British Standard

BRITISH STANDARD

BS 2594:1975
Incorporating
Amendment No. 1

Specification for carbon steel welded horizontal cylindrical storage tanks

UDC 621.642.037 – 111.2:669.14:621.791

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and professional and industrial organizations:

Associated Offices Technical Committee
Association of Consulting Engineers
Association of Hydraulic Equipment Manufacturers Ltd.
Association of Mining Electrical and Mechanical Engineers
British Compressed Air Society
British Electrical and Allied Manufacturers' Association
British Gas Corporation*
British Gear Manufacturers' Association
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British Mechanical Engineering Confederation
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Chemical Industries Association Ltd.
Council of British Manufacturers of Petroleum Equipment
Oil Companies Materials Association

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Contents

Foreword

This British Standard, which was first published in 1955 under the joint authority of the Mechanical Engineering Industry Standards Committee and the Petroleum Equipment Industry Standards Committee, is intended to provide for tanks of adequate safety and reasonable economy, in a range of sizes to suit the requirements of user industries for the static storage of petroleum and other chemical products vented to atmosphere. Tanks intended for the storage of liquids corrosive to mild steel should be suitably protected.

In this revision, dimensions are based on chosen metric capacities. Dished and flanged ends of only four sizes are used, which are convenient for the manufacture of compartmented tanks; these are based on metric outside diameters. Imperial dimensions for dished ends are retained for current production purposes, but as and when existing tooling requires renewal it should be replaced to suit the metric sizes specified in this standard.

Due to the current low demand, unflanged ends and flanged ends butt-welded to the shell are not included in this revision. However, if justified by demands from industry, consideration will be given to the reinstatement of either or both of these forms of construction at a future date.

Dimensions for lifting lugs are included and certain of the requirements dealing with welding and testing have been revised.

Manhole details are given and manholes are shown positioned near one end of the tank, with the advantages that:

a) it is easy to avoid a joint weld through the manhole;
b) some degree of production standardization can be achieved;
c) tank manlid connections can be grouped at one end, which can be particularly useful in multitank installations.

The above-ground tanks specified in this standard comply with the performance requirements for Type A tanks in BS 799-5.

Certification. Attention is drawn to 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 17 and a back cover.

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Sidelining in this document indicates the most recent changes by amendment.

1 Scope

This British Standard specifies requirements for the design and construction of carbon steel fusion welded horizontal cylindrical storage tanks with dished and flanged ends for the storage of liquids. The standard includes both above-ground tanks with saddle supports and underground tanks.

Details of the range of dished and flanged ends upon which the range of standard diameter tank sizes has been based are given in Table 2A and Table 2B.

The overall lengths given in Table 1A and Table 1B relate to tanks with butt-welded circumferential seams. Tanks wholly fabricated at the manufacturer's works may be constructed using either of the types of construction illustrated in Figure 3, provided the overall lengths specified are maintained.

NOTE 1 The above-ground storage tanks specified in this standard are not intended for mobile applications.

NOTE 2 Except where otherwise stated the requirements specified apply to both above-ground and underground tanks.

NOTE 3 Attention is drawn to regulations concerning the storage of flammable liquids. Petroleum spirit must be stored in tanks complying with the requirements of licensing authorities.

2 References

The titles of the British Standards referred to in this standard are listed on the inside back cover.

3 Information to be supplied by the purchaser

The following information, as appropriate, shall be supplied by the purchaser with his enquiry.

a) The diameter and length or the nominal capcity of the tank.

b) The shell and end plate thickness required.

c) The diameter, number and position of any extra manholes required (see **8.3.2**).

d) The material to be used for the manhole and other gaskets (see **8.3.2.6**).

e) Whether the tank is to be wholly fabricated at the manufacturer's works or to be supplied "plate small". For tanks supplied "plate small", the purchaser shall indicate the shell plating arrangement required (see **6.2**).

f) Whether any treatment is required for the removal of mill scale (see **7.1.2**).

g) Dimensioned drawings giving details of the type class and position of any fittings or mountings.

h) Whether welding procedure drawings are required (see **9.4.2**).

i) Whether the test to be carried out shall be particularly hydraulic or pneumatic (see **10.1.1.1**).

j) Whether a test certificate is required (see **10.5**).

k) Whether the capacity of the tank is to be calibrated (see clause **11**).

l) The protection required on internal and external surfaces (see **14.1**).

m) Whether the tank has to be specially packed or marked for transit (see **14.2**).

n) For above-ground tanks, the relative density of the liquid to be stored.

o) For above-ground tanks, whether or not integral saddle supports are to be supplied.

4 Working conditions

Tanks complying with this standard shall be suitable for a maximum internal working pressure up to and including 0.40 bar[1)], measured at the top of the tank, and a maximum internal vacuum of 10 mbar. Tanks shall not be used at pressures or vacua higher than these values.

NOTE The plate thicknesses specified in this standard are based on a liquid contents relative density of unity (water). Special consideration should be given if the relative density of the liquid to be stored is significantly greater.

1) 1 bar = 10^5 N/m^2 = 10^2 kPa.

5 Standard tank sizes

5.1 Standard tank sizes shall conform to the dimensions given in Table 1A or Table 1B. The corresponding dished ends and compartment plates shall conform to the dimensions given in Table 2A or Table 2B as appropriate.

5.2 The ullages of the tanks given in Table 1A and Table 1B relate to tanks constructed with all butt-welded shells overlapping the dished ends. Depending on the type of shell plate arrangement used and the plate sizes available, there will necessarily be small variations in overall nominal capacities.

