BRITISH STANDARD

BS 5276-3: 1979

Specification for

Pressure vessel details (dimensions) —

Part 3: Dimensional tolerances for ferrous pressure vessels

UDC 621.772.4:621.642.3:66.023

Cooperating organizations

The Pressure Vessel Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government department and scientific and industrial organizations:

Associated Offices Technical Committee*
Association of Shell Boilermakers
British Chemical Engineering Contractors' Association*
British Gas Corporation*
British Insurance (Atomic Energy) Committee*
British Steel Industry*
CBMPE*
Chemical Industries Association*
Department of Trade (Marine Division)
Electricity Supply Industry in England and Wales*
Engineering Equipment Users' Association*
Health and Safety Executive
Institution of Chemical Engineers
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Lloyd's Register of Shipping*
Oil Companies Materials Association*
Process Plant Association*
United Kingdom Atomic Energy Authority
University of Manchester Institute of Science and Technology
Water-tube Boilermakers' Association
Welding Institute

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Association of Consulting Engineers
National Association of Drop Forgers and Stampers

This British Standard, having been prepared under the direction of Pressure Vessel Standards Committee, was published under the authority of the Executive Board and comes into effect on 28 February 1979

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The following BSI references relate to the work on this standard:
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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This British Standard has been prepared under the direction of the Pressure Vessel Standards Committee to cover the dimensions of pressure vessel details. It has been arranged in Parts as follows:

— *Part 1: Davits for branch covers;*

— *Part 2: Saddle supports for horizontal cylindrical pressure vessels;*

— *Part 3: Dimensional tolerances for ferrous pressure vessels;*

— *Part 4: Standardized pressure vessels.*

This Part replaces DD 42 "*Recommendations for dimensional tolerances for pressure vessels*", which was published in 1974 to obtain experience of the practical application of the recommended dimensional tolerances. The result of this experience is reflected in this present Part. DD 42 is now withdrawn.

It is recognized that certain processes demand vessels having features positioned to tolerances closer than those specified in this Part; in these cases the tolerances are subject to agreement between purchaser and manufacturer.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, 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 5276 specifies dimensional tolerances for ferrous pressure vessels and the non-pressure-containing parts associated with them.

The tolerance values specified represent good practice based upon economical manufacture.

NOTE 1 If wider tolerances are acceptable or closer tolerances are required these should be agreed between the purchaser and the manufacturer (see foreword).

NOTE 2 The requirements for aluminium alloy and other non-ferrous vessels are being considered for inclusion at a later date.

2 Tangent lines [see Figure 1(a) and Figure 2(a)]

Tangent lines are taken as reference planes. The vessel axis is taken as the straight line passing through the centre of the reference planes.

3 Tolerances

3.1 Tolerance on length (*L*) between reference planes [see Figure 1(a) and Figure 2(a)]. The tolerances shall be as detailed in Table 1.

Table 1 — Tolerance on length (*L*) between reference planes

Length	Tolerance
	mm
Up to and including 2.5 m	± 6
Over 2.5 m up to and including 5 m	± 10
Over 5 m up to and including 10 m	± 13
Over 10 m up to and including 15 m	± 16
Over 15 m up to and including 30 m	± 20
Over 30 m	see note

NOTE No tolerance for lengths over 30 m is specified. This is dependent on an agreement between purchaser and manufacturer. Special consideration may have to be given to the effect of shrinkage due to welding.

3.2 Diameter, circumference, straightness and out-of-roundness. The tolerances on these dimensions shall be as specified in the applicable Design Code, e.g. BS 5500.

3.3 Radial orientation [see Figure 1 (c)]. Tolerance on the radial orientation of downcovers and seal pans measured on the internal surface of the vessel shall be ± 6 mm.

3.4 Tolerance on supports for vertical vessels [see Figure 1(a)]. The tolerances shall be as follows:

a) distance from underside of support feet to reference plane: + 12 mm, – 0;

b) distance from underside of base ring to reference plane: + 0, – 12 mm.

3.5 Base ring out of level, measured over any diameter [see Figure 1 (a)]. The tolerances shall be as detailed in Table 2.

Table 2 — Out of level tolerance on base ring

Vessel diameter	Tolerance
	mm
Up to and including 2 m	3
Over 2 m	5

3.6 Bolt circle diameter (for holding down bolts in base plates) [see Figure 1(a)]. The tolerances shall be as detailed in Table 3 and **3.6.1**.

