

# Oil burning equipment —

## Part 5: Specification for oil storage tanks

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- Association of Shell Boilermakers
- British Combustion Equipment Manufacturers' Association
- British Tar Industry Association
- Chartered Institution of Building Services Engineers
- Chief and Assistant Chief Fire Officers' Association
- Department of the Environment (Building Research Establishment)
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- Electricity Supply Industry in England and Wales
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- Fire Offices Committee
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- Institute of Domestic Heating and Environmental Engineers
- Institute of Energy
- Institution of Fire Engineers
- Water-tube Boilermakers' Association

The following body was also represented in the drafting of the standard:

- Institution of Mechanical Engineers

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# Foreword

This Part of BS 799 has been prepared under the direction of the Refrigeration, Heating and Air Conditioning Industry Standards Committee. It supersedes BS 799-5:1975 which is withdrawn. It deals with tanks used for the storage of liquid fuel used in conjunction with oil burning equipment.

Some changes from the previous edition have been made. In particular, upper limits on tank volumes have been included, certain design heads and plate thicknesses have been altered for tank types A to L and the tanks to the previous type H are now included with type E.

Reference to coal tar liquid fuels complying with BS 1469 have been omitted as BS 1469 has now been withdrawn. The tanks may still be considered suitable for the storage of coal tar liquid fuels provided that the characteristics of the particular fuel to be stored can be obtained.

The text dealing with storage capacity in the appendix of the previous edition has been omitted in this edition because this subject is now referred to in BS 5410 to which reference should be made for general recommendations in respect of the installation of storage tanks.

The tank plate thicknesses are in accordance with Table 2 of BS 6722:1986.

General requirements for the design and staying or stiffening of tanks are given.

An appendix C has been included which lists the information to be supplied by the purchaser.

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 to iv pages 1 to 24, 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 799 specifies requirements for tanks for the storage of liquid fuel, used in conjunction with oil burning equipment, and includes:

- a) integral tanks which form a part of a complete oil fired unit;
- b) service tanks;
- c) storage tanks with a maximum height of 10 m.

The maximum capacities of the various types of tank are specified.

This standard is applicable to tanks constructed of plain carbon steel.

NOTE 1 The requirements of this standard should not be applied to tanks constructed of plastics or materials other than plain carbon steel.

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 Part of BS 799, the following definitions apply.

### 2.1

#### oil

petroleum oil fuels of classes C, D, E, F, G and H as specified in BS 2869

### 2.2

#### integral tank

a small tank up to 25 L capacity which forms an integral part of an oil fired unit or appliance and which requires filling by hand

### 2.3

#### service tank

an auxiliary tank having a capacity of not more than 1 000 L, which isolates the main storage tank or tanks from the burner installation

### 2.4

#### design pressure or head

that pressure or equivalent head of water acting at the bottom, sides and top of the tank

### 2.5

#### design pressure or head at the bottom of the tank

the tank depth plus a vent height of 0.5 m. If the height of the vent pipe exceeds 0.5 m or where it is not possible to provide a pressure relief device, the full equivalent height of the vent pipe including frictional loss is taken into account when calculating the design pressure

NOTE See appendix B.

### 2.6

#### design pressure or head at the top of the tank

a vent height of 0.5 m. If the height of the vent pipe exceeds 0.5 m or where it is not possible to provide a pressure relief device, the full equivalent height of the vent pipe including frictional loss is taken into account when calculating the design pressure

NOTE See appendix B.

### 2.7

#### design pressure or head at the side of the tank

two-thirds the pressure at the bottom of the tank

### 2.8

#### tank capacity

the gross internal volume of the tank

### 2.9

#### fire valve

an automatically operated quick closing valve held open by any one of the following methods:

- a) by means of the tension of a wire on which are one or more fusible links;
- b) electrically; operated by one or more heat sensitive devices;
- c) pneumatically; the air system is sealed by one or more fusible plugs;
- d) by means of a sealed system incorporating a sensitive phial placed over the firing point.

## 3 Integral tanks

### 3.1 General

Integral tanks shall have a capacity of not more than 25 L.

Each integral tank shall carry a prominent notice at the filling point to indicate that the tank is not to be filled whilst the burner is alight and specifying the grade of oil to be used.

