BS 7181:1989

CONFIRMED
DECEMBER 2007

Specification for

Storage cisterns up to 500 L actual capacity for water supply for domestic purposes

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Building Services Standards Policy Committee (SEB/-) to Technical Committee SEB/41, upon which the following bodies were represented:

British Constructional Steelwork Association Ltd.
British Non-Ferrous Metals Federation
British Plumbing Fittings Manufacturers' Association
Builders Merchants Federation
Building Employers Confederation
Chartered Institution of Building Services Engineers
Department of the Environment (Property Services Agency)
Fibre Cement Manufacturers' Association Limited
Galvanizers Association
Heating and Ventilating Contractors' Association
Institute of Plumbing
Institution of Water and Environmental Management (IWEM)
Insulation Jacket Manufacturers' Association
National Association of Plumbing, Heating and Mechanical Services Contractors
National GRP Construction Federation
Plastic Tanks and Cisterns Manufacturers' Association
Royal Institute of British Architects
Water Authorities Association
Water Companies Association
Zinc Development Association

This British Standard, having been prepared under the direction of the Building Services Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 28 February 1990

The following BSI references relate to the work on this standard:
Committee reference SEB/41
Draft for comment 87/10000 DC

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Amendments issued since publication

Amd. No.	Date	Comments

Contents

Foreword

This British Standard has been prepared under the direction of the Building Services Standards Policy Committee as a result of proposals made by the former National Water Council (now the Water Authorities Association and the Water Companies Association) and cistern manufacturers, following publication of the European Community Directive on Water for Human Consumption, which implied that water from any domestic draw-off point should be of drinking water quality.

The New Model Water Byelaws published in June 1986 require detailed provisions to safeguard the integrity of stored water for domestic purposes. This standard specifies additional performance requirements for cisterns and associated fittings to assist in safeguarding against waste and contamination. The fittings include cistern covers, screen air inlets, screened warning pipe and vent pipe entry devices. This standard also deals with insulation to safeguard cisterns against freezing or warming termination assemblies and it provides methods of test for the assessment of the ingress of particles and insects and for the performance of thermal insulation.

This standard is applicable to all cisterns up to 500 L actual capacity from which water is drawn for domestic purposes. BS 7181 can be used by purchasers, specifiers and Water Byelaw/Regulation organisations in addition to the basic product specifications, e.g. BS 417 and BS 4213. Where used the requirements of this standard take precedence over those in the product standard.

Product certification. Users of this British Standard are advised to consider the desirability of third part 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.

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 6, 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 standard specifies the performance requirements for cisterns up to 500 L actual capacity designed for the storage of water for domestic purposes.

NOTE 1 Flushing cisterns are outside the scope of this standard.

These requirements are additional to those of the basic product specifications, (e.g. BS 417 and BS 4213).

NOTE 2 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
vent pipe

a pipe open to the atmosphere and used in connection with a hot water system for the escape of air and/or steam

2.2
warning pipe

an overflow pipe fixed so that its outlet, whether inside or outside the building, is in a conspicuous position where the discharge of water can be seen readily

2.3
water for domestic purposes

water supplied for drinking, washing, cooking or sanitary purposes

3 General

Cisterns complying with this standard shall be supplied in the package form complete with all components referred to in this standard.

All cisterns, covers and components shall comply with the relevant British Standard product specification and the performance requirements of this specification. Where the requirements conflict, this specification shall take precedence.

NOTE Attention is drawn to the need for installations and component parts to comply with the Water Byelaws (Water Regulations in Northern Ireland) of the appropriate water supply organization.

4 Materials

4.1 General

All materials in or likely to become in contact with water (including condensate) shall comply with the appropriate requirements to safeguard water quality as specified by the Water Research Centre. When used under the conditions for which they are designed, all 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.

4.2 Non-metallic materials

All products and components covered by this standard which contain non-metallic materials and are liable to come into contact with water shall comply with of BS 6920.

5 Design and construction

5.1 Coating for galvanized cisterns

Where the purchaser requires the cistern to be supplied coated internally in accordance with local Water Byelaws/Regulations or for other reasons, the coating shall comply with BS 417.

5.2 Cover

The cistern shall have a close fitting rigid cover secured by mechanical means which excludes light and the ingress of particles and/or insects from the cistern. Where connections pass through the cover a means of excluding external condensate shall be provided.

5.3 Screened air inlet (Breather)

The cistern shall be provided with an air inlet through the cover or integral top to allow the escape of air and to preserve the integrity of the stored water. The air inlet shall have a screen with apertures not exceeding 0.65 mm × 0.65 mm in order to prevent the ingress of insects and particles.