Table 3 — Tolerance on bolt circle diameter

Vessel diameter	Tolerance
	mm
Up to and including 2.2 m	± 3
Over 2.2 m	± 6

3.6.1 Circumferential position of bolt holes measured on the bolt circle: tolerance shall be ± 3 mm.

3.7 Saddles (see Figure 2)

3.7.1 For location of welded saddles,

a) from saddle centreline to reference plane,

b) between saddles,

the tolerances shall be as detailed in Table 4.

Table 4 — Tolerance on location of welded saddles

Dimension (a) and (b)	Tolerance
	mm
Up to and including 4 m	± 3
Over 4 m up to and including 7 m	± 6
Over 7 m up to and including 10 m	± 9
Over 10 m	± 13

3.7.2 Tolerance on bolt hole centres in a saddle base plate shall be ± 3 mm.

3.7.3 Tolerance on the height of welded-on saddles shall be + 0, – 6 mm.

3.7.4 Deviation from level of the saddle base plate along its length shall be 3 mm max.

3.7.5 Deviation from level of the saddle base plate across its width shall be 1.5 mm max.

3.8 Nozzle. Tolerances on nozzles shown on vertical vessels (see Figure 1) apply equally to horizontal vessels although they are not all illustrated in Figure 2.

3.8.1 Tolerance on dimensions locating a nozzle (not manways) to the reference plane shall be ± 6 mm, with the following exceptions [see Figure 1(a) and Figure 2(a)]:

a) tolerance on the dimension from support ring to nozzles related to trays and draw-off pans shall be ± 3 mm;

b) tolerance on locating dimension for nozzles used as reboiler connection shall be ± 3 mm;

c) tolerance on nozzles where dimensions are marked "MAINTAIN" (see **3.8.6**).

3.8.2 Tolerance on the orientation of nozzles and other attachments (not manways) measured by external strapping of the shell shall be ± 6 mm [see Figure 1(b) and Figure 1(c)].

3.8.3 Tolerance on the dimension between the flange face of a nozzle and the outside surface of a shell or reference plane shall be ± 5 mm [see Figure 1(a) and Figure 2(a)].

3.8.4 The flange face of a nozzle shall not deviate from parallelism with the indicated plane by more than 1 mm per 100 mm of flange diameter (± ½ °) to a maximum of 6 mm [see Figure 1(a)].

3.8.5 Maximum rotational displacement of bolt holes in the bolt circle of nozzle flanges shall not exceed the diametrical clearance in the bolt holes [see Figure 1(b)].

3.8.6 Where dimensions between nozzles are marked "MAINTAIN" e.g. level gauge connections, the following tolerances shall apply [see Figure 1(a) and Figure 1(e)]:

a) distance between nozzles shall be ± 1.5 mm;

b) difference in vertical alignment shall not exceed 1.5 mm;

c) flange faces shall not deviate from the vertical plane by more than 1.5 mm;

d) flange faces shall not deviate from parallelism, when compared with a flat surface, by more than 0.5 mm per 100 mm of flange diameter.

3.9 Manways

3.9.1 Manways shall be positioned within ± 13 mm of their indicated position [see Figure 1(a) and Figure 2(a)].

3.9.2 Tolerance on the dimension between the flange face of a manway and the outside surface of the shell shall be ± 10 mm [see Figure 1(a) and Figure 2(a)].

3.9.3 The maximum tilt across the flange face of a manway shall not exceed 6 mm [see Figure 1(a) and Figure 2(a)].

3.10 Tray support rings

3.10.1 Tolerance on the dimension between the first tray support ring and the reference plane shall be ± 5 mm [see Figure 1(a)].

3.10.2 Tolerance on distance between adjacent tray support rings and related parts (height of weirs and orifice openings) shall be ± 3 mm [see Figure 1(a)].

3.10.3 The tray support rings across the diameter shall be level within the limits detailed in Table 5 [see Figure 1(a)].

Table 5 — Tolerance on level of tray support rings

Tray diameter	Difference between high and low point
	mm
Up to and including 1.2 m	3
Over 1.2 m up to and including 2.4 m	5
Over 2.4 m	6

3.10.4 Welded tray support rings shall be at right angles to the shell within a tolerance of 1 mm per 50 mm of support ring width [see Figure 1(d)].