6 Forms of construction

6.1 The minimum thickness of dished end and compartment plates and shell plates shall be as given in Table 1A or Table 1B.

6.2 Two different methods of shell plate arrangement are permitted as follows:

a) shell plated circumferentially; all seams with butt welds;

b) shell plated circumferentially; lapped circumferential seams with butt welds for the longitudinal seams (by prior agreement with the purchaser only).

The method of welding lapped circumferential seams is illustrated in Figure 6.

6.3 Permissible forms of shell construction are illustrated in Figure 3.

6.4 The method of welding dished and flanged ends to the shell and a method of welding compartment plates to the shell are illustrated in Figure 4 and Figure 5.

Table 1A — Dimensions and capacities of horizontal underground and above-ground storage tanks with dished and flanged ends

Nominal capacity		Shell inside diameter	Tangent length (see Figure 2)	Overall length	External end depth	Approximate volume of two ends		Thickness [see clause 3 b)]			Approximate ullage (above nominal capacity)
								t_b shell plate (min.)		End plate and compartment plate (min.)[a] t_e	
								Underground tanks	Above-ground tanks		
		D	A	L	H						
m^3	litres	mm	mm	mm	mm	m^3	litres	mm	mm	mm	%
5.0	5 000	1 500	2 750	3 118	184	0.368	368	6.0	6.0	6.0	+ 5
7.5	7 500	1 500	4 250	4 618	184	0.368	368	6.0	6.0	6.0	+ 5
10	10 000	2 000	3 100	3 560	230	0.804	804	6.0	6.0	6.0	+ 5
15	15 000	2 000	4 750	5 210	230	0.804	804	6.0	6.0	6.0	+ 5
20	20 000	2 000	6 500	6 960	230	0.804	804	6.0	6.0	6.0	+ 5
20	20 000	2 500	4 000	4 540	270	1.456	1 456	6.0	6.0	8.0	+ 4
25	25 000	2 500	5 000	5 540	270	1.456	1 456	6.0	8.0	8.0	+ 4
25	25 000	2 750	4 000	4 638	319	2.050	2 050	6.0	8.0	8.0	+ 4
30	30 000	2 750	4 900	5 538	319	2.050	2 050	6.0	8.0	8.0	+ 4
35	35 000	2 750	5 750	6 388	319	2.050	2 050	6.0	8.0	8.0	+ 4
40	40 000	2 750	6 600	7 238	319	2.050	2 050	6.0	8.0	8.0	+ 3
45	45 000	2 750	7 500	8 138	319	2.050	2 050	6.0	8.0	8.0	+ 3
50	50 000	2 750	8 300	8 938	319	2.050	2 050	6.0	8.0	8.0	+ 3
55	55 000	2 750	9 200	9 838	319	2.050	2 050	6.0	8.0	8.0	+ 3
60	60 000	2 750	10 000	10 638	319	2.050	2 050	6.0	8.0	8.0	+ 3
70	70 000	2 750	11 750	12 388	319	2.050	2 050	6.0	8.0	8.0	+ 3
80	80 000	2 750	13 500	14 138	319	2.050	2 050	6.0	9.0	8.0	+ 3
90	90 000	2 750	15 250	15 888	319	2.050	2 050	6.0	9.0	8.0	+ 3

[a] The finished thickness at the knuckle radius shall not be reduced by more than 5 % of the specified minimum plate thickness.

Table 1B — Dimensions and capacities of horizontal underground and above-ground storage tanks utilizing existing imperial dished and flanged ends

Nominal capacity		Shell inside diameter		Tangent length (see Figure 2)	Overall length	External end depth	Approximate volume of two ends		Thickness [see clause 3b)]			Approximate ullage (above nominal capacity)
									t_b shell plate (min.)		End plate and compartment plate (min.)[a] t_e	
									Underground tanks	Above-ground tanks		
		D		A	L	H						
m^3	litres	ft	in	mm	mm	mm	m^3	litres	mm	mm	mm	%
5.0	5 000	4	6	3 400	3 676	138	0.232	232	6.0	6.0	6.0	+ 5
7.5	7 500	4	6	5 200	5 476	138	0.232	232	6.0	6.0	6.0	+ 5
10	10 000	6	6	3 200	3 576	188	0.644	644	6.0	6.0	6.0	+ 5
15	15 000	6	6	4 900	5 276	188	0.644	644	6.0	6.0	6.0	+ 5
20	20 000	6	6	6 600	6 976	188	0.644	644	6.0	6.0	6.0	+ 5
20	20 000	8	0	4 200	4 678	239	1.214	1 214	6.0	6.0	8.0	+ 4
25	25 000	8	0	5 300	5 778	239	1.214	1 214	6.0	8.0	8.0	+ 4
25	25 000	9	0	4 100	4 692	296	1.868	1 868	6.0	8.0	8.0	+ 4
30	30 000	9	0	5 000	5 592	296	1.868	1 868	6.0	8.0	8.0	+ 4
35	35 000	9	0	5 900	6 492	296	1.868	1 868	6.0	8.0	8.0	+ 4
40	40 000	9	0	6 600	7 192	296	1.868	1 868	6.0	8.0	8.0	+ 3
45	45 000	9	0	7 500	8 092	296	1.868	1 868	6.0	8.0	8.0	+ 3
50	50 000	9	0	8 400	8 992	296	1.868	1 868	6.0	8.0	8.0	+ 3
55	55 000	9	0	9 300	9 892	296	1.868	1 868	6.0	8.0	8.0	+ 3
60	60 000	9	0	10 200	10 792	296	1.868	1 868	6.0	8.0	8.0	+ 3
70	70 000	9	0	11 900	12 492	296	1.868	1 868	6.0	8.0	8.0	+ 3
80	80 000	9	0	13 700	14 292	296	1.868	1 868	6.0	9.0	8.0	+ 3
90	90 000	9	0	15 400	15 992	296	1.868	1 868	6.0	9.0	8.0	+ 3

[a] The finished thickness at the knuckle radius shall not be reduced by more than 5 % of the specified minimum plate thickness.

