BRITISH STANDARD

BS 5254:1976

Incorporating Amendment Nos. 1 and 2

Specification for

Polypropylene waste pipe and fittings —

(external diameter 34.6 mm, 41.0 mm and 54.1 mm)

UDC 621.643.29:678.742.3 – 462:696.122:628.21

Co-operating organizations

The Plastics Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and industrial organizations:

British Plastics Federation*
British Resin Manufacturers' Association
Chemical Industries Association Ltd.*
Department of the Environment, Building Research Establishment*
Department of Industry — Chemicals and Textiles
Electrical and Electronic Insulation Association
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National Water Council
Oil Companies Materials Association
Pitch Fibre Pipe Association
Royal Institution of Chartered Surveyors
Royal Society of Health
Society of Builders' Merchants
Water Companies' Association
Water Research Association

This British Standard, having been approved by the Plastics Industry Standards Committee, was published under the authority of the Executive Board on
30 January 1976

The following BSI references relate to the work on this standard:
Committee references PLC/9 and PLC/9/4
Draft for comment 71/52878

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Amendments issued since publication

Amd. No.	Date of issue	Comments
3588	May 1981	
4438	December 1983	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the authority of the Plastics Industry Standards Committee.

Requirements are given for waste pipe and fittings manufactured from polypropylene intended to convey normal domestic effluent.

Detailed material requirements are not specified but there is a requirement to be able to withstand the long term effects of the intermittent discharge of hot water.

The outside diameters of pipes specified in this standard are based upon superseded copper pipe sizes in accordance with BS 659 (generally copper tubes are now manufactured to metric sizes in accordance with Part 1 "*Copper tubes for water, gas and sanitation*" of BS 2871 "*Copper and copper alloys, tubes*") and some local authorities in the UK may deem them to be unacceptable.

Attention is drawn to BS 5255 "*Plastics waste pipe and fittings*", which specifies waste pipe systems with bore dimensions based on the clear bore principle and manufactured from ABS, modified UPVC, polypropylene and high density polyethylene.

Notwithstanding the foregoing, the minimum bore of pipes and fittings covered by this standard is in excess of the minimum bore of the outlets of associated plastic traps in accordance with BS 3943 "*Plastics waste traps*" which discharge into the waste pipes covered by this standard.

It is the intention to continue studies towards the introduction of a fully rational range of pipe in line with those being considered internationally by Technical Committee 138 of the International Organization for Standardization (ISO).

The various jointing methods in use preclude at present the standardization of the lengths and configurations of fittings.

Because the length of waste pipe from the sanitary apparatus is subjected to waste water at its highest temperature and may also be flowing full-bore, the elevated temperature cycling test for waste pipe and fittings is carried out using hotter water than the similar test for soil pipe and fittings.

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 12, 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 polypropylene waste pipe and fittings intended to convey normal domestic effluent.

NOTE If it is intended to use this pipe and these fittings other than in installations for normal domestic effluent it is essential to seek expert advice from the manufacturer on the suitability for the particular application.

If the waste pipe is to be installed outside a building and will be subjected to direct sunlight, it may be necessary to protect it from the degradation effects of ultraviolet light. This may be effected by the use of suitable pigments and/or stabilizers in the pipe material but otherwise the pipe should be painted with a suitable paint which has no deleterious effects on the plastics material.

2 References

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

3 Material

3.1 The material from which the pipe and fittings are produced shall consist substantially of a suitable grade of polypropylene copolymer, with only those additives 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.

3.2 The addition of the manufacturer's own clean rework material resulting from the manufacture of pipe and/or fittings in accordance with this standard is permissible; no other rework material shall be used.

4 Appearance

4.1 The internal and external surfaces of the pipe and fittings shall be clean, smooth and free from grooving and other defects that would impair their performance in service.

4.2 The ends of the pipe and fittings shall be square with the axis of the component.

5 Pipe dimensions

Pipe shall conform to the relevant dimensions given in Table 1.

6 Fitting dimensions

6.1 Fittings shall conform to the relevant dimensions given in Table 1 and Table 2 and Figure 1, 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 1.

The effective bore of fittings shall be not less than the minimum bore of the pipe complying with this standard to which they fit.

The positions for the measurement of the minimum wall thicknesses given in Table 1, for a typical design of snap cap, shall be as illustrated in Figure 1d.

6.2 Branch fittings and bends of 91¼°/92½° and 112½° shall be swept and shall have a radius of not less than that shown in Figure 2 and Figure 3.

