

**ASME B16.36-2020**  
(Revision of ASME B16.36-2015)

# Orifice Flanges

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

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Two Park Avenue • New York, NY • 10016 USA

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# FOREWORD

August of 1956 marked the first recorded correspondence noting the lack of standardization for orifice flanges. There were, and still are, several codes for the performance and calibration of orifice flanges, but there had been no standardization of the flanges themselves. Over the ensuing 3 years, correspondence continued among the Instrument Society of America, American Gas Association, and the B16 Standards Committee.

On December 3, 1959, Subcommittee 3 (now Subcommittee C) of B16 authorized the appointment of a Task Force to undertake drafting of a standard. Although the initial work progressed smoothly, a controversy developed over the standard size of taps to be specified for the flanges. This required many years to resolve. It was finally achieved in 1973 with the issuance of a draft from the Task Force. Comments and objections to this draft from members of Subcommittee C were resolved, and a redraft was approved by the Subcommittee late in 1974. The B16 Standards Committee was balloted in the spring of 1975 and approval was gained. Comments from B16 members from the gas industry requested that the Class 400 orifice flange be included, and the B16 Subcommittee C agreed to consider this for a possible addendum. The Standard was approved by ANSI on August 15, 1975.

On April 30, 1979, an addenda was issued, which added Class 400 flanges and Mandatory Appendix II covering reference documents and organizations.

In 1982, American National Standards Committee B16 was reorganized as an ASME Committee operating under procedures accredited by ANSI. In the 1988 edition, figures were added to illustrate jack bolts and corner taps, metric units were omitted, and references to other standards were updated. Following approval by the B16 Main Committee and the ASME Supervisory Board, the Standard was approved as an American National Standard by ANSI on February 18, 1988.

In 1996, several revisions were made, including the addition of angular meter taps for ring joint flanges in sizes not previously covered. Following approval by the B16 Main Committee and the ASME Supervisory Board, the Standard was approved as an American National Standard by ANSI on November 6, 1996.

In 2006, several revisions were made, including the use of metric units as the primary reference units, while maintaining U.S. Customary units in either parenthetical or separate forms. Changes to dimensions and nomenclature followed that were contained within the 2003 edition of ASME B16.5. This includes the change of minimum flange thickness from  $C$  to  $t_f$  and corrections for  $Y_1$  and  $Y_2$ . Class 400 remains in U.S. Customary tables in Mandatory Appendix II, but is not given in the metric dimensional tables. There were numerous requirement clarifications and editorial revisions. Following the approvals of the Standards Committee and ASME, approval for the new edition was granted by the American National Standards Institute on November 6, 2006.

In the 2009 edition, Mandatory Appendix III was revised and updated. Also, section 4, the materials section, was revised to cover requirements of material specification editions other than those listed in Mandatory Appendix III of ASME B16.5.

In ASME B16.36-2020, the U.S. Customary tables in former Mandatory Appendix I have been merged with the SI tables in the main text. The tables and figures have been redesignated, former Mandatory Appendix I has been deleted, and subsequent Mandatory Appendices have been redesignated. Cross-references have been updated accordingly. In addition, this edition adds caution regarding O.D. of raised faces, updates requirements for nipple connections, and clarifies several sections. Following approval by the ASME B16 Standards Committee, this revision to the 2015 edition was approved as an American National Standard by ANSI on December 4, 2020, with the designation ASME B16.36-2020.

# ASME B16 COMMITTEE

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(The following is the roster of the Committee at the time of approval of this Standard.)

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Secretary, B16 Standards Committee  
The American Society of Mechanical Engineers  
Two Park Avenue  
New York, NY 10016-5990  
<http://go.asme.org/Inquiry>

**Proposing Revisions.** Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

**Proposing a Case.** Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

**Interpretations.** Upon request, the B16 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B16 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may e-mail the request to the Secretary of the B16 Standards Committee at [SecretaryB16@asme.org](mailto:SecretaryB16@asme.org), or mail it to the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.



Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

**Attending Committee Meetings.** The B16 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B16 Standards Committee.



# ASME B16.36-2020

## SUMMARY OF CHANGES

Following approval by the ASME B16 Standards Committee and ASME, and after public review, ASME B16.36-2020 was approved by the American National Standards Institute on December 4, 2020.

In ASME B16.36-2020, the U.S. Customary tables in former Mandatory Appendix I have been merged with the SI tables in the main text. The tables and figures have been redesignated, former Mandatory Appendix I has been deleted, and subsequent Mandatory Appendices have been redesignated. Cross-references have been updated accordingly. In addition, this edition includes the following changes identified by a margin note, **(20)**. The Record Numbers listed below are explained in more detail in the “List of Changes in Record Number Order” following this Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
<a href="#">1</a>	1	Subparagraphs (a) and (b) revised and subpara. (c) deleted (18-2822)
<a href="#">1</a>	2.3	Last two sentences revised (18-2822)
<a href="#">1</a>	2.5.1	Revised (18-2822)
<a href="#">1</a>	4.1	Revised (18-2822)
<a href="#">2</a>	4.2	Revised (18-2822)
	8.2	Revised in its entirety (18-2822)
<a href="#">2</a>	9	(1) In para. 9.1, last sentence in second paragraph deleted (18-2822) (2) Paragraphs 9.2 and 9.3 revised in their entirety (18-2822)
<a href="#">3</a>	11	Revised (18-2808)
<a href="#">23</a>	Figure 9.3.2-1	Added (18-2822)
<a href="#">27</a>	Mandatory Appendix II	Former Mandatory Appendix III redesignated and updated (18-2822)

## LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
18-2808	Revised section 11 to include requirements so that flanges with ring joint flanges have a minimum thickness at the ring groove.
18-2822	Revised sections 1, 2, and 3, and para. 2.5.1 to clarify and simplify language. Revised para. 8.2 to correct caution regarding O.D. of raised faces. Revised paras. 9.1, 9.2.1, 9.2.2, 9.3, and added new paras. 9.3.1 and 9.3.2, and new Figure 9.3.2-1 to clarify requirements and add nipple connection requirements. Revised paras. 4.1 and 4.2 to clarify and simplify language and add permission to weld when nipples are specified. Updated references in Mandatory Appendix II (former Mandatory Appendix III).

