

# Glass fibre reinforced plastics cisterns for cold water storage —

## Part 1: Specification for one-piece cisterns of capacity up to 500 L

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Plastics and Rubber Standards Policy Committee (PRM/-) to Technical Committee PRM/63, upon which the following bodies were represented:

- Association of GRP and Plastic Moulders
- British Plastics Federation
- Composites Processing Association
- Department of the Environment (Property Services Agency)
- National GRP Construction Federation
- Plastic Tanks and Cisterns Manufacturers' Association
- Water Byelaws Advisory Service

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## Foreword

This Part of BS 7491 has been prepared under the direction of the Plastics and Rubber Standards Policy Committee. BS 7491 will comprise two Parts.

- *Part 1: Specification for one-piece cisterns of capacity up to 500 L;*
- *Part 2: Specification for one-piece cisterns of nominal capacity from 501 L to 25 000 L.*

This Part of BS 7491 is applicable to glass fibre reinforced plastics cisterns and covers for the domestic and industrial storage of cold water and recognizes new requirements for water quality embodied in the European Standards for drinking water. It also provides methods of test for the evaluation of the properties of cisterns and covers made by any of the glass fibre reinforced plastics processes. It applies to both circular and non-circular cisterns and covers.

New Water Byelaws implemented in January 1989 require detailed provisions to safeguard the integrity of stored water for domestic purposes. This Part of BS 7491 includes cistern and associated fitting requirements to assist in safeguarding against waste and contamination. The fittings are cistern covers, screened air inlets, screened warning pipes and vent pipe entry devices. Requirements for insulation to reduce the likelihood of the stored water freezing or warming are also given, together with a method of test for the assessment of the ingress of particles and insects.

This Part of BS 7491 incorporates the general requirements for water tanks prepared under the direction of the Building Services Standards Policy Committee, following publication of the European Community Directive on Water for Human Consumption, which implied that water quality from any domestic draw-off point should be of drinking water quality. Accordingly class A cisterns marked as complying with this standard also indicate compliance with BS 7181.

Because slight changes in plumbing practice are necessary when using these cisterns, as opposed to cisterns of more rigid materials, additional information relating to installation has also been included.

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 14, 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 Part of BS 7491 specifies requirements for one-piece glass fibre reinforced plastics cold water storage cisterns, combined feed and expansion cisterns and expansion cisterns, for both domestic and industrial use. Particular requirements for additional components for cisterns for domestic use are also included. The range of capacities covered is up to 500 L.

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 cistern

fixed container for holding water at atmospheric pressure and at a maximum temperature of 39 °C

NOTE 1 This temperature is higher than is acceptable for drinking water, which should not normally exceed 20 °C.

NOTE 2 The water is usually supplied through a float-operated valve.

### 2.2 cold water storage cistern

cistern used only for storing cold water

### 2.3 water for domestic purposes

water supplied for drinking, washing, cooking and sanitary purposes

### 2.4 cistern for storing cold water for domestic purposes

cold water storage cistern complete with cover and the additional component kit (see 2.5)

### 2.5 additional component kit

assembly of all the additional components for the cistern e.g. the insulation (if not applied to the cistern), the cover, the screened warning pipe assembly, the screened air inlet (breather) and the vent pipe connector

### 2.6 feed cistern

any storage cistern used for supplying cold water to a hot water apparatus, cylinder or tank

### 2.7 combined feed and expansion cistern

cistern for supplying cold water to the primary circuit of a hot water system without a separate expansion cistern

### 2.8 expansion cistern

cistern connected to a hot water heating system which accommodates the increase in volume of water in that system when it is heated from cold

### 2.9 test water line

line marked on the cistern at 100 mm below the top for the purposes of testing

### 2.10 nominal capacity

volume of the cistern, measured to the top of the cistern

### 2.11 top of the cistern

plane across the cistern where the cover makes contact with the flange

### 2.12 secondary water heating system

part of the hot water system comprising the cold feed pipe, any storage cistern, the water heater and the flow and return pipework from which hot water for use is conveyed to all points of draw-off

### 2.13 primary circuit

assembly of pipes and fittings in which water circulates between a boiler (or other water heater) and the primary heater, inside a hot water storage vessel

### 2.14 vent pipe

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

### 2.15 warning pipe

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

## 3 Designation of cisterns

Each cistern shall be designated by a code comprising components in the following order.