Each integral tank shall be so mounted and positioned that when the ambient temperature is 25 °C or higher the temperature of the oil in the tank does not exceed 35 °C with class C oil or 55 °C with class D oil.

Each integral tank shall be mounted in such a position that oil accidentally spilled during filling or escaping is unable to come into contact with any heated surface.

### 3.2 Pressure testing

Before being painted, each tank shall be pressure tested by the manufacturer in accordance with appendix A. The manufacturer shall provide the purchaser with a copy of the test certificate for each tank supplied.

Each tank shall be able to withstand the design pressure.

NOTE 1 All the pressures to which the tank may be subjected (see 2.4 to 2.7) should be taken into consideration.

NOTE 2 The purchaser should inform the manufacturer of the required design pressure [see C.1 a)].

### 3.3 Construction

All joints below the full fuel level shall be made by brazing or welding.

NOTE Attention should be paid in the design of integral tanks to ensure that they can be safely used for the purpose for which they are intended by providing sufficient strength and rigidity to resist that distortion which may give rise to hazardous discharge of oil or vapour. Integral tanks should be resistant to corrosion.

## 4 Service tanks

### 4.1 Types

Service tanks shall be designated as follows.

Type S1: cylindrical tanks having a capacity up to and including 250 L.

Type S2: rectangular tanks having a capacity up to and including 250 L.

Type S3: horizontal cylindrical tanks having a capacity over 250 L but not exceeding 1 000 L.

Type S4: rectangular tanks having a capacity over 250 L but not exceeding 1 000 L.

Type S5: horizontal oval tanks having a capacity not exceeding 1 000 L.

### 4.2 General

4.2.1 Service tanks shall have a capacity of not more than 1 000 L.

4.2.2 The requirements for tank oil heaters, when installed (see 15.3 and appendix C), shall be as specified in clause 7.

4.2.3 An oil drain valve and, in addition for coal tar liquid fuels, a water drain valve shall be provided as specified in clause 9.

4.2.4 A separate vent pipe or return pipe shall be provided for each tank, at the higher end. (See clauses 11 and 13 and BS 5410.)

4.2.5 For oil draw-off lines and where return lines as specified in 15.1 c) are used, fire valves shall be provided as specified in clause 16.

4.2.6 Service tanks shall be installed as specified in clause 15 (see also BS 5410).

### 4.3 Pressure testing

Before being painted, each tank shall be pressure tested in accordance with appendix A at the manufacturer's works or on site when the tank is fabricated on site.

Tanks tested on site shall be tested hydraulically.

The manufacturer shall provide the purchaser with a copy of the test certificate for each tank supplied.

Each tank shall be able to withstand the design pressure.

NOTE 1 All the pressures to which the tank may be subjected (see 2.4 to 2.7) should be taken into consideration.

NOTE 2 The purchaser should inform the manufacturer of the required design pressure [see C.1 a)].

### 4.4 Marking

The following information shall be permanently and clearly marked on the tank on the vertical centre line near the outlet connection:

- a) capacity (in L);
- b) date of manufacture;
- c) manufacturer's name or trade mark;
- d) manufacturer's reference number;
- e) the number and date of this British Standard<sup>1)</sup> and type of tank (e.g. BS 799-5:1987 type S1).

### 4.5 Construction and plate thickness

4.5.1 Service tanks shall be of welded construction and made of rolled steel sheets which comply with the requirements for grade CR4 material suitable for welding as specified in BS 1449-1. Galvanized steel shall not be used.

4.5.2 The provision of manholes or inspection openings, if required for access to internal fittings, shall be as specified in clause 6.

4.5.3 For service tanks having a capacity up to and including 250 L (types S1 and S2) the minimum thickness of the steel sheets shall be 1.2 mm.

For cylindrical tanks, the maximum height shall not exceed 750 mm and the maximum diameter shall not exceed 600 mm.

NOTE All welding should be sound and of good penetration.

