BRITISH STANDARD

BS 4660:2000
Incorporating Corrigenda Nos. 1 and 2

Thermoplastics ancillary fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage

ICS 83.140.30; 91.140.80; 93.030

British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee PRI/61, Plastics piping systems and components, to Subcommittee PRI/61/1, Thermoplastics piping systems and components for non-pressure applications, upon which the following bodies were represented:

British Adhesives and Sealants Association

British Plastics Federation

DETR — British Board of Agreement

DETR — Building Research Establishment

DETR — Central Transport Group

DOE for Northern Ireland

Health and Safety Executive

Institute of Building Control

Institute of Plumbing

Land Drainage Contractors Association

National Association of Plumbing, Heating and Mechanical Services Contractors

Plastics Land Drainage Manufacturers Association

Water UK

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10875 Corrigendum No. 1	March 2000	Indicated by a sideline
13946 Corrigendum No. 2	9 December 2002	Change to **6.3.1**

Contents

Foreword

This British Standard has been prepared by Subcommittee PRI/61/1. It supersedes BS 4660:1989 which is withdrawn.

The nominal sizes of the fittings covered by this standard are 110 and 160, in accordance with BS 2782-11:Method 1121B:1998 (ISO 161-1:1996).

The major changes between this edition and the previous edition are as follows.

a) Pipes, bends, branches and couplers have been removed and are covered in BS EN 1401-1:1998. This edition specifies ancillary access fittings not covered by BS EN 1401-1:1998.

b) Dimensions and requirements for joint sockets, including seal-retaining components, have been clarified and the minimum wall thickness of sockets has been brought into line with BS EN 1401-1:1998.

c) The title and scope have been modified, from "Unplasticized poly(vinyl chloride) (PVCU) fittings ···" to "Thermoplastics ancillary access fittings ···", to recognize the fact that this standard does (and always has) specified some requirements for certain fittings of thermoplastics materials other than PVC-U.

Annex A, which is normative, specifies a method of test for the impact resistance of polyolefin fittings.

Annex B, which is normative, specifies a method of test for the water seal of a trapped gully.

Annex C, which is informative, gives guidance on quality control testing.

A bibliography is included.

Attention is drawn to ENV 1401-3, BS 5955-6, BS EN 1610 and BS EN 752, which give guidance on storage, handling and installation. Attention is drawn to controls and guidance embodied in building regulations and associated documents, such as The Building Regulations 1991 (Amended 1992), Part H: Drainage and waste disposal approved documents, which is applicable in England and Wales.

Product certification/inspection/testing. Users of this British Standard are advised to consider the desirability of third-party certification/inspection/testing of product conformity to this British Standard. Appropriate conformity attestation arrangements are described in BS EN 45011. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Attention is drawn to the provisions of the Health and Safety at Work etc. Act 1974 and the need to ensure that appropriate precautions are taken to ensure the safety of personnel when carrying out methods of test required by this standard.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 10, an inside back cover and a back cover.

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1 Scope

This British Standard specifies requirements for thermoplastics ancillary access fittings suitable for the construction of gravity drains and sewers, other than conventional branches, bends and couplers which are covered in BS EN 1401-1:1998. It is applicable to access fittings with nominal sizes of 110 and 160 together with necessary joints and accessories.

Methods of test, associated guidance and information on quality control testing are given in Annex A, Annex B and Annex C.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this British Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

BS 2782-11:Method 1101A, *Methods of testing plastics — Thermoplastics pipes, fittings and valves — Measurement of dimensions of pipes.*

BS 2782-11:Method 1108C:1996, *Plastics piping and ducting system — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock method.*
(BS EN 744:1996)

BS 2782-11:Method 1109A, *Methods of testing plastics — Thermoplastics pipes, fittings and valves — Resistance to environmental stress cracking of polyethylene pipes and fittings for non-pressure applications.*

BS 2782-11:Method 1112B, *Plastics piping systems — Thermoplastics piping systems for non-pressure applications — Test method for watertightness.*
(BS EN 1053:1996)

BS 2782-11:Methods 1112L, M, N and Q:1996, *Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test methods for leaktightness of elastomeric sealing ring joints.*
(BS EN 1277:1996)

BS 3412:1992, *Methods of specifying general purpose polyethylene materials for moulding and extrusion.*

BS 4346-3, *Specification for solvent cement.*

BS 5139:1991, *Method of specifying general purpose polypropylene and propylene copolymer materials for moulding and extrusion.*

