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Specification for

Copper direct cylinders for domestic purposes

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Building Services Standards Committee (SEB/-) to Technical Committee SEB/9 upon which the following bodies were represented:

- Association of Manufacturers of Domestic Electrical Appliances
- British Copper Cylinder Association
- British Gas Corporation
- British Non-ferrous Metals Federation
- Chartered Institute of Building
- Copper Cylinder and Boiler Manufacturers
- Copper Development Association
- Department of the Environment (Property Services Agency)
- Department of the Environment (Building Research Establishment)
- Electricity Supply Industry in England and Wales
- Galvanizers' Association
- Heating and Ventilating Contractors' Association
- Institute of Plumbing
- London Boroughs Association
- Manufacturers' Association of Radiators and Convectors Ltd
- National Water Council
- Royal Institute of British Architects
- Royal Institute of Public Health and Hygiene
- Solid Fuel Advisory Service
- Thames Water Authority (Metropolitan Water Division)
- Water Companies Association
- Zinc Development Association
- Coopted member

This British Standard, having been prepared under the direction of the Building Services Standards Committee was published under the authority of the Board of BSI. It comes into effect on 31 July 1984 (see foreword)

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Foreword

This British Standard has been prepared under the direction of the Building Services Standards Committee. It is a revision of BS 699:1972, but will not become effective until six months after the date of publication (see back cover), to allow time for manufacturers to comply with the new requirements. In the meantime, BS 699:1972 remains as the current standard.

This revision has been prepared in conjunction with BS 1566-1 "*Copper indirect cylinders for domestic purposes*" Part 1 "*Double feed indirect cylinders*" which is complementary to BS 1566-2 "*Single feed indirect cylinders*".

A change has been made to the range of sizes to rationalize these with BS 1566-1 and an additional new size 9E has been introduced. The dimensions and positioning of connections remains unaltered.

The new size 9E has been added to provide an additional size of cylinder suitable for use with off-peak electric water heating systems.

Four grades of cylinder are now included, Grades 1, 2 and 3 remaining unaltered but with a new Grade 4. This new Grade covers cylinders specifically designed for installations which are subject to a lower maximum working head than the maximum permitted in Grade 3 thus enabling a reduction to be made in the thickness of copper sheet used.

Metal thicknesses are now specified before and after forming.

Attention is drawn to the preferred sizes of cylinders in Table 1.

This standard now specifies material and heat loss performance requirements for thermal insulation where this is applied to cylinders by the manufacturer at the factory. In the interest of energy saving, it is recommended that all cylinders are either insulated at the factory or are provided with an insulating jacket complying with BS 5615.

A specification for aluminium protector rods is now included. It is recommended that these be fitted to copper cylinders during manufacture to help to ensure long service in those supply waters that have been known to cause or are expected to cause premature failure by pin hole corrosion. It is rarely possible and never satisfactory to install aluminium protector rods after the cylinder has been put into service. Leaflet MP. 538 published by BNF Metals Technology Centre, Grove Laboratories, Denchworth Road, Wantage, Oxon, OX12 9BJ gives further information.

Copper cylinders require careful handling during transit and installation to avoid damage. Factory insulation is recommended to help prevent such damage (see 10.5).

This standard and BS 417, BS 1565, BS 1566-1 and BS 1566-2, BS 2777, BS 3198 and BS 4213 cover water storage vessels mainly for domestic use and now form a series to which others may be added when such a course is considered necessary.

NOTE BSI Sales Department will respond to purchase orders for BS 699 by supplying copies of the 1984 edition. Copies of the 1972 edition may be obtained by quoting the number "BS 699/72".

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 copper cylinders, with or without the optional features listed in Clause 10, for the storage of hot water. Four grades and 16 sizes are specified. The storage capacities are from 74 L to 450 L. The cylinders are intended for fixing in the vertical position and are all of the type in which the bottom is domed inwards.

The information to be supplied with an enquiry or order is set out in Appendix A.

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

cylinder

a closed cylindrical vessel with domed ends

2.2

screwed connection

any threaded connection to which pipes or apparatus can be fitted

2.3

length of threaded portion (of screwed connection)

the distance measured from the front face of the connection (including any chamfer or radius) to either the leading face of a plug or screw ring gauge which has been screwed as far as possible by hand into or onto the connection or in the case of a fully threaded female connection, to the back face

2.4

metal thickness before forming

the nominal thickness of copper sheet (which is subject to the tolerances specified in BS 2870) from which units are manufactured

2.5

storage capacity

the total volume of water that can be stored in the cylinder

3 Sizes and grades

The size of cylinder, the grade and the thickness of material appropriate to each grade shall comply with Table 1.

