

**BRITISH STANDARD**

# **Acrylonitrile-butadiene- styrene (ABS) pressure pipe –**

## **Part 1: Specification**

ICS 23.040.20

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# Contents

Foreword *ii*

|           |                                         |          |
|-----------|-----------------------------------------|----------|
| <b>1</b>  | Scope                                   | <i>1</i> |
| <b>2</b>  | Normative references                    | <i>1</i> |
| <b>3</b>  | Terms and definitions                   | <i>2</i> |
| <b>4</b>  | Material                                | <i>3</i> |
| <b>5</b>  | Classification of pipe                  | <i>3</i> |
| <b>6</b>  | Dimensions                              | <i>3</i> |
| <b>7</b>  | Physical and mechanical characteristics | <i>4</i> |
| <b>8</b>  | Assessment of conformity                | <i>7</i> |
| <b>9</b>  | Marking                                 | <i>7</i> |
| <b>10</b> | Stocking and transport                  | <i>7</i> |

## Annexes

|                       |                                           |           |
|-----------------------|-------------------------------------------|-----------|
| Annex A (normative)   | Longitudinal reversion test               | <i>8</i>  |
| Annex B (normative)   | Test for resistance to heat ageing        | <i>8</i>  |
| Annex C (normative)   | Test for resistance to weathering         | <i>9</i>  |
| Annex D (normative)   | Test for impact resistance at 0 °C        | <i>9</i>  |
| Annex E (normative)   | Short-term hydrostatic resistance test    | <i>13</i> |
| Annex F (normative)   | Long-term hydrostatic resistance test     | <i>14</i> |
| Annex G (informative) | Guidance for the assessment of conformity | <i>14</i> |

Bibliography *19*

## List of figures

Figure D.1 – Suitable impact testing machine *11*

## List of tables

|                                                                         |           |
|-------------------------------------------------------------------------|-----------|
| Table 1 – Classification of pipe                                        | <i>3</i>  |
| Table 2 – Dimensions                                                    | <i>4</i>  |
| Table 3 – Short-term internal hydrostatic test pressures                | <i>6</i>  |
| Table 4 – Long-term circumferential (hoop) stresses                     | <i>6</i>  |
| Table A.1 – Longitudinal reversion test                                 | <i>8</i>  |
| Table D.1 – Number of lines for “round the clock” testing               | <i>10</i> |
| Table D.2 – Total mass of striker                                       | <i>12</i> |
| Table D.3 – Conditioning of test specimens prior to impact testing      | <i>12</i> |
| Table E.1 – Parameters for short-term hydrostatic resistance testing    | <i>13</i> |
| Table F.1 – Parameters for long-term hydrostatic resistance testing     | <i>14</i> |
| Table G.1 – Characteristics of material that require type testing       | <i>15</i> |
| Table G.2 – Characteristics of pipes that require type testing          | <i>15</i> |
| Table G.3 – Characteristics of pipes that require batch release testing | <i>17</i> |
| Table G.4 – Characteristics of pipes that require audit testing         | <i>17</i> |
| Table G.5 – Conditions for the change of material                       | <i>18</i> |

## Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 19 and a back cover.



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# Foreword

## Publishing information

This British Standard is published by BSI and came into effect on 29 December 2006. It was prepared by Subcommittee PRI/88/2, *Plastics piping for pressure applications*, 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.

## Supersession

This British Standard supersedes BS 5391-1:1976, which is withdrawn.

## Relationship with other publications

Attention is also drawn to BS 5392-1, which specifies requirements for ABS fittings for use with the pipe.

## Information about this document

This British Standard can be referred to as BS 5391 instead of BS 5391-1 because there are no other parts to this standard. Future revisions of this standard will drop Part 1 from the identifier. In preparation for this, pipes conforming to this standard can be marked with “BS 5391” instead of “BS 5391-1”.

For this revision, the nominal size dimensions specified in Table 1 conform to BS ISO 11922-2:1997 instead of BS 3867, which has been declared obsolescent. This revision also introduces nominal dimension sizes of 10 and 12.

Maximum sustained working pressures are based on a recommended working stress for the material of 7.5 MPa at a temperature of 20 °C when in pipe form and are specified in bars (where 1 bar =  $10^5$  N/m<sup>2</sup> = 100 kPa).

**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.

## Presentational conventions

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.**

# 1 Scope

This British Standard specifies requirements for pipe made from acrylonitrile-butadiene-styrene (ABS) polymer for the conveyance of liquid and gaseous fluids as well as solid matter in fluids.

