

Specification for

Plastics pipes and fittings for use as subsoil field drains

Confirmed
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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Plastics Standards Policy Committee (PLM/-) to Technical Committee PLM/9, upon which the following bodies were represented:

- British Board of Agrément
- British Gas plc
- British Plastics Federation
- British Plumbing Fittings Manufacturers' Association
- British Valve and Actuator Manufacturers' Association
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Construction Industries Directorate)
- Department of the Environment (Property Services Agency)
- Department of Transport
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Health and Safety Executive
- Institution of Civil Engineers
- Institution of Gas Engineers
- Institution of Production Engineers
- Institution of Water and Environmental Management (IWEM)
- National Association of Plumbing, Heating and Mechanical Services Contractors
- Plastics and Rubber Institute
- Plastics Land Drainage Manufacturers' Association
- Royal Institute of Public Health and Hygiene
- Society of British Gas Industries
- Water Authorities Association
- Water Companies Association
- Water Research Centre

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Adhesives and Sealants Association
- Department of Agriculture and Fisheries for Scotland
- Department of Agriculture Northern Ireland
- Heating and Ventilating Contractors' Association
- Institute of Plumbing
- Land Drainage Contractors' Association
- Ministry of Agriculture, Fisheries and Food
- National Association of Agricultural Contractors
- National Farmers' Union

This British Standard, having been prepared under the direction of the Plastics Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 July 1989

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Definitions	1
3 Materials	1
4 Construction and dimensions	1
5 Pipe stiffness	2
6 Resistance to impact	2
7 Flexibility of coilable pipe and associated joints	3
8 Extensibility of coilable pipe and associated joints	3
9 Fittings for joints and junctions	3
10 Marking	3
Appendix A <i>Text deleted</i>	5
Appendix B Determination of specific tangential end stiffness and ring stiffness of the pipe	5
Appendix C <i>Text deleted</i>	5
Appendix D <i>Text deleted</i>	6
Appendix E Determination of resistance to impact	6
Appendix F Determination of flexibility	9
Appendix G Extensibility and joint tests	11
Appendix H Methods of test for stretched pipe	13
Appendix J Guidance on quality control testing	18
Appendix K Guidance on storage and installation	19
Figure 1 <i>Figure deleted</i>	5
Figure 2 <i>Figure deleted</i>	5
Figure 3 — Typical test apparatus for determination of resistance to impact	7
Figure 4 — Typical layout of ducts for determination of flexibility	10
Figure 5 — Diagrammatic representation of extensibility and joint strength tests	12
Figure 6 — Typical internal grip for extending test pieces	14
Figure 7 — Typical external grips for extending test pieces	15
Figure 8 — Bedding conditions for open trench laying	20
Table 1 <i>Table deleted</i>	1
Table 2 — Example of the typical plot of impact test data	8
Table 3 — Example of data tabulation	8
Table 4 — Applicability of requirements and test methods	18
Publications referred to	Inside back cover

Foreword

This British Standard has been prepared under the direction of the Plastics Standards Policy Committee. It is a revision of BS 4962:1982 which is withdrawn. The main differences between this revision and the previous edition are as follows.

- a) The title of the specification has been changed:
 - 1) to indicate that the specification applies to pipes and fittings;
 - 2) to delete “light duty” and substitute “field”, for clarity of purpose.
- b) The maximum design outside diameter for pipes has been increased from 200 mm to 400 mm.
- c) The scope and requirements have been extended to include unperforated pipes otherwise corresponding to the perforated pipes for use as carrier drains or where systems of perforated pipes are to be linked by unperforated sections, as in the vicinity of tree roots.
- d) Methods for testing pipe in a stretched condition have been detailed, by introduction of Appendix H.
- e) *Text deleted*
- f) The severity of the impact test has been increased by doubling the mass of the striker to be used.
- g) The marking requirements include the date of this British Standard and this together with the number of this British Standard is to be marked on each pipe and fitting to supplement the manufacturer’s identification.

The standard remains largely a performance specification and no restriction is made on the type of plastics material to be used for the manufacture of pipes and fittings in accordance with this standard.

In the preparation of this British Standard attention has been given to the work of Technical Committee 138 of the International Organization for Standardization (ISO). In this British Standard, however, general performance requirements are specified whereas the ISO approach will be to issue specifications for each type of material which can be used for this application.

Appendix J gives general guidance on the nature of the requirements and the primary purpose of the test methods, to assist in the preparation of quality plans.

Appendix K gives guidance for storage and laying conditions for pipes and is based on a technical note originally prepared by the Ministry of Agriculture, Fisheries and Food (MAFF).

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier’s quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

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.

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 to iv, pages 1 to 20, 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 the construction, dimensions, materials and performance of plastics pipes of up to 400 mm nominal outside diameter, with or without perforations, and for any associated fittings for normal field drainage.

No restrictions are placed on the type of plastics material to be used.

Methods of test, associated guidance and information on quality control testing are given in appendices.