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# ORIFICE FLANGES

## (20) 1 SCOPE

This Standard covers pressure-temperature ratings, materials, dimensions, tolerances, testing, and making of flanges (similar to those covered in ASME B16.5) that have orifice pressure differential connections. Coverage is limited to the following:

- (a) welding neck flanges Classes 300, 400, 600, 900, 1500, and 2500
- (b) slip-on and threaded Class 300

## 2 GENERAL

### 2.1 References

Codes, standards, and specifications containing provisions to the extent referenced herein constitute requirements of this Standard. These reference documents are listed in [Mandatory Appendix II](#).

### 2.2 Quality Systems

Nonmandatory requirements relating to the product manufacturer's Quality System Program are described in [Nonmandatory Appendix A](#).

## (20) 2.3 Relevant Units

This Standard states values in both SI (Metric) and U.S. Customary units. As an exception, diameter of bolts and flange bolt holes are expressed in inch units only. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, it is required that each system of units be used independently of the other. Except for diameter of bolts and flange bolt holes, combining values from the two systems constitutes nonconformance with the Standard. The main text of this Standard does not contain requirements expressed in SI units for Class 400 flanges; however, [Mandatory Appendix I](#) does contain requirements for this class, expressed in U.S. Customary units only.

### 2.4 Convention

For determining conformance with this Standard, the convention for fixing significant digits where limits (maximum and minimum values) are specified shall be as defined in ASTM E29. This requires that an observed or calculated value be rounded off to the nearest unit in the

last right-hand digit used for expressing the limit. Decimal values and tolerances do not imply a particular method of measurement.

## 2.5 Denotation

**2.5.1 Pressure Rating Designation.** Class, followed by a dimensionless number, is the designation for pressure-temperature ratings as follows: Classes 300, 400, 600, 900, 1500, and 2500.

**2.5.2 Sizes.** NPS, followed by a dimensionless number, is the designation for the nominal flange size. NPS is related to the reference nominal diameter, DN, used in international standards. The relationship is, typically, as follows:

NPS	DN
1	25
1½	40
2	50
2½	65
3	80
4	100

GENERAL NOTE: For  $NPS \geq 4$ , the related  $DN = 25 \times (NPS)$ .

## 2.6 Service Conditions

Criteria for selection of materials suitable for the particular fluid service are not within the scope of this Standard.

## 3 PRESSURE-TEMPERATURE RATINGS

The pressure-temperature ratings, including all use recommendations and limitations, and the method of rating given in ASME B16.5 apply to these flanges.

## 4 MATERIAL

### 4.1 General

Flange materials shall be in accordance with the requirements of ASME B16.5. Flanges shall be manufactured as one piece in accordance with the applicable materials specification. Except when the purchaser chooses flanges with nipples welded to the flange taps, assembly of multiple pieces into the finished product by welding or other means is not permitted by this Standard.



**(20) 4.2 Bolting**

Bolting material recommendations are given in ASME B16.5.

**4.3 Materials Manufactured to Other Editions**

Materials may meet the requirements of material specification editions other than those listed in ASME B16.5, Mandatory Appendix II, provided

(a) the materials are the same specification, e.g., grade, type, class, or alloy, and heat-treated conditions, as applicable

(b) the flange manufacturer certifies that the requirements of the edition of the specification listed in ASME B16.5, Mandatory Appendix II have been met

**4.4 Plugs**

Pressure-retaining plugs shall conform to ASME B16.11, unless otherwise agreed between purchaser and manufacturer. Plug material shall be at least as corrosion resistant as the corresponding flange material.

**5 SIZE**

Orifice flange sizes are indicated by the nominal pipe size to which they are attached. Only those listed in [Tables 5.1](#) through [5.5](#) and [Mandatory Appendix I](#) are considered standard.

**6 MARKING**

Flanges shall be marked as required in ASME B16.5. For welding neck flanges only, the bore diameter shall be marked.

**7 FLANGE FACING FINISH**

The finish of contact faces shall conform to the requirements of ASME B16.5.

**8 GASKETS FOR RAISED FACE FLANGES**

Changing the distance from the face of the flange to the tap centerline may also be accomplished by changing the raised face height. If flat gaskets are being used and the raised face is completely removed, the user is cautioned to limit the outside diameter of the gasket or orifice plate to the outside diameter of raised face,  $R$ , in order to ensure proper gasket compression.

**9 PRESSURE TAPS****(20)****9.1 General**

Each orifice flange shall be provided with two pressure tap holes extending radially from the outside diameter of the flange to the inside diameter of the flange. Corner taps may be used on NPS 1½ and smaller if space permits. See [Figure 9.1-1](#).

For ring joint flanges listed in [Tables 5-2](#) through [5-5](#), and [Mandatory Appendix I](#), where radial taps will interfere with the ring groove, angular meter taps, as illustrated in [Figure 9.1-2](#), will be required.

**9.2 Location**

**9.2.1 Measurement.** The distance between the centerline of the tap and the face of the flange shall be measured at the bore. Dimensions different than those shown in the tables may be supplied by agreement between the purchaser and manufacturer.

**9.2.2 Identification.** When methods other than those described in this Standard are used for ring joint flanges requiring changes to the pressure tap location due to interference with the ring groove, such changes shall be identified as agreed by purchaser and manufacturer.

**9.3 Pipe Connection**

Unless otherwise specified by the purchaser, orifice flanges shall be supplied with NPS ½ threaded connections.

**9.3.1 NPS ½ Taps.** Pressure tap connections may be



(d) be at least as corrosion resistant as the corresponding flange material

Welding shall be in accordance with the requirements of ASME B31.1 or ASME B31.3. The NPS  $\frac{1}{2}$  nipple shall be socket welded to the flange. The NPS  $\frac{3}{4}$  nipple shall be full penetration groove welded to the flange as illustrated in Figure 9.3.2-1.

## 10 JACK SCREW PROVISION

### 10.1 Location

Each flange shall have a machine bolt mounted in a hole drilled on the flange bolt circle centerline at 90 deg from the pressure taps, for use as a jack screw. The machine bolt shall be regular with one heavy hex nut. See Figure 10.1-1.