BS 5572, *Code of practice for sanitary pipework.*

BS 5955-6, *Code of practice for plastics pipework (thermoplastics materials) — Part 6: Installation of unplasticized PVC pipework for gravity drains and sewers.*

BS 6100-3-3.3, *Glossary of building and civil engineering terms — Part 3: Services — Section 3.3: Sanitation.*

BS 6209, *Specification for solvent cement for non-pressure thermoplastics pipe systems.*

BS EN 681-1:1996, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber.*

BS EN 752-1:1996, *Drain and sewer systems outside buildings — Part 1: Generalities and definitions.*

BS EN 752-2:1997, *Drain and sewer systems outside buildings — Part 2: Performance requirements.*

BS EN 752-3:1997, *Drain and sewer systems outside buildings — Part 3: Planning.*

BS EN 1401-1:1998, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: Specification for pipes, fittings and the system.*

BS EN 1253-2:1999, *Gullies for buildings — Part 2: Test methods.*

BS ISO 472:1988, *Plastics — Vocabulary.*

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 5572, BS 6100-3-3.3, BS EN 752-1:1996, BS EN 752-2:1997, BS EN 752-3:1997, BS EN 1401-1:1998 and BS ISO 472 and the following apply.

3.1
access fitting
fitting to provide access for rodding in more than one direction and for testing

NOTE On a buried drain it is used in one of three ways:

a) as an opening in the top of a drain having a sealed cover and a separate cover bedded at surface level;

b) with a raising piece terminating with a suitable cover at surface level;

c) with a sealed cover located within an inspection chamber or manhole.

3.2
adaptor
fitting to provide for connection between a fitting conforming to this specification and any other fitting or between a fitting conforming to this specification and a pipe

3.3
cleaning eye
access opening in a pipe or pipe fitting arranged to facilitate cleaning or the clearing of obstructions within the pipe or fitting and fitted with a cap or plug

3.4
gully
trapped fitting intended to receive discharge from domestic waste and rainwater pipes

3.5
exposed fitting
fitting which terminates at surface level with a cover or grating or which is designed for use entirely within an inspection chamber or manhole

3.6
fabricated fitting
fitting produced by modification of a moulded or extruded component

3.7
rodding eye
access opening having a removable cover to enable obstructions to be cleared by rodding

4 Materials

4.1 Fittings

NOTE The design of systems using pipes and fittings made of different plastics should take account of any relevant differences in their properties, for example thermal expansion coefficients.

4.1.1 *Fittings other than exposed fittings*

Except for snap caps, which may also be produced from any other thermoplastics material, the material from which the fitting is produced shall comprise an unplasticized poly(vinyl chloride) (PVC-U) plastic, in each case incorporating or blended with other ingredients as necessary to enable manufacture of a fitting conforming to the other requirements of this standard as applicable and specified accordingly.

4.1.2 *Exposed fittings (see 3.5)*

NOTE 1 Fittings made using material in accordance with b) or c) are referred to collectively as polyolefin fittings. For the purposes of this standard their use is restricted to exposed fittings.

The material from which the fitting is produced shall comprise one of the following plastics (see notes 1 and 2), incorporating or blended with other ingredients as necessary to enable the manufacture of a fitting conforming to the other requirements of this standard as applicable.

a) Unplasticized poly(vinyl chloride) (PVC-U) plastic, to be specified as either brown in accordance with **5.1** or black and otherwise in respect of other ingredients and/or properties as appropriate (see **7.1**).

b) Polyethylene (PE) plastic, to be specified as class W in accordance with BS 3412:1992, including the designation applicable to the method of processing to be used for the manufacture of the fitting and in respect of other ingredients and/or properties as appropriate.

c) Polypropylene (PP) plastic or propylene plastic, to be specified in accordance with BS 5139:1991 as light-stablized and weather-stablized and black together with the designation applicable to the method of processing to be used for the manufacture of the fitting and in respect of other ingredients and/or properties as appropriate.

NOTE 2 For the purposes of this standard, PP is used to signify both polypropylene plastics and propylene plastics.

4.2 Adhesives

If an adhesive is used to make a fabricated fitting of PVC-U, the adhesive shall conform to BS 6209 or BS 4346-3, as applicable.

4.3 Reworked material

If reworked material is added or used, it shall comprise the manufacturer's own clean reworked material from products conforming to the requirements of this standard and to BS EN 1401-1 for the corresponding material for pipes or fittings, as applicable, and it shall be of the same type as and compatible with any material to which it is added.

