

BRITISH STANDARD

Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings

Part 1: General requirements

ICS 83.140.30, 91.140.60



NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI 2006

ISBN 0 580 48413 0

The following BSI references relate to the work on this standard:

Committee reference PRI/88

Draft for comment 05/30111064 DC

Publication history

First published, May 1990

Second edition, October 2001

Third edition, June 2006

Amendments issued since publication

Amd. no.	Date	Text affected
-----------------	-------------	----------------------

Contents

Foreword *ii*

1	Scope	<i>1</i>
2	Normative references	<i>1</i>
3	Terms and definitions	<i>2</i>
4	Performance	<i>3</i>
5	Dimensions	<i>3</i>
6	Performance	<i>4</i>
7	Marking and associated information	<i>6</i>

Bibliography *22*

Annexes

Annex A (normative)	Test for minimum failure time	<i>8</i>
Annex B (normative)	Method of test for hydrostatic pressure resistance of fittings	<i>12</i>
Annex C (normative)	Method of test for resistance to thermal cycling	<i>13</i>
Annex D (normative)	Method of test for resistance to cyclic pressure shock	<i>17</i>
Annex E (normative)	Method for determination of permeability to oxygen	<i>18</i>
Annex F (informative)	Guidance on factory control procedures	<i>20</i>

List of figures

Figure 1 – Designation of fittings	<i>7</i>
Figure B.1 – Typical arrangement for hydrostatic pressure resistance test for fittings	<i>13</i>
Figure C.1 – Test assembly for systems based on rigid pipes	<i>14</i>
Figure C.2 – Test assembly for systems based on flexible pipes	<i>16</i>
Figure C.3 – Configuration of bent flexible pipes for thermal cycle testing	<i>16</i>
Figure D.1 – Diagram of typical equipment arrangement for cyclic pressure shock test	<i>18</i>

List of tables

Table 1 – Class “S” service conditions	<i>3</i>
Table 2 – Circumferential stress values	<i>4</i>
Table 3 – Class “S” thermal cycling test schedule	<i>5</i>
Table A.1 – Failure point distribution	<i>8</i>
Table A.2 – Percentage points of Student's t distribution (upper 2½ % points)	<i>11</i>
Table F.1 – Applicability of requirement and test methods	<i>21</i>

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iii, pages 1 to 22, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 7291 was published by BSI and came into effect on 24 July 2006. It supersedes BS 7291-1:2001, which is withdrawn. It was prepared by Subcommittee PRI/88/2/P3, *Plastics piping for hot and cold water*, under the authority of Technical Committee PRI/88, *Plastics piping systems*. A list of organizations represented on this committee can be obtained on request to its secretary.

Information about this document

The major changes between this revision and the previous edition arise from the use in the UK of higher service and malfunction temperatures for thermoplastics pipes than those prevalent in continental Europe. These higher temperatures lead to health and safety concerns in the UK which have been addressed within this revision by the exclusive use of the Class “S” category for the full range of service conditions given in Table 1.

The size range of pipes and associated fittings to which this standard is applicable is up to and including 110 mm nominal outside diameter. Particular ranges of sizes are specified with reference to BS ISO 4065 and/or BS EN 1057 and/or BS EN 1254-2 and/or BS EN 1254-3 as appropriate by the other parts of BS 7291. These alternative size ranges arise because, in addition to providing for specifications in accordance with metric sizes of thermoplastics pipes, it is considered desirable to standardize the requirements for plastics pipes made and widely used for such applications with dimensions compatible with pipework, fittings and accessories for metric sizes of copper pipes.

Complementary requirements for pipes and fittings made from specific types of thermoplastics materials are given in other parts of BS 7291:

Part 2: Specification for polybutylene (PB) pipes and associated fittings;

Part 3: Specification for crosslinked polyethylene (PE-X) pipes and associated fittings.

In particular, these parts specify requirements and test methods to ensure the quality of the material and the performance of pipes and fittings of that material, including requirements for component dimensions, which contribute to performance. The other parts also rationalize the pipe sizes specified and identify suitable jointing methods.

Fittings are permitted to be made of plastics materials other than those from which the pipes are made or of other materials, e.g. metallic fittings conforming to BS EN 1254-2 and/or BS EN 1254-3, subject to conformity with this part of BS 7291 and with any applicable requirements for jointed assemblies given in BS 7291-2 or BS 7291-3, as applicable.

Attention is drawn to BS 5955-8, which specifies the installation requirements for plastics pipes and associated fittings falling within the scope of BS 7291 and references other relevant standards.

Product certification/inspection/testing. Users of this British Standard are advised to consider the desirability of third-party certification/

inspection/testing of product conformity with this British Standard. Appropriate conformity attestation arrangements are described in BS EN ISO/IEC 17025. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Assessed capability. Users of this British Standard are advised to consider the desirability of quality system assessment and registration against the appropriate standard in the BS EN ISO 9000 series by an accredited third-party certification body.

Use of this document

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

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 cannot confer immunity from legal obligations.

In particular, attention is drawn to the following statutory regulations:

The Health and Safety at Work, etc Act 1974 [1]

The Water Supply (Water Fittings) Regulations 1999 [2]

Annexes A, B, C, D, and E are normative. Annex F is informative.

1 Scope

This part of BS 7291 specifies general requirements and methods of test for thermoplastics pipes and associated fittings intended for use within buildings for the conveyance of water under pressure, for distribution of hot and cold water, including drinking water, and for circulation of hot water for heating purposes.