### 10.2 Slot for Nut

A slot shall be provided in the flange 2 mm (0.06 in.) wider than the width across flats of the nut. The depth of the slot shall admit the nut so that there is no interference with the joining of the flanges when bolted together without orifice plate.

### 10.3 Tapped Hole

As an alternative to para. 10.2, a tapped hole may be provided and the hex nut omitted when agreed on between the purchaser and the manufacturer.

## (20) 11 FLANGE DIMENSIONS

Dimensions are listed in Tables 5-1 through 5-5.

For flanges that have a ring-type joint facing, the flange thickness from back of the flange to the bottom of a ring joint groove shall be at least equal to the minimum flange thickness,  $t_f$ . This requirement is illustrated in Tables 5-2 through 5-5 and Table I-1.

## 12 FLANGE THREADS

Threaded flanges shall have an American National Standard taper pipe thread conforming to ASME B1.20.1.

(a) The thread shall be concentric with the axis of the flange. Variations in alignment shall not exceed 5 mm/m (0.06 in./ft).

(b) The flanges are made with counterbores at the back of the flange and the threads shall be chamfered to the diameter of the counterbore at an angle of approximately 45 deg with the axis of the thread to afford easy entrance in making a joint. The counterbore and chamfer shall be concentric with the thread.

(c) In order to permit the pipe to be inserted into the face of the flange, the threads should have full root diameters through to the face of the flange, or shall have a counterbore at the face of the flange.

(d) The gaging notch of the working gage shall come flush with the bottom of the chamfer in all threaded flanges and shall be considered as being the intersection of the chamfer cone and the pitch cone of the thread. This depth of chamfer is approximately equal to one-half the pitch of the thread.

(e) The maximum allowable thread variation is one turn large or small from the gaging notch.

## 13 TOLERANCES

Tolerances on all dimensions shall be as shown in ASME B16.5 except for those shown below.

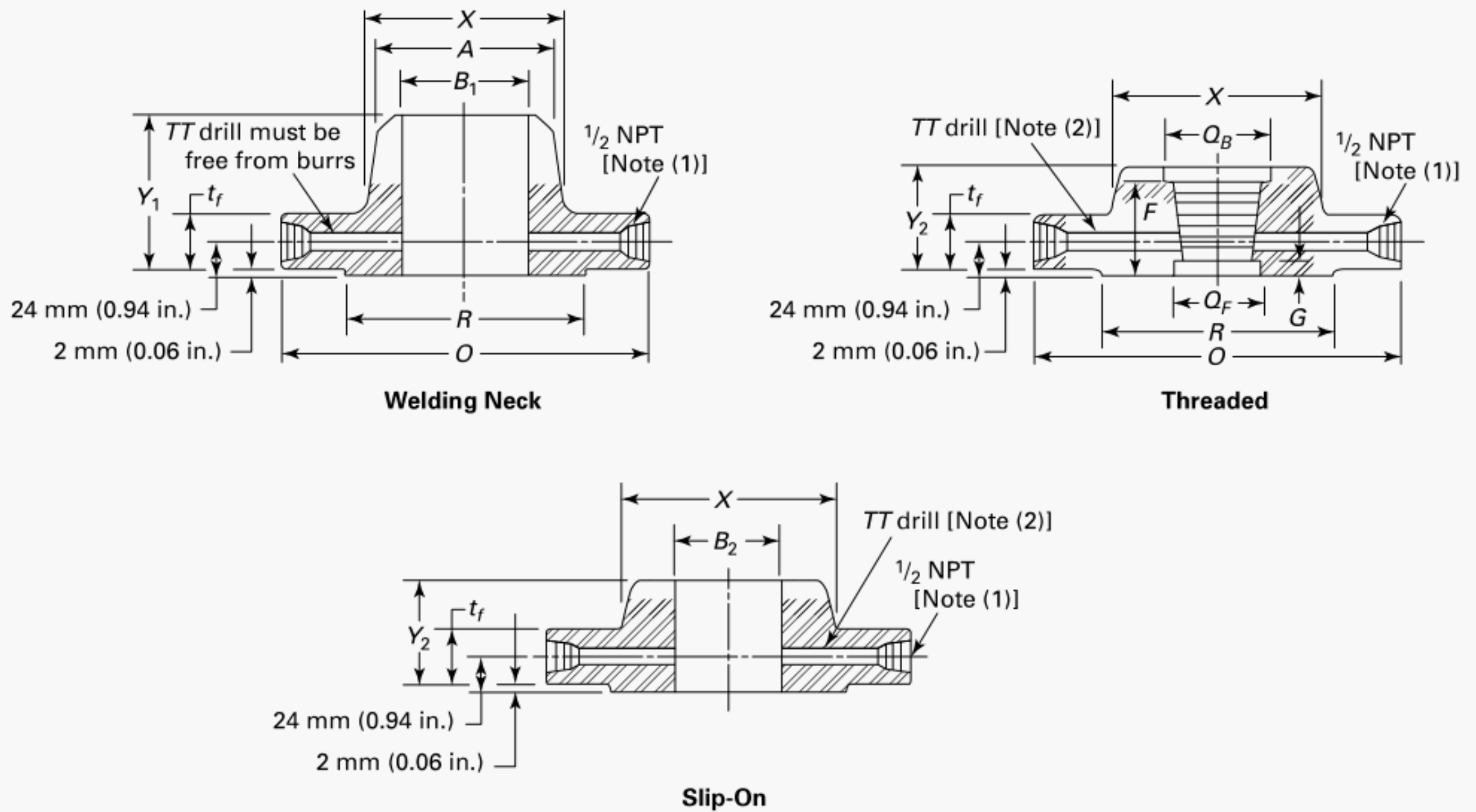
### 13.1 Pressure Tap Location

Tolerance on location of center of pressure tap hole from flange face (see para. 9.2) shall be

- (a)  $\pm 0.5$  mm ( $\pm 0.02$  in.) for flanges smaller than NPS 4
- (b)  $\pm 0.8$  mm ( $\pm 0.03$  in.) for flanges NPS 4 and larger

### 13.2 Bore Diameter

Bore diameter tolerance (welding neck flanges only) is  $\pm 0.5\%$  of nominal value.