6.3 If a connection is to be made to a metal threaded component the thread form shall comply with the requirements of BS 21 or BS 2779 and shall have a length of engagement of not less than four full threads.

6.4 All thread forms shall have a minimum internal radius of 0.25 mm.

6.5 All fittings shall comply with the requirements specified in **6.1** to **6.4**. Apart from the specified dimensions, Figure 1 to Figure 3 are only intended to be generally illustrative of the range of fittings.

7 Length of pipe

The standard length of pipe as supplied shall be 4 m. Other lengths may be supplied as agreed between the purchaser and the supplier.

8 Marking

Each length of pipe and every fitting shall be clearly and durably marked to show manufacturer's identification, the number of this British Standard, i.e. "BS 5254", the material code (PP) and the nominal size description as shown in the appropriate table or figure. Marking of the pipe shall be at intervals of not more than 1 m.

9 Heat reversion requirement for pipe

When tested by the method described in Appendix A, samples of pipe shall not alter in length by more than 1 %.

At least one test specimen shall be tested from each 24 h production batch.

10 Impact requirement for pipe

When tested by the method described in Appendix B using an impact energy of 24 J, compliance shall be judged on the failure rate (a failure being defined as a test specimen fracturing or cracking right through the complete wall thickness) as follows:

a) if the first 14 specimens tested contain no failures the batch of pipe shall be deemed to be satisfactory;

b) if the first 14 specimens tested contain four or more failures the batch of pipe shall be deemed to be unsatisfactory;

c) if the first 14 specimens tested contain one, two or three failures a further 28 test specimens shall be tested; if during this further testing the total number of failures exceeds five, the batch of pipe shall be deemed to be unsatisfactory.

11 Hydrostatic pressure requirement

When tested by the method described in Appendix C at a pressure of 0.7 bar[1)], any joint assembly of pipe and fittings shall show no signs of leakage or any other defects.

This is a type test and shall be carried out for each formulation used and when any change is made in composition or method of manufacture of pipe or fittings.

12 Stress relief requirement (for injection moulded fittings only)

When an injection moulded fitting is tested by the method described in Appendix D, no part of the weld line shall open completely. For fittings moulded by conventional techniques, special care shall be taken in examining the area around the point of injection where no cracks or delaminations shall penetrate to a depth greater than 50 % of the wall thickness. For fittings moulded by end-gating techniques e.g. ring or diaphragm methods, cracks or delaminations in the wall of the fitting adjacent to the injection area shall be parallel to the axis and shall not penetrate to a depth of more than 25% of the socket depth.

Three samples as moulded shall be tested from each 24 h production batch. If only one of the three fittings fails to comply with the requirements, a retest is permissible and a further six fittings from the same batch shall be tested. If any of these six fittings fails to comply with the requirements, the batch of fittings shall be deemed not to comply with the requirements of this standard.

13 Elevated temperature cycling requirement

When tested for 2 500 cycles by the method described in Appendix E, the following requirements shall be met.

a) No leaks shall have occurred during the test sequence.

b) The maximum deflection in any place in the system, between any two adjacent supports, shall be not greater than 1/10 of the nominal bore of the pipe.

c) Upon completion of the cycling test the system shall be exposed to a static head of 1 m by plugging the foot of the soil vent stack and then filling the system with cold water. There shall be no leak in the waste run over a period of 10 min.

d) After the completion of the test, the system, exclusive of the trap, shall be capable of accommodating the passage of a ball of diameter 6 mm less than the nominal bore of the pipe.

This is a type test and shall be carried out for each formulation used and when any change is made in composition or method of manufacture of pipe or fittings.

[1)] 1 bar = 10^5 N/m^2 = 100 kPa.

14 Joint systems

The jointing systems covered in this standard are based on the use of rubber seals; the most commonly used seal is the "O" ring. The rubber sealing rings supplied with the pipe or fittings shall comply with the requirements of BS 2494. Joints and other pipe fittings are illustrated in Figure 1 to Figure 8.

Some systems incorporate multi-vane seals which are effective over a wide area of the socket depth. Such joints shall comply with dimension *b* of Table 2 when measured at the centre of the gasket zone [see Figure 1(b)].

A further design feature dealt with is the mechanical compression joint. With such joints the depth of the socket shall provide a minimum distance of 10 mm beyond the compression zone [see Figure 1(c)].