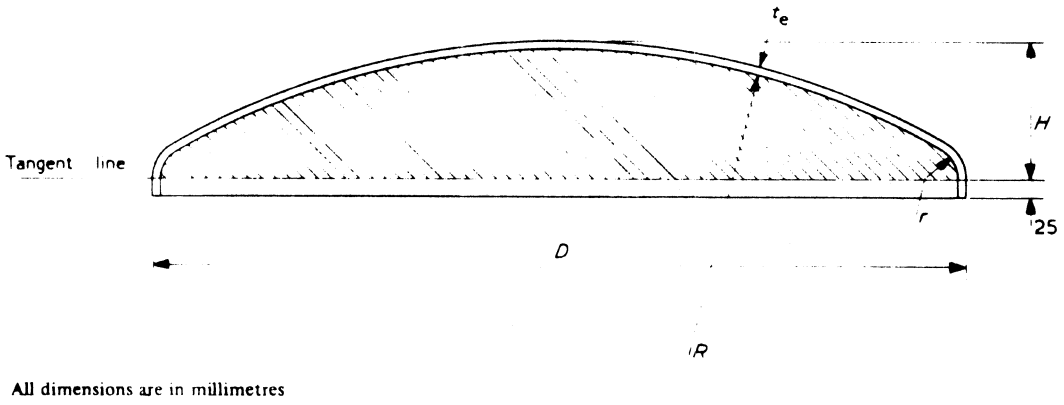


Figure 1 — Dished and flanged end configuration

Table 2A — Dished and flanged end configuration (metric)

Inside diameter of tank *D* mm	Crown radius *R* mm	Knuckle radius *r* mm	Outside depth of end *H* mm	Approximate capacity of end (hatched portion) m^3	 litres
1 500	2 000	50	184	0.184	184
2 000	2 700	50	230	0.402	402
2 500	3 500	50	270	0.728	728
2 750	3 500	50	319	1.025	1 025

Table 2B — Dished and flanged end configuration (existing imperial sizes)

Inside diameter of tank *D*		Crown radius *R*		Knuckle radius *r*	Outside depth of end *H*	Approximate capacity of end (hatched portion) m^3	 litres
ft	in	ft	in	in	mm		
4	6	7	6	1½	138	0.116	116
6	6	10	6	1½	188	0.322	322
8	0	12	0	1½	239	0.607	607
9	0	12	0	1½	296	0.934	934

7 Materials

7.1 Plates for shell and ends

7.1.1 For normal applications, tanks shall be constructed of carbon steel plates complying with the requirements of grade 43A of BS 4360:1979. Attention is drawn to situations where low temperature conditions apply and where steels complying with the requirements of BS 4360 with specified impact properties at low temperatures are necessary.

By agreement between the purchaser and the manufacturer, steels equivalent to the above may be used.

7.1.2 Where specified by the purchaser the plates for the shell and ends shall be pickled or blast cleaned or otherwise treated for the removal of the mill scale.

NOTE Attention is drawn to BS 4232.

7.2 Tank fittings

7.2.1 Plate material used for fabricating tank fittings, including cradle wrapper plates, if welded to the tank shall be in accordance with **7.1.1** or from an equivalent and compatible material.

7.2.2 All piping used shall comply with the requirements of BS 1387 or BS 3601 or as may be otherwise specified by the purchaser.

7.3 Structural bolts. Any bolts used in connection with the tank, e.g. for manhole lid or mounting attachments, shall comply with the requirements of BS 4190.

8 Design

8.1 Dimensions. The tanks shall be constructed to dimensions selected from Table 1A or Table 1B.

8.2 Tolerances

8.2.1 *Tolerance on shell diameter.* The diameter at any point on the length of the tank shell shall be calculated from an external circumferential measurement and the tolerance shall not exceed ±0.25 % of the specified diameter.

8.2.2 *Tolerance on circularity.* The tolerance on circularity at any point on the length of the shell, i.e. the difference between maximum and minimum internal shell diameter, shall not exceed 1 % of the nominal diameter, due allowance being made where necessary for outside lapped plates.

8.2.3 *Tolerance on overall length L* (see Figure 2 and Table 1A or Table 1B). The overall length of the tank shall not differ by more than 0.5 % of the nominal overall length given in Table 1A or Table 1B.

8.3 Design of tank

8.3.1 *Shell plate arrangement.* When the shell length is produced from more than one single plate the longitudinal seams shall break joint at intermediate circumferential seams.

It is recommended that whenever possible a longitudinal seam should not be situated in the lower third of a tank or on the top centre-line.

8.3.2 ***Manhole***

8.3.2.1 Unless otherwise specified, the manhole centre-line shall be positioned 450 mm from one end of the shell and shall be fabricated in accordance with Table 3 and Figure 7.

NOTE The use of 460 mm inside diameter manholes is recommended on tanks up to and including 2 000 mm inside diameter. On tanks over 2 000 mm diameter and on tanks where personnel have to wear protective clothing for entry, the use of 600 mm inside diameter manholes is recommended.