**Table 5-1 Class 300 Orifice Flanges, Welding Neck, Threaded, and Slip-On**

Nominal Pipe Size	Outside Diameter of Raised Face, $R$	Outside Diameter of Flange, $O$	Minimum Thickness of Flange, $t_f$	Length Through Hub			Hub Diameter Beginning of Chamfer (W.N.), $A$	Diameter of Counterbore		Counterbore Depth (From Face)	
				Slip-On and Threaded, $Y_2$	Welding Neck, $Y_1$	Diameter of Hub, $X$		Back, $Q_B$	Face, $Q_F$	$F$	$G$
1	50.8 (2.00)	125 (4.88)	36.6 (1.44)	46 (1.81)	81 (3.19)	54 (2.12)	33.4 (1.32)	35.8 (1.41)	33.0 (1.30)	36.5 (1.44)	19.0 (0.75)
1½	73.0 (2.88)	155 (6.12)	36.6 (1.44)	46 (1.81)	84 (3.31)	70 (2.75)	48.3 (1.90)	50.5 (1.99)	48.0 (1.89)	37.3 (1.47)	18.3 (0.72)
2	92.1 (3.62)	165 (6.50)	36.6 (1.44)	48 (1.88)	84 (3.31)	84 (3.31)	60.3 (2.38)	63.5 (2.50)	59.9 (2.36)	38.1 (1.50)	17.5 (0.69)
2½	104.8 (4.12)	190 (7.50)	36.6 (1.44)	49 (1.94)	87 (3.44)	100 (3.94)	73.0 (2.88)	76.2 (3.00)	72.1 (2.84)	44.4 (1.75)	14.3 (0.56)
3	127.0 (5.00)	210 (8.25)	36.6 (1.44)	51 (2.00)	87 (3.44)	117 (4.62)	88.9 (3.50)	92.2 (3.63)	87.9 (3.46)	46.0 (1.81)	14.3 (0.56)
4	157.2 (6.19)	255 (10.00)	36.6 (1.44)	52 (2.06)	90 (3.56)	146 (5.75)	114.3 (4.50)	117.6 (4.63)	113.0 (4.45)	47.6 (1.88)	14.3 (0.56)
6	215.9 (8.50)	320 (12.50)	36.6 (1.44)	52 (2.06)	98 (3.88)	206 (8.12)	168.3 (6.63)	171.4 (6.75)	166.9 (6.57)	47.6 (1.88)	7.9 (0.31)
8	269.9 (10.62)	380 (15.00)	39.7 (1.56)	60 (2.38)	110 (4.31)	260 (10.25)	219.1 (8.63)	222.2 (8.75)	217.2 (8.55)	55.6 (2.19)	11.1 (0.44)
10	323.8 (12.75)	445 (17.50)	46.1 (1.81)	65 (2.56)	116 (4.56)	321 (12.62)	273.0 (10.75)	(6)	(6)	(6)	(6)
12	381.0 (15.00)	520 (20.50)	49.3 (1.94)	71 (2.81)	129 (5.06)	375 (14.75)	323.8 (12.75)	(6)	(6)	(6)	(6)
14	412.8 (16.25)	585 (23.00)	52.4 (2.06)	75 (2.94)	141 (5.56)	425 (16.75)	355.6 (14.00)	(6)	(6)	(6)	(6)
16	469.9 (18.50)	650 (25.50)	55.6 (2.19)	81 (3.19)	144 (5.69)	483 (19.00)	406.4 (16.00)	(6)	(6)	(6)	(6)
18	533.4 (21.00)	710 (28.00)	58.8 (2.31)	87 (3.44)	157 (6.19)	533 (21.00)	457.0 (18.00)	(6)	(6)	(6)	(6)
20	584.2 (23.00)	775 (30.50)	62.0 (2.44)	94 (3.69)	160 (6.31)	587 (23.12)	508.0 (20.00)	(6)	(6)	(6)	(6)
24	692.2 (27.25)	915 (36.00)	68.3 (2.69)	105 (4.12)	167 (6.56)	702 (27.62)	610.0 (24.00)	(6)	(6)	(6)	(6)



**Table 5-1 Class 300 Orifice Flanges, Welding Neck, Threaded, and Slip-On**

Bore		Drilling Template					Bolt Length [(3), (4)]		
Slip-On, $B_2$	Welding Neck, $B_1$	Diameter of Pressure Connection, $TT$	Bolt Circle	Number of Holes	Diameter of Holes	Diameter of Bolts	Machine Bolts	Stud Bolts	Nominal Pipe Size
34.5 (1.36)	(5)	6.4 ( $\frac{1}{4}$ )	88.9 (3.50)	4	$\frac{11}{16}$	$\frac{5}{8}$	115 (4.50)	125 (5.00)	1
49.5 (1.95)	(5)	6.4 ( $\frac{1}{4}$ )	114.3 (4.50)	4	$\frac{13}{16}$	$\frac{3}{4}$	120 (4.75)	135 (5.25)	1½
61.9 (2.44)	(5)	6.4 ( $\frac{1}{4}$ )	127.0 (5.00)	8	$\frac{11}{16}$	$\frac{5}{8}$	115 (4.50)	125 (5.00)	2
74.6 (2.94)	(5)	6.4 ( $\frac{1}{4}$ )	149.2 (5.88)	8	$\frac{13}{16}$	$\frac{3}{4}$	120 (4.75)	135 (5.25)	2½
90.7 (3.57)	(5)	9.5 ( $\frac{8}{3}$ )	168.3 (6.62)	8	$\frac{13}{16}$	$\frac{3}{4}$	120 (4.75)	135 (5.25)	3
116.1 (4.57)	(5)	12.7 ( $\frac{1}{2}$ )	200.0 (7.88)	8	$\frac{13}{16}$	$\frac{3}{4}$	120 (4.75)	135 (5.25)	4
170.7 (6.72)	(5)	12.7 ( $\frac{1}{2}$ )	269.9 (10.62)	12	$\frac{7}{8}$	$\frac{3}{4}$	120 (4.75)	135 (5.25)	6
221.5 (8.72)	(5)	12.7 ( $\frac{1}{2}$ )	330.2 (13.00)	12	1	$\frac{7}{8}$	125 (5.00)	145 (5.75)	8
276.2 (10.88)	(5)	12.7 ( $\frac{1}{2}$ )	387.4 (15.25)	16	1½	1	145 (5.75)	165 (6.50)	10
327.0 (12.88)	(5)	12.7 ( $\frac{1}{2}$ )	450.8 (17.75)	16	1¼	1½	160 (6.25)	180 (7.00)	12
359.2 (14.14)	(5)	12.7 ( $\frac{1}{2}$ )	514.4 (20.25)	20	1¼	1½	165 (6.50)	185 (7.25)	14
410.5 (16.16)	(5)	12.7 ( $\frac{1}{2}$ )	571.5 (22.50)	20	1¾	1¼	180 (7.00)	195 (7.75)	16
461.8 (18.18)	(5)	12.7 ( $\frac{1}{2}$ )	628.6 (24.75)	24	1¾	1¼	185 (7.25)	205 (8.00)	18
513.1 (20.20)	(5)	12.7 ( $\frac{1}{2}$ )	685.8 (27.00)	24	1¾	1¼	190 (7.50)	215 (8.50)	20
616.0 (24.25)	(5)	12.7 ( $\frac{1}{2}$ )	812.8 (32.00)	24	1½	1½	210 (8.25)	240 (9.50)	24