4.4 Elastomeric joint rings

If elastomeric joint rings are incorporated or used in joints, they shall conform to the requirements of BS EN 681-1:1996 for type WC.

5 Appearance

5.1 Colour

Except for some exposed fittings (see **4.1.2**), the colour of fittings shall be brown. For covers, frames and gratings, black shall be an alternative colour (see **4.1.2**).

5.2 Structural features

Except in so far as appropriate surfaces may be deliberately roughened for jointing to other materials, the surfaces of the fittings shall be clean, smooth and free from grooving and other features that would prevent conformity to Clauses **6**, **7**, **8** and **9** of this standard, as applicable.

6 Dimensions

6.1 General

Measurement of dimensions of fittings shall be carried out in accordance with BS 2782-11: Method 1101A.

6.2 Nominal size

The nominal size of the fitting shall be one of the sizes given in BS EN 1401-1:1998, Table 3.

6.3 Sockets and fittings

6.3.1 *Wall thickness*

The dimensions and wall thickness of all sockets and fittings shall conform to the limits given for class SN4 in BS EN 1401-1:1998, Tables 3, 5, 6 and 8.

6.3.2 *Lengths*

The lengths of parts of sockets and spigots shall conform to the application limits given in BS EN 1401-1:1998, Table 5 and Table 8, except as follows.

a) For joints fabricated or assembled by the manufacturer under workshop conditions, dimensions $L_{1,\text{min.}}$ and $L_{2,\text{min.}}$ may be reduced by up to 50 % of the values given in BS EN 1401-1:1998, Table 8.

b) For reducers and plugs, the minimum length for L_1 may be reduced by up to 50 %, provided that there is a stop to prevent entry beyond the seal zone.

c) For rodding eyes and gully hoppers, the minimum length for L_2 may be reduced by up to 50 % of the values given in BS EN 1401-1:1998, Table 8.

d) Where a spigot is chamfered, the external chamfer angle shall be not less than 10 .

6.3.3 *Rodding eyes*

If rodding eyes are supplied with a spigot or socket for connection to pipework, the internal opening shall have a minimum dimension of not less than 100 mm and shall be sealed so that it shall not leak when tested in accordance with BS 2782-11:Method 1112B.

6.3.4 *Cleaning eyes*

Where a fitting is provided with a cleaning eye, the opening should have a minimum cross-section dimension or diameter greater than 20 mm and shall be sealed so that it shall not leak when tested in accordance with BS 2782-11:Method 1112B.

6.3.5 *Channel fittings*

The minimum centre line length, a (see Figure 1), of the opening shall be 150 mm.

6.3.6 *Access fittings*

The minimum internal opening into the pipe shall be 150 mm × 100 mm or 150 mm diameter. The cover to the opening, or an associated seal, shall be so dimensioned as to provide a watertight joint when tested in accordance with BS 2782-11:Method 1112B.

6.3.7 *Gullies*

The gully or gully assembly shall comprise an exposed fitting of which the top inlet shall have a minimum inlet dimension of 100 mm. For trapped gullies the minimum depth of water seal shall be 50 mm.

7 Physical properties

7.1 PVC-U fittings

Fittings manufactured from PVC by injection moulding shall meet the requirements of BS EN 1401-1:1998, Table 13.

7.2 Polyethylene fittings

7.2.1 *Resistance to stress cracking of moulded polyethylene fittings*

When tested in accordance with BS 2782-11:Method 1109A using a test piece comprising either a complete fitting or pieces cut from a fitting, so that collectively the pieces include all points of injection and weld lines without interfering with the continuity of features, the test piece shall not exhibit any visible cracking or delamination.

7.2.2 *Impact resistance of polyolefin fittings*

When subjected to a single blow by testing in accordance with Annex A, the fitting shall show no visible cracks.

NOTE The presence of stress marking without visible cracks does not constitute failure.

8 Performance characteristics

8.1 Leaktightness of joints

Joints between access fittings or with pipes or fittings conforming to BS EN 1401 shall conform to the requirements given in BS EN 1401-1:1998, Table 15.

When a gully which has been subjected to the temperature cycling test described in BS EN 1253-2:1999 is tested in accordance with Annex B of this British Standard, using a gauge pressure of 4 mbar, there shall be no drop in pressure within 15 min and there shall be no visible leakage.

8.2 Resistance to surface loading

When tested in accordance with BS EN 1253-2:1999, Clause **4**, gully gratings, grating assemblies, rodding eyes and sealing plates shall be classified by loading strength into one of the following classes as applicable: K3; L15; M25 (see **8.3**). Gullies either not accessible to foot traffic or not required to withstand external loads are not classified.