The total unobstructed area of the inlet and screen shall be 200 mm^2 minimum. The inlet shall be shrouded to alleviate dust entry and build up of dust and to prevent the entry of light.

5.4 Vent pipe entry device

A fixing, connection or other device shall be provided to allow entry of a vent pipe through the cover or integral top. Such a device shall prevent any displacement or distortion of the cistern or cover due to expansion or other movement of the vent pipe.

5.5 Screened warning pipe termination assembly

A warning pipe termination assembly shall be provided for fitting through the side wall of the cistern and for connection to an external warning pipe. It shall incorporate a turn-down inside the cistern with its outlet 50 ± 10 mm below the shut-off water level and a free-draining watertight housing, containing a screen, for fitting to the warning pipe outside the cistern. The screen shall have apertures not exceeding 0.65 mm × 0.65 mm, shall not restrict the full flow of the warning pipe and shall be easily removable for inspection and cleaning.

5.6 Thermal insulation

The cistern shall be provided with insulation for all surfaces except the base.

NOTE 1 It is permissible for the purchaser to specify a cistern to this standard but excluding insulation where the cistern is to be dedicated to the supply of water to a hot water system, is not required to supply cold water to a draw-off and is to be installed in a frost-free location.

The insulation set provided shall retain its function if the installer is required to cut holes in the insulation material. Where this integrity is not inherent in the set, a method of safeguarding shall be provided.

The insulation shall not obstruct the operation and maintenance of the cistern full fixing instructions shall be provided.

NOTE 2 Insulation reduces the rate of heat loss from the cistern and contents. It will not remove the possibility of freezing during extended periods of temperatures below freezing point but it will delay the onset of freezing and so provide worthwhile protection.

6 Testing

6.1 Particle ingress limitation between the cistern and fittings

When the assembled installation is tested in accordance with Appendix B, all particles retained by the filter paper or bag in the air extraction line shall have at least two dimensions of 0.65 mm or less.

NOTE It is permissible for the fittings, i.e. screened air inlet, vent pipe entry device and screened warning pipe termination assembly, to be tested on one size of cistern and cover only.

6.2 Thermal insulation

When the thermal insulation is tested in accordance with Appendix C, the temperature drop over the test period shall not exceed 10 °C.

7 Marking

7.1 Thermal insulation

Where the insulation is not factory applied it shall be clearly and indelibly marked with the following information:

a) the manufacturer's name or trade mark;

b) the words "This insulation set complies with BS 7181:1989"[1)];

c) the type and dimensions of the cistern with cover for which the insulation set is intended.

7.2 Cisterns

In addition to the marking required by the relevant product specification all cisterns shall be permanently marked with the following:

a) the number and date of this British Standard i.e. BS 7181:1989[1)];

b) the words "Install with a secured cover, screened air inlet, screened warning pipe termination assembly, insulation, and, if applicable, vent pipe entry device".

c) the words "This installation requires insulation when it supplies a cold water draw-off system".

NOTE Insulation may only be omitted where the cistern solely supplies water to a hot water system and is installed in a frost-free location.

[1)] Marking BS 7181:1989 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendix A Information to be supplied by the purchaser

For the purposes of ordering, the following information should be supplied by the purchaser.

a) Size or reference of cistern.

b) Cistern material.

c) In the case of a galvanized cistern, whether internal coating is required. Galvanized cisterns will be supplied without internal coating unless ordered to the contrary.

d) Whether the package is to include insulation. Insulation will be supplied unless ordered to the contrary.

Appendix B Method of test for the assessment of ingress of particles and insects

B.1 Apparatus

NOTE A typical installation is shown in Figure 1.

B.1.1 *Test box with a removable lid*, fitted with an inlet to allow entry of an air line and with a connection for the vacuum pump at the top. The test box dimensions shall be such that there is at least a 150 mm gap between the box and cistern to permit a free flow of air when installed.

B.1.2 *Polyethylene particles*, measuring 0.5 mm to 1.00 mm.

B.1.3 *Vacuum pump and connection*, fitted with a filter paper or bag capable of retaining the polyethylene particles. The vacuum pump shall be capable of maintaining a partial vacuum of 50 ± 10 mm water gauge. A relief valve vented to atmosphere shall be fitted for control of the vacuum.

B.1.4 *U-tube manometer*, to measure partial vacuum applied to the cistern.

B.2 Procedure

Carry out the procedure as follows.