The socket depths shown in Figure 1 are designed to operate with maximum lengths of 2.5 m. Longer lengths may be installed strictly in accordance with the manufacturer's instructions.

Table 1 — Dimensions of polypropylene pipe and fittings

Nominal size	Mean outside diameter of pipe	Tolerance on outside diameter of pipe	Minimum wall thickness of pipe and fittings	Maximum wall thickness of pipe
	mm	mm	mm	mm
1¼/32	34.6	± 0.150	1.8	2.2
1½/40	41.0	± 0.150	1.9	2.3
2/50	54.1	± 0.150	2.0	2.4

NOTE The outside diameter shall be the arithmetic mean of two measurements taken at right angles across the pipe. The wall thickness shall be measured with a ball-ended or barrel-ended micrometer.

Table 2 — Dimensions of joint sockets (see Figure 1)

Nominal size	*b*	*c*
	mm	mm
1¼/32	25	3.8
1½/40	25	3.8
2/50	25	3.8

NOTE Dimensions *b* and *c* are specified minimum values.

Appendix A Heat reversion test for pipe

A.1 Form of test specimen. The test specimen shall consist of a length of pipe approximately 300 mm long. Two circumferential marks shall be scribed on the test specimen 100 mm apart and in such a way that one of these marks is approximately 15 mm from one end of the specimen.

A.2 Apparatus. The apparatus shall consist of a thermostatically controlled bath which maintains the temperature of the heat transfer medium at 120 ± 2 °C.

The heat transfer medium may be a mineral oil free from aromatic hydrocarbons, a silicone oil or a polyethylene glycol.

A.3 Procedure. Suspend the test specimen in the heat transfer medium by the end furthest from the scribed marks in such a way that both scribed marks are completely immersed. Care shall be taken to ensure that the specimen does not contact the sides or bottom of the bath.

Keep the test specimen in the bath for a period of 15 min, counted from the moment when the test temperature is re-attained after inserting the specimen, then remove it from the bath and allow it to cool to room temperature. Measure the distance between the two scribed marks along the surface of the pipe and calculate the percentage change in length.

As an alternative, it is permissible to use an air circulating oven in which the test specimen shall be supported in such a way as to leave it free of external stresses. Place the test specimen in the oven for a period of 30 min, counted from the moment when the test temperature is re-attained after inserting the specimen, allow it to cool to room temperature and measure the distance between the scribed marks as described above.

Appendix B Impact test for pipe

B.1 Form of test specimen. Each specimen shall be a complete section of pipe of length not less than 200 mm. The ends of the specimens shall be square to the axis of the pipe.

B.2 Apparatus. A falling weight machine (a suitable form of which is shown in Figure 9) shall be used and shall consist essentially of the following.

a) A main frame which can be rigidly fixed in a true vertical position.

b) Guide rails carried from the inside of the main frame, on side bearings which can be adjusted to keep them parallel and vertical.

c) A weighted striker which can fall freely within the guide rails and which is equipped with a hardened hemispherical striking surface of 25 mm diameter. The striking surface shall be free from flats and other imperfections. The combined mass of striker and weight shall be 1.25 ± 0.05 kg.

d) A specimen support comprising a 120° vee block at least 230 mm in length which is positioned below the guide rails so that the tip of the striker is not more than 2.5 mm from the axis of the vee block.

e) A release mechanism which allows the striker to fall through a height of 2.0 ± 0.01 m on to the top surface of the pipe specimen.

f) Means for maintaining a constant height of fall by vertical movement of either the vee block, the release mechanism or the main frame, in order to accommodate different diameters of pipe.

B.3 Procedure. Condition each specimen for at least 30 min in a water bath maintained at a temperature of 20 ± 1 °C and test individual specimens within 5 min of removal from the bath. Allow the striker to fall freely through a height of 2 m on to the pipe specimen which is centrally mounted on the vee block support. Each specimen shall be subjected to a single blow only.

Appendix C Hydrostatic pressure test

C.1 Apparatus. The apparatus shall consist of end-sealing devices of size and method appropriate to the pipe system under test. The sealing devices shall be retained to prevent their movement when pressure is applied. They shall not exert axial loads on the system prior to application of the test pressure.

One end-sealing device shall be connected to a source of hydrostatic pressure. A bleed valve shall be provided at the upper end-sealing device to enable all air to escape when pressure is applied.

C.2 Procedure. Apply and maintain a pressure of 0.7 bar[2)] for not less than 15 s and for such longer time as may be required for proper proof and inspection up to a maximum of 60 s. The test shall be carried out at 20 ± 5 °C.