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

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1

coilable pipe

pipe which, together with associated joints, is intended for machine laying, i.e. it is required to be able to bend reasonably freely and to withstand tensile forces without excessive extension during the laying process. Typically, such pipe will have a corrugated wall and employ a jointing system which positively engages with the pipe

2.2

design internal diameter

the internal diameter of a pipe declared by the pipe and fitting manufacturer

2.3

design outside diameter

the outside diameter of a pipe declared by the pipe and fitting manufacturer

2.4

design perforation length

the design length of individual perforations declared by the pipe manufacturer

NOTE This is the length against which the requirements of 4.5 are determined.

2.5 Text deleted

2.6

non-coilable pipe

pipe which, together with associated joints, is neither required to be able to bend appreciably nor to withstand tensile forces. Typically, such pipe will be smooth walled on both interior and exterior surfaces and employ a spigot and socket jointing system

2.7

specific tangential end stiffness ($STES_{2\text{ year}}$)

the stiffness corresponding to the 2 year value of STES in accordance with Annex A of BS EN ISO 9967

3 Materials

The material used for the manufacture of the pipe or fitting shall comprise any plastics material.

4 Construction and dimensions

4.1 Construction

The pipe shall be smooth and/or corrugated in conformation and of any design outside diameter up to 400 mm.

4.2 Internal diameter

The internal diameter of the pipe shall be not less than the design value stated by the manufacturer.

Before assessing a pipe for compliance, re-rounding of the pipe is permissible.

For pipe of design internal diameter not greater than 200 mm, compliance shall be checked using a plug gauge to suit the design diameter stated by the manufacturer and at least half that pipe diameter in length. Before using this gauge, any swarf or small protrusions on the inside of the pipe shall be removed.

For larger diameter pipes, compliance shall be checked using any device capable of measuring internal diameter to an accuracy of within $\pm 0.2\%$, such as a bore micrometer or calipers, to determine the minimum internal diameter over a length corresponding to not less than half the design internal diameter.

4.3 Outside diameter

The outside diameter of the pipe shall comply with 4.1 and shall not differ from the design value stated by the manufacturer by more than $^{+0.5}_{-1.5}$ mm or $^{+0.25}_{-0.75}\%$, whichever is the greater.

Before assessing a pipe for compliance, re-rounding of the pipe is permissible.

For pipe of design internal diameter not greater than 200 mm, compliance shall be checked using the ring gauges appropriate to the pipe design outside diameter, and the applicable tolerance thereon, and having a length of at least half their internal diameter. Before using these gauges any swarf on the cut end shall be removed.

For larger diameter pipes, compliance shall be checked using any device capable of measuring outside diameter to an accuracy of within $\pm 0.02\%$, such as a circumferential tape or calipers, to determine the maximum and minimum outside diameter over a length corresponding to not less than half the design outside diameter.

4.4 Ovality

The largest outside diameter of the pipe shall be such that it is not more than 110 % of the outside diameter at right angles to it.

4.5 Perforations

4.5.1 Pipes shall be perforated or unperforated. If perforated, the pipe shall have perforations for water entry which comply with **4.5.2** to **4.5.4**, except for zones within two pipe diameters of either end of a length or coil, where such zones may be either perforated or unperforated.

If the extension of the pipe is greater than 10 % when tested in accordance with Appendix G, additional test pieces shall comply with **4.5.2** to **4.5.4** when stretched to the extension obtained (see Appendix H).

4.5.2 Perforations in their least dimension, except as given in **4.5.3**, shall be not less than 0.8 mm and not greater than 2.0 mm. Compliance shall be checked for at least the design perforation length using a GO gauge of 0.8 mm and a NOT-GO gauge of 2.0 mm. No force shall be applied in using the gauges, in particular no material shall be removed to facilitate the entry of the gauge.

When some types of pipe are coiled, there is a tendency for the perforations to distort slightly; therefore, in cases of dispute, the check with the GO/NOT-GO gauges shall be made on a straightened length of pipe.

4.5.3 Provided that there are not less than 500 mm total length of perforations complying with **4.5.2** per metre of pipe, perforations measured on any metre of pipe taken at random need not comply with **4.5.2** in that up to 25 % of the perforations may have a least dimension of less than 0.8 mm, and up to 2 % of the perforations may have a least dimension greater than 2.0 mm but not greater than 3.0 mm. The length of the individual perforations shall not exceed the design perforation length by more than 50 %.

4.5.4 The distribution of perforations shall be such that there is at least one perforation in every 50 mm length of pipe and at least one perforation per 120° segment in every 150 mm length of pipe, except for zones unperforated in accordance with **4.5.1**.

5 Pipe stiffness

5.1 Specific tangential end stiffness ($STES_{2\text{ year}}$)

NOTE 1 This test is intended as a type test (see Appendix J).

When tested in accordance with Appendix B the predicted 2 year (17 520 h) $STES_{2\text{ year}}$ value shall be not less than 1.00 kN/m².

NOTE 2 For some pipe constructions, the arrangement of perforations is such that the orientation of the pipe with regard to the applied force significantly affects the stiffness. The requirements apply to the least favourable orientation.