8.3.2.2 Bolt holes shall be drilled off the tank longitudinal axis. Bolts or studs, nuts and washers shall be provided.

8.3.2.3 The height of the neck from the tank shell to the top face of the flange shall be not less than 75 mm.

8.3.2.4 When manhole frames are formed as pressings from one single plate, the thickness at any point after pressing shall be not less than that of the tank shell plate.

8.3.2.5 In cases where manhole necks protrude inside the tank a vent shall be provided on each side of the neck, on the longitudinal axis, to prevent air locks.

8.3.2.6 A full-face manhole gasket shall be provided in a material agreed between the purchaser and the manufacturer.

8.4 Lifting lugs. Lifting lugs shall be provided in accordance with Figure 8. These are to be used only for lifting empty tanks.

8.5 Manlid connections for underground tanks. The following connections shall be fitted to the manlids of underground storage tanks only.

a) An R_c 4 screwed combined dip and fill socket (double tapered) complying with the requirements of BS 1387 and BS 21.

b) A 50 mm diameter flanged suction pipe.

c) An R_c 2 screwed vent socket complying with the requirements of BS 1387 and BS 21.

8.6 Above-ground tanks: special requirements

8.6.1 *Saddle supports.* Where supplied, saddle supports shall be constructed and located generally in accordance with Figure 9 and Table 4.

8.6.2 *Drain point.* A drain socket, screwed R_c 2 complying with the requirements of BS 1387 and BS 21, shall be fitted at the lowest point in the tank and ground flush with the inside of the shell plate.

8.6.3 *Filling point (other than manhole).* A filling socket, screwed R_c 3 complying with the requirements of BS 1387 and BS 21, shall be fitted to the highest point in the tank shell.

8.6.4 *Vent and dip point.* A vent socket, screwed R_c 3 complying with the requirements of BS 1387 and BS 21, shall be fitted, preferably to the centre of the manhole lid. Where a dip point is required, the vent connection may be used by inserting a suitable pipe T-piece complete with dip cap so that the tank vents through the side of the T-piece.

NOTE Attention is drawn to the appendix dealing with capacity and overfilling of oil storage tanks in BS 799-5 (in course of preparation).

8.6.5 *Draw-off.* A horizontal socket, screwed not less than R_c 2 complying with the requirements of BS 1387 and BS 21, shall be welded near the base of the tank on the vertical centre-line and at the opposite end to the drain point.

9 Shop fabrication

9.1 Plate preparation. Plate edge preparation for welding may be done by any one of the following methods:

a) planing;

b) flame cutting by machine;

c) flame cutting by hand, followed by removal of slag and irregularities by machining, grinding, chipping or filling;

d) shearing, unless otherwise specified by the purchaser.

9.2 Laminations. After cutting to size, the plate edges shall be examined visually for laminations. Where such faults are found, the plate shall be deemed unsuitable for the fabrication of tanks to comply with this British Standard.

9.3 Shell plate rolling. All plates shall be rolled to the required curvature over the full width or length of the plate. The fabricator shall ensure that there is continuity of curvature at the longitudinal butt welds.

9.4 Fabrication

9.4.1 Fabrication shall be by welding using any suitable fusion welding process.

9.4.2 Welding procedure drawings shall be supplied by the manufacturer when specifically asked for by the purchaser (see BS 5135).

9.5 Welding consumables

9.5.1 Manual metal-arc welding electrodes shall comply with the requirements of BS 639:1972 sections 1 and 2, 1 and 3, or 1 and 4.

9.5.2 Consumables for submerged arc welding shall comply with the requirements of BS 4165:1971 section 1 and either section 2 or 5.

9.5.3 Welding consumables used in other processes shall deposit weld metal with physical properties not less than the minima specified in BS 639.

9.6 Welds

9.6.1 All butt welds shall have a throat section not less than the thickness of the plates being joined and shall be welded from either:

a) both sides;

b) one side with removable backing strips, or

c) one side with consumable backing strips with the prior agreement of the purchaser.

9.6.2 In butt joints the root edges or root faces shall not be out of alignment by more than 25 % of the thickness of the thinner material, or 3 mm, whichever is less.

9.6.3 The leg length of fillet welds shall not be less than the thickness of the thinnest plate or parts that they join and they may be mitre or convex in profile.

9.6.4 In fillet welded joints the gap due to faulty workmanship or incorrect fit-up shall not exceed 1.5 mm.

9.7 Quality of welds

9.7.1 The welded joints shall be free from defects that would impair the service performance of the construction, but slight incomplete root penetration in butt welds shall not be a cause for rejection.

9.7.2 The weld metal shall be properly fused with the parent metal without serious undercutting or overlapping at the toes of the weld.

9.7.3 Whenever practicable all welding shall be carried out in the flat position.

9.7.4 All slag shall be removed from welds and the visible surfaces shall be clean, regular and of consistently uniform contour.

9.7.5 Examination of welds shall be by visual means. Non-destructive techniques such as X-rays or ultrasonics shall not form criteria of acceptance for welds produced to this standard.

NOTE Attention is drawn to BS 5289.

9.8 Repair of welds. Defective welds found during the pressure test described in clause **10** shall be cut out for a distance of not less than 25 mm on either side of the defect and shall be rewelded.

10 Tank testing

10.1 Pressure test

10.1.1 Each tank shall be thoroughly cleaned internally of all loose matter and then tested to a pressure of 0.7 bar[2)], measured at the top of the tank.

