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Specification for

# Carbon steel pipe flanges —

(Over 24 inches nominal size) —

For the petroleum industry

## Co-operating organizations

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

British Iron & Steel Federation\*  
 Council of British Manufacturers of Petroleum Equipment\*  
 Engineering Equipment Users' Association  
 Federation of British Rubber and Allied Manufacturers  
 Institute of Petroleum  
 Ministry of Power  
 Oil Companies Materials Association\*

The industrial 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:

British Valve Manufacturers' Association  
 National Association of Drop Forgers and Stampers

This British Standard, having been approved by the Petroleum Equipment Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 30 December 1960

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# Contents

	Page
Co-operating organizations	Inside front cover
Foreword	ii
<hr/>	
Section 1. General	
1 Scope	1
2 Designation and pressure/temperature ratings	1
3 Flange facings	1
4 Nominal sizes	1
<hr/>	
Section 2. Materials	
5 Materials for flanges	1
6 Bolting materials	1
<hr/>	
Section 3. Dimensions and Tolerances	
7 Flanges	1
8 Flange facings and gaskets	2
9 Flange bolting dimensions	2
10 Spot-facing and back-facing of flanges	2
<hr/>	
Section 4. Inspection	
11 Inspection	3
12 Repair of defects	3
<hr/>	
Section 5. Marking	
13 Marking	3
<hr/>	
Section 6. Preparation and Despatch	
14 Preparation	3
15 Despatch	3
<hr/>	
Table 1 — Dimensions of flanges, Class 150	4
Table 2 — Drilling, bolting and facing dimensions for flanges, Class 150	5
Table 3 — Dimensions of flanges, Class 300	6
Table 4 — Drilling, bolting and facing dimensions for flanges, Class 300	7
Table 5 — Dimensions of flanges, Class 400	8
Table 6 — Drilling, bolting and facing dimensions for flanges, Class 400	9
Table 7 — Dimensions of flanges, Class 600	10
Table 8 — Drilling, bolting and facing dimensions for flanges, Class 600	11
Table 9 — Dimensions of compressed asbestos fibre gaskets	12
Table 10 — Numbers and dimensions of ring-joint gaskets for Class 300, 400 and 600 flanges	13

## Foreword

This British Standard makes reference to the following British Standards:

BS 1503, *Steels for fired and unfired pressure vessels. Forgings.*

BS 1560, *Steel pipe flanges and flanged fittings (nominal sizes  $\frac{1}{2}$  in to 24 in) for the petroleum industry.*

BS 1750, *Bolting for the petroleum industry.*

BS 3351, *Piping systems for petroleum refineries and petrochemical plants.*

and to the following American Standards Association Standard (obtainable through the British Standards Institution):

A.S.A. B16.20, *Ring-joint gaskets and grooves for steel pipe flanges.*

This British Standard is one of a series prepared under the authority of the Petroleum Equipment Industry Standards Committee. It is complementary to BS 1560, "*Steel pipe flanges and flanged fittings (Nominal sizes  $\frac{1}{2}$  in to 24 in) for the petroleum industry*".

In view of the international character of the petroleum industry care has been taken to ensure interchangeability in practice between flanges of the sizes covered which are produced by British and American manufacturers. At present there is no national American standard for steel flanges above 24 in nominal size. The dimensions given herein are, however, in general conformity with the standard practice of the American Manufacturers' Standardization Society of the Valve and Fittings Industry (SP 44) and with those currently adopted by the principal American flange makers.

Acknowledgment is made to the American Standards Association, the American Society for Testing Materials and to the American Manufacturers' Standardization Society of the Valve and Fittings Industry for data use.

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 13 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.

## Section 1. General

### 1 Scope

This British Standard is a material and dimensional standard only and applies to forged carbon steel slip-on and welding neck flanges of nominal sizes 26 in and larger, for use in the petroleum industry. Drilling, bolting, facing and thickness dimensions are applicable also to integral end flanges of valve and fittings.

Four classes of flanges are provided for, namely Classes 150, 300, 400 and 600.

The standard does not include pressure/temperature ratings; the flange designations quoted are for identification purposes only.

### 2 Designation and pressure temperature ratings

To facilitate ordering and to ensure interchangeability, flanges in this standard are designated as Classes 150, 300, 400 and 600. These class designations, however, do not imply specific pressure/temperature ratings in the same manner as flanges in accordance with BS 1560. Users shall therefore satisfy themselves that the flanges selected are adequate for the intended duty. Where it is required to use the flanges in this standard at temperatures below  $-20\text{ }^{\circ}\text{F}$  reference should be made to BS 3351.

### 3 Flange facings

For Class 150 flanges, raised facings only are specified. For Classes 300, 400 and 600 flanges, both raised facings and ring-joint facings are specified, and the purchaser shall specify when ordering, which type of facing is required. The  $\frac{1}{16}$  in high facing is the regular type of raised facing for flanges of Classes 150 and 300, and the  $\frac{1}{4}$  in high facing is the regular type of raised facing for flanges of Classes 400 and 600.

### 4 Nominal sizes

The nominal size of a flange as shown in the tables is the same as the nominal pipe size.

## Section 2. Materials

### 5 Materials for flanges

Flanges shall be carbon steel forgings to the following specification, full details of which are contained in BS 1503

British Standard	Comparable A.S.T.M. Standard
BS 1503-161 Grade 32 Class A or B.	A105 Grade II

Material to BS 1503-161 Grade 28 Class A or B. (A.S.T.M. A105, Grade I) may be supplied if specified by the purchaser

### 6 Bolting materials

All bolting material shall comply with BS 1750<sup>1)</sup>. For pressures and temperatures above 275 psi and  $450\text{ }^{\circ}\text{F}$ , bolts shall be of alloy steel in conformity with Part 1 of the above standard, and nuts shall be of carbon or alloy steel in conformity with Part 2.

For pressures and temperatures up to and including 275 psi and  $450\text{ }^{\circ}\text{F}$ , carbon steel bolts and nuts complying with Part 3 of the above standard may be used.

## Section 3. Dimensions and tolerances

### 7 Flanges

a) *Flange dimensions.* Flange dimensions shall conform to those given in Table 1, Table 3, Table 5 and Table 7.

In no case, regardless of the type of facing provided and the tolerances referred to in Clause 7 b), shall the minimum thickness of a flange, as specified in the tables listed above, be reduced in order to provide adequate height for a raised facing or adequate depth for a ring groove, except where a Class 150 or a Class 300 flange is provided with a  $\frac{1}{16}$  in raised facing, when the height of the facing is included in the minimum flange thickness specified.

b) *Tolerances on flange dimensions.* The following are the tolerances permitted on flange dimensions:

i) *Slip-on welding flanges* (Table 1, Table 3, Table 5 and Table 7).

On flange bore	Dimension B <sub>1</sub>	$+ \frac{1}{16}$ in $- 0$ in
On flange thickness	Dimension C	$+ \frac{3}{16}$ in $- 0$ in

<sup>1)</sup> "Bolting for the petroleum industry".

On overall length through hub	Dimension $Y_1$ (Table 1) Dimension $Y$ (Table 3, Table 5, Table 7)	} $\pm 1/8$ in
ii) <i>Welding-neck flanges</i> (Table 1, Table 3, Table 5 and Table 7).		
<sup>a</sup> On flange bore	Dimension $B_2$	$+ 1/8$ in $- 1/16$ in
On flange thickness	Dimension $C$	$+ 3/16$ in $- 0$ in
On overall length through hub	Dimension $Y_2$ (Table 1) Dimension $Y$ (Table 3, Table 5, Table 7)	} $\pm 1/8$ in
<sup>a</sup> Outside diameter of welding end of hub	Dimension $A$ (Table 1) Dimension $A_2$ (Table 3, Table 5, Table 7)	$+ 5/32$ in $- 1/32$ in

<sup>a</sup> In no case, regardless of the tolerances permitted on flange bore ( $B_2$ ) and outside hub diameter ( $A$  and  $A_2$ ), shall the thickness of the welding end of a welding-neck flange be less than  $87\frac{1}{2}$  per cent of the nominal thickness of the pipe to which it is to be attached.

## 8 Flange facings and gaskets

a) *Flange facing dimensions*. Flange facing dimensions shall conform to those given in Table 2, Table 4, Table 6 and Table 8.

Raised facings shall be finished in accordance with the requirements of BS 1560<sup>2)</sup>. Ring-joint grooves shall be machined true with the face and concentric with the bolt circle and the bore of the flanges. Grooves shall be finished smooth and shall be free from ridges and chatter marks.

b) *Tolerances on flange facing dimensions*. The following are the tolerances permitted on flange facing dimensions:

i) *Raised facings* (Table 2, Table 4, Table 6 and Table 8).