- a) The number and date of this standard, i.e. BS 7491-1:1991.
- b) The capital letters GRP.
- c) The capital letter A or B.

A indicates a class A cistern, which is for use in potable water storage as one of the following:

- 1) a cold water storage cistern;
- 2) a feed cistern or a combined feed and expansion cistern, supplying a secondary water heating system;
- 3) a combination of these.

B indicates a class B cistern, which is for use in the storing of non-potable water, as one of the following:

- i) a combined feed and expansion cistern to a primary circuit;
- ii) an expansion cistern.

NOTE Class B cisterns are not used as cold water storage cisterns.

- d) A number representing the nominal capacity in litres.

For example a cistern of capacity 30 L intended to be used for potable water storage would be designated as BS 7491-1:1991/GRP/A30.

## 4 Materials

NOTE 1 There are many thermosetting resin systems and the properties vary especially with respect to chemical resistance and heat distortion point. Resin systems in common use include polyester or epoxy based systems.

NOTE 2 Where required, an additive for modifying the properties of a resin may be used. For example, the resin often contains active additives to change the viscosity or to modify the fire retardancy of the main system.

NOTE 3 Where required, resins may incorporate pigments or dyes.

### 4.1 Fibrous reinforcement

The glass fibre reinforcement used shall be of type "E" glass as follows:

- a) glass fibre rovings complying with BS 3691;
- b) glass fibre chopped strand mat complying with BS 3496;
- c) glass fibre woven fabrics complying with BS 3396-1;
- d) glass fibre woven roving fabrics complying with BS 3749.

The glass fibre shall have a surface treatment compatible with the resin.

NOTE 1 Any construction of the fibrous reinforcement is acceptable.

NOTE 2 Sandwich structures including fibre and appropriate core materials may also be used.

### 4.2 Other materials

#### 4.2.1 Aggregates

Where required, inert granular material between 5 mm and 0.05 mm shall be used as a design part of the structure, e.g. graded silica sands.

#### 4.2.2 Inert fillers

Where required, an inert filler with a particle size below 0.05 mm shall be used if required as a resin extender and incorporated either on its own or together with the aggregate.

#### 4.3 Metal brace

Where a metal brace which can be in contact with water is supplied with any cistern, it shall be corrosion proofed and free from sharp edges, sharp corners and surface projections.

## 5 Appearance and configuration

### 5.1 Appearance and quality of finish of cisterns

The internal surfaces of cisterns, and of covers for class A cisterns, shall be smooth, of even texture, and free from surface imperfections which may detract from the performance of the cistern in use.

### 5.2 Configuration

When a change in the direction of the cistern wall is necessary, this shall be accomplished by the use of a radius of not less than 3 mm. Where the walls of the cistern are tapered, the taper shall not exceed 7° from the vertical.

## 6 Requirements for all cisterns

### 6.1 General performance requirements

#### 6.1.1 Resistance to deformation

The volume of added water shall not exceed 2 % of the volume in the cistern at the start of the test, when the cistern is tested in accordance with Appendix A.

#### 6.1.2 Resistance to deflection

The deflection shall be not greater than 32 mm, when the cistern is tested in accordance with Appendix B.

#### 6.1.3 Fatigue resistance

There shall be no visible mechanical failure, when the cistern is tested in accordance with Appendix C.

#### 6.1.4 Opacity

The cistern shall not transmit more than 0.2 % of the visible light incident upon it, when tested in accordance with BS 2782:Method 1104A.

#### 6.1.5 Impact resistance

There shall be no visible leaks resulting from any impact damage, when the cistern is tested in accordance with Appendix D.

#### 6.1.6 Leak test

There shall be no visible leaks, when the cistern is tested in accordance with Appendix E.