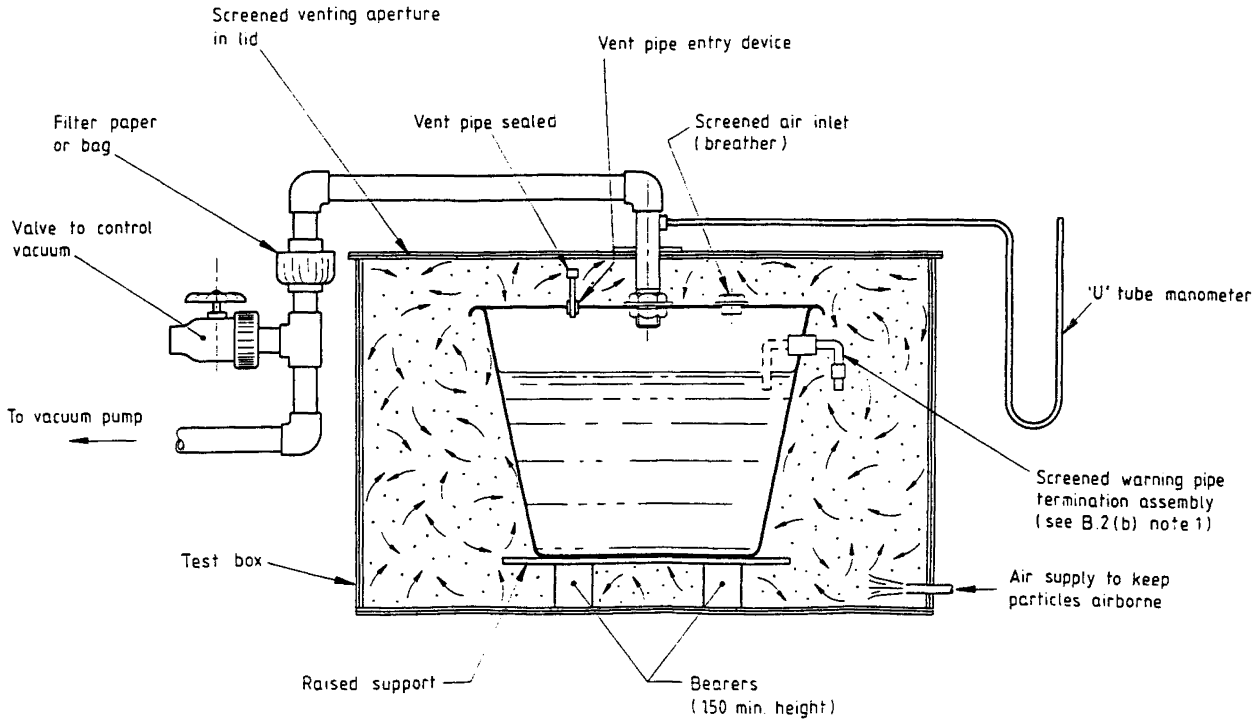
a) Remove the lid form the test box.

b) Install the cistern, cover and fittings to be evaluated in the test box and place the cistern on the raised support base.

NOTE 1 The turn-down on the waring pipe should be removed or adjusted so that it is not below the water level.
NOTE 2 The vent pipe should be sealed.

c) Partly fill the test box with polyethylene particles to a height not less than 75 mm above the test box base.

d) Fill the cistern with water at ambient temperature to the normal water level and fit the cover to the cistern in accordance with the manufacturer's instructions.



The dimension is in millimetres.

Figure 1 — Typical installation for particle ingress test

e) Replace the lid on the test box and ensure that it is air tight.

f) Activate the air supply so that the particles remain airborne.

g) Activate the vacuum pump leaving the relief valve fully open to atmosphere. Gradually close the relief valve until the manometer indicates that a partial vacuum of 50 ± 10 mm water gauge is being applied to the drinking water cistern. Maintain this partial vacuum for five min ± 10 s.

h) At the end of the test, shut off the equipment, examine the filter paper or bag in the vacuum pump line and measure any particle found.

Appendix C Method of test for performance of thermal insulation

C.1 General

NOTE A typical installation is shown in Figure 2.

The test shall be conducted within a room or other enclosed area equipped with facilities to maintain a constant ambient temperature ± 2 °C between 10 °C and 25 °C and to monitor ambient temperature throughout the test period.

C.2 Apparatus

C.2.1 *Test bed* comprising a sheet of 18 mm plywood, at least as large as the plan area of the insulation set to be tested, mounted on transverse 50 mm × 50 mm timber bearers at 400 mm centres.