These systems are also suitable for the conveyance of cold water for a period of 50 years at a temperature of 20 °C and a design pressure of 12½ bar.

This British Standard is applicable only to Class “S” pipes and fittings.

Details of the specific applications and service conditions are given in Table 1.

This specification is applicable to rigid or flexible plain pipes, and pipes incorporating a polymeric barrier to inhibit gas permeability through the pipe wall and having a nominal outside diameter up to and including 110 mm.

NOTE 1 Methods of test and guidance on quality control testing are given in the annexes.

NOTE 2 BS 7291-2 and BS 7291-3 specify additional requirements for pipes and/or fittings manufactured from specific thermoplastics materials. They should be read in conjunction with this part of BS 7291.

NOTE 3 Reference to “pressure” in this part of BS 7291 means “gauge pressure”, unless otherwise stated.

NOTE 4 Where the pipe or fitting is of a thermoplastics material covered by a part of BS 7291-1, BS 7291-2 or BS 7291-3, either the requirements for preventing or controlling the extent of permeation specified in the applicable part, e.g. by use of a barrier pipe, should be followed, or a corrosion inhibitor should be added to the primary circuits in accordance with BS 5955-8.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

BS 2782-11: Method 1104A, *Methods of testing plastics — Part 11: Method 1104A, Thermoplastics pipes, fitting and valves — Measurement of opacity of thermoplastics pipes and fittings.*

BS 5955-8, *Plastics pipework (thermoplastics materials) — Part 8: Specification for the installation of thermoplastics pipes and associated fittings for use in domestic hot and cold water services and heating systems in buildings.*

BS 6920-1, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water — Part 1: Specification.*

BS 7291-2:2006, *Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in*

buildings — Part 2: Specification for polybutylene (PB) pipes and associated fittings.

BS 7291-3:2006, Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings — Part 3: Specification for crosslinked polyethylene (PE-X) pipes and associated fittings.

BS EN 578:1994, Plastics piping systems — Plastics pipes and fittings — Determination of the opacity.

BS EN 921, including amendment No.2:1996, Plastics piping systems — Thermoplastic pipes — Determination of resistance to internal pressure.

BS EN 1057, Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating installations.

BS EN 1254-2, Copper and copper alloys — Plumbing fittings — Part 2: Fittings with compression ends for use with copper tubes.

BS EN 1254-3, Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes.

BS EN ISO 9080, Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation.

BS EN ISO 15875-2:2003, Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 2: Pipes.

BS EN ISO 15876-2:2003, Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 2: Pipes.

BS ISO 4065:1996, Thermoplastics pipes — Universal wall thickness table.

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 1755-1, BS 6100-2.7, and BS 6100-3.3, and the following apply.

3.1 flexible pipes

pipes available in coil form

3.2 rigid pipes

pipes available only in straight lengths

3.3 barrier pipes

pipes incorporating a polymeric barrier layer to prevent or greatly diminish the diffusion of oxygen into or through the pipe wall where the design stress requirements are totally met by base polymer

NOTE The performance requirements, with the exception of oxygen permeability, are the same for plain pipes and barrier pipes.

3.4 maximum system service temperature T_s

maximum service temperature that can occur during normal operation

NOTE An example is thermal stratification within hot water storage vessels or of the positioning and/or operating tolerances of temperature controls.

3.5 nominal system flow temperature T_f

intended maximum flow temperature of a system for a particular application as recommended in codes of practice and other guidance documents

3.6 system malfunction temperature T_m

maximum temperature likely to be applied to pipes and fittings in the event of control thermostat failure or malfunction

4 Performance

The performance of pipes and fittings shall conform to Table 1.

Table 1 Class “S” service conditions

Application	Nominal system flow temperature T_f °C	Maximum system service temperature T_s °C	System malfunction temperature T_m °C	System maximum working pressure ^A Bar ^B
Indirect cold water systems	20	20	-	3½
Direct mains-fed cold water systems	20	20	-	12½
Subsurface heating systems	60	83	100	3½
Vented hot water systems	65	83	100	3½
Unvented hot water systems including instantaneous heaters and/or incorporating storage	65	95	100	6
Vented central heating systems	82	95	100	3½
Sealed central heating systems	82	105	114	3

^A Where a nominal working pressure does not comprise an integer value, the mantissa is expressed in a fractional format. This is done to reduce the possibility of misinterpretation or obscurity that could cause a system to be subjected to an excessive pressure (see also 7.4).

^B 1 bar = 10⁵ N/m² = 10⁵ Pa.

5 Dimensions

5.1 General

Subject to 5.2 and 5.3, the dimensions and their tolerances for specific pipes shall be as specified in BS 7291-2 and BS 7291-3, as applicable, and shall be compatible with either:

- outside diameters up to and including 110 mm for pipe systems conforming to BS ISO 4065; or
- compression fittings conforming to BS EN 1254-2 and/or BS EN 1254-3 to suit sizes of tube up to and including 35 mm conforming to BS EN 1057.

NOTE 1 The sizes adopted for a specific component may be selected from either or both of the ranges in a) and b).

NOTE 2 The dimensions and associated tolerances for fittings to suit a given pipe and application are not specified but are controlled by the need for conformity with the performance requirements of BS 7291-1 and BS 7291-2 and BS 7291-3, as applicable. The method of designating the size or pattern of a fitting is given in 7.5.