On outside diameter of raised face	Dimension $R$	$\pm 1/64$ in
------------------------------------	---------------	---------------

ii) *Ring-joint facings* (Table 4, Table 6 and Table 8).

On pitch diameter of groove	Dimension $P$	$\pm 0.005$ in
On width of groove	Dimension $F$	$\pm 0.008$ in
On depth of groove	Dimension $E$	$+ 1/64$ in $- 0$ in
On $23^\circ$ flank angle of groove		$\pm 1/2^\circ$

c) *Gasket dimensions*. Dimensions of compressed asbestos fibre gaskets for use with raised facings are given in Table 9. Dimensions of ring-joint gaskets are given in Table 10.

d) *Tolerances on gasket dimensions*. The following are the tolerances permitted on gasket dimensions:

i) *Compressed asbestos fibre gaskets* (Table 9). Tolerances on these gaskets are not specified.

ii) *Ring-joint gaskets* (Table 10)<sup>3)</sup>.

On average pitch diameter of ring	Dimension $P$	$\pm 0.007$ in
On width of ring	Dimension $A$	$\pm 0.008$ in
On height of ring	Dimension $H^a$	$\pm 1/64$ in.
On width of flat	Dimension $C$	$\pm 0.008$ in
On corner radius	Dimension $R$	$\pm 1/64$ in
On $23^\circ$ flank angle of ring		$\pm 1/2^\circ$

<sup>a</sup> A plus tolerance of  $3/64$  inch on height is permitted provided that the variation in the height of any given ring does not exceed  $1/64$  inch throughout its entire circumference.

## 9 Flange bolting dimensions

The number of bolts, their size and the bolt circle diameter for each class and size of flange shall be as given in Table 2, Table 4, Table 6 and Table 8.

Bolt holes shall be pitched evenly around the bolt circle.

## 10 Spot-facing and back-facing of flanges

Flanges need not be spot-faced or back-faced provided that their backs are parallel, within  $1^\circ$ , to their faces and the fillets of their hubs do not interfere with the full bearing of the fastening nuts.

<sup>2)</sup> BS 1560, "Steel pipe flanges and flanged fittings (Nominal sizes  $1/2$  in to 24 in) for the petroleum industry".

<sup>3)</sup> Extracted from A.S.A. Std. B 16.20, "Ring-joint gaskets and grooves for steel pipe flanges" (obtainable from the British Standards Institution).

When spot-facing is required its diameter shall not be less than the dimension across the corners of the appropriate nut plus  $\frac{1}{8}$  inch.

When a spot-facing cuts into the fillet of a flange its diameter shall not exceed the dimension across the corners of the nut by more than  $\frac{3}{16}$  inch.

When a flange is back-faced the fillet may be reduced but not eliminated entirely. A sharp corner at the junction of the flange and its hub shall not be permitted.

The specified minimum thickness of any flange whether or not it is spot-faced or back-faced shall not be exceeded by more than the tolerance permitted under Clause 7, nor shall the process of spot-facing or back-facing reduce its thickness at any point to less than the specified minimum.

## Section 4. Inspection

### 11 Inspection

The purchaser or his representative shall have free access, at all reasonable times, to those parts of the manufacturer's works engaged upon his contract and shall be at liberty to inspect, at any stage of manufacture, the materials covered by this contract. He shall be at liberty to reject any material which does not comply with the requirements of this standard.

**NOTE** This standard does not make provision for the pressure testing of loose flanges. These may be tested after attachment to pipe or equipment. The test pressure will then depend on the requirements of the Code to which the pipe or equipment has been fabricated.

### 12 Repair of defects

Defects which do not impair the strength of a flange may be welded by a procedure approved by the purchaser. They shall be cleaned out to sound metal before welding and shall be submitted to the purchaser's inspector for approval in this condition, after which they may be welded if the inspector so agrees. Such welds need not be heat treated, unless required by the inspector. When the welding of defects is permitted the welding rod shall be such as to produce a weld having characteristics similar to the parent metal.

## Section 5. Marking

### 13 Marking

The following markings are required on flanges covered by this standard:

- a) The manufacturer's name or trade mark.
- b) BS 3293
- c) The word "Steel".
- d) Nominal pipe size in inches.
- e) On flanges provided with ring-joint facings, the letter "R" followed by the appropriate ring number, this marking being located on the flange edge.

## Section 6. Preparation and despatch

### 14 Preparation

Painting of finished flanges shall be optional to the manufacturer, unless otherwise specified by the purchaser.

Machined surfaces shall be well covered with an approved rust-inhibiting composition.

### 15 Despatch

Flanges shall be fastened together in such a manner that they are paired and no flange facings remain exposed.

Exposed facings of single flanges shall be protected over their entire surface with a suitable close-fitting protector securely attached at not less than four points. The type of protector and method of attachment shall be approved by the purchaser.

Other methods of preparation for despatch shall be subject to agreement between the purchaser and the manufacturer.