**Table 5-1 Class 300 Orifice Flanges, Welding Neck, Threaded, and Slip-On (Cont'd)**

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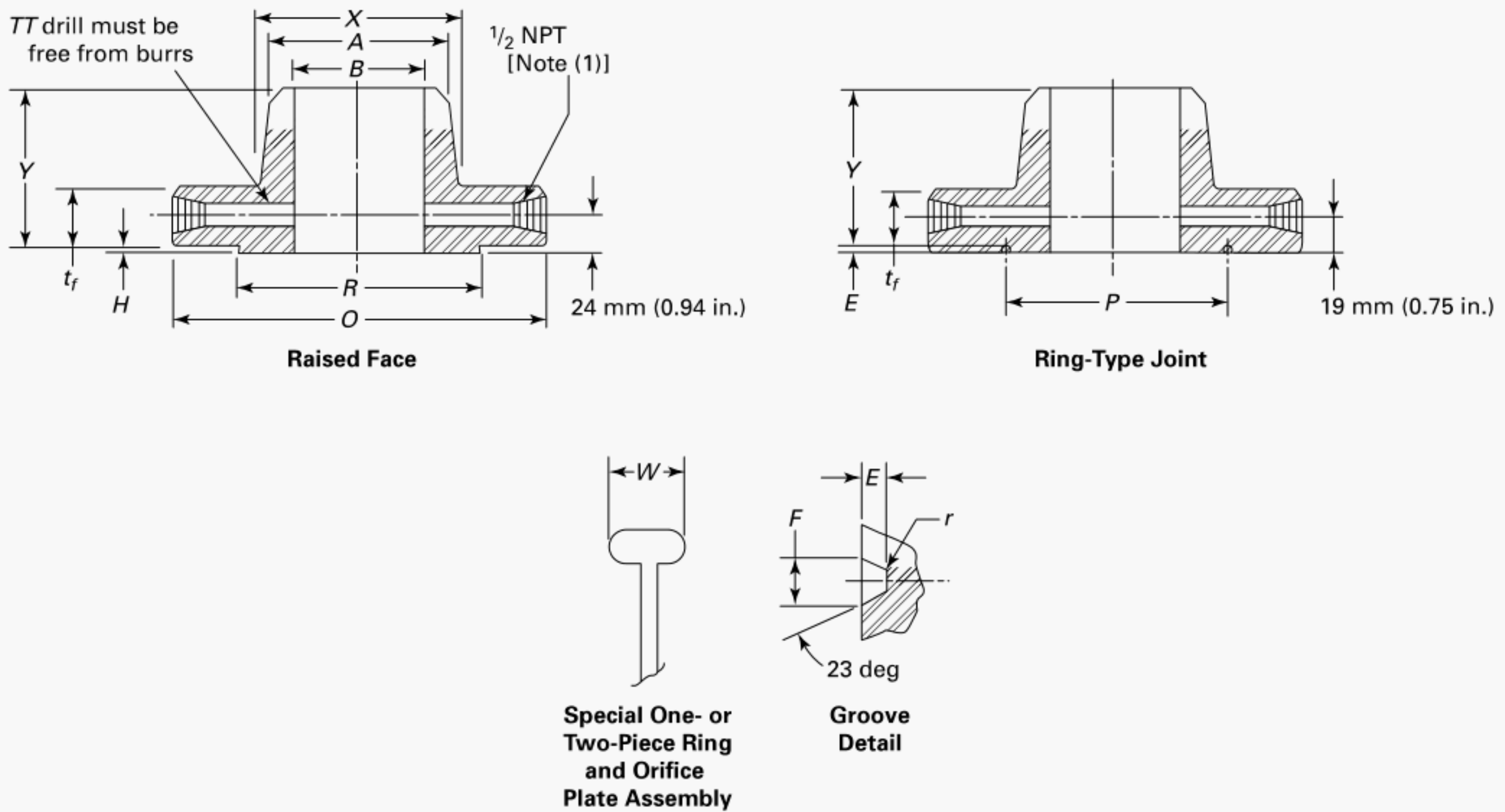
GENERAL NOTES:

- (a) Dimensions are in millimeters (inches). For bolts and bolt holes, dimensions are in inches.
- (b) Welding neck flanges NPS 3 and smaller are dimensionally identical to Class 600 flanges and may be so marked.
- (c) All other dimensions are in accordance with ASME B16.5.

NOTES:

- (1) Other NPT sizes may be furnished if required.
- (2) For slip-on and threaded flanges, verify that *TT* drilling extends to inside diameter of pipe after assembly and is free from burrs.
- (3) Bolt lengths include allowance for orifice and gasket thickness of 6 mm (0.25 in.) for NPS 1 to NPS 12 and 10 mm (0.38 in.) for NPS 14 to NPS 24.
- (4) In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- (5) Bore diameter of welding neck flanges is to be specified by the purchaser.
- (6) Threaded flanges are furnished in NPS 1 to NPS 8 only.