8.3 Classification by area of installation

NOTE The following classes have been reproduced from BS EN 1253-2:1999. The selection of the class of gully appropriate to the place of installation is the responsibility of the specifier for the installation.

a) *Class K3*

Areas without vehicular traffic, such as bathrooms in dwellings, old peoples' homes, hotels, schools, swimming baths, public wash and shower facilities, balconies, loggias, terraces and roofs with greenery.

b) *Class L15*

Areas with light vehicular traffic, excluding fork lift trucks, in commercially used premises.

c) *Class M125*

Areas with vehicular traffic, such as car parks, factories and workshops.

9 Marking

9.1 Each fitting shall be clearly and indelibly marked (see **9.2**) with the following:

a) the manufacturer's identification;

b) the number and date of this British Standard, i.e. BS 4660:2000;

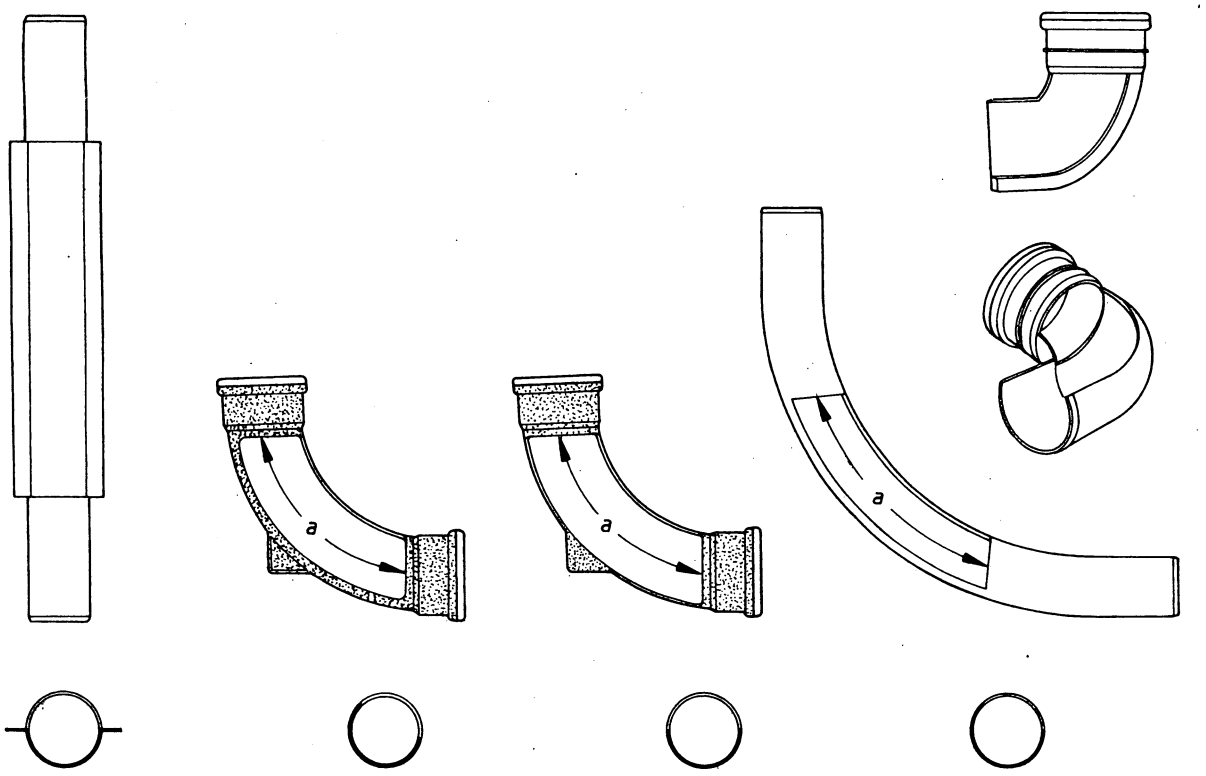
c) the nominal size, i.e. 110 or 160, as applicable.