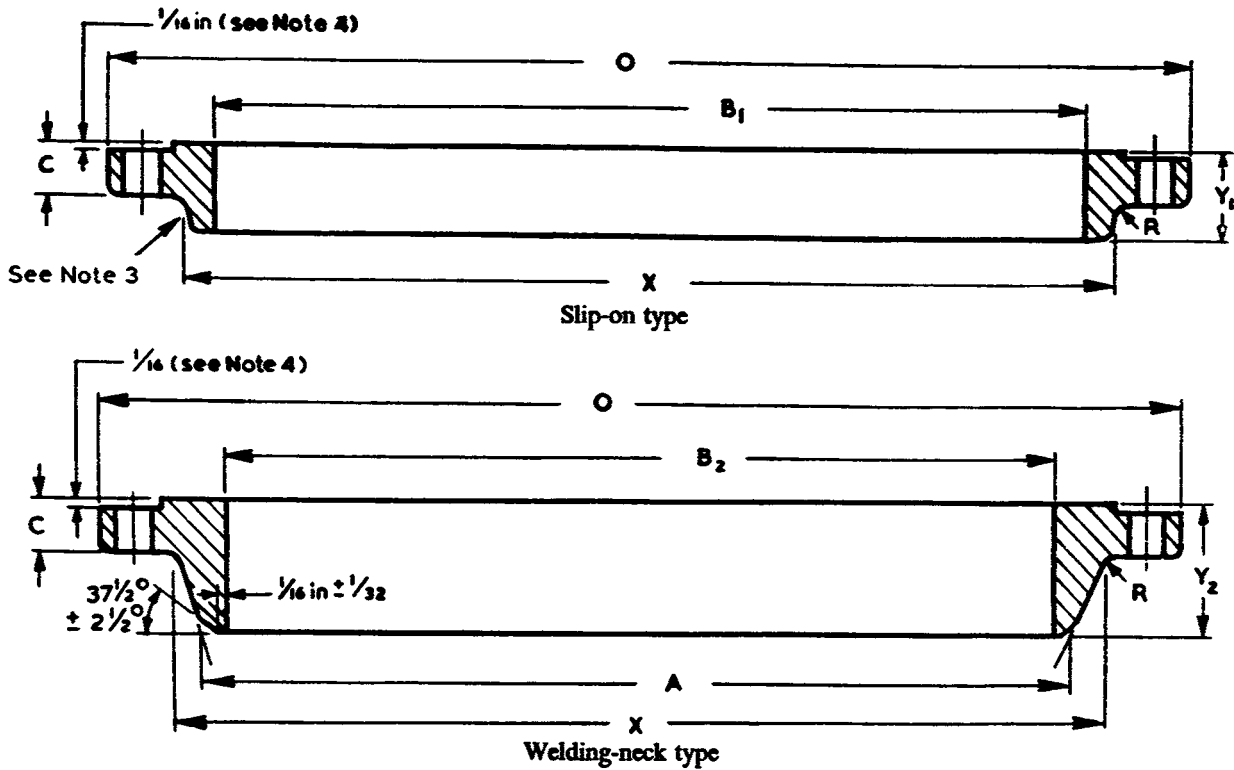


Table 1 — Dimensions of flanges, class 150

1 Nominal pipe size	2 Outside diameter of flange O	3 Thickness of flange min. C	4 Outside diameter of large end of hub X	5 Outside diameter of small end of hub: Welding neck A	6 Length through hub		8 Fillet radius R	9 Flange bore	
					Slip-on Y <sub>1</sub>	Welding-neck Y <sub>2</sub>		Slip-on B <sub>1</sub>	Welding-neck B <sub>2</sub>
in	in	in	in	in	in	in	in	in	in
26	34 <sup>1</sup> / <sub>4</sub>	2	28 <sup>1</sup> / <sub>2</sub>	26	3 <sup>3</sup> / <sub>8</sub>	5	1/4	26 <sup>1</sup> / <sub>4</sub>	To be specified by the purchaser
28	36 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>16</sub>	30 <sup>3</sup> / <sub>4</sub>	28	3 <sup>7</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>16</sub>	1/4	28 <sup>1</sup> / <sub>4</sub>	
30	38 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>8</sub>	32 <sup>3</sup> / <sub>4</sub>	30	3 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>8</sub>	1/4	30 <sup>1</sup> / <sub>4</sub>	
32	41 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	35	32	3 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>4</sub>	5/16	32 <sup>1</sup> / <sub>4</sub>	
34	43 <sup>3</sup> / <sub>4</sub>	2 <sup>5</sup> / <sub>16</sub>	37	34	3 <sup>11</sup> / <sub>16</sub>	5 <sup>5</sup> / <sub>16</sub>	5/16	34 <sup>1</sup> / <sub>4</sub>	
36	46	2 <sup>3</sup> / <sub>8</sub>	39 <sup>1</sup> / <sub>4</sub>	36	3 <sup>3</sup> / <sub>4</sub>	5 <sup>3</sup> / <sub>8</sub>	5/16	36 <sup>1</sup> / <sub>4</sub>	
38	48 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	41 <sup>3</sup> / <sub>4</sub>	38	3 <sup>3</sup> / <sub>4</sub>	5 <sup>3</sup> / <sub>8</sub>	3/8	38 <sup>1</sup> / <sub>4</sub>	
40	50 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>	43 <sup>3</sup> / <sub>4</sub>	40	3 <sup>7</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>	3/8	40 <sup>1</sup> / <sub>4</sub>	
42	53	2 <sup>5</sup> / <sub>8</sub>	46	42	4	5 <sup>5</sup> / <sub>8</sub>	3/8	42 <sup>1</sup> / <sub>4</sub>	
44	55 <sup>1</sup> / <sub>4</sub>	2 <sup>5</sup> / <sub>8</sub>	48	44	4	5 <sup>5</sup> / <sub>8</sub>	7/16	44 <sup>1</sup> / <sub>4</sub>	
46	57 <sup>1</sup> / <sub>4</sub>	2 <sup>11</sup> / <sub>16</sub>	50	46	4 <sup>1</sup> / <sub>16</sub>	5 <sup>11</sup> / <sub>16</sub>	7/16	46 <sup>1</sup> / <sub>4</sub>	
48	59 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	52 <sup>1</sup> / <sub>4</sub>	48	4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>4</sub>	7/16	48 <sup>1</sup> / <sub>4</sub>	

NOTE 1 For relevant drilling, bolting and facing dimensions, see Table 2.

NOTE 2 For tolerances permitted on flange dimensions, see Clause 7.

NOTE 3 The hubs of slip-on welding flanges may be cylindrical or, alternatively, may have a draft of not more than 7° on the outside surface for forging purposes.

NOTE 4 Each sketch at the head of this table depicts a flange with a 1/16 in raised facing. The dimensions C, Y<sub>1</sub>, and Y<sub>2</sub>, therefore, include the height of the facing (see Clause 7). If any other type of facing is required its height shall be additional to the minimum flange thickness.



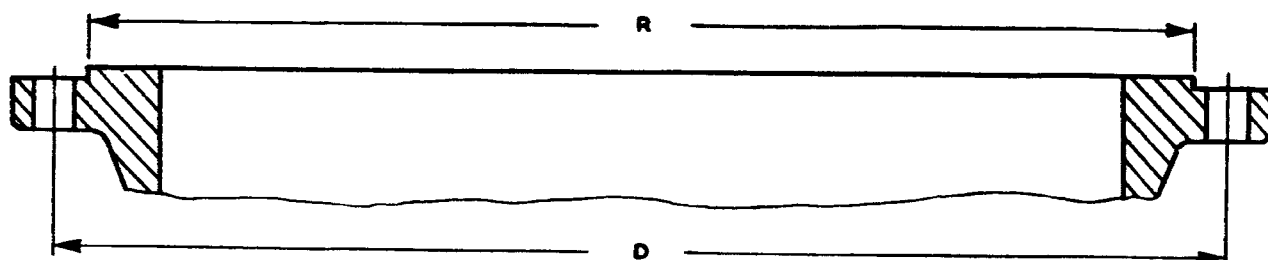


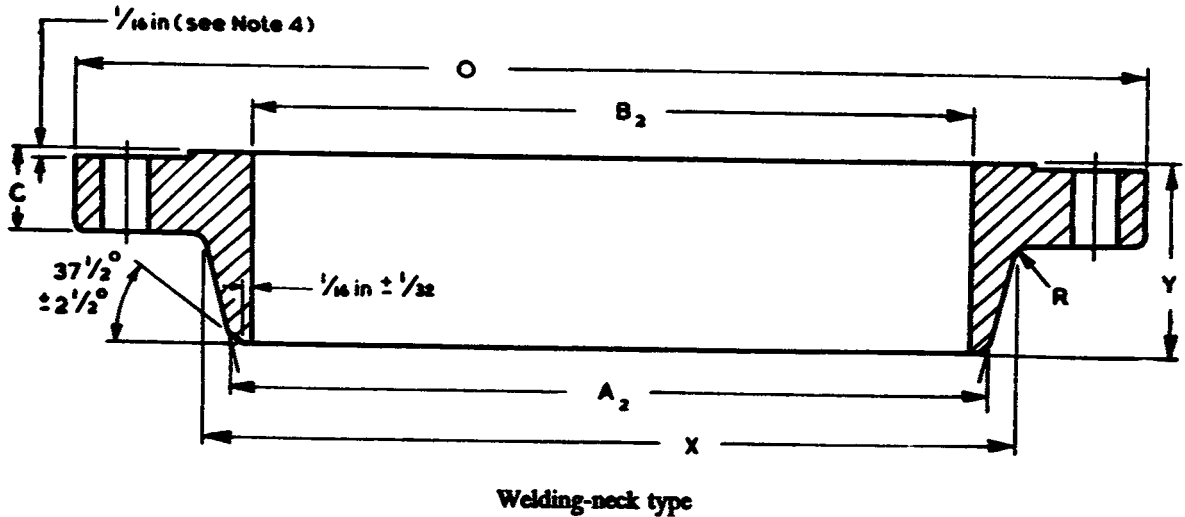
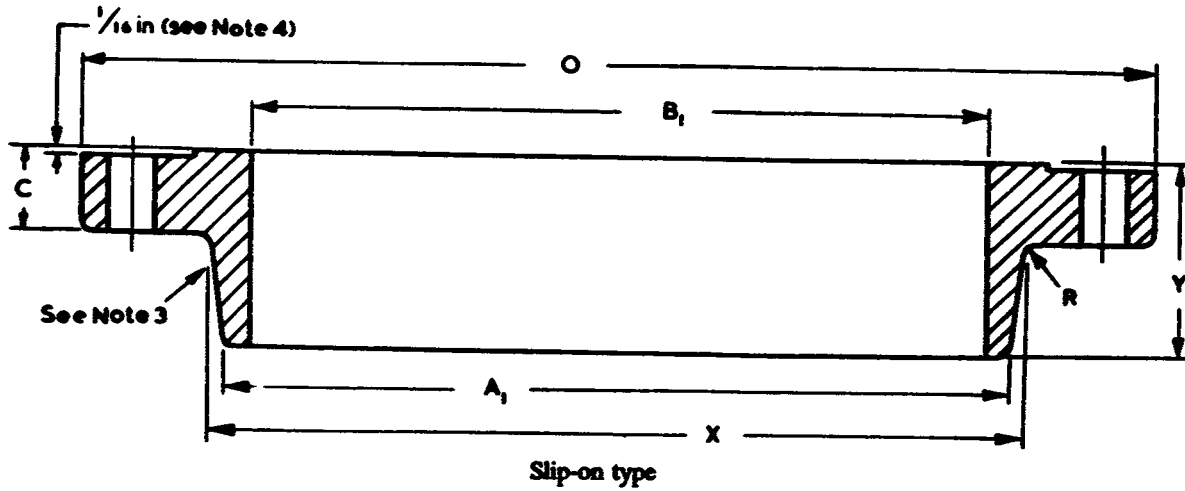
Table 2 — Drilling, bolting and facing dimensions for flanges, class 150

