

Specification for

Blue polyethylene pipes up to nominal size 63 for below ground use for potable water

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Committees responsible for this British Standard

This British Standard was published under the direction of the Plastics Standards Committee (PLM/-). Its preparation was entrusted to Technical Committee PLM/9, upon which the following bodies were represented:

- British Chemical Distributors' and Traders' Association Ltd.
- British Gas Corporation
- British Plastics Federation
- British Valve Manufacturers' Association Ltd.
- Copper Tube Fittings Manufacturers' Association
- Department of the Environment (Housing and Construction Industries)
- Department of the Environment (Property Services Agency)
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Institution of Civil Engineers
- Institution of Production Engineers
- Institution of Public Health Engineers
- Institution of Water Engineers and Scientists
- 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
- Water Authorities Association
- Water Companies Association
- Water Research Centre
- Coopted members

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

- Institute of Plumbing
- Ministry of Agriculture, Fisheries and Food
- National Brassfoundry Association

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Foreword

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

The prime purpose of this standard is to introduce a specification for potable water pipes characterized by a blue colour for use below ground, to distinguish the pipes from other services such as black electrical cables. This standard includes requirements for the effects of materials on water quality, to enable pipes meeting this British Standard to be acceptable to water undertakings.

Pipes are designated by their nominal metric size. This British Standard provides a specification for polyethylene pipes up to and including nominal size 63. The minimum wall thicknesses in this standard have been calculated using a maximum working stress for the material of 6.3 MPa at 20 °C when in pipe form to ensure a working pressure of at least 12 bar at 20 °C, based on data obtained using higher stresses and temperatures and including extrapolation of failure times at 20 °C to a period of 50 years.

Polyethylenes are manufactured by different processes and contain a range of, and varying quantities of, co-monomers which can result in substantial differences in basic properties, such as melt flow rate, density, creep resistance, etc. Different materials each known to be suitable for the manufacture of pipe to this standard may not be compatible for fusion jointing, and the guidance of the manufacturer should be sought before fusion jointing dissimilar materials.

Attention is drawn to CP 312-1 and CP 312-3 and to BS 5955-7 which have been prepared to assist users in assessing the suitability of plastics pipes for particular purposes and to give guidance on proper application.

The scope of this standard covers part of that of BS 3284, which is scheduled for withdrawal in January 1985, and of BS 1972, which is scheduled for amendment to relate to above ground uses only from April 1985.

A complementary British Standard for black polyethylene pipes up to nominal size 63 for above ground use for cold potable water is being prepared.

A complementary British Standard for polyethylene pipes for use in cold potable water services for sizes greater than nominal size 63 is being prepared.

A British Standard for fusion joints and fittings for use with pipes complying with this standard, i.e. BS 6572, and the proposed standard for pipes of nominal sizes greater than 63, is being prepared.

A British Standard for copper alloy compression fittings which will enable pipes complying with this standard, i.e. BS 6572, to be joined by mechanical means is being prepared.

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 the 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. In particular, attention is drawn to water industry requirements for materials in contact with potable work.

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 the composition, physical attributes, performance and identification of blue pigmented polyethylene (PE) pipe for use in cold potable water services at pressures up to 12 bar¹⁾ at 20 °C either in below ground systems or where protected from sunlight by enclosure in ducts or buildings.

The pipes are specified in nominal sizes 20 to 63 as straight or coiled pipe. Methods of test and information on quality control testing are given in appendices.

NOTE 1 The information on quality control testing is included because of particular features associated with the method of manufacture of these products, and adherence to the various clauses of appendix F will facilitate the production of pipes which meet the requirements of this British Standard.

NOTE 2 The titles of publications referred to in this standard are listed on the inside back cover.

2 Definition

For the purposes of this British Standard, the following definition applies.

ovality. The difference between the measured maximum outside diameter ($d_{y,max}$) and the measured minimum outside diameter ($d_{y,min}$) in the same cross section of the pipe

3 Dimensions and tolerances

3.1 Nominal size

The nominal size of the pipe shall be one of the sizes given in Table 1.

Table 1 — Pipe dimensions

Nominal size DN	Mean outside diameter		Wall thickness	
	min.	max.	min.	max.
	mm	mm	mm	mm
20	20.0	20.3	2.3	2.6
25	25.0	25.3	2.3	2.6
32	32.0	32.3	3.0	3.4
50	50.0	50.4	4.6	5.2
63	63.0	63.4	5.8	6.5

3.2 Outside diameter and wall thickness

The mean outside diameters of pipes shall comply with the limits specified in Table 1, when determined in accordance with BS 2782:Method 1101A at a point at least one diameter away from the pipe end.

The wall thickness of pipes shall comply with the limits specified in Table 1 when determined in accordance with BS 2782:Method 1101A at any point around the circumference.

3.3 Ovality

NOTE The ovality of pipe in coils is assessed in accordance with 3.3.1 or 3.3.2. The ovality of straight pipe is assessed in accordance with 3.3.2.

3.3.1 Pipe in coils as manufactured. When determined by the method described in Appendix A, the ovality, expressed in millimetres, of pipe from coils in the as manufactured condition shall not exceed the value of 0.06 of the nominal size (DN) of the pipe.

3.3.2 Pipe in coils after relaxation and straight pipe. When determined by the method described in Appendix A, the ovality, expressed in millimetres, of pipe from coils subjected to relaxation, and of straight pipe shall not exceed the value of $1 + [0.008 \text{ of the nominal size (DN) of the pipe}]$.