4.5.4 For service tanks having a capacity over 250 L but not exceeding 1 000 L (types S3, S4 and S5) all welding shall comply with the requirements of BS 5135. Rectangular tanks (type S4) shall be stayed or stiffened and have a thickness of plate not less than as shown in Figure 1. For cylindrical tanks (type S3) the diameter of shell and the thickness of the shell and ends shall be not less than as given in Table 1. For oval tanks (type S5) the major axis of the shell and the thickness of the shell and ends shall be not less than as given in Table 1.

<sup>1)</sup> Marking BS 799-5:1987 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.

Table 1 — Minimum plate thicknesses for service tanks of types S3 and S5

| Capacity                     | Minimum thickness of plate |                         |                                                                             |                                        |                                |
|------------------------------|----------------------------|-------------------------|-----------------------------------------------------------------------------|----------------------------------------|--------------------------------|
|                              | Shell                      | Dished and flanged ends | Ends dished only<br>Flat flanged ends<br>Flat unflanged ends<br>(stiffened) | Flat unflanged ends<br>(not stiffened) | Maximum diameter or major axis |
| L                            | mm                         | mm                      | mm                                                                          | mm                                     | m                              |
| Up to and including 500      | 1.6                        | 1.6                     | 2.0                                                                         | 3.0                                    | 0.25                           |
| Over 500 and including 1 000 | 2.0                        | 2.0                     | 2.5                                                                         | 4.0                                    | 1.0                            |

## 5 Oil storage tanks

### 5.1 Types

NOTE The type of tank to be used will depend on the size of the plant as well as on the site available (see BS 5410-2 or BS 5410-3).

Oil storage tanks shall be designated as follows.

- a) Tanks having a capacity of not more than 3 500 L and having a venting device or pipe not exceeding 0.5 m in height or equivalent friction head:

- Type I : horizontal cylindrical tanks;  
 Type II : horizontal oval tanks (with the major axis horizontal);  
 Type III : rectangular tanks.

- b) Tanks excluding those covered by a) and not exceeding 10 m in height:

Type A: horizontal cylindrical tanks having a capacity of not more than 60 000 L, with dished or flat ends, for a design head equivalent to a head of water not exceeding 0.5 m above the top of the tank;

Type B: horizontal cylindrical tanks having a capacity of not more than 60 000 L, with dished ends, for a design head equivalent to a head of water not exceeding 4.5 m above the top of the tank;

Type C: horizontal cylindrical tanks having a capacity of not more than 60 000 L, with dished ends, for a design head equivalent to a head of water greater than 4.5 m above the top of the tank;

Type D: vertical cylindrical tanks having a capacity of not more than 65 000 L, with dished ends, for a design head equivalent to a head of water not exceeding 0.5 m above the top of the tank;

Type E: vertical cylindrical tanks having a capacity of not more than 145 000 L, with dished ends, for a design head equivalent to a head of water not exceeding 7.5 m above the top of the tank;

Type F: vertical cylindrical tanks having a capacity of not more than 65 000 L, with dished ends, for a design head equivalent to a head of water greater than 7.5 m above the top of the tank;

Type G: vertical cylindrical tanks having a capacity of not more than 145 000 L, with flat bottom end plates, for a design head equivalent to a head of water not exceeding 0.5 m above the top of the tank;

Type J: rectangular tanks having a capacity of not more than 150 000 L, for a design head equivalent to a head of water not exceeding 0.5 m above the top of the tank;

Type K: rectangular tanks having a capacity of not more than 150 000 L, for a design head equivalent to a head of water not exceeding 7.5 m above the top of the tank;

Type L: rectangular sectional tanks having a capacity of not more than 150 000 L. These tanks shall only be used when the use of factory or site welded tanks is not practicable.

### 5.2 General

**5.2.1** The requirements for tank oil heaters, when installed (see 15.3 and appendix C), shall be as specified in clause 7.

**5.2.2** Tanks shall be provided with an oil level indicator as specified in clause 8.

**5.2.3** An oil drain valve and, in addition for coal tar liquid fuels, a water drain valve, shall be provided as specified in clause 9.

**5.2.4** Filling pipes and connections shall be as specified in clause 10.

**5.2.5** A separate vent pipe shall be provided for each tank at the higher end as specified in clause 11.

**5.2.6** Outlet valves and pipes shall be provided as specified in clause 12.

**5.2.7** Oil return pipes shall be connected as specified in clause 13.

**5.2.8** For oil draw-off lines and where return lines as specified in 13.1 c) are used, fire valves shall be provided as specified in clause 14.