1	2	3	4	5	6	7	8
Nominal pipe size	Drilling				Raised face	Length of stud-bolts (see Note 3)	Length of headed bolts (see note 3)
	Diameter of bolt circle D	Number of bolt holes	Diameter of bolts	Diameter of bolt holes	Outside diameter R		
in	in		in	in	in	in	in
26	31 <sup>3</sup> / <sub>4</sub>	24	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	29 <sup>1</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>4</sub>	5 <sup>3</sup> / <sub>4</sub>
28	34	28	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	31 <sup>1</sup> / <sub>4</sub>	7	6
30	36	28	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	33 <sup>3</sup> / <sub>4</sub>	7	6
32	38 <sup>1</sup> / <sub>2</sub>	28	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	35 <sup>3</sup> / <sub>4</sub>	7 <sup>3</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>2</sub>
34	40 <sup>1</sup> / <sub>2</sub>	32	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	37 <sup>3</sup> / <sub>4</sub>	8	6 <sup>3</sup> / <sub>4</sub>
36	42 <sup>3</sup> / <sub>4</sub>	32	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	40 <sup>1</sup> / <sub>4</sub>	8	6 <sup>3</sup> / <sub>4</sub>
38	45 <sup>1</sup> / <sub>4</sub>	32	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	42 <sup>1</sup> / <sub>4</sub>	8	6 <sup>3</sup> / <sub>4</sub>
40	47 <sup>1</sup> / <sub>4</sub>	36	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	44 <sup>1</sup> / <sub>4</sub>	8 <sup>1</sup> / <sub>4</sub>	7
42	49 <sup>1</sup> / <sub>2</sub>	36	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	47	8 <sup>1</sup> / <sub>2</sub>	7 <sup>1</sup> / <sub>4</sub>
44	51 <sup>3</sup> / <sub>4</sub>	40	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	49	8 <sup>1</sup> / <sub>2</sub>	7 <sup>1</sup> / <sub>4</sub>
46	53 <sup>3</sup> / <sub>4</sub>	40	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	51	8 <sup>3</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>2</sub>
48	56	44	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	53 <sup>1</sup> / <sub>2</sub>	8 <sup>3</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>2</sub>

NOTE 1 For relevant flange dimensions, see Table 1.

NOTE 2 For the tolerance permitted on dimension R, see Clause 8.

NOTE 3 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths in Column 7 do not include the heights of these ends. The lengths for headed bolts in Column 8 include end heights.



**Table 3 — Dimensions of flanges, class 300**

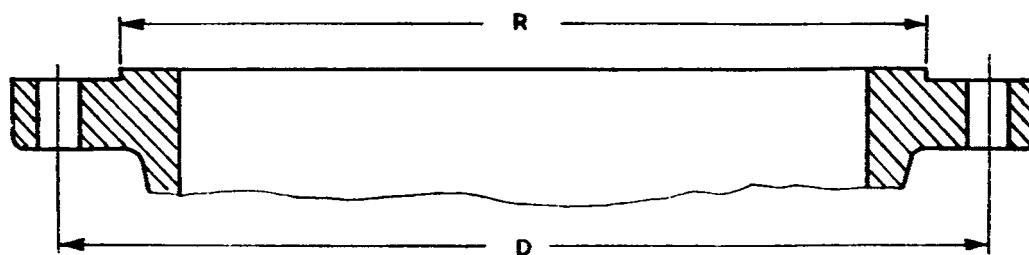
1 Nominal pipe size	2 Outside diameter of flange  O	3 Thickness of flange min.  C	4 Outside diameter large end of hub  X	5 Outside diameter small end of hub		7 Length through hub  Y	8 Fillet radius  R	9 Flange bore	
				Slip-on	Welding-neck			Slip-on and welding-neck	Slip-on
				A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>			
in	in	in	in	in	in	in	in	in	
26	38 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>8</sub>	28 <sup>3</sup> / <sub>8</sub>	27 <sup>1</sup> / <sub>16</sub>	26 <sup>1</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	26 <sup>1</sup> / <sub>4</sub>	To be specified by the purchaser
28	40 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	30 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>8</sub>	28 <sup>1</sup> / <sub>4</sub>	7 <sup>3</sup> / <sub>4</sub>	7 <sup>7</sup> / <sub>16</sub>	28 <sup>1</sup> / <sub>4</sub>	
30	43	3 <sup>5</sup> / <sub>8</sub>	32 <sup>8</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	30 <sup>1</sup> / <sub>4</sub>	8 <sup>1</sup> / <sub>4</sub>	7 <sup>7</sup> / <sub>16</sub>	30 <sup>1</sup> / <sub>4</sub>	
32	45 <sup>1</sup> / <sub>4</sub>	3 <sup>7</sup> / <sub>8</sub>	34 <sup>11</sup> / <sub>16</sub>	33 <sup>1</sup> / <sub>4</sub>	32 <sup>1</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	7 <sup>7</sup> / <sub>16</sub>	32 <sup>1</sup> / <sub>4</sub>	
34	47 <sup>1</sup> / <sub>2</sub>	4	36 <sup>7</sup> / <sub>8</sub>	35 <sup>5</sup> / <sub>16</sub>	34 <sup>5</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	34 <sup>1</sup> / <sub>4</sub>	
36	50	4 <sup>1</sup> / <sub>8</sub>	39	37 <sup>3</sup> / <sub>8</sub>	36 <sup>5</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	36 <sup>1</sup> / <sub>4</sub>	

NOTE 1 For relevant drilling, bolting and facing dimensions, see Table 4.

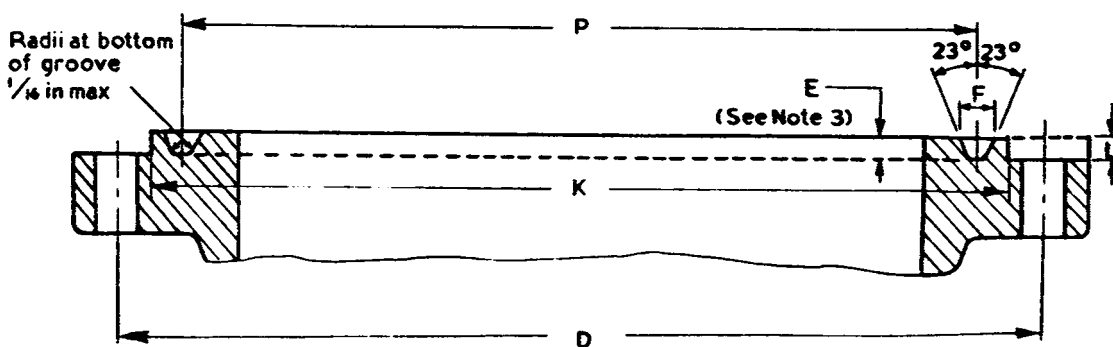
NOTE 2 For tolerances permitted on flange dimensions, see Clause 7.

NOTE 3 The hub taper on slip-on flanges may be continuous as shown in the figure or be a compound taper, at the manufacturer's option.

NOTE 4 Each sketch at the head of this table depicts a flange with a 1/16 in raised facing. The dimensions C and Y therefore, include the height of the facing (see Clause 7). If any other type of facing is required its height shall be additional to the minimum flange thickness.