Appendix D Stress relief test (for injection moulded fittings only)

D.1 Procedure. Place the test specimens in a hot air oven previously raised to 150 ± 2 °C, or alternatively in a bath containing polyethylene glycol, glycerol or a mineral oil free from aromatic hydrocarbons, and at the same temperature. Place the fittings as moulded vertically, standing on one socket mouth. An automatic temperature control shall be provided to maintain the oven or bath at the appropriate temperature for the duration of the test. Remove the samples after 30 min, counted from the moment when the test temperature is re-attained after inserting the specimens. Care shall be taken not to distort or damage them in handling. Allow the samples to cool naturally in air before examination.

Appendix E Elevated temperature cycling test

E.1 Installation. The installation shall consist of pipe and fittings so that the distance from the centreline of the waste outlet to the centreline of the soil stack shall be a minimum of 2.5 m with a fall of between 1° and 5°. One end of the pipe shall be fitted to a waste trap complying with the requirements of BS 3943 and the other end to a vertical bossed soil pipe complying with the requirements of BS 4514.

A typical test assembly is depicted in Figure 10. Provision shall be made for a static head of 1 m to be applied as required. (The use of a sink unit is optional.)

The assembly shall be mounted in accordance with the manufacturer's instructions.

E.2 Procedure. Subject the assembly to the passage of hot/cold water according to the following schedule for 2 500 cycles.

a) 35 ± 3 litres water at a temperature of 93 ± 1 °C over a period of 90 s to 95 s. The water temperature shall be measured at the waste trap.

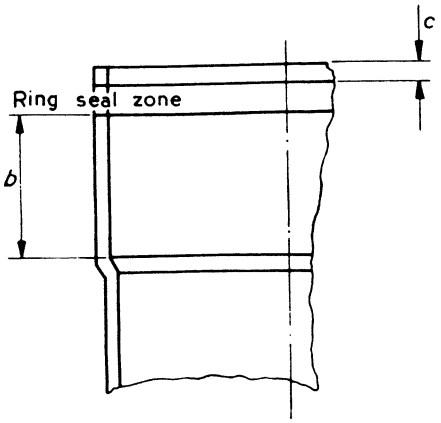
b) Rest and drain period of 60 s to 70 s.

c) 35 ± 3 litres of cold water over a period of 90 s to 95 s.

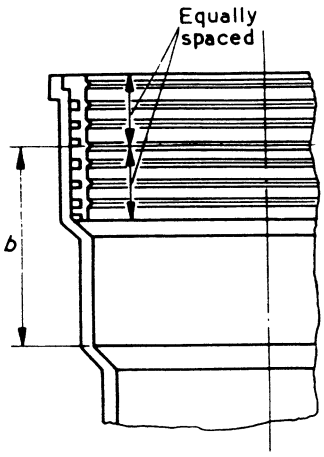
d) Rest and drain period not less than 60 s.

During the test the ambient temperature shall be 17 ± 5 °C.

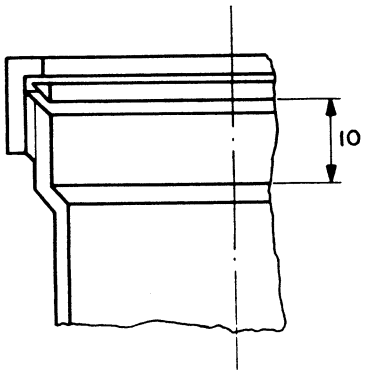
[2)] 1 bar = 10^5 N/m^2 = 100 kPa.



(a) Ring seal socket



(b) Multi-vane socket



(c) Compression socket

The dimension is in millimetres

NOTE 1 Values for *b* and *c* are given in Table 2.

NOTE 2 If a ring seal is retained by means of a snap cap, there is no requirement in respect of dimension *c*.