C.2.2 *Temperature sensor* (Celsius scale) with stand and/or fixings.

C.2.3 114 L *capacity cistern* (or the nearest in the manufacturer's range) together with an insulation set of the relevant size.

C.3 Procedure

Carry out the procedure as follows.

a) Arrange the cistern, excluding the cover, on the test bed.

b) Fit the insulation in accordance with manufacturer's instructions but without the top insulation.

c) Position the temperature sensor, using the stand and/or fixings, at the centre of the cistern plan area at a depth below the normal water level of one third of the distance between the normal water level and the base of the cistern.

d) Record the ambient room temperature which shall be between 10 °C and 25 °C. If the thermometer is not of the constant recording type, re-record the ambient temperature at the commencement of the test period and at 60 ± 10 min intervals throughout the test period.

NOTE 1 In determining the ambient temperature to be applied the characteristics and properties of the cistern material should be taken into account.

e) Fill the cistern to the normal water level with water at a temperature not less than 25 ± 0.5 °C above the recorded ambient temperature.

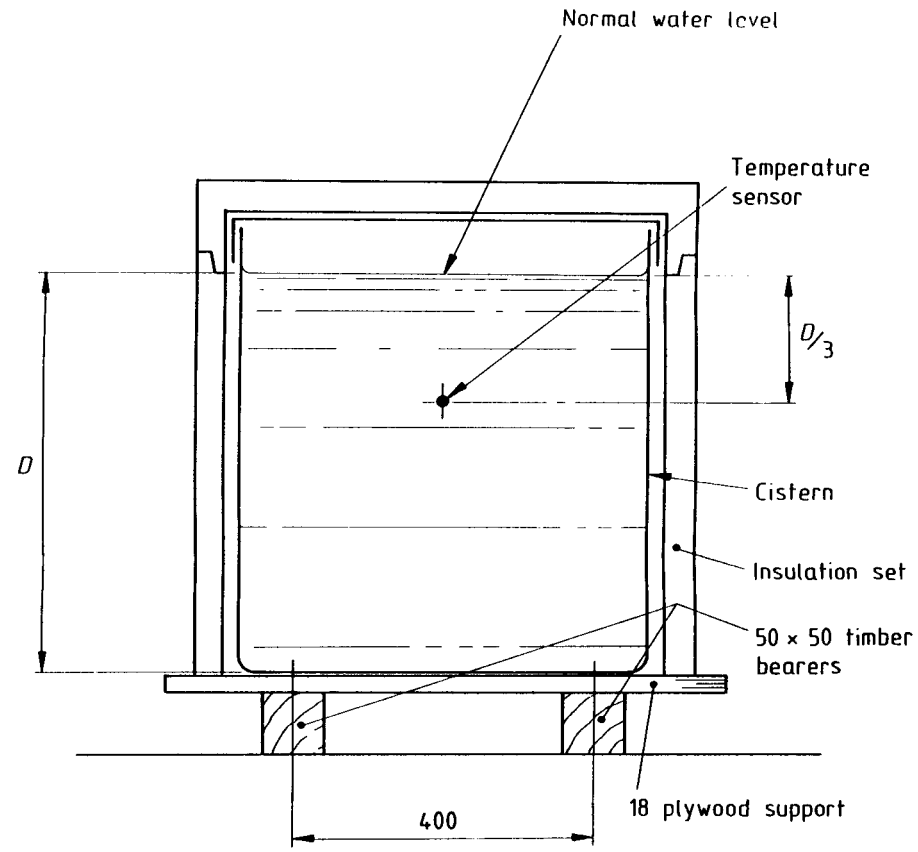
f) Leave the test to stand with occasional agitation, until the sensor registers 20 ± 0.5 °C above the recorded ambient temperature

g) Fit the cistern cover and top insulation.

h) Commence the test period.

i) After a period of 18 h ± 15 min remove the top insulation and cistern cover and record the sensor reading.

NOTE 2 All thermometer and sensor readings should be recorded to an accuracy of 0.5 °C.



All dimensions are in millimetres.

Figure 2 — Typical installation for thermal insulation test

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Publications referred to

BS 417, *Specification for galvanized low carbon steel cisterns, cistern lids, tanks and cylinders.*

BS 417-2, *Metric units.*

BS 4213, *Specification for cold water storage and feed and expansion cisterns (polyolefin or olefin copolymer) and cistern lids.*

BS 5750, *Quality systems.*

BS 6920, *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.*

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