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**Table 5-2 Class 600 Orifice Flanges, Welding Neck****Ring-Type Joint**

Nomi- nal Pipe Size	Outside Diameter of Raised Face, <i>R</i>	Outside Diameter of Flange, <i>O</i>	Minimum Thickness of Flange, <i>t<sub>f</sub></i>	Length Through Hub, <i>Y</i>	Height of Raised Face, <i>H</i>	Groove Number	Pitch Diameter, <i>P</i>	Groove Depth, <i>E</i>	Groove Width, <i>F</i>	Radius at Bottom, <i>r</i>	Special Oval Ring Height, <i>W</i>
1	50.8 (2.00)	125 (4.88)	36.6 (1.44)	81 (3.19)	2 (0.06)	R16	50.80 (2.000)	6.35 (0.250)	8.74 (0.344)	0.8 (0.03)	25.4 (1.00)
1½	73.0 (2.88)	155 (6.12)	36.6 (1.44)	84 (3.32)	2 (0.06)	R20	68.27 (2.688)	6.35 (0.250)	8.74 (0.344)	0.8 (0.03)	25.4 (1.00)
2	92.1 (3.62)	165 (6.50)	36.6 (1.44)	84 (3.32)	2 (0.06)	R23	82.55 (3.250)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
2½	104.8 (4.12)	190 (7.50)	36.6 (1.44)	87 (3.44)	2 (0.06)	R26	101.60 (4.000)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
3	127.0 (5.00)	210 (8.25)	36.6 (1.44)	87 (3.44)	2 (0.06)	R31	123.83 (4.875)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
4	157.2 (6.19)	275 (10.75)	38.1 (1.50)	102 (4.00)	7 (0.25)	R37	149.23 (5.875)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
6	215.9 (8.50)	355 (14.00)	47.7 (1.88)	117 (4.62)	7 (0.25)	R45	211.12 (8.312)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
8	269.9 (10.62)	420 (16.50)	55.6 (2.19)	133 (5.25)	7 (0.25)	R49	269.88 (10.625)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
10	323.8 (12.75)	510 (20.00)	63.5 (2.50)	152 (6.00)	7 (0.25)	R53	323.85 (12.750)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
12	381.0 (15.00)	560 (22.00)	66.7 (2.62)	156 (6.12)	7 (0.25)	R57	381.00 (15.000)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
14	412.8 (16.25)	605 (23.75)	69.9 (2.75)	165 (6.50)	7 (0.25)	R61	419.10 (16.500)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
16	469.9 (18.50)	685 (27.00)	76.2 (3.00)	178 (7.00)	7 (0.25)	R65	469.90 (18.500)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	30.2 (1.19)
18	533.4 (21.00)	745 (29.25)	82.6 (3.25)	184 (7.25)	7 (0.25)	R69	533.40 (21.000)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	30.2 (1.19)
20	584.2 (23.00)	815 (32.00)	88.9 (3.50)	190 (7.50)	7 (0.25)	R73	584.20 (23.000)	9.53 (0.375)	13.49 (0.531)	1.5 (0.06)	31.8 (1.25)
24	692.2 (27.25)	940 (37.00)	101.6 (4.00)	203 (8.00)	7 (0.25)	R77	692.15 (27.250)	11.13 (0.438)	16.66 (0.656)	1.5 (0.06)	36.5 (1.44)

**Table 5-2 Class 600 Orifice Flanges, Welding Neck**

Drilling Template											
Diameter of Hub, <i>X</i>	Hub Diameter Beginning of Chamfer, <i>A</i>	Bore, <i>B</i>	Diameter of Pressure Connection, <i>TT</i>	Bolt Circle	Number of Holes	Diameter of Holes		Diameter of Bolts	Length of Stud Bolts [(2), (3)]		Nominal Pipe Size
						Raised Face	Ring Joint		Raised Face	Ring Joint	
54 (2.12)	33.5 (1.32)	(4)	6.4 ( $\frac{1}{4}$ )	88.9 (3.50)	4	$\frac{11}{16}$ (0.69)	$\frac{3}{4}$ (0.75)	$\frac{5}{8}$	125 (5.00)	140 (5.50)	1
70 (2.75)	48.3 (1.90)	(4)	6.4 ( $\frac{1}{4}$ )	114.3 (4.50)	4	$\frac{13}{16}$ (0.69)	$\frac{7}{8}$ (0.75)	$\frac{3}{4}$	135 (5.25)	140 (5.50)	1½
84 (3.31)	60.3 (2.38)	(4)	6.4 ( $\frac{1}{4}$ )	127.0 (5.00)	8	$\frac{11}{16}$ (0.69)	$\frac{3}{4}$ (0.75)	$\frac{5}{8}$	125 (5.00)	140 (5.50)	2
100 (3.94)	73.0 (2.88)	(4)	6.4 ( $\frac{1}{4}$ )	149.2 (5.88)	8	$\frac{13}{16}$ (0.81)	$\frac{7}{8}$ (0.88)	$\frac{3}{4}$	135 (5.00)	145 (5.50)	2½
117 (4.62)	88.9 (3.50)	(4)	9.5 ( $\frac{8}{3}$ )	168.3 (6.62)	8	$\frac{13}{16}$ (0.81)	$\frac{7}{8}$ (0.88)	$\frac{3}{4}$	135 (5.25)	145 (5.75)	3
152 (6.00)	114.3 (4.50)	(4)	12.7 ( $\frac{1}{2}$ )	215.9 (8.50)	8	1 (1.00)	1 (1.00)	$\frac{7}{8}$	150 (6.00)	165 (6.50)	4
222 (8.75)	168.3 (6.63)	(4)	12.7 ( $\frac{1}{2}$ )	292.1 (11.50)	12	$1\frac{1}{8}$ (1.12)	$1\frac{1}{8}$ (1.12)	1	180 (7.00)	190 (7.50)	6
273 (10.75)	219.1 (8.63)	(4)	12.7 ( $\frac{1}{2}$ )	349.2 (13.75)	12	$1\frac{1}{4}$ (1.25)	$1\frac{1}{4}$ (1.25)	$1\frac{1}{8}$	195 (7.75)	210 (8.25)	8
343 (13.50)	273.0 (10.75)	(4)	12.7 ( $\frac{1}{2}$ )	431.8 (17.00)	16	$1\frac{3}{8}$ (1.38)	$1\frac{3}{8}$ (1.38)	$1\frac{1}{4}$	220 (8.75)	235 (9.25)	10
400 (15.75)	323.8 (12.75)	(4)	12.7 ( $\frac{1}{2}$ )	489.0 (19.25)	20	$1\frac{3}{8}$ (1.38)	$1\frac{3}{8}$ (1.38)	$1\frac{1}{4}$	230 (9.00)	240 (9.50)	12
432 (17.00)	355.6 (14.00)	(4)	12.7 ( $\frac{1}{2}$ )	527.0 (20.75)	20	$1\frac{1}{2}$ (1.50)	$1\frac{1}{2}$ (1.50)	$1\frac{3}{8}$	240 (9.50)	255 (10.00)	14
495 (19.50)	406.4 (16.00)	(4)	12.7 ( $\frac{1}{2}$ )	603.2 (23.75)	20	$1\frac{5}{8}$ (1.62)	$1\frac{5}{8}$ (1.62)	$1\frac{1}{2}$	260 (10.25)	275 (10.75)	16
546 (21.50)	457.2 (18.00)	(4)	12.7 ( $\frac{1}{2}$ )	654.0 (25.75)	20	$1\frac{3}{4}$ (1.75)	$1\frac{3}{4}$ (1.75)	$1\frac{5}{8}$	280 (11.00)	290 (11.50)	18
610 (24.00)	508.0 (20.00)	(4)	12.7 ( $\frac{1}{2}$ )	723.9 (28.50)	24	$1\frac{3}{4}$ (1.75)	$1\frac{3}{4}$ (1.75)	$1\frac{5}{8}$	300 (11.75)	320 (12.50)	20
718 (28.25)	609.6 (24.00)	(4)	12.7 ( $\frac{1}{2}$ )	838.2 (33.00)	24	2 (2.00)	2 (2.00)	$1\frac{7}{8}$	335 (13.25)	350 (13.75)	24