Figure 1 — Socket dimensions for fittings

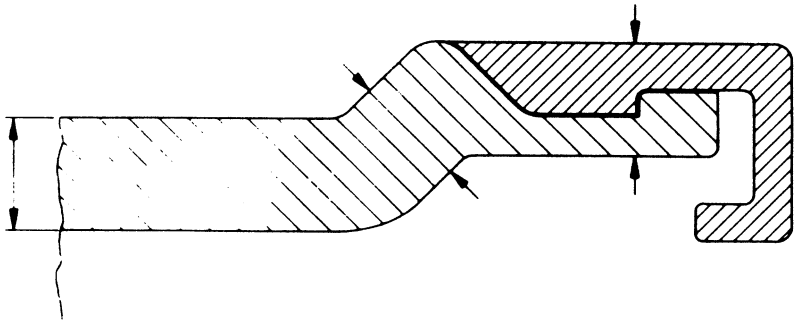
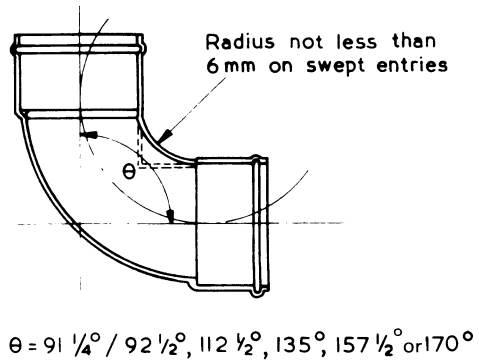
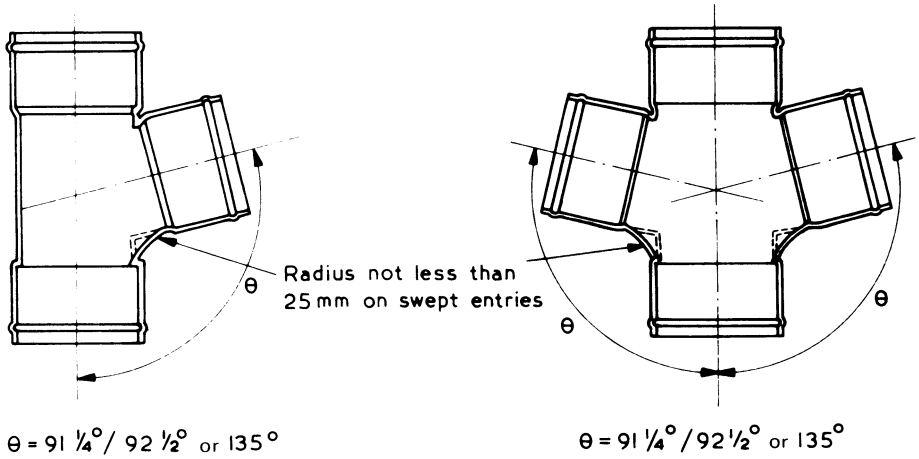


Figure 1d — Positions for measurement of snap cap wall thicknesses



(a) Bend
Nominal size descriptions
1¼32, 1½/40, 2/50



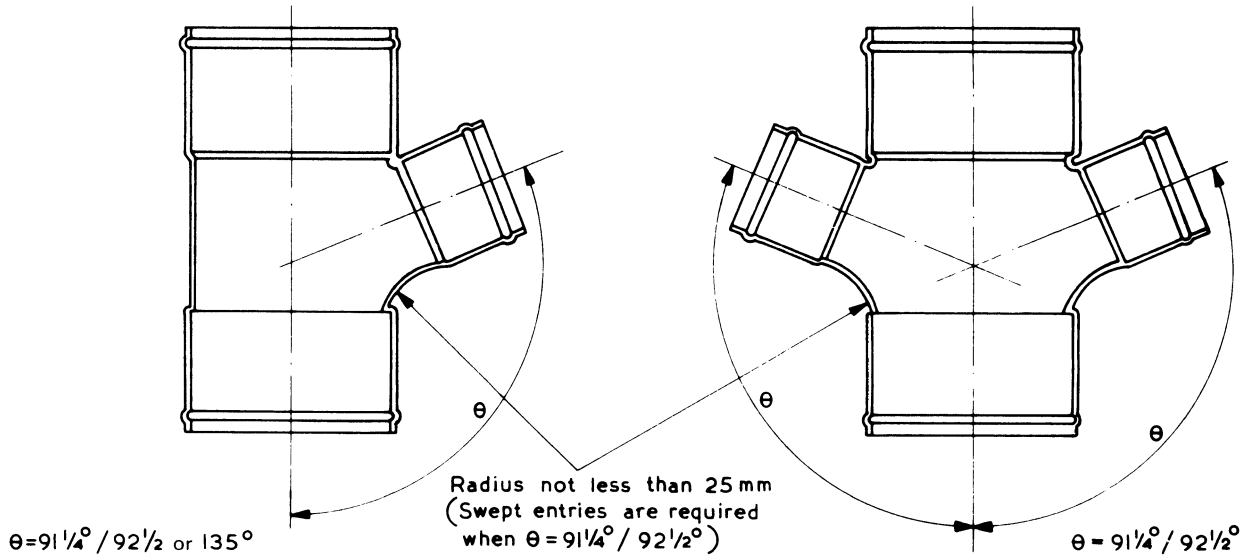
NOTE (Swept entries are required when θ = 91¼°/92½° or 112½°)