This British Standard is applicable, for example, to pipes intended to be used for:

- a) chemical plants;
- b) industrial sewerage engineering;
- c) power engineering (cooling and general-purpose water supply);
- d) electroplating and pickling plants;
- e) the semiconductor industry;
- f) agricultural production plants;
- g) water treatment;
- h) potable water supply;
- i) low temperature applications down to  $-40^{\circ}\text{C}$ .

*NOTE* Pipe conforming to this standard can be used for the transport of water intended for human consumption if it conforms to the relevant national, regional or local regulatory provisions applicable in the place of use. For products in the United Kingdom, attention is drawn to The Water Supply (Water Fittings) Regulations 1999 [1].

# 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 21, *Specification pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)*

BS EN 743:1995, *Plastics piping and ducting systems – Thermoplastic pipes – Determination of the longitudinal reversion*

BS EN ISO 306:2004, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

BS EN ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids – Determination of the resistance to internal pressure – Part 1: General method*

BS EN ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids – Determination of the resistance to internal pressure – Part 2: Preparation of pipe test pieces*

BS EN ISO 3126, *Plastics piping systems – Plastics components – Determination of dimensions*

## 3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

### 3.1 audit test

test performed by or on behalf of a certification body to confirm that the material, component, joint or assembly continues to conform to the requirements given in the standard and to provide information to assess the effectiveness of the quality system

[DD CEN/TS 1555-7:2003, 3.1.11]

### 3.2 batch release test

test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before that batch can be released

[DD CEN/TS 1555-7:2003, 3.1.9]

### 3.3 certification body

impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out certification of conformity according to given rules of procedure and management

[DD CEN/TS 1555-7:2003, 3.1.1]

### 3.4 lot

clearly identifiable sub-division of a batch for inspection purposes

[DD CEN/TS 1555-7:2003, 3.1.19]

### 3.5 out of roundness

difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-sectional plane of the pipe

[BS ISO 11922-2:1997, 3.2.5]

### 3.6 pipe batch

*NOTE The pipe batch is defined and identified by the pipe manufacturer.*

number of pipes, all of them the same nominal diameter and nominal wall thickness, extruded from the same compound and the same machine

[DD CEN/TS 1555-7:2003, 3.1.17]

### 3.7 quality system

organizational structure, responsibilities, procedures and resources for implementing quality management

[DD CEN/TS 1555-7:2003, 3.1.4]

### 3.8 quality plan

document setting out specific quality practices, resources and sequence of activities relevant to a particular product or range of products

[DD CEN/TS 1555-7:2003, 3.1.5]

### 3.9 type test

test performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard

[DD CEN/TS 1555-7:2003, 3.1.6]

## 4 Material

**4.1** The material from which the pipe is made shall be acrylonitrile-butadiene-styrene (ABS) polymer.

*NOTE* If the pipe is intended for use with foodstuffs or pharmaceuticals, attention is drawn to the guidance given in British Plastics Federation publication, Plastics in contact with food – A guide [2].

**4.2** The Vicat softening temperature of the material from which the pipe is made shall be determined in accordance with BS EN ISO 306:2004, method B50. The deformation temperature of the material shall not be lower than 90 °C.

**4.3** When using reprocessible material, it shall be from either:

- a) pipe manufactured in accordance with this standard; or
- b) fittings manufactured in accordance with BS 5392-1.

## 5 Classification of pipe

Pipe shall be classified in accordance with Table 1, according to its suitability for threading and for maintaining a particular maximum sustained working pressure.

Table 1 **Classification of pipe**

| Pressure class | Working pressure<br>bar <sup>A)</sup> | Suitability for threading                       |
|----------------|---------------------------------------|-------------------------------------------------|
| Class B        | 6.0                                   | Unsuitable for threading                        |
| Class C        | 9.0                                   |                                                 |
| Class D        | 12.0                                  |                                                 |
| Class E        | 15.0                                  |                                                 |
| Class T        | 12.0                                  | Suitable for threading in accordance with BS 21 |

*NOTE* The maximum sustained working pressures are based on the conveyance of water at a temperature of 20 °C. These pressures are the respective maximum sustained working pressures for which the classes of pipe are suitable for use.

<sup>A)</sup> 1 bar = 10<sup>5</sup> N/m<sup>2</sup> = 100 kPa

## 6 Dimensions

**6.1** Pipe dimensions shall be measured in accordance with BS EN ISO 3126.

**6.2** Pipe shall conform to the dimensions given in Table 2.

**6.3** Pipe dimensions shall be designated by the nominal sizes in Table 2.

**6.4** Pipe shall be supplied in straight lengths.

*NOTE* Pipe is normally supplied in 6 m lengths.

Table 2 **Dimensions**  
Dimensions in mm

| Diameter     |            |                                     |       |                                                    | Wall thickness for a particular pressure class <sup>A)</sup> |      |         |      |          |      |          |      |                       |      |
|--------------|------------|-------------------------------------|-------|----------------------------------------------------|--------------------------------------------------------------|------|---------|------|----------|------|----------|------|-----------------------|------|
| Nominal size | Size group | Mean outside diameter <sup>B)</sup> |       | Out of roundness of outside diameter <sup>C)</sup> | Class B                                                      |      | Class C |      | Class D  |      | Class E  |      | Class T <sup>D)</sup> |      |
|              |            |                                     |       |                                                    | 6.0 bar                                                      |      | 9.0 bar |      | 12.0 bar |      | 15.0 bar |      | 12.0 bar              |      |
|              |            | min.                                | max.  | max.                                               | min.                                                         | max. | min.    | max. | min.     | max. | min.     | max. | min.                  | max. |
| 3/8          | 1          | 17.0                                | 17.3  | 0.5                                                | –                                                            | –    | –       | –    | –        | –    | 1.6      | 1.9  | 3.4                   | 3.8  |
| 1/2          |            | 21.2                                | 21.5  | 0.5                                                | –                                                            | –    | –       | –    | –        | –    | 1.9      | 2.2  | 3.5                   | 4.0  |
| 3/4          |            | 26.6                                | 26.9  | 0.5                                                | –                                                            | –    | –       | –    | –        | –    | 2.4      | 2.8  | 3.5                   | 4.0  |
| 1            |            | 33.4                                | 33.7  | 0.5                                                | –                                                            | –    | 1.9     | 2.2  | 2.5      | 2.9  | 3.0      | 3.5  | 4.2                   | 4.8  |
| 1 1/4        |            | 42.1                                | 42.4  | 0.6                                                | –                                                            | –    | 2.4     | 2.8  | 3.1      | 3.6  | 3.8      | 4.3  | 5.1                   | 5.8  |
| 1 1/2        |            | 48.1                                | 48.4  | 0.6                                                | –                                                            | –    | 2.7     | 3.1  | 3.6      | 4.1  | 4.4      | 5.0  | 5.8                   | 6.5  |
| 2            | 2          | 60.2                                | 60.5  | 0.8                                                | –                                                            | –    | 3.4     | 3.9  | 4.5      | 5.1  | 5.5      | 6.2  | 7.0                   | 7.9  |
| 3            |            | 88.7                                | 89.1  | 1.1                                                | –                                                            | –    | 5.0     | 5.7  | 6.5      | 7.3  | 8.1      | 9.1  | –                     | –    |
| 4            |            | 114.1                               | 114.5 | 1.4                                                | –                                                            | –    | 6.5     | 7.3  | 8.4      | 9.4  | 10.4     | 11.6 | –                     | –    |
| 6            |            | 168.0                               | 168.5 | 2.1                                                | 6.5                                                          | 7.3  | 9.5     | 10.6 | 12.3     | 13.7 | 15.3     | 17.0 | –                     | –    |
| 8            | 3          | 218.8                               | 219.5 | 2.7                                                | 8.4                                                          | 9.4  | 12.4    | 13.8 | 16.2     | 18.1 | 19.9     | 22.1 | –                     | –    |
| 10           |            | 272.6                               | 273.5 | 3.3                                                | 10.5                                                         | 11.7 | –       | –    | –        | –    | –        | –    | –                     | –    |
| 12           |            | 323.4                               | 324.4 | 3.9                                                | 12.5                                                         | 13.9 | –       | –    | –        | –    | –        | –    | –                     | –    |

<sup>A)</sup> The values correspond to Grade V of BS ISO 11922-2:1997.

<sup>B)</sup> Mean outside diameter of a pipe is taken to be the arithmetic mean of any two perpendicularly opposed individual outside diameters. Alternatively, the mean outside diameter may be measured by means of a circumference tape.

<sup>C)</sup> The values correspond to 0.5 × Grade Q of BS ISO 11922-2:1997.

<sup>D)</sup> Class T pipe is intended only for threading. A maximum sustained working pressure of 12 bar applies when threading is carried out in accordance with BS 21.

## 7 Physical and mechanical characteristics

### 7.1 Appearance and colour

**7.1.1** The internal and external surfaces of the pipe shall be smooth, clean and free from surface defects to an extent that would prevent conformity to this standard.

**7.1.2** The ends of the pipe shall be cleanly cut and square to the axis of the pipe.

**7.1.3** The colour of the pipe shall be agreed between manufacturer and purchaser.

*NOTE* Preferably, the colour should be grey.