10.1.2 It is recommended that tanks be tested hydraulically, but a pneumatic test may be substituted at the discretion of the manufacturer unless otherwise specified by the purchaser [see clause **3**ii)]. Where a pneumatic test is made the procedure in **10.3** shall be followed.

10.2 Hydraulic testing

10.2.1 The pressure shall be raised slowly and steadily until the test pressure is reached.

10.2.2 The pressure shall be maintained while a thorough examination is made to ensure that the tank is sound and shows no leaks or undue distortion.

10.2.3 After the test the tank shall be thoroughly dried out.

2) 1 bar = 10^5 N/m^2 = 10^2 kPa.

10.3 Pneumatic testing

10.3.1 Pneumatic testing is potentially a much more dangerous operation than hydraulic testing because, irrespective of tank size, any failure during test is likely to be of a highly explosive nature.

The manufacturer shall ensure that as far as is reasonably practicable, no person is exposed to injury should the tank fail during the test operation. The manufacturer shall take special precautions to minimize the risk of such injury.

NOTE 1 Examples of appropriate precautions are the following:

a) adequate blast protection;
b) an adequate safety area cleared for test purposes;
c) adequate inspection of the tank before testing.

NOTE 2 Attention is drawn to Guidance Note GS 4, "Safety in pressure testing" produced by the Health and Safety Executive and obtainable from HMSO.

10.3.2 The following test procedure shall be used.

a) Raise the pressure slowly and steadily to 0.7 bar[2)] and maintain this pressure for 5 minutes.

b) Reduce the pressure to 0.4 bar and carry out an inspection to ensure that the tank is sound and that there are no leaks or distortion.

The tank shall not be approached until the pressure is reduced to 0.4 bar.

10.4 Repeat pressure tests. Following the execution of any repairs found to be necessary (see **9.8**) the tank shall again be tested in accordance with **10.2** or **10.3** as appropriate.

10.5 Test certificate. A test certificate, recording the results of the pressure test carried out, shall be established and a copy shall be supplied to the purchaser on request.

11 Calibration

11.1 When the purchaser requires the tank to be calibrated for capacity he shall state the form of such calibration on his enquiry and order.

NOTE Commercially precalibrated dip rods are not normally considered to be an accurate means of tanks contents measurement.

11.2 It is recommended that when frequent dipping of the tank is necessary a reinforcing pad be welded to the inside of the bottom of the tank directly under the dipping opening.

12 Inspection

12.1 The inspector representing the purchaser shall have free access, at all reasonable times, to those parts of the manufacturer's works which are concerned with the manufacture and testing of the tank and he shall be afforded all reasonable facilities to satisfy himself that the tank is being manufactured in accordance with the requirements of this standard.

12.2 Unless otherwise specified, inspections of tanks shall be made at the place of manufacture before despatch and shall be conducted so as not to interfere unnecessarily with the operation of the works.

13 Marking

13.1 The following information shall be permanently and clearly marked on a nameplate attached adjacent to the manhole or shall be stamped on the manhole neck.

a) The number of this British Standard, i.e. BS 2594.

b) Nominal capacity (cubic metres or litres).

c) Test pressure and date of test.

d) Manufacturer's name or trade mark.

e) Manufacturer's reference number.

13.2 If the manufacturer's reference number [see **13.1** e)] has been permanently marked on the tank, the information in items a) to e) above may be given on a nameplate attached to the manhole lid or be stamped on the lid.

14 Preparation for despatch

14.1 Protection

14.1.1 External and internal surfaces of completed tanks shall be protected in a manner specified by the purchaser.

NOTE 1 Attention is drawn to the guidance given in BS 5493.

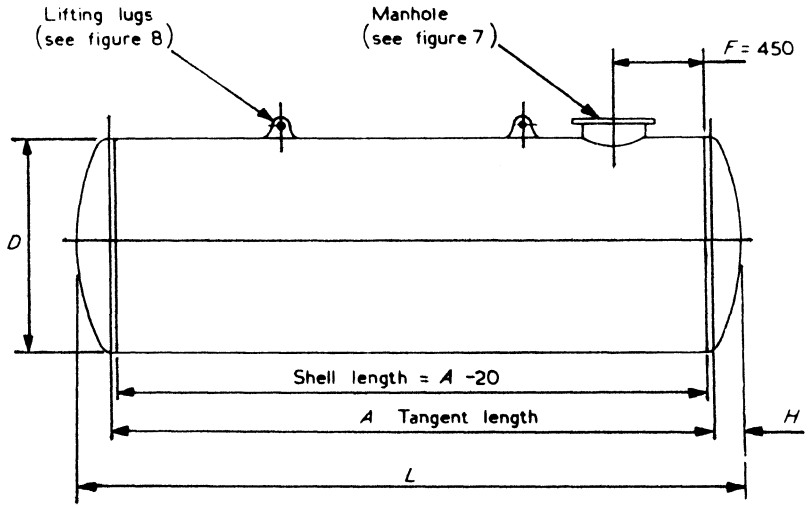
14.1.2 All openings in tanks shall be adequately covered to exclude dirt and other foreign matter from the interior of the tank during transit.