(b) Equal single branch
Nominal size descriptions
1¼/32, 1½/40, 2/50

(c) Equal double branch
Nominal size descriptions
1½/40, 2/50

NOTE The sealing ring type indicated on these and the following drawings is diagramatic. Other ring designs are permitted.

Figure 2 — Bends and equal branches



(a) Unequal single branch

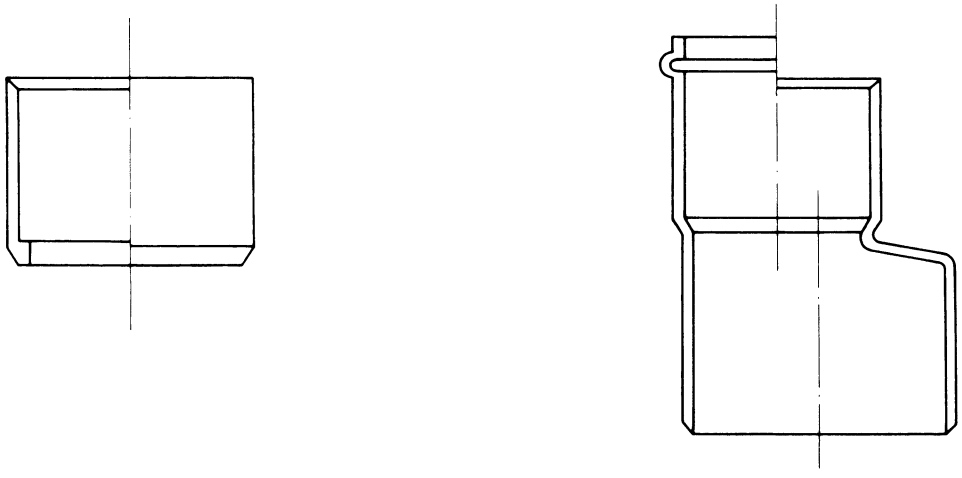
(b) Unequal double branch

Nominal size descriptions

2/50 × 1¼/32
2/50 × 1½/40
1½/40 × 1¼/32

NOTE The sealing ring type indicated on these and the following drawings is diagramatic. Other ring designs are permitted.

Figure 3 — Unequal branches



(a) Concentric reducer

Nominal size description

1½/40 × 1¼/32
2/50 × 1½/40

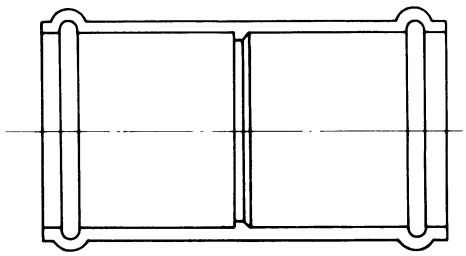
(b) Level invert reducer

Nominal size description

1½/40 × 1¼/32
2/50 × 1¼/32
2/50 × 1½/40

NOTE The sealing ring type indicated on these and the following drawings is diagramatic. Other ring designs are permitted.

Figure 4 — Reducers



NOTE The sealing ring type indicated on these and the following drawings is diagramatic. Other ring designs are permitted.

Figure 5 — Straight coupling (with or without register)

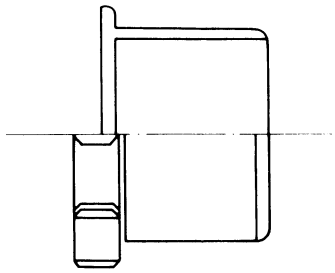
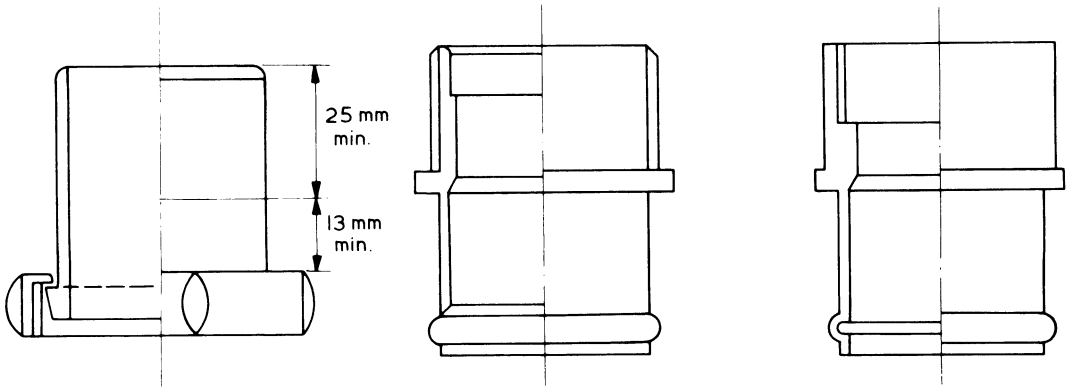