Raised face type—welding-neck and slip-on



Ring-joint type—welding-neck and slip-on

Table 4 — Drilling, bolting and facing dimensions for flanges, class 300

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nominal pipe size	Drilling				Facing dimensions						Length of stud-bolts (see Note 4)		Length of headed bolts (see Note 4)	
	Diameter of bolt circle D	Number of bolts	Diameter of bolts	Diameter of bolt holes	Raised face	Ring-joint					Raised face	Ring-joint	Raised face	Ring-joint
					Outside diameter R	Pitch diameter P	Groove width F	Depth of groove E. Height of facing L. (See note 3)	Diameter of raised portion K. (see Note 3)	Ring number				
in	in		in	in	in	in	in	in	in		in	in	in	in
26	34 <sup>1</sup> / <sub>2</sub>	28	1 <sup>5</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	29 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>2</sub>	<sup>25</sup> / <sub>32</sub>	<sup>1</sup> / <sub>2</sub>	31 <sup>7</sup> / <sub>8</sub>	R 93	9 <sup>3</sup> / <sub>4</sub>	11	8 <sup>1</sup> / <sub>2</sub>	9 <sup>1</sup> / <sub>2</sub>
28	37	28	1 <sup>5</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	31 <sup>1</sup> / <sub>2</sub>	31 <sup>1</sup> / <sub>2</sub>	<sup>25</sup> / <sub>32</sub>	<sup>1</sup> / <sub>2</sub>	33 <sup>7</sup> / <sub>8</sub>	R 94	10 <sup>1</sup> / <sub>4</sub>	11 <sup>1</sup> / <sub>2</sub>	9	10
30	39 <sup>1</sup> / <sub>4</sub>	28	1 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	33 <sup>3</sup> / <sub>4</sub>	33 <sup>3</sup> / <sub>4</sub>	<sup>25</sup> / <sub>32</sub>	<sup>1</sup> / <sub>2</sub>	36 <sup>1</sup> / <sub>8</sub>	R 95	11	12 <sup>1</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>2</sub>	10 <sup>1</sup> / <sub>2</sub>
32	41 <sup>1</sup> / <sub>2</sub>	28	1 <sup>7</sup> / <sub>8</sub>	2	36	36	<sup>29</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	38 <sup>3</sup> / <sub>4</sub>	R 96	11 <sup>3</sup> / <sub>4</sub>	13	10 <sup>1</sup> / <sub>4</sub>	11 <sup>1</sup> / <sub>4</sub>
34	43 <sup>1</sup> / <sub>2</sub>	28	1 <sup>7</sup> / <sub>8</sub>	2	38	38	<sup>29</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	40 <sup>3</sup> / <sub>4</sub>	R 97	12	13 <sup>1</sup> / <sub>4</sub>	10 <sup>1</sup> / <sub>2</sub>	11 <sup>1</sup> / <sub>2</sub>
36	46	32	2	2 <sup>1</sup> / <sub>8</sub>	40 <sup>1</sup> / <sub>4</sub>	40 <sup>1</sup> / <sub>4</sub>	<sup>29</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	43	R 98	12 <sup>1</sup> / <sub>2</sub>	13 <sup>3</sup> / <sub>4</sub>	10 <sup>3</sup> / <sub>4</sub>	12

NOTE 1 For relevant flange dimensions, see Table 3.

NOTE 2 For the tolerances permitted on flange facing dimensions, see Clause 8.

NOTE 3 The height L of a ring-joint facing is equal to the depth E of the ring groove but is not subject to the tolerances on E. Raised portion or full-face may be supplied unless specified in the order.

NOTE 4 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths in Columns 12 and 13 do not include the heights of these ends. The lengths for headed bolts in Columns 14 and 15 include end heights.

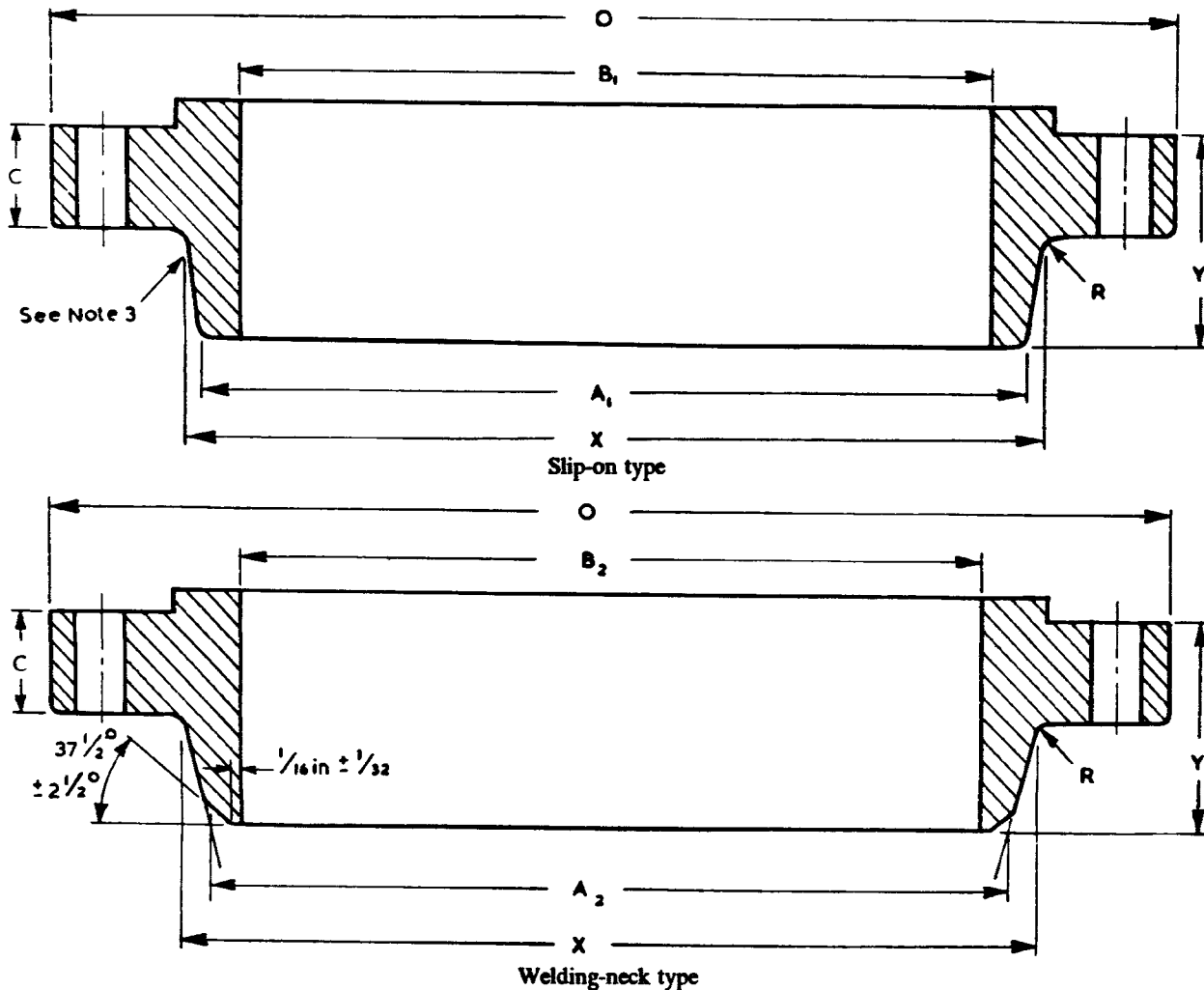


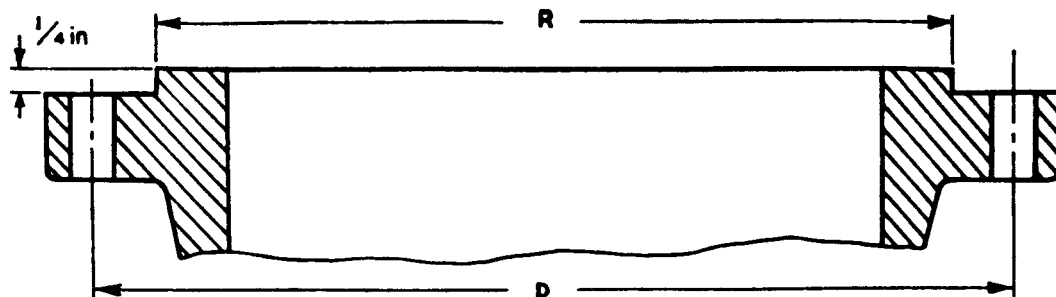
Table 5 — Dimensions of flanges, class 400

1 Nominal pipe size	2 Outside diameter of flange  O	3 Thickness of flange min.  C	4 Outside diameter large end of hub  X	5 Outside diameter small end of hub		7 Length through hub  Y	8 Fillet radius  R	9 Flange bore	
				Slip-on  A <sub>1</sub>	Welding-neck  A <sub>2</sub>			Slip-on and welding-neck	Slip-on  B <sub>1</sub>
in	in	in	in	in	in	in	in	in	in
26	38 1/4	3 1/2	28 5/8	27 5/16	26 5/16	7 5/8	7/16	26 1/4	To be specified by the purchaser
28	40 3/4	3 3/4	30 13/16	29 3/8	28 5/16	8 1/8	1/2	28 1/4	
30	43	4	32 15/16	31 1/2	30 5/16	8 5/8	1/2	30 1/4	
32	45 1/4	4 1/4	35	33 9/16	32 3/8	9 1/8	1/2	32 1/4	
34	47 1/2	4 3/8	37 3/16	35 5/8	34 3/8	9 1/2	9/16	34 1/4	
36	50	4 1/2	39 3/8	37 3/4	36 7/16	9 7/8	9/16	36 1/4	

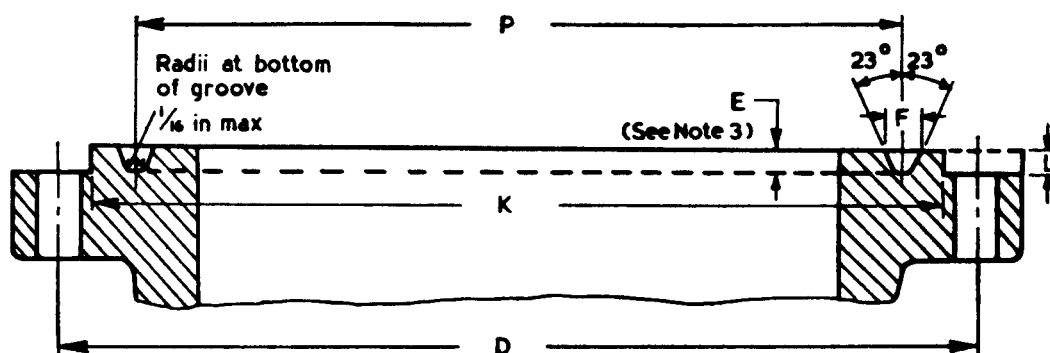
NOTE 1 For relevant drilling, bolting and facing dimensions, see Table 6.