14.2 Packing and marking for transit

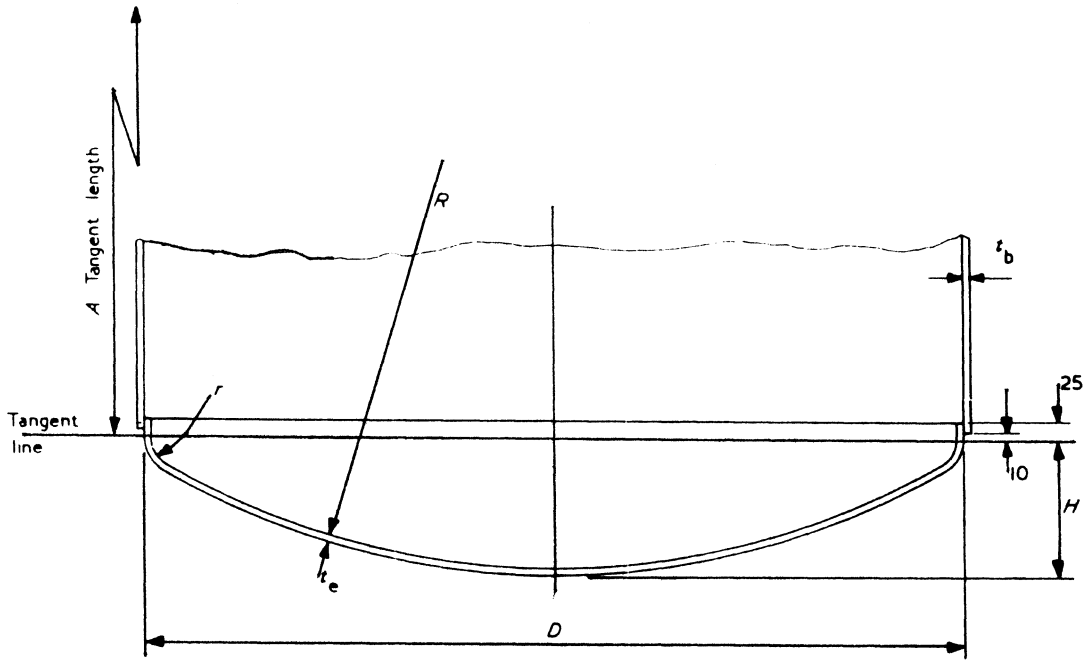
14.2.1 Packing and marking shall be in accordance with the purchaser's requirements as specified on the order.

14.2.2 Any necessary requirements for the support or stiffening of the tank for transit and lifting purposes shall be agreed between the purchaser and the manufacturer.

14.2.3 The net weight of the tank shall be clearly painted on one end of the tank.



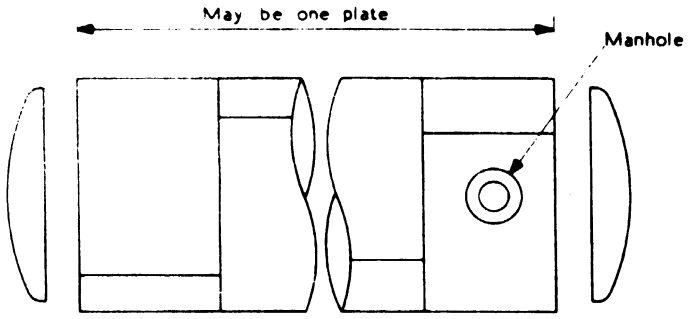
(a) Tank dimensions (see tables 1A and 1B)



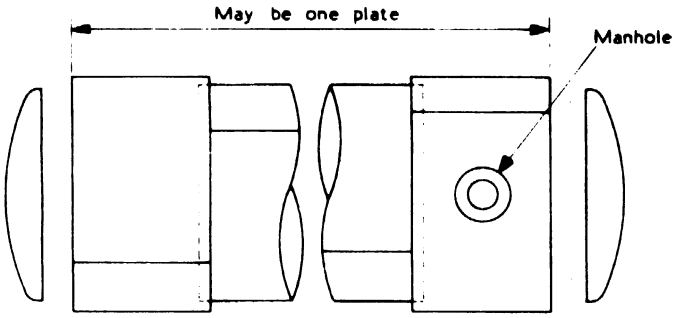
(b) Dished ends (see tables 2A and 2B)

All dimensions are in millimetres

Figure 2 — General dimensions



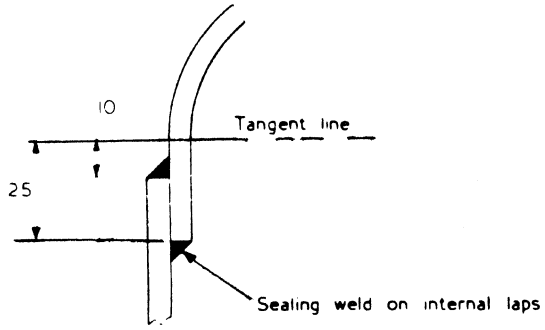
(a) Shell plated circumferentially; all seams with butt welds



(b) Shell plated circumferentially; lapped circumferential seams, longitudinal seams with butt welds

IMPORTANT. All longitudinal seams shall break joint at circumferential seams. All ends with lap welds (see figure 4)

Figure 3 — Types of shell construction



All dimensions are in millimetres

Figure 4 — Method of welding ends to shell

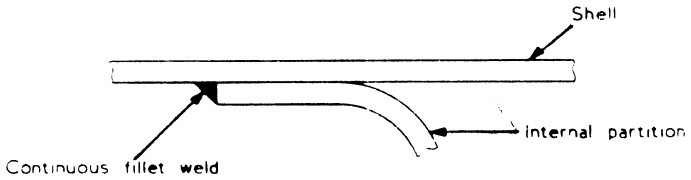
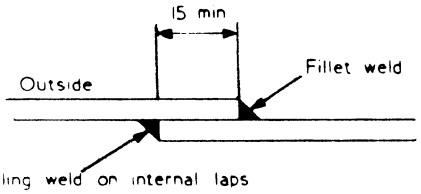