**5.2.9** Oil storage tanks shall be installed as specified in clause 15 (see also BS 5410).

### 5.3 Pressure testing

**5.3.1 Types I to III.** Before being painted (see 5.4) each tank shall be pressure tested in accordance with appendix A at the manufacturer's works or on site when the tank is fabricated on site.

Tanks tested on site shall be tested hydraulically. The manufacturer shall provide the purchaser with a copy of the test certificate for each tank supplied. Each tank shall be able to withstand the design pressure. Tanks shall not be used on any site that requires a vent pipe exceeding 0.5 m in height (or equivalent friction head) unless a pressure relief device is fitted (see 2.4 to 2.7).

**NOTE** The purchaser should inform the manufacturer of the required design pressure [see C.1 a)].

#### 5.3.2 Types A to L

**5.3.2.1 Types A to K.** Before being painted (see 5.4) each tank shall be pressure tested in accordance with appendix A at the manufacturer's works or on site when the tank is fabricated on site.

Tanks tested on site shall be tested hydraulically. The manufacturer shall provide the purchaser with a copy of the test certificate for each tank supplied.

**5.3.2.2 Type L.** Where a sectional tank cannot be subjected to a pressure equivalent to the head of oil in the tank and vent pipe (such as by overfilling) it shall be tested by being filled with water to its capacity. The test shall be maintained for a period of 24 h.

The manufacturer shall provide the purchaser with a copy of the test certificate for each tank supplied.

**5.3.2.3 Conditions for types A to L.** Each tank shall be able to withstand the design pressure.

**NOTE 1** The grade of oil and the pressure to which the tank may be subject in the event of overfilling (see appendix B) or the pressure at which the pressure relief device operates if one is fitted (see clause 11) should be taken into consideration.

**NOTE 2** The purchaser should inform the manufacturer of the required design pressure [see C.1 (a)].

### 5.4 Painting and cleaning

**5.4.1 Types I to III.** Each tank fabricated at the manufacturer's work shall, before despatch, be cleaned externally and either:

- a) be protected externally with a rust-inhibiting priming paint; or
- b) be left unprotected.

**NOTE** The tank will be protected externally with a rust-inhibiting priming paint unless it is specifically requested by the purchaser that the tank be left unprotected.

The inside of the tank shall be cleaned and all openings closed to prevent ingress of foreign matter. Tanks built on site shall be cleaned externally and internally after testing and painted externally.

**5.4.2 Types A to L.** Tanks of types A to K fabricated at the manufacturer's works shall, before despatch, be cleaned externally and painted with anti-corrosive paint; the inside of the tank shall be cleaned and all openings closed to prevent ingress of foreign matter. Tanks built on site (including type L) shall be cleaned externally and internally after testing and painted externally.

### 5.5 Marking

The following information shall be permanently and clearly marked on the tank on the vertical centre line near the outlet connection:

- a) capacity (in L);
- b) date of manufacture;
- c) manufacturer's name or trade mark;
- d) manufacturer's reference number;
- e) the number and date of this British Standard<sup>2)</sup> and type of tank (e.g. BS 799-5:1987 type D).

### 5.6 Construction and plate thicknesses

#### 5.6.1 General

**5.6.1.1 Types I to III.** Storage tanks of types I to III shall be of welded construction and made of rolled steel sheets or plates which comply with the requirements for grade CR4 material suitable for welding as specified in BS 1449-1. Galvanized steel shall not be used. All welding shall be as specified in BS 5135.

**5.6.1.2 Types A to K.** Storage tanks of types A to K shall be of welded construction and made of rolled steel plates which comply with the requirements for grade 43A material as specified in BS 4360. Galvanized steel shall not be used. All welding shall be as specified in BS 5135.

**5.6.1.3 Access (types I to III and A to L).** The provision of manholes or inspection openings, if required for access to internal fittings, shall be as specified in clause 6.

<sup>2)</sup> Marking BS 799-5:1987 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.