Additional markings shall be applied as follows:

1) for gratings, grating assemblies, access plates and rodding eyes, the load rating grade in accordance with **8.2**;

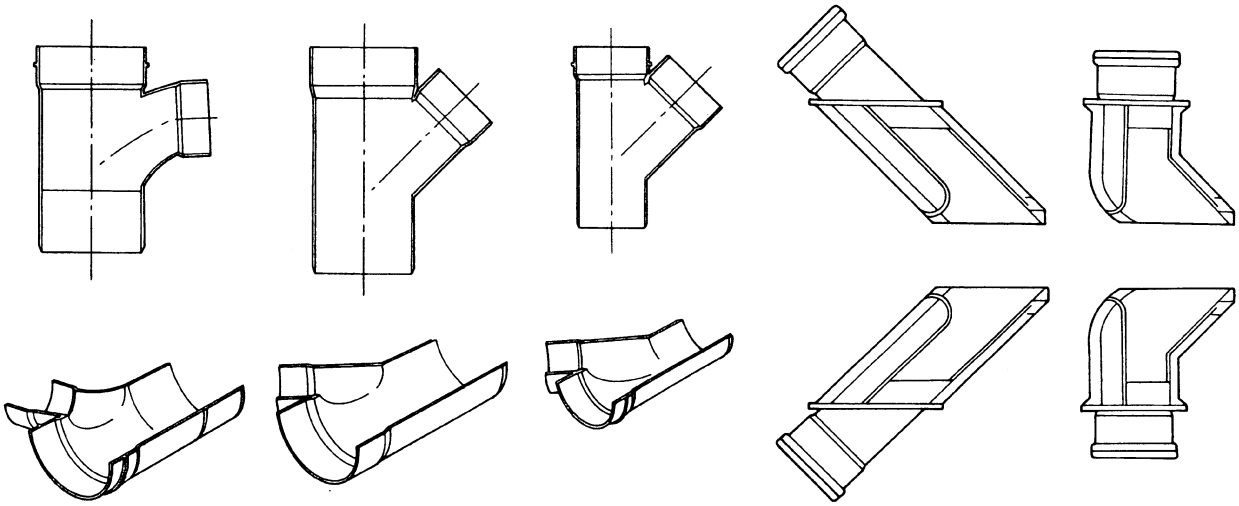
2) for fittings conforming to **4.1.2** the material symbol PE or PP as applicable in accordance with **4.1.2** or, if the body is made of PVC-U plastic, that symbol or no marking in this respect.

9.2 The marking shall remain legible under handling storage and installation procedures in accordance with BS 5955-6 as applicable.



a) Main channel fittings

a is not less than 150 mm



b) Side branch fittings

Figure 1 — Typical channel fittings

Annex A (normative)
Method of test for the impact resistance of polyolefin fittings

A.1 Apparatus

A.1.1 *Falling weight apparatus*, in accordance with BS 2782-11:Method 1108C:1996, subject to the following requirements or options.

a) *Main frame*, in which the guide rails or, alternatively, a *guide tube* maintained vertical to within 1°, shall be supported above or astride the test piece and its support [see c)].

b) *Striker*, having a hemispherical striking surface (50 ± 1) mm in diameter and a nominal mass of 1.50 kg.

c) *Test piece support*, comprising a box containing clean dry sand to a depth of not less than 75 mm and of sufficient area to support the test piece in accordance with **A.4**. The bottom of the box shall be flat and shall rest on a smooth concrete floor or plinth.

A.1.2 *Water bath* or *equivalent enclosure* or *room*, maintained at (20 ± 2) °C.

A.2 Test piece

Each test piece shall comprise a complete fitting.

A.3 Conditioning

Condition the test piece for not less than 2 h in air or, and in case of dispute, not less than 30 min in water, at (20 ± 2) °C. Test pieces shall be tested within 5 min of their removal from the conditioning environment. If this interval is exceeded by up to 5 min, the test pieces shall be returned immediately to the conditioning environment for reconditioning for a period of at least 10 min. If the test piece is not returned to the conditioning environment within 11 min of initial removal, it shall be reconditioned for at least 2 h in air or 30 min in water, as applicable.

A.4 Procedure

Remove the test piece from its conditioning environment and place the test piece in the sand box so that the centre of the test piece is within 2.5 mm of the projection of the path of the centre of the hemispherical striker nose and no part of the test piece is less than 25 mm from the walls or bottom of the box. To prevent the test piece rolling, it may be partially bedded in the sand to a depth not exceeding half its height.

Adjust the striker so that its nose is not less than 2 000 mm above the test piece.

Release the striker within 5 min of removing the test piece from the conditioning environment.

Examine the test piece for damage. If necessary, cut the test piece open to enable the surface opposite the point of impact of the striker to be examined.