Figure 5 — Method of attaching internal partitions to shell



All dimensions are in millimetres

Figure 6 — Method of welding lapped circumferential seams

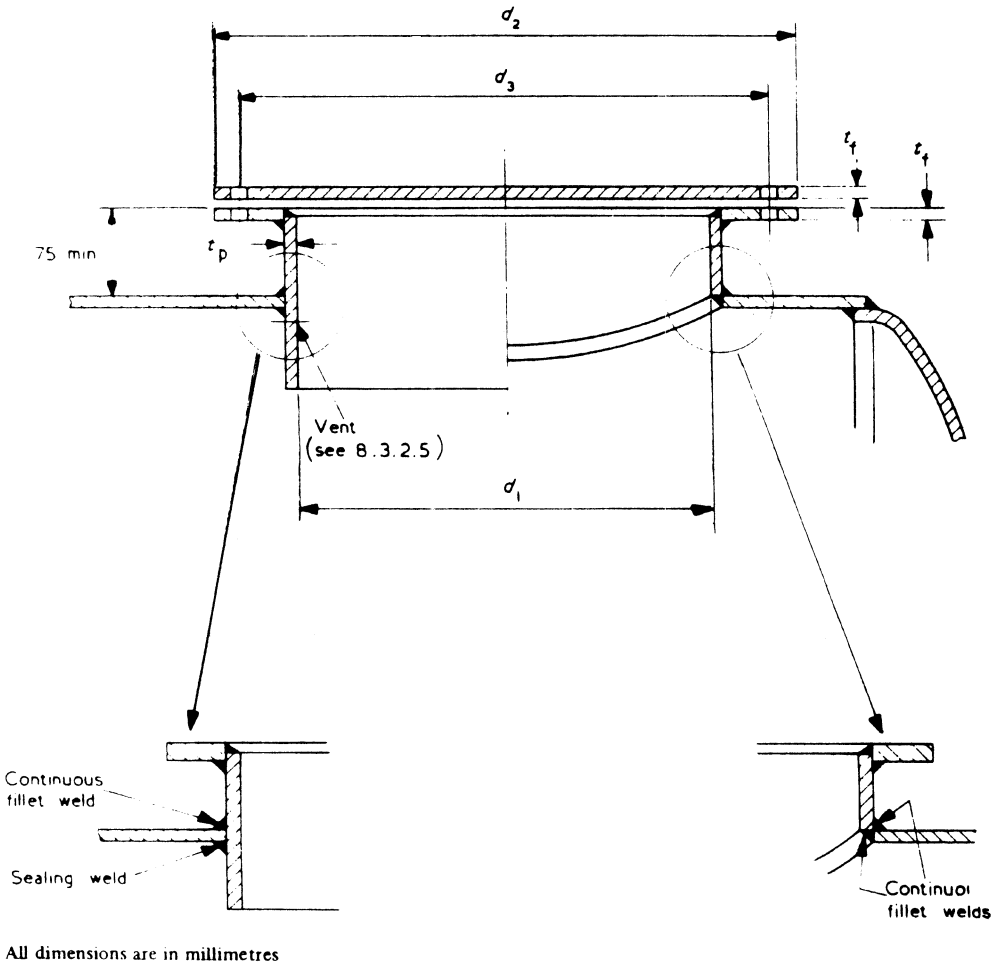
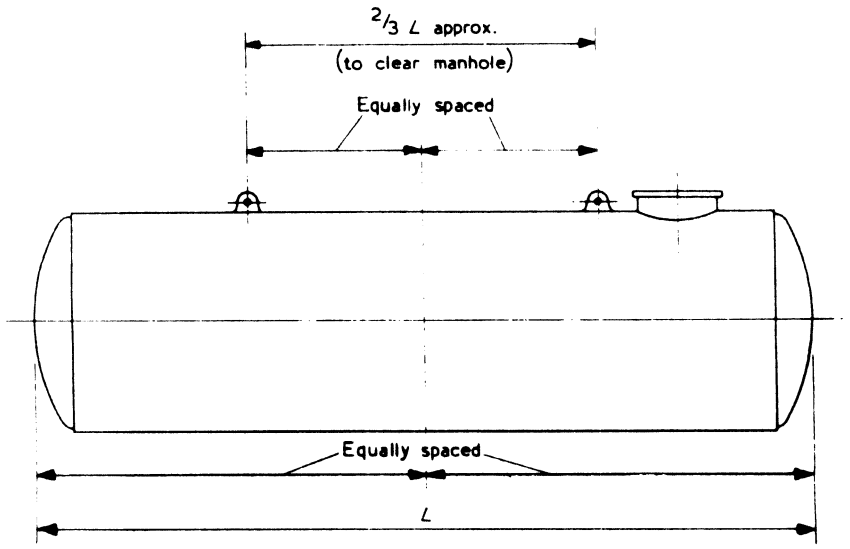