3.11 Weirs, etc.

3.11.1 Tolerance on weir location to far side of the tower shall be ± 10 mm [see Figure 1(a)].

3.11.2 The top of the weir shall be level within the limits detailed in Table 6 [see Figure 1(a)].

Table 6 — Tolerance on level of top of weir

Vessel diameter	Difference between high and low point
	mm
Up to and including 1.2 m	3
Over 1.2 m up to and including 2.4 m	5
Over 2.4 m	6

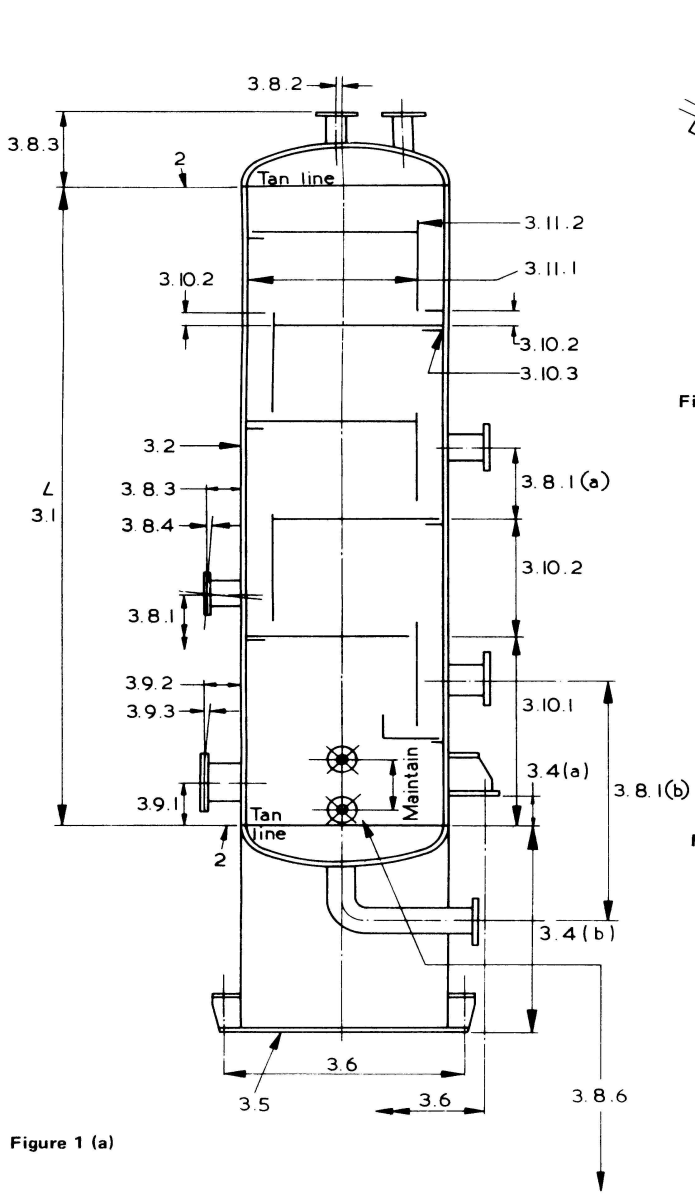

Figure 1 (a)

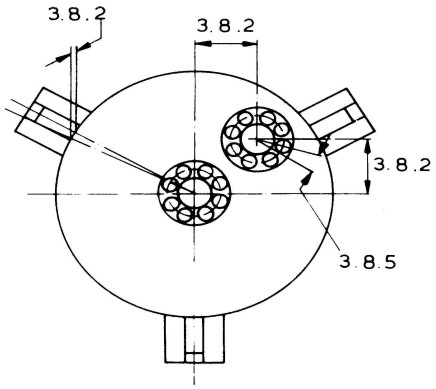

Figure 1 (b)

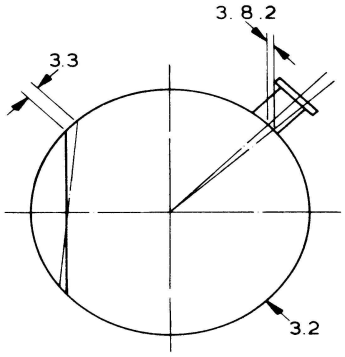

Figure 1 (c)

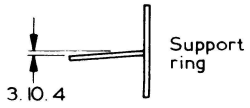

Figure 1 (d)

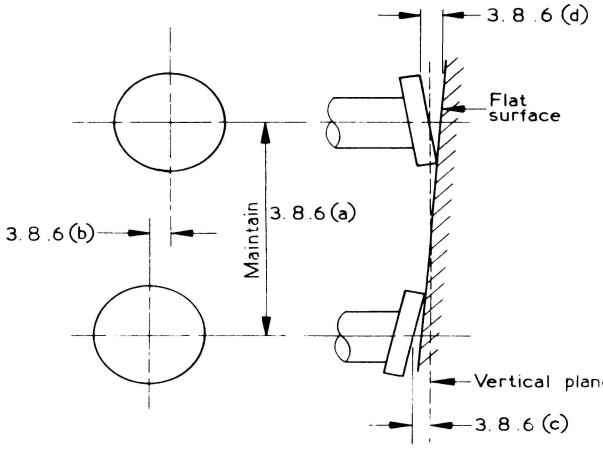

Figure 1 (e)

NOTE Numbers on the drawing refer to text subclauses.