3.4 Tolerance on length

Each end of the pipe shall be cleanly cut square with the axis to within the tolerances given in Table 2. If the lengths of individual pipes or coils are specified, such lengths shall be not less than that specified when determined at 23 ± 2 °C.

NOTE The preferred lengths of straight pipe are 6 m, 9 m or 12 m and of coils are 50 m, 100 m or 150 m.

Table 2 — Out-of-square tolerances for ends

Nominal size DN	Maximum out-of-square of each pipe end
	mm
20 to 32	2
50 to 63	3

3.5 Coil diameters

Coiled pipes shall have a minimum internal coil diameter in accordance with Table 3.

Table 3 — Coil diameters

Nominal size of pipe DN	Minimum internal coil diameter
	m
20	0.6
25	0.6
32	0.7
50	1.0
63	1.3

¹⁾ 1 bar = $10^5 \text{ N/m}^2 = 0.1 \text{ MPa}$.

4 Compound composition

4.1 Effect of materials on water quality

When used under the conditions for which they are designed, materials in contact with or likely to come into contact with potable water shall not constitute a toxic hazard, shall not support microbial growth and shall not give rise to unpleasant taste or odour, cloudiness or discoloration of the water.

Concentrations of substances, chemicals and biological agents leached from materials in contact with potable water, and measurements of the relevant organoleptic/physical parameters shall not exceed the maximum values recommended by the World Health Organization in its publication "Guidelines for drinking water quality" Vol. 1 "Recommendations" (WHO, Geneva, 1984) or as required by the EEC Council Directive of 15 July 1980 relating to the quality of water intended for human consumption (Official Journal of the European Communities L229 pp 11–29), whichever in each case is the more stringent.

NOTE 1 Requirements for the testing of non-metallic materials in these respects are set out in the UK Water Fittings Byelaws Scheme Information and Guidance Note No 5-01-02, ISSN 0267 – 0313 obtainable from the Water Research Centre, Fittings Testing Station, 660 Ajax Avenue, Slough, Berkshire SL1 4BG.

NOTE 2 Requirements for the testing of metallic materials in these respects are set out in DD 82.

NOTE 3 Pending the determination of suitable means of characterizing the toxicity of leachates from materials in contact with potable water, materials approved by the Department of the Environment Committee on Chemicals and Materials of Construction for use in Public Water Supply and Swimming Pools are considered free from toxic hazard for the purposes of compliance with this subclause. A list of approved chemicals and materials is available from the Technical Secretary of that Committee at the Department of the Environment, Water Division, Romney House, 43 Marsham Street, London SW1P 3PY.

NOTE 4 Products manufactured for installation and use in the United Kingdom which are verified and listed under the UK Water Fittings Byelaws Scheme administered by the Water Research Centre (address as in note 1) are deemed to satisfy the requirements detailed in this subclause.

4.2 Base polymer

4.2.1 The base polymer shall be polyethylene, or a copolymer of ethylene and higher olefins in which the higher olefin constituent does not exceed 10 % by mass, with a derived density of between 930 kg/m^3 and 944 kg/m^3 inclusive at 23°C when determined in accordance with BS 3412:1976 (as amended by Amendment Nos. 1 and 2).

4.2.2 The base polymer shall be in accordance with clauses 4, 5 and 9 of BS 3412:1976 (as amended by Amendment Nos. 1 and 2) in respect of density, melt flow rate, colour variation and impurities.

4.3 Additives

4.3.1 General. The base polymer shall include or be blended with additives (see 4.3.2 for antioxidants, 4.4.2 for pigment, 6.3 for UV stabilizers, etc.) as necessary to produce a compound for the manufacture, storage and use of pipes to this standard.

The compound shall be in accordance with clause 4, 5 and 9 of BS 3412:1976 (as amended by Amendment Nos. 1 and 2) in respect of density, melt flow rate, colour variation and impurities.

4.3.2 Antioxidants. The compound shall be class N as defined in BS 3412:1976 (as amended by Amendment Nos. 1 and 2) and the antioxidants used shall comply with 8.1 and 8.2 of that standard. In addition, with the exception of 6,6'-diterbutyl-4,4'-thiodi-*m*-cresol, which shall not be used for the purposes of this British Standard, only antioxidants listed in Table 2 of BS 3412:1976 (as amended by Amendment Nos. 1 and 2) shall be used.

4.3.3 Rework material. If rework material is added or used, it shall be clean, derived from pipe produced in accordance with this standard and reground under the supervision of the same manufacturer, and it shall be compatible with any materials to which it is added.

4.4 Pipe material

4.4.1 Conditioning. Test pieces of pipe material, comprising or taken from samples of pipe, shall be conditioned or preconditioned in accordance with one of the procedures given in Appendix C as appropriate to the purpose of the test and references to that appendix by other clauses in this British Standard.

NOTE The conditioning periods and conditions given in Appendix C are considered appropriate to the non-hygroscopic nature of the material, the limited thickness of test pieces required by this British Standard and the need for some data for quality control purposes to be obtained with the minimum of delay.

4.4.2 Pigmentation. The colour of the pipe shall be blue within the range 18 E 51 and 18 E 53 of BS 4901. When tested across the pipe wall by the method described in BS 2782:Method 1106A:1983, the pigment dispersion shall be at least as uniform in appearance as that shown in photomicrograph 2 of Figure 1 of BS 2782:Method 1106A:1983, i.e. appearances similar to those shown in photomicrographs 3 to 6 of that figure are unacceptable.

4.4.3 Thermal stability

4.4.3.1 General. The material of which the pipe is made shall meet the requirements of either 4.4.3.2 or 4.4.3.3.