A.5 Test report

The test report shall include the following:

a) the identification of the test piece;

b) a reference to this method, i.e. BS 4660:2000, Annex A;

c) a description of any damage to the test piece, with particular reference to any cracking;

d) the date of the test.

Annex B (normative)
Method of test for water seal

NOTE This method is based on that given for the water seal test of BS 3943:1979, Appendix F, adapted to correspond to a minimum depth of water seal of 50 mm as specified in **6.3.7**. It is intended to ensure that a trapped gully maintains the specified minimum water seal after subjection to elevated temperature cycling.

B.1 Apparatus

B.1.1 *Means for applying and isolating a specified pneumatic pressure*, in the range 0 mbar to 10 mbar and for measuring the applied pressure to an accuracy of within 0.1 mbar, for example a U-tube manometer of the necessary height and calibrated in increments of 1 mm water.

B.1.2 *An interval timer*, capable of indicating a period of 10 s.

B.1.3 *An adaptor*, to interconnect the source of pressure and pressure measurement (**B.1.1**) with the connection point of the test assembly and otherwise block and seal that connection point.

B.2 Procedure

Connect the pneumatic source and pressure indicating systems via the adaptor to the test piece or test assembly as applicable and apply the specified pressure. Isolate the pressure source and inspect the test piece/adaptor assembly for any leakage or loss of pressure associated with the test piece(s) during or after a specified period.

B.3 Test report

The test report shall include the following:

a) the identification of the test piece or components of the test assembly;

b) a reference to this method, i.e. BS 4660:2000, Annex B;

c) a report of the occurrence of any leakage or loss of pressure;

d) the date of the test.

Annex C (informative)
Guidance on quality control testing

The following guidance on the nature of the requirements and test methods specified in this British Standard is provided to assist in the preparation of quality plans for the manufacture of fittings conforming to this standard.

The applicability of specific requirements and associated methods of test to different types of fitting is summarized in Table A.1, in which each requirement is classified as being considered particularly suitable for type test and/or inspection test purposes.

Type tests are intended to prove the suitability and performance of a material composition, a compounding or processing technique or a design or size of fitting or joint assembly. Such tests should be performed when any introduction or change is made in one or more of those aspects, but they may be performed more frequently by incorporation into a plan for monitoring the consistency of manufacture.

Inspection tests are carried out during and/or following manufacture to monitor the quality of a product item as applicable. Certain test methods and associated requirements have been included because of the practicality and speed with which they may be performed in conjunction with a production process, in comparison with some of the type tests.

Some of the requirements in this standard are relevant to both type tests and inspection tests, e.g. those for dimensions.

Table C.1 — Applicability of requirements and test methods

Product	Property	Clause	Method	Type test	Inspection test
All	Material	**4**		×	
All	Colour	**5.1**		×	
All	Structural features	**5.2**		×	
All fittings	Wall thickness	**6.3.1**	BS 2782-11: Method 1101A	×	×
All fittings	Socket design	**6.3.2**		×	
Rodding eyes	Dimensions and leaktightness	**6.3.3**	BS 2782-11: Method 1101A and Method 1112B	×	
Cleaning eyes	Dimensions and leaktightness	**6.3.4**	BS 2782-11: Method 1101A and Method 1112B	×	
Channel fittings	Dimensions	**6.3.5**	BS 2782-11: Method 1101A	×	
Access fittings	Dimensions and leaktightness	**6.3.6**	BS 2782-11: Method 1101A and Method 1112B	×	
Gullies	Dimensions	**6.3.7**		×	
All products of PVC-U	Physical properties	**7.1**	BS EN 1401-1:1998, Table 13	×	×
Moulded PE fittings	Resistance to stress cracking	**7.1.2**	BS 2782-11: Method 1109A	×	
Moulded polyolefin fittings	Impact resistance	**7.1.3**	Annex A		×
Tightness of pipe/socket joints	Leaktightness	**8.1**	BS EN 1401-1:1998, Table 15	×	
Gullies	Elevated temperature cycling	**8.1**	BS EN 1253-2	×	
Gullies	Odour tightness	**8.1**	Annex B	×	
Surface fittings	Resistance to loading	**8.2**	BS EN 1253-2	×	

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BS 3943:1979, *Specification for plastics waste traps*.

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BS 45011, *General requirements for bodies operating product certification schemes*.

BS EN ISO 9002, *Quality systems — Model for quality assurance in production, installation and servicing*.

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Other documents

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GREAT BRITAIN. The Building Regulations 1991 (Amended 1992), Part H: Drainage and waste disposal approved documents. London, Cardiff: The Stationery Office.

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