5.2 Ring stiffness (S)

5.2.1 For type test purposes, when tested in accordance with **B.2.2** the ring stiffness of each test piece, e.g. S_a as designated in that method, shall be not less than 2.00 kN/m².

5.2.2 For inspection testing purposes, when tested in accordance with BS 2782-11:Method 1114B (BS EN ISO 9969) the ring stiffness of each test piece, e.g. S_a as designated in that method, shall be not less than the higher of the following limits, as applicable:

- a) 2.00 kN/m²;
- b) not less than:
 - 1) 90 % of the value of S obtained in accordance with **5.2.1** if the corresponding $STES_{2\text{ year}}$ value was not greater than 1.50 kN/m²;
 - 2) 80 % of the value of S obtained in accordance with **5.2.1** if the corresponding $STES_{2\text{ year}}$ value was greater than 1.50 kN/m².

6 Resistance to impact

When tested in accordance with Appendix E using the procedure described in **E.5** the pipe shall fulfil one of the following conditions:

- a) in the first 17 test pieces tested no failures occur (in which case the seventeenth impact height will be 2 m);
- b) during the sequence of passes and failures a test piece is tested at 2 m and passes at that height;
- c) neither a) nor b) is applicable but the mean value of the drop heights of the 50 test pieces minus twice the standard deviation of the values of their drop heights exceeds 500 mm.

NOTE Test results are evaluated on a statistical basis, since plastics pipes of the types that are currently in use commonly exhibit a variation in impact strength between individual test pieces in any one batch. It is important, therefore, that any test should not only determine the average impact strength of the batch but take some account of the degree of scatter as well. The simplest way of allowing for scatter is to consider the range of the test results; this, however, is not entirely satisfactory since a single exceptionally high or low figure can give a false impression of the ability to withstand impact. For this reason the frequently used statistical concept of standard deviation has been introduced as a measure of the scatter or dispersion of the results.

There are two apparent complications. The first is that an assumed mean has been used rather than the absolute mean since this enables the calculations to be reduced to one comprehensive equation. The second is that in the case of strong pipes it may not be possible to obtain the data which are necessary for the statistical calculations. In order to cater for such cases the maximum drop height has been fixed at such a level that any pipe which withstands the test at that level can be regarded as satisfactory.

7 Flexibility of coilable pipe and associated joints

When tested in accordance with Appendix F, using either the 1, 2, 3, 4 or 5 m radius duct as stated by the manufacturer, the end force required to pull a length of pipe, including a joint, through the duct shall be less than or equal to the greater of the following:

- a) $(1.5 \times D)$ N, where D is the pipe mean outside diameter (in mm);
- b) 300 N.

NOTE The duct radius used corresponds with the minimum bend radius of the pipe [see item f) of 10.2].

After being left in the duct for 10 min, the pipe shall not show any fracture or kinking when removed.

8 Extensibility of coilable pipe and associated joints

8.1 The pipe shall comply with 8.2 or 8.3 when tested in accordance with Appendix G using the greater applied force of the following:

- a) $(1.5 \times D)$ N, where D is the pipe mean outside diameter (in mm);
- b) 300 N.

8.2 The extension of the pipe shall be not greater than 10 % (but see 8.3).

8.3 If the extension is greater than 10 %, additional test pieces stretched to and held at this greater extension and tested in accordance with Appendix H shall comply with 4.5, 5.1 and clause 6.

9 Fittings for joints and junctions

9.1 The jointing system shall ensure that the ends of the pipes are located without any obstruction to the pipe bore, and the fit shall be such that no gap in the joint is greater than 2 mm. Compliance shall be checked by examination of three joints or junctions assembled from the pipe and other necessary joint components chosen at random.

9.2 Joints made to connect coilable pipe shall not separate when tested in accordance with Appendix G using the greater applied force of the following:

- a) $(1.5 \times D)$ N, where D is the pipe mean outside diameter (in mm);
- b) 300 N.

Where pipes of different diameter are being joined then the value of D shall be that applicable to the larger pipe.

9.3 Junctions shall permit the connection of branch pipes, which may be of either equal or different diameters.

The fit shall be such that no gap in the junction is greater than 2 mm. Compliance shall be checked by examination of three junctions assembled with pipes and other necessary joint components chosen at random.

10 Marking

10.1 General

The marking shall remain legible under handling, storage and installation procedures in accordance with Appendix K and with BS 5955-6 and BS 8301 as applicable. Marking by indentation to a depth not greater than 0.15 mm shall be deemed to comply with this clause without infringing any applicable design limits for wall thickness or outside diameter (see 4.3). If the marking is effected by means of printing or labels (see 10.2 and/or 10.3), it shall comply with B.1.2 or B.1.3 (as applicable) and B.1.4 of BS 3955:1986 and, as applicable, with BS 4781-1 except that, if the label is to be applied directly to a plastics pipe or fitting, the substrate to be used for the method of test for adhesion shall comprise a film made of the corresponding plastics material.

10.2 Pipe

Pipe manufactured in accordance with this standard shall be clearly marked with the following.

- a) Manufacturer's identification and month and year of manufacture.