1 Pipe. When two random samples, taken from pipe, are tested by method 120B of BS 2782, the deformation temperature of each sample shall not be lower than 79 °C.

8.1.2.2 Moulded fittings. When two random samples, taken from moulded fittings of a given formulation, are tested by method 120B of BS 2782, the deformation temperature of each sample shall not be lower than 75 °C.

Table 5 — Type tests (clause references)

Requirement	Pipe	Moulded fittings	Fabricated fittings	Ring seal joints
Vicat softening point	8.1.2.1	8.1.2.2	—	—
Impact	8.1.3	—	—	—
Reversion	8.1.4	—	—	—
Stress relief	—	8.1.5	—	—
Stress rupture	8.1.5	—	—	—
Drop resistance	—	—	8.1.7	—
Negative pressure	—	—	—	8.1.8

8.1.3 Impact resistance requirement at 20 °C for pipe. When tested by the method described in Appendix G, samples of each combination of pipe size and material formulation shall have a true impact rate (TIR) below 10 % at a confidence level of 90 %. The test conditions shall be in accordance with Table 6.

Table 6 — Test parameters for impact resistance requirements

Nominal size	Mass of falling weight	Fall height
mm	kg	mm
200	4.0	2 000 ± 10
250	5.75	2 000 ± 10
315	7.5	2 000 ± 10
>315	7.5	2 000 ± 10

8.1.4 Reversion requirement for pipe. When three samples from each combination of pipe size and material formulation are tested by the method described in Appendix A, at no point around a specimen shall the length change by more than 5 %. After testing, the specimens shall show no faults, e.g. cracks, cavities or blisters.

¹⁾ See foreword for explanation of SDR.