**Table 5-2 Class 600 Orifice Flanges, Welding Neck (Cont'd)**

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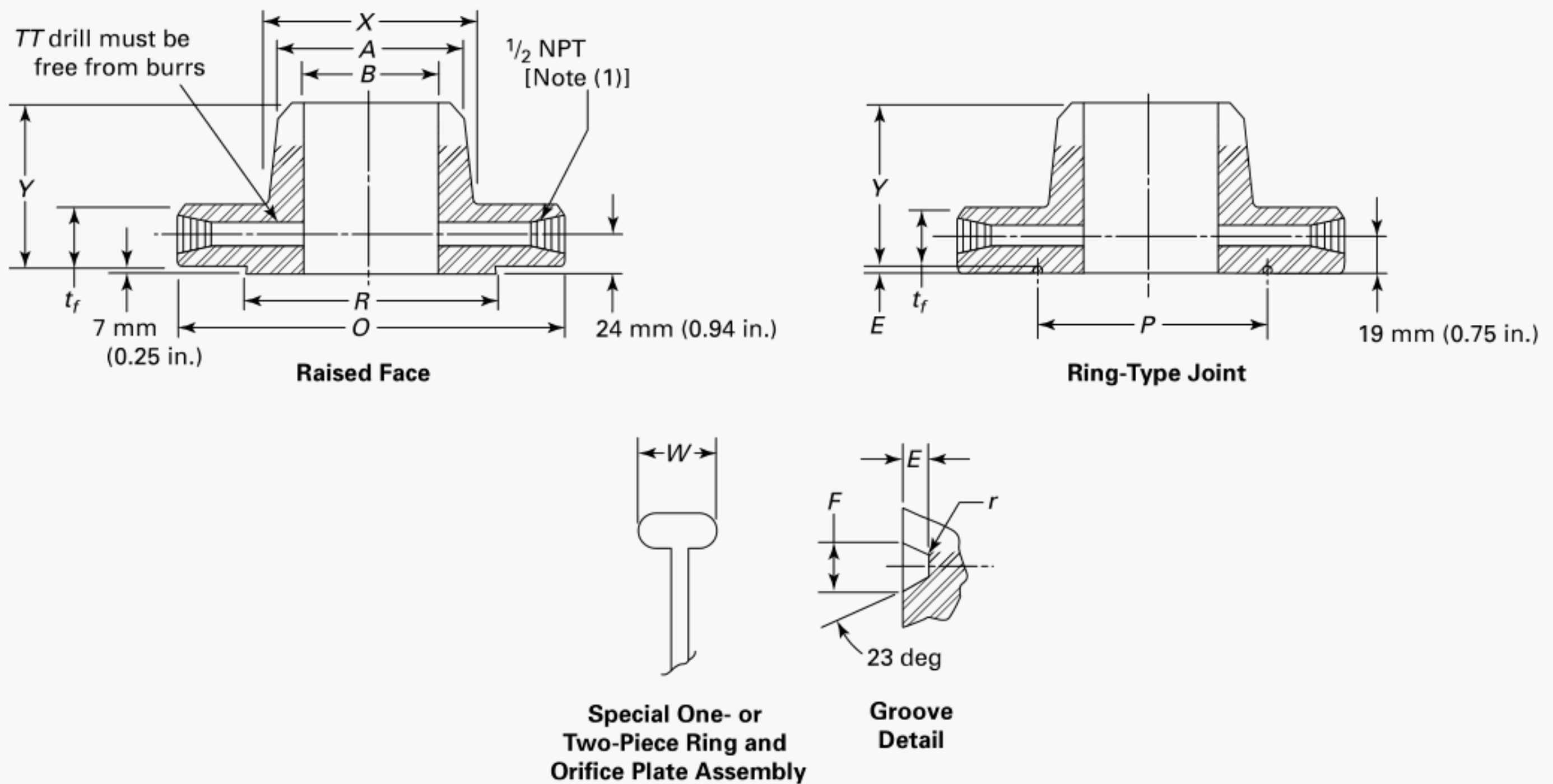
GENERAL NOTES:

- (a) Dimensions are in millimeters (inches). For bolt and bolt holes, dimensions are in inches.
- (b) Welding neck flanges NPS 3 and smaller are identical to Class 300 flanges except for bolting and may be used for such service.
- (c) All other dimensions are in accordance with ASME B16.5.
- (d) Ring joint flange in NPS 24 will require an angular meter tap as shown in [Figure 9.1-2](#).