Figure 7 — Manhole details

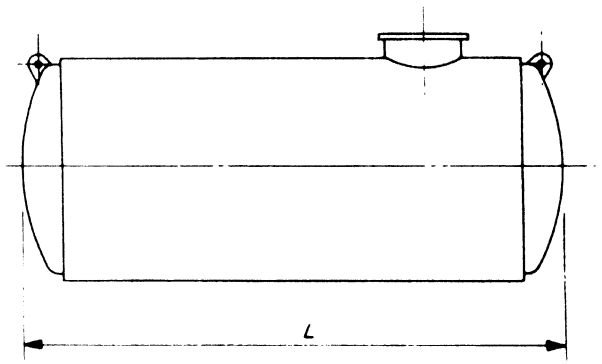
Table 3 — Dimensions for manholes

All dimensions are in millimetres

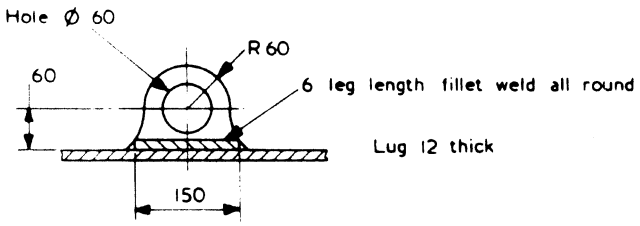
Inside diameter of manhole	d_1	460	600
Minimum plate thickness of manhole body	t_p	6.0	6.0
Diameter of manhole flange and lid	d_2	570	720
Minimum plate thickness of manhole flange and lid	t_f	10	10
P.C.D. for bolts	d_3	530	680
Diameter of bolt holes		18	18
Designation of bolts		M16	M16
Number of bolts		16	24



(a) Location of lifting lugs on tanks where L exceeds 5500



(b) Location of lifting lugs on tanks where L does not exceed 5500



(c) Typical detail for lifting lug

Figure 8 — Lifting lugs

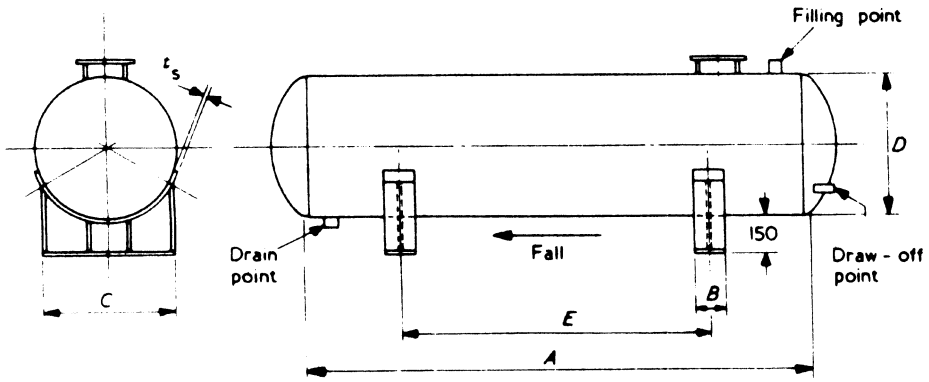


Figure 9 — Cradle supports

Table 4 — Dimensions for cradle supports

Nominal capacity		Shell inside diameter	Tangent length	Saddle position (min.)	Steel saddle width (min.)	Steel saddle breadth (min.)	Thickness of top plate
		D	*A*	*E*	*B*	*C*	t_s
litres	m^3	mm	mm	mm	mm	mm	mm
5 000	5.0	1 500	2 750	2 050	150	1 300	6.0
7 500	7.5	1 500	4 250	3 550	150	1 300	6.0
10 000	10.0	2 000	3 100	2 100	250	1 750	6.0
15 000	15.0	2 000	4 750	3 750	250	1 750	6.0
20 000	20.0	2 000	6 500	5 500	250	1 750	6.0
20 000	20.0	2 500	4 000	2 800	250	2 200	6.0
25 000	25.0	2 500	5 000	3 750	250	2 200	8.0
25 000	25.0	2 750	4 000	2 640	250	2 400	8.0
30 000	30.0	2 750	4 900	3 540	250	2 400	8.0
35 000	35.0	2 750	5 750	4 390	250	2 400	8.0
40 000	40.0	2 750	6 600	5 240	250	2 400	8.0
45 000	45.0	2 750	7 500	6 140	250	2 400	8.0
50 000	50.0	2 750	8 300	6 940	250	2 400	8.0
55 000	55.0	2 750	9 200	7 840	250	2 400	8.0
60 000	60.0	2 750	10 000	8 640	250	2 400	8.0
70 000	70.0	2 750	11 750	10 390	250	2 400	8.0
80 000	80.0	2 750	13 500	12 140	250	2 400	9.0
90 000	90.0	2 750	15 250	13 890	250	2 400	9.0

Publications referred to

This standard makes reference to the following British Standards:

BS 21, *Pipe threads for tubes and fittings where pressure-tight joints are made on the threads.*

BS 639, *Covered electrodes for the manual metal-arc welding of mild steel and medium-tensile steel.*

BS 799, *Oil burning equipment.*

BS 799-5, *Oil storage tanks.*

BS 1387, *Steel tubes and tubulars suitable for screwing to BS 21 pipe threads.*

BS 3601, *Steel pipes and tubes for pressure purposes: carbon steel with specified room temperature properties.*

BS 4165, *Electrode wires and fluxes for the submerged arc welding of carbon steel and medium-tensile steel.*

BS 4190, *ISO metric black hexagon bolts, screws and nuts.*

BS 4232, *Surface finish of blast-cleaned steel for painting.*

BS 4360, *Weldable structural steels.*

BS 5135, *Metal-arc welding of carbon and carbon manganese steels.*

BS 5289, *Code of practice for visual inspection of fusion welded joints.*

BS 5493, *Code of practice for protective coating of iron and steel structures against corrosion.*

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