NOTE For thicknesses of materials after forming see Clause 7.

The diameter of a cylinder shall be measured externally and the height externally from base to top of dome, excluding any seam, screwed connection or other projection.

4 Designation of copper cylinders for ordering purposes

For ordering purposes, copper cylinders shall be designated BS 699 followed by the appropriate BS type reference and grade from Table 1, e.g. BS 699: Ref.3: Grade 2.

5 Tolerances

The maximum tolerances on the dimensions given in Table 1 shall be as follows:

- a) position of screwed connections: 6 mm in any direction;
- b) diameter and height of cylinder: ± 6 mm;
- c) thickness of material: the tolerances specified in BS 2870 apply.

6 Materials

The cylinders shall be made from copper sheet complying with section eight of BS 2870:1980.

NOTE Where joints are to be welded in copper thicker than 1.2 mm, material designated C106 is preferred.

Screwed connections shall be made of copper, gunmetal or alpha brass (inhibited against dezincification) and shall be suitable for attaching to the cylinder by either brazing, welding or mechanical means. Filler alloys for brazing shall be types CP1 or CP2 of BS 1845, or other corrosion resistant alloy that does not undergo dezincification and does not produce brittle joints. Filler rods for welding shall be types C7, C8, C9 or C21 of BS 2901-3.

Aluminium protector rods shall be made from alloy 1050A complying with BS 1475.

Any non-metallic materials shall not under the expected usual conditions of use for which the cylinder is designed impart to the water with which they will come in contact, unpleasant taste or odour, any cloudiness or discolouration, or any toxic or undesirable substances. For compliance with this requirement see the National Water Council Publication "Requirements for the testing of non-metallic materials for use in contact with potable water"¹⁾.

¹⁾ Obtainable from the Water Research Centre, Fittings Testing Station, 660 Ajax Avenue, Slough, Berks SL1 4BG.

7 Manufacture

7.1 After manufacture the copper forming the cylinder shall be in the work-hardened condition except in areas of brazed or welded joints.

All seams shall be jointed by one of the following methods:

- a) welting in a manner which gives four times the thickness of metal at the seam, and brazing;
- b) overlapping, not less than 5 mm wide and brazing;
- c) butt welding.

7.2 The minimum thickness of copper after forming for the tops and the concave surfaces of the bottoms of cylinders shall be not less than 67 % of the nominal thickness specified in Table 1. The minimum thickness of copper after forming for the upstand portion of the bottom of cylinders shall be not less than 67 % of the nominal thickness specified for tops in Table 1.

Thickness measurements shall be made using a pointed anvil micrometer or similar instrument.

7.3 The body of the cylinder shall be plain sided with the exception of not more than two circumferential swages. The swages shall be rounded and not sharp edged. It is permissible for the top and bottom of the cylinder to have a spinning location recess.

Where the body sheet is swaged and/or manipulated to form a seam, the minimum thickness of the sheet at the swage or seam shall be not less than 67 % of the nominal thickness before forming specified in Table 1. The thickness of the body other than at a swage or seam shall be not less than the minimum nominal thickness before forming specified in Table 1.

8 Design of cylinder top and bottom

8.1 The top of the cylinder [see Figure 1(a)] shall have a radius of curvature not exceeding three-quarters of the nominal diameter of its body. The height of the top, excluding any spinning location recess, shall comply with the dimensions given in Table 2. The top curve shall be blended, by means of a radius not less than 25 mm or more than 50 mm, to form a straight portion to meet the body.

8.2 The bottom of a cylinder shall have a radius of curvature not exceeding three-quarters of the nominal diameter of its body.

The radius at, and adjacent to, the flange connecting the curved end to the body shall be between 25 mm and 50 mm [see Figure 1(b)].

NOTE It is permissible to join the two radii at the bottom of the cylinder with a straight section.

Where the flange is extended to remove the brazed seam from the curved portion, the minimum diameter of the curved portion and the maximum upstand of the flange shall be in accordance with Figure 1(c).