Figure 1 — Vertical pressure vessel

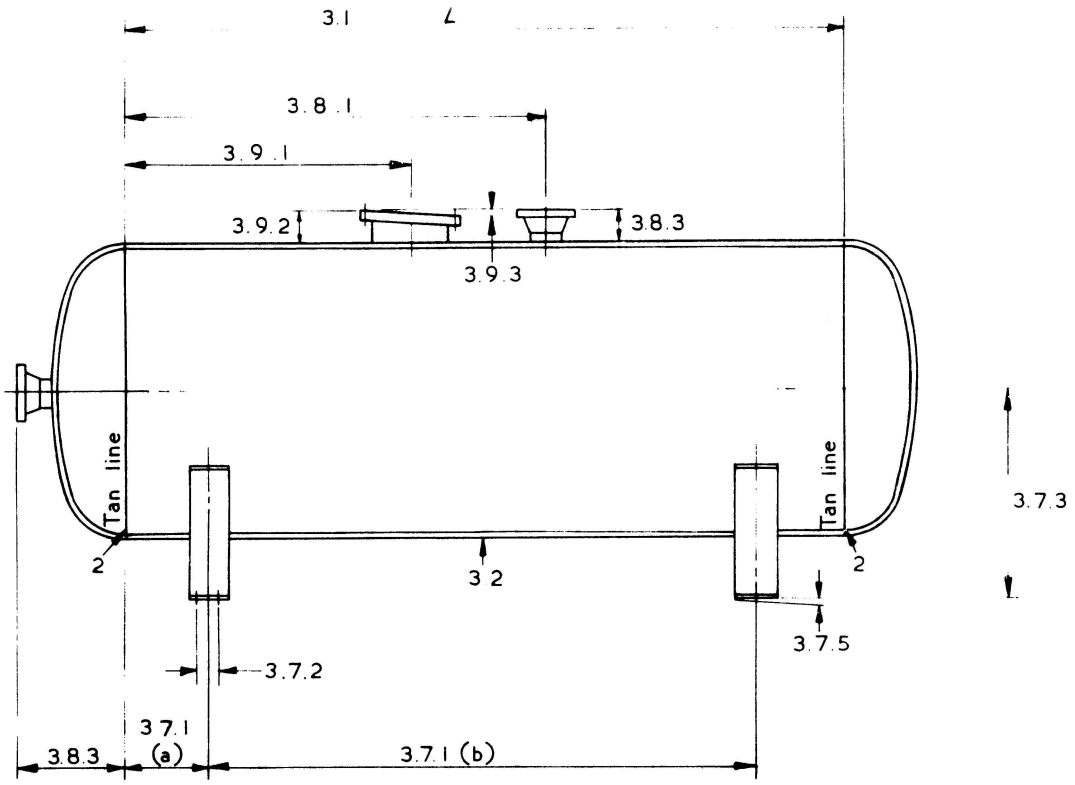

Figure 2 (a)

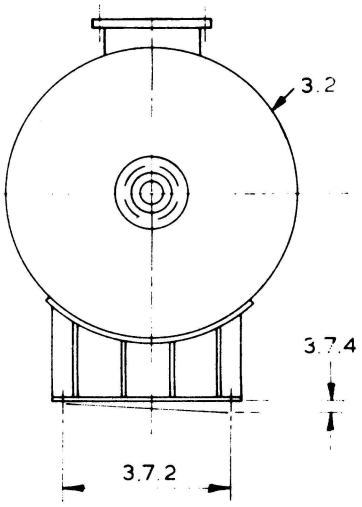

Figure 2 (b)

NOTE Numbers on the drawing refer to text subclauses.

Figure 2 — Horizontal pressure vessel

Publications referred to

BS 5276, *Pressure vessel details (dimensions)*[1)].
BS 5276-1, *Davits for branch covers.*
BS 5276-2, *Saddle supports for horizontal cylindrical pressure vessels.*
BS 5276-4, *Standardized pressure vessels.*
BS 5500, *Unfired fusion welded pressure vessels.*

[1)] Referred to in foreword only.

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