NOTE 2 For tolerances permitted on flange dimensions, see Clause 7.

NOTE 3 The hub taper on slip-on flanges may be continuous as shown in the figure or be a compound taper, at the manufacturer's option.



Raised face type—welding-neck and slip-on



Ring-joint type—welding-neck and slip-on

Table 6 — Drilling, bolting and facing dimensions for flanges, class 400

1 Nominal pipe size	2 Drilling				3 Facing dimensions						4 Length of stud-bolts (see Note 4)	
	5 Diameter of bolt circle D	6 Number of bolts	7 Diameter of bolts	8 Diameter of bolt holes	9 Raised face	10 Ring-joint					11 Raised face	12 Ring-joint
					13 Outside diameter R	14 Pitch diameter P	15 Groove width F	16 Depth of groove E. Height of facing L. (See Note 3)	17 Diameter of raised portion K (See Note 3)	18 Ring number		
in	in		in	in	in	in	in	in	in		in	in
26	34 <sup>1</sup> / <sub>2</sub>	28	1 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	29 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>2</sub>	25 <sup>3</sup> / <sub>32</sub>	1 <sup>1</sup> / <sub>2</sub>	31 <sup>7</sup> / <sub>8</sub>	R 93	11 <sup>1</sup> / <sub>4</sub>	12 <sup>1</sup> / <sub>2</sub>
28	37	28	1 <sup>7</sup> / <sub>8</sub>	2	31 <sup>1</sup> / <sub>2</sub>	31 <sup>1</sup> / <sub>2</sub>	25 <sup>3</sup> / <sub>32</sub>	1 <sup>1</sup> / <sub>2</sub>	33 <sup>7</sup> / <sub>8</sub>	R 94	12	13 <sup>1</sup> / <sub>4</sub>
30	39 <sup>1</sup> / <sub>4</sub>	28	2	2 <sup>1</sup> / <sub>8</sub>	33 <sup>3</sup> / <sub>4</sub>	33 <sup>3</sup> / <sub>4</sub>	25 <sup>3</sup> / <sub>32</sub>	1 <sup>1</sup> / <sub>2</sub>	36 <sup>1</sup> / <sub>8</sub>	R 95	12 <sup>3</sup> / <sub>4</sub>	14
32	41 <sup>1</sup> / <sub>2</sub>	28	2	2 <sup>1</sup> / <sub>8</sub>	36	36	29 <sup>3</sup> / <sub>32</sub>	9 <sup>1</sup> / <sub>16</sub>	38 <sup>3</sup> / <sub>4</sub>	R 96	13 <sup>1</sup> / <sub>4</sub>	14 <sup>3</sup> / <sub>4</sub>
34	43 <sup>1</sup> / <sub>2</sub>	28	2	2 <sup>1</sup> / <sub>8</sub>	38	38	29 <sup>3</sup> / <sub>32</sub>	9 <sup>1</sup> / <sub>16</sub>	40 <sup>3</sup> / <sub>4</sub>	R 97	13 <sup>1</sup> / <sub>2</sub>	15
36	46	32	2	2 <sup>1</sup> / <sub>8</sub>	40 <sup>1</sup> / <sub>4</sub>	40 <sup>1</sup> / <sub>4</sub>	29 <sup>3</sup> / <sub>32</sub>	9 <sup>1</sup> / <sub>16</sub>	43	R 98	13 <sup>3</sup> / <sub>4</sub>	15 <sup>1</sup> / <sub>4</sub>

NOTE 1 For relevant flange dimensions, see Table 5.

NOTE 2 For the tolerances permitted on flange facing dimensions, see Clause 8.

NOTE 3 The height L of a ring-joint facing is equal to the depth E of the ring groove but is not subject to the tolerances on E. Raised portion or full-face may be supplied unless specified in the order.

NOTE 4 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths in Columns 12 and 13 do not include the heights of these ends.

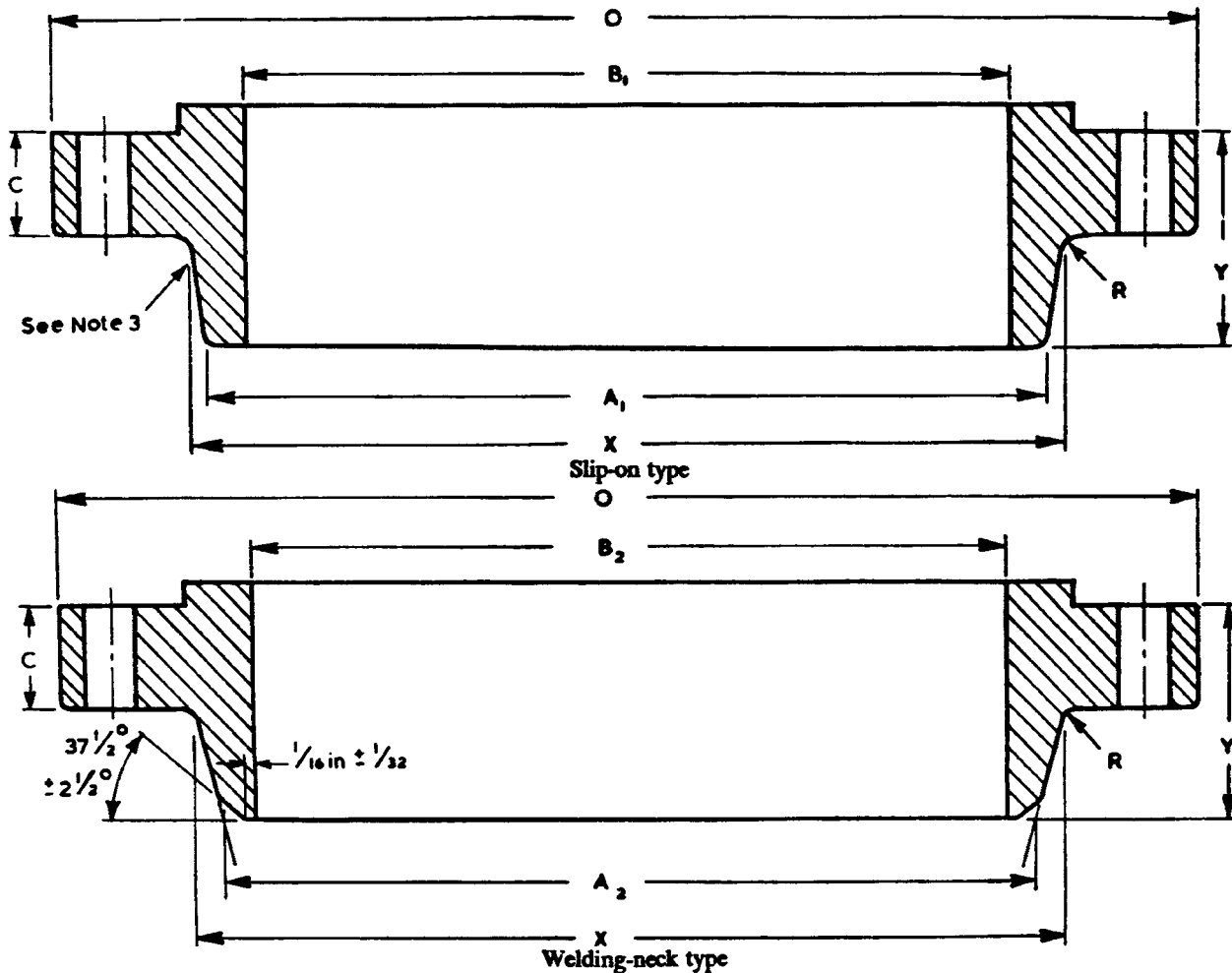


Table 7 — Dimensions of flanges, class 600

1 Nominal pipe size	2 Outside diameter of flange  O	3 Thickness of flange min.  C	4 Outside diameter large end of hub  X	5 Outside diameter small end of hub		7 Length through hub  Slip-on welding-neck Y	8 Fillet radius  R	9 Flange bore	
				Slip-on A <sub>1</sub>	Welding-neck A <sub>2</sub>			Slip-on B <sub>1</sub>	Welding-neck B <sub>2</sub>
in	in	in	in	in	in	in	in	in	in
26	40	4 <sup>1</sup> / <sub>4</sub>	29 <sup>7</sup> / <sub>16</sub>	27 <sup>13</sup> / <sub>16</sub>	26 <sup>7</sup> / <sub>16</sub>	8 <sup>3</sup> / <sub>4</sub>	9 <sup>9</sup> / <sub>16</sub>	26 <sup>1</sup> / <sub>4</sub>	To be specified by the purchaser
28	42 <sup>1</sup> / <sub>4</sub>	4 <sup>3</sup> / <sub>8</sub>	31 <sup>5</sup> / <sub>8</sub>	29 <sup>15</sup> / <sub>16</sub>	28 <sup>1</sup> / <sub>2</sub>	9 <sup>1</sup> / <sub>4</sub>	5 <sup>5</sup> / <sub>8</sub>	28 <sup>1</sup> / <sub>4</sub>	
30	44 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>2</sub>	33 <sup>15</sup> / <sub>16</sub>	32 <sup>1</sup> / <sub>16</sub>	30 <sup>1</sup> / <sub>2</sub>	9 <sup>3</sup> / <sub>4</sub>	11 <sup>11</sup> / <sub>16</sub>	30 <sup>1</sup> / <sub>4</sub>	
32	47	4 <sup>5</sup> / <sub>8</sub>	36 <sup>1</sup> / <sub>8</sub>	34 <sup>3</sup> / <sub>16</sub>	32 <sup>1</sup> / <sub>2</sub>	10 <sup>1</sup> / <sub>4</sub>	11 <sup>11</sup> / <sub>16</sub>	32 <sup>1</sup> / <sub>4</sub>	
34	49	4 <sup>3</sup> / <sub>4</sub>	38 <sup>5</sup> / <sub>16</sub>	36 <sup>5</sup> / <sub>16</sub>	34 <sup>9</sup> / <sub>16</sub>	10 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	34 <sup>1</sup> / <sub>4</sub>	
36	51 <sup>3</sup> / <sub>4</sub>	4 <sup>7</sup> / <sub>8</sub>	40 <sup>5</sup> / <sub>8</sub>	38 <sup>7</sup> / <sub>16</sub>	36 <sup>9</sup> / <sub>16</sub>	11 <sup>1</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	36 <sup>1</sup> / <sub>4</sub>	

NOTE 1 For relevant drilling, bolting and facing dimensions, see Table 8.

NOTE 2 For tolerances permitted on flange dimensions, see Clause 7.

NOTE 3 The hub taper on slip-on flanges may be continuous as shown in the figure or be a compound taper, at the manufacturer's option.

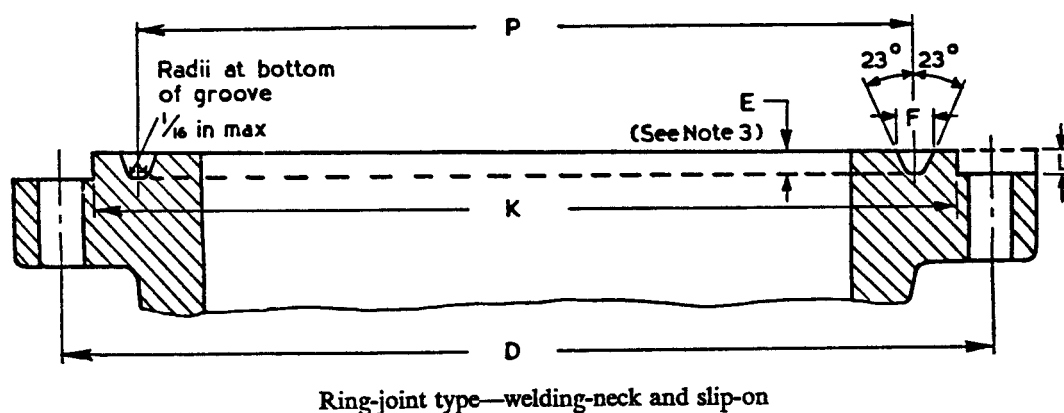
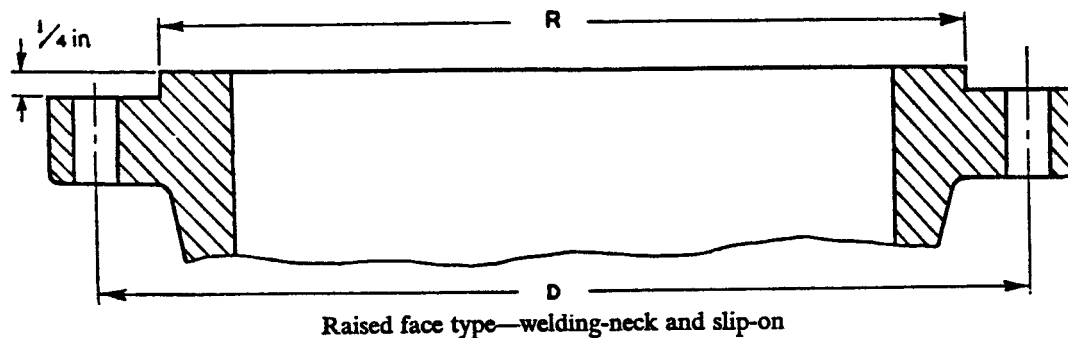


Table 8 — Drilling, bolting and facing dimensions for flanges, class 600

1 Normal pipe size	2 Drilling				3 Facing dimensions						4 Length of stud-bolts (See Note 4)	
	Diameter of bolt circle  D	Number of bolts	Diameter of bolts	Diameter of bolt holes	Raised face	Ring-joint					Raised face	Ring-joint
					Outside diameter  R	Pitch diameter  P	Groove width  F	Depth of groove E. Height of facing L. (See Note 3)	Diameter of raised portion K (See Note 3)	Ring number		
in	in		in	in	in	in	in	in	in	in	in	in
26	36	28	1 <sup>7</sup> / <sub>8</sub>	2	29 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>2</sub>	<sup>25</sup> / <sub>32</sub>	<sup>1</sup> / <sub>2</sub>	31 <sup>7</sup> / <sub>8</sub>	R 93	13	14 <sup>1</sup> / <sub>4</sub>
28	38	28	2	2 <sup>1</sup> / <sub>8</sub>	31 <sup>1</sup> / <sub>2</sub>	31 <sup>1</sup> / <sub>2</sub>	<sup>25</sup> / <sub>32</sub>	<sup>1</sup> / <sub>2</sub>	33 <sup>7</sup> / <sub>8</sub>	R 94	13 <sup>1</sup> / <sub>2</sub>	14 <sup>3</sup> / <sub>4</sub>
30	40 <sup>1</sup> / <sub>4</sub>	28	2	2 <sup>1</sup> / <sub>8</sub>	33 <sup>3</sup> / <sub>4</sub>	33 <sup>3</sup> / <sub>4</sub>	<sup>25</sup> / <sub>32</sub>	<sup>1</sup> / <sub>2</sub>	36 <sup>1</sup> / <sub>8</sub>	R 95	13 <sup>3</sup> / <sub>4</sub>	15
32	42 <sup>1</sup> / <sub>2</sub>	28	2 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	36	36	<sup>29</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	38 <sup>3</sup> / <sub>4</sub>	R 96	14 <sup>1</sup> / <sub>2</sub>	16
34	44 <sup>1</sup> / <sub>2</sub>	28	2 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	38	38	<sup>29</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	40 <sup>3</sup> / <sub>4</sub>	R 97	14 <sup>3</sup> / <sub>4</sub>	16 <sup>1</sup> / <sub>4</sub>
36	47	28	2 <sup>1</sup> / <sub>2</sub>	2 <sup>5</sup> / <sub>8</sub>	40 <sup>1</sup> / <sub>4</sub>	40 <sup>1</sup> / <sub>4</sub>	<sup>29</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	43	R 98	15 <sup>1</sup> / <sub>2</sub>	17

NOTE 1 For relevant flange dimensions, see Table 7.

NOTE 2 For the tolerances permitted on flange facing dimensions, see Clause 8.

NOTE 3 The height L of a ring-joint facing is equal to the depth E of the ring groove but is not subject to the tolerances on E. Raised portion or full-face may be supplied unless specified in the order.

NOTE 4 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths in Columns 12 and 13 do not include the heights of these ends.

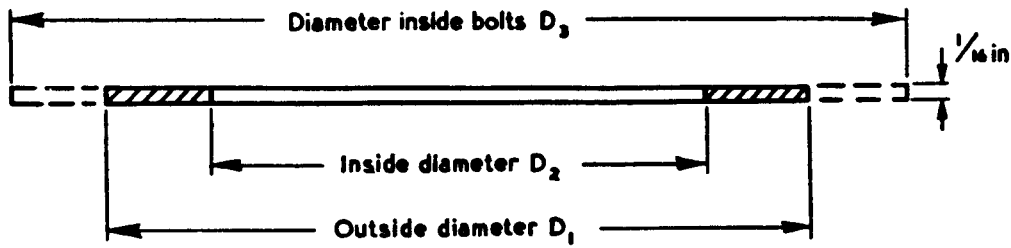


Table 9 — Dimensions of compressed asbestos fibre gaskets

A. For class 150 flanges

1	2	3	4
Nominal pipe size	Outside diameter of gasket	Inside diameter of gasket	Diameter inside bolts
	$D_1$	$D_2$	$D_2$
in	in	in	in
26	29 <sup>1</sup> / <sub>4</sub>	28 <sup>1</sup> / <sub>4</sub>	30 <sup>1</sup> / <sub>2</sub>
28	31 <sup>1</sup> / <sub>4</sub>	30 <sup>1</sup> / <sub>4</sub>	32 <sup>3</sup> / <sub>4</sub>
30	33 <sup>3</sup> / <sub>4</sub>	32 <sup>3</sup> / <sub>4</sub>	34 <sup>3</sup> / <sub>4</sub>
32	35 <sup>3</sup> / <sub>4</sub>	34 <sup>3</sup> / <sub>8</sub>	37
34	37 <sup>3</sup> / <sub>4</sub>	36 <sup>1</sup> / <sub>4</sub>	39
36	40 <sup>1</sup> / <sub>4</sub>	38 <sup>3</sup> / <sub>4</sub>	41 <sup>1</sup> / <sub>4</sub>
38	42 <sup>1</sup> / <sub>4</sub>	40 <sup>7</sup> / <sub>8</sub>	43 <sup>3</sup> / <sub>4</sub>
40	44 <sup>1</sup> / <sub>4</sub>	42 <sup>7</sup> / <sub>8</sub>	45 <sup>3</sup> / <sub>4</sub>
42	47	45 <sup>5</sup> / <sub>8</sub>	48
44	49	47 <sup>5</sup> / <sub>8</sub>	50 <sup>1</sup> / <sub>4</sub>
46	51	49 <sup>5</sup> / <sub>8</sub>	52 <sup>1</sup> / <sub>4</sub>
48	53 <sup>1</sup> / <sub>2</sub>	52 <sup>1</sup> / <sub>8</sub>	54 <sup>1</sup> / <sub>2</sub>

B. For class 300, 400 and 600 flanges

1	2	3	4	5	6	7	8
Nominal pipe size	Outside Diameter of gasket all classes	Inside diameter of gasket			Diameter inside bolts		
		$D_2$			$D_2$		
	$D_1$	Class 300	Class 400	Class 600	Class 300	Class 400	Class 600
in	in	in	in	in	in	in	in
26	29 <sup>1</sup> / <sub>2</sub>	27 <sup>5</sup> / <sub>8</sub>	27	26 <sup>5</sup> / <sub>8</sub>	32 <sup>7</sup> / <sub>8</sub>	32 <sup>3</sup> / <sub>4</sub>	34 <sup>1</sup> / <sub>8</sub>
28	31 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>2</sub>	28 <sup>7</sup> / <sub>8</sub>	28 <sup>3</sup> / <sub>8</sub>	35 <sup>3</sup> / <sub>8</sub>	35 <sup>1</sup> / <sub>8</sub>	36
30	33 <sup>3</sup> / <sub>4</sub>	31 <sup>5</sup> / <sub>8</sub>	30 <sup>7</sup> / <sub>8</sub>	30 <sup>3</sup> / <sub>8</sub>	37 <sup>1</sup> / <sub>2</sub>	37 <sup>1</sup> / <sub>4</sub>	38 <sup>1</sup> / <sub>4</sub>
32	36	33 <sup>3</sup> / <sub>4</sub>	33	32 <sup>1</sup> / <sub>2</sub>	39 <sup>5</sup> / <sub>8</sub>	39 <sup>1</sup> / <sub>2</sub>	40 <sup>1</sup> / <sub>4</sub>
34	38	35 <sup>5</sup> / <sub>8</sub>	34 <sup>7</sup> / <sub>8</sub>	34 <sup>1</sup> / <sub>4</sub>	41 <sup>5</sup> / <sub>8</sub>	41 <sup>1</sup> / <sub>2</sub>	42 <sup>1</sup> / <sub>4</sub>
36	40 <sup>1</sup> / <sub>4</sub>	37 <sup>5</sup> / <sub>8</sub>	36 <sup>7</sup> / <sub>8</sub>	36 <sup>1</sup> / <sub>4</sub>	44	44	44 <sup>1</sup> / <sub>2</sub>

NOTE 1 The outside diameters  $D_1$  of the gaskets are the same as the relevant raised facing diameters of the flanges. Diameters  $D_2$  are for use where it is desired to extend the gaskets to the flange bolts for centering purposes.

NOTE 2 No tolerances are specified for these gaskets.



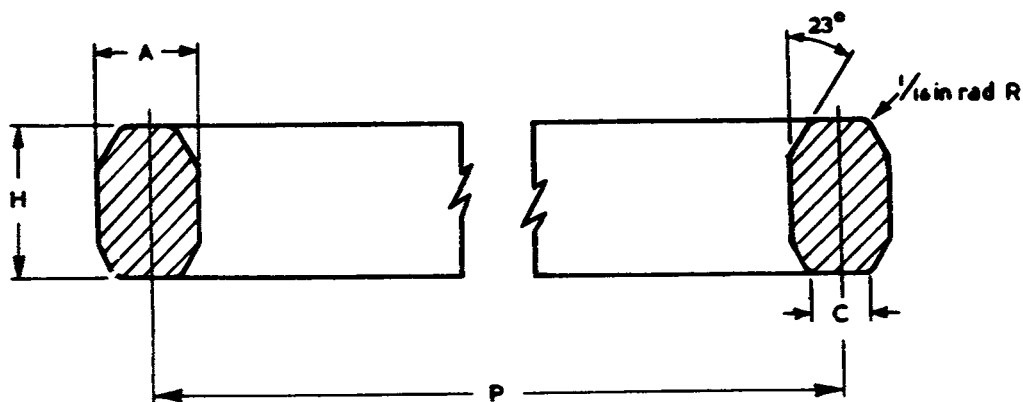


Table 10 — Numbers and dimensions of ring-joint gaskets  
for class 300, 400 and 600 flanges

1	2	3	4	5	6
Normal pipe size	Pitch diameter of ring	Width of ring	Height of ring	Width of flat	Ring number
in	P	A	H	C	
in	in	in	in	in	
26	29 <sup>1</sup> / <sub>2</sub>	<sup>3</sup> / <sub>4</sub>	<sup>15</sup> / <sub>16</sub>	0.485	R 93
28	31 <sup>1</sup> / <sub>2</sub>	<sup>3</sup> / <sub>4</sub>	<sup>15</sup> / <sub>16</sub>	0.485	R 94
30	33 <sup>3</sup> / <sub>4</sub>	<sup>3</sup> / <sub>4</sub>	<sup>15</sup> / <sub>16</sub>	0.485	R 95
32	36	<sup>7</sup> / <sub>8</sub>	<sup>1</sup> / <sub>16</sub>	0.583	R 96
34	38	<sup>7</sup> / <sub>8</sub>	<sup>1</sup> / <sub>16</sub>	0.583	R 97
36	40 <sup>1</sup> / <sub>4</sub>	<sup>7</sup> / <sub>8</sub>	<sup>1</sup> / <sub>16</sub>	0.583	R 98

NOTE 1 The presence of a small forging fin, located so that it does not prevent the ring from seating properly in the groove, is not objectionable.

NOTE 2 Dimensions for ring-joint gaskets in the above table, together with dimensions of groove in Table 4, Table 6, and Table 8, are identical with those for corresponding ring numbers in A.S.A. Std. B.16.20.

NOTE 3 For tolerances on ring-joint gaskets, see Clause 8.

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