NOTES:

- (1) Other NPT sizes may be furnished if required.
- (2) In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- (3) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 6 mm (0.25 in.) for NPS 1 to NPS 12 and 10 mm (0.38 in.) for NPS 14 to NPS 24. Bolt lengths for ring-type joint flanges include allowance of 15 mm (0.62 in.) for NPS 1 to NPS 10, 19 mm (0.75 in.) for NPS 12 to NPS 18, and 22 mm (0.88 in.) for NPS 20.
- (4) Bore is to be specified by the purchaser.

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**Table 5-3 Class 900 Orifice Flanges, Welding Neck**

Nominal Pipe Size	Outside Diameter of Raised Face, <i>R</i>	Outside Diameter of Flange, <i>O</i>	Minimum Thickness of Flange, <i>t<sub>f</sub></i>	Length Through Hub, <i>Y</i>	Ring-Type Joint					Special Oval Ring Height, <i>W</i>
					Groove Number	Pitch Diameter, <i>P</i>	Groove Depth, <i>E</i>	Groove Width, <i>F</i>	Radius at Bottom, <i>r</i>	
1	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
1½	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
2	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
2½	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
3	127.0 (5.00)	240 (9.50)	38.1 (1.50)	102 (4.00)	R31	123.83 (4.875)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
4	157.2 (6.19)	290 (11.50)	44.5 (1.75)	114 (4.50)	R37	149.23 (5.875)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
6	215.9 (8.50)	380 (15.00)	55.6 (2.19)	140 (5.50)	R45	211.12 (8.312)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
8	269.9 (10.62)	470 (18.50)	63.5 (2.50)	162 (6.38)	R49	269.88 (10.625)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
10	323.8 (12.75)	545 (21.50)	69.9 (2.75)	184 (7.25)	R53	323.85 (12.750)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
12	381.0 (15.00)	610 (24.00)	79.4 (3.12)	200 (7.88)	R57	381.00 (15.000)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
14	412.8 (16.25)	640 (25.25)	85.8 (3.38)	213 (8.38)	R62	419.10 (16.500)	11.13 (0.438)	16.66 (0.656)	1.5 (0.06)	33.3 (1.31)
16	469.9 (18.50)	705 (27.75)	88.9 (3.50)	216 (8.50)	R66	469.90 (18.500)	11.13 (0.438)	16.66 (0.656)	1.5 (0.06)	36.5 (1.44)
18	533.4 (21.00)	785 (31.00)	101.6 (4.00)	229 (9.00)	R70	533.40 (21.000)	12.70 (0.500)	19.84 (0.781)	1.5 (0.06)	39.7 (1.56)
20	584.2 (23.00)	855 (33.75)	108.0 (4.25)	248 (9.75)	R74	584.20 (23.000)	12.70 (0.500)	19.84 (0.781)	1.5 (0.06)	39.7 (1.56)
24	692.2 (27.25)	1 040 (41.00)	139.7 (5.50)	292 (11.50)	R78	692.15 (27.250)	15.88 (0.625)	26.97 (1.062)	2.4 (0.09)	47.6 (1.88)

**Table 5-3 Class 900 Orifice Flanges, Welding Neck**

Diameter of Hub, <i>X</i>	Hub Diameter Beginning of Chamfer, <i>A</i>	Bore, <i>B</i>	Diameter of Pressure Connection, <i>TT</i>	Drilling Template				Length of Stud Bolts [(2), (3)]		Nominal Pipe Size
				Diameter of Bolt Circle	Number of Holes	Diameter of Holes	Diameter of Bolts	Raised Face	Ring Joint	
(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	1
(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	1½
(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	2
(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	2½
127 (5.00)	88.9 (3.50)	(5)	9.5 ( $\frac{8}{3}$ )	190.5 (7.50)	8	1 (1.00)	$\frac{7}{8}$	150 (6.00)	165 (6.50)	3
159 (6.25)	114.3 (4.50)	(5)	12.7 ( $\frac{1}{2}$ )	235.0 (9.25)	8	1¼ (1.25)	1⅝	180 (7.00)	190 (7.50)	4
235 (9.25)	168.3 (6.63)	(5)	12.7 ( $\frac{1}{2}$ )	317.5 (12.50)	12	1¼ (1.25)	1⅝	195 (7.75)	210 (8.25)	6
298 (11.75)	219.1 (8.63)	(5)	12.7 ( $\frac{1}{2}$ )	393.7 (15.50)	12	1½ (1.50)	1⅝	230 (9.00)	240 (9.50)	8
368 (14.50)	273.0 (10.75)	(5)	12.7 ( $\frac{1}{2}$ )	469.9 (18.50)	16	1½ (1.50)	1⅝	240 (9.50)	255 (10.00)	10
419 (16.50)	323.8 (12.75)	(5)	12.7 ( $\frac{1}{2}$ )	533.4 (21.00)	20	1½ (1.50)	1⅝	260 (10.25)	275 (10.75)	12
451 (17.75)	355.6 (14.00)	(5)	12.7 ( $\frac{1}{2}$ )	558.8 (22.00)	20	1⅝ (1.62)	1½	280 (11.00)	290 (11.50)	14
508 (20.00)	406.4 (16.00)	(5)	12.7 ( $\frac{1}{2}$ )	616.0 (24.25)	20	1¾ (1.75)	1⅝	290 (11.50)	305 (12.00)	16
565 (22.25)	457.2 (18.00)	(5)	12.7 ( $\frac{1}{2}$ )	685.8 (27.00)	20	2 (2.00)	1⅞	330 (13.00)	350 (13.75)	18
622 (24.50)	508.0 (20.00)	(5)	12.7 ( $\frac{1}{2}$ )	749.3 (29.50)	20	2⅛ (2.12)	2	355 (14.00)	375 (14.75)	20
749 (29.50)	609.6 (24.00)	(5)	12.7 ( $\frac{1}{2}$ )	901.7 (35.50)	20	2⅝ (2.62)	2½	445 (17.50)	470 (18.50)	24



**Table 5-3 Class 900 Orifice Flanges, Welding Neck (Cont'd)**