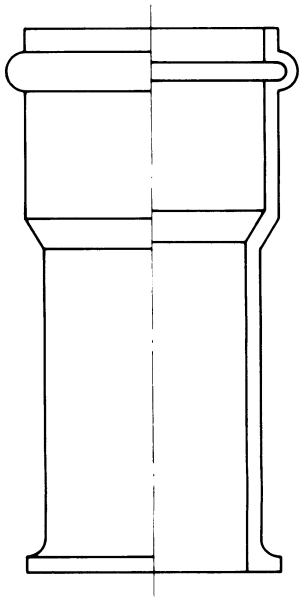
Figure 6 — Socket plugs (with or without access cap)



Connections to boss with a pipe thread complying with the requirements of BS 21 (male and female)

NOTE The sealing ring type indicated on these and the following drawing is diagrammatic. Other ring designs are permitted.

Figure 7 — Adaptors



NOTE The sealing ring type indicated on this drawing is diagrammatic. Other ring designs are permitted.

Figure 8 — Typical caulking bush

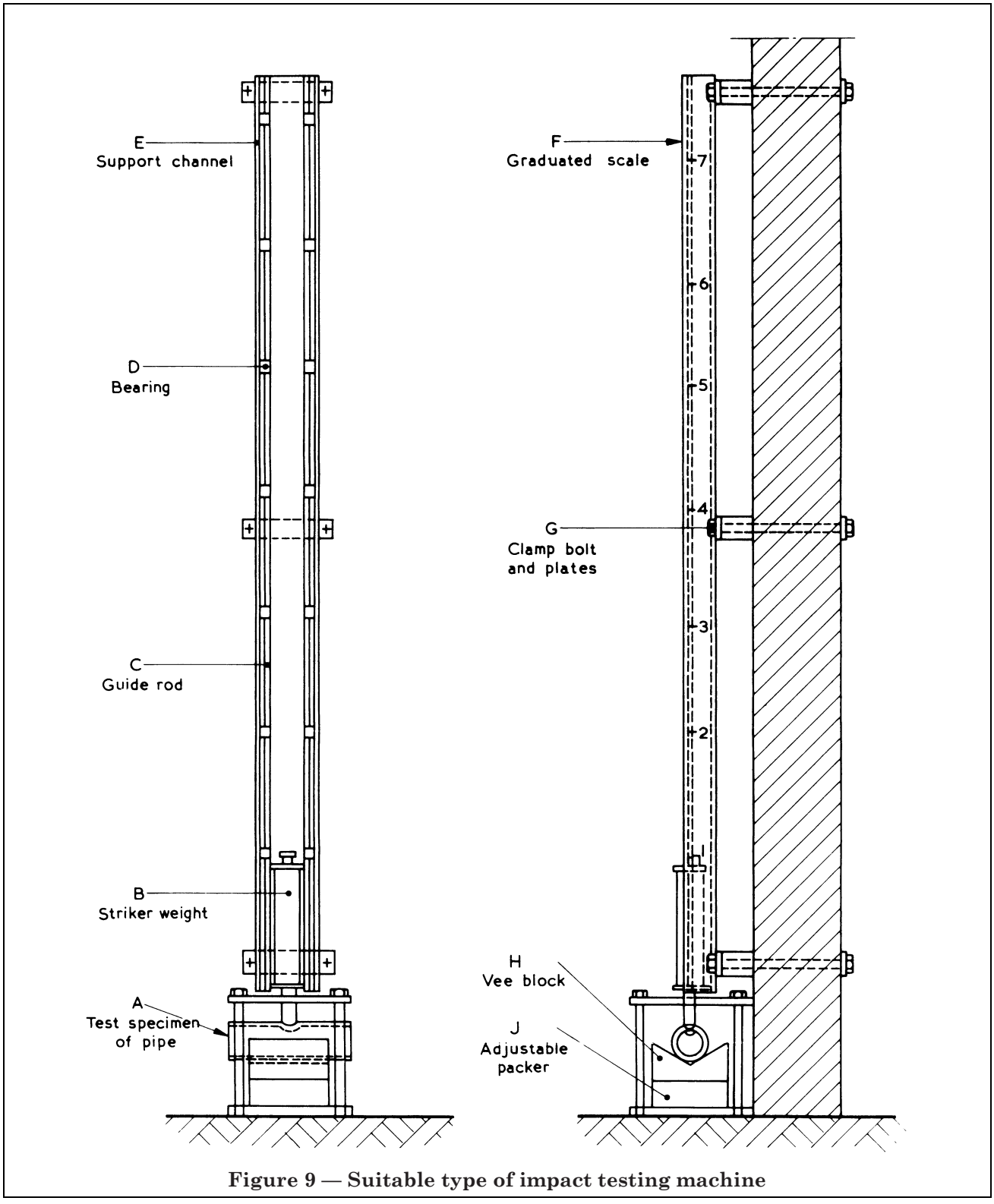


Figure 9 — Suitable type of impact testing machine

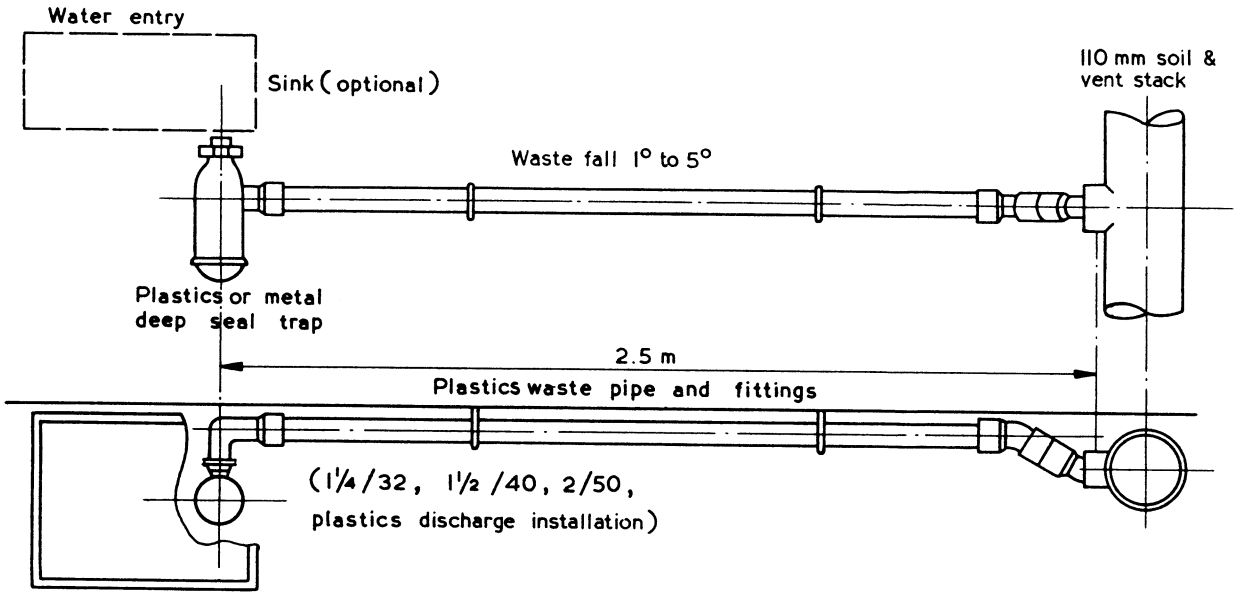


Figure 10 — Typical test installation for elevated temperature cycling test

Publications referred to

This standard makes reference to the following British Standards:
BS 21, *Pipe threads for tubes and fittings where pressure-tight joints are made on the threads.*
BS 2494, *Materials for elastomeric joint rings for pipework and pipelines.*
BS 2494-2, *Rubber joint rings for drainage purposes.*
BS 2779, *Pipe threads where pressure-tight joints are not made on the threads.*
BS 3943, *Plastics waste traps.*
BS 4514, *Unplasticized PVC soil and ventilating pipe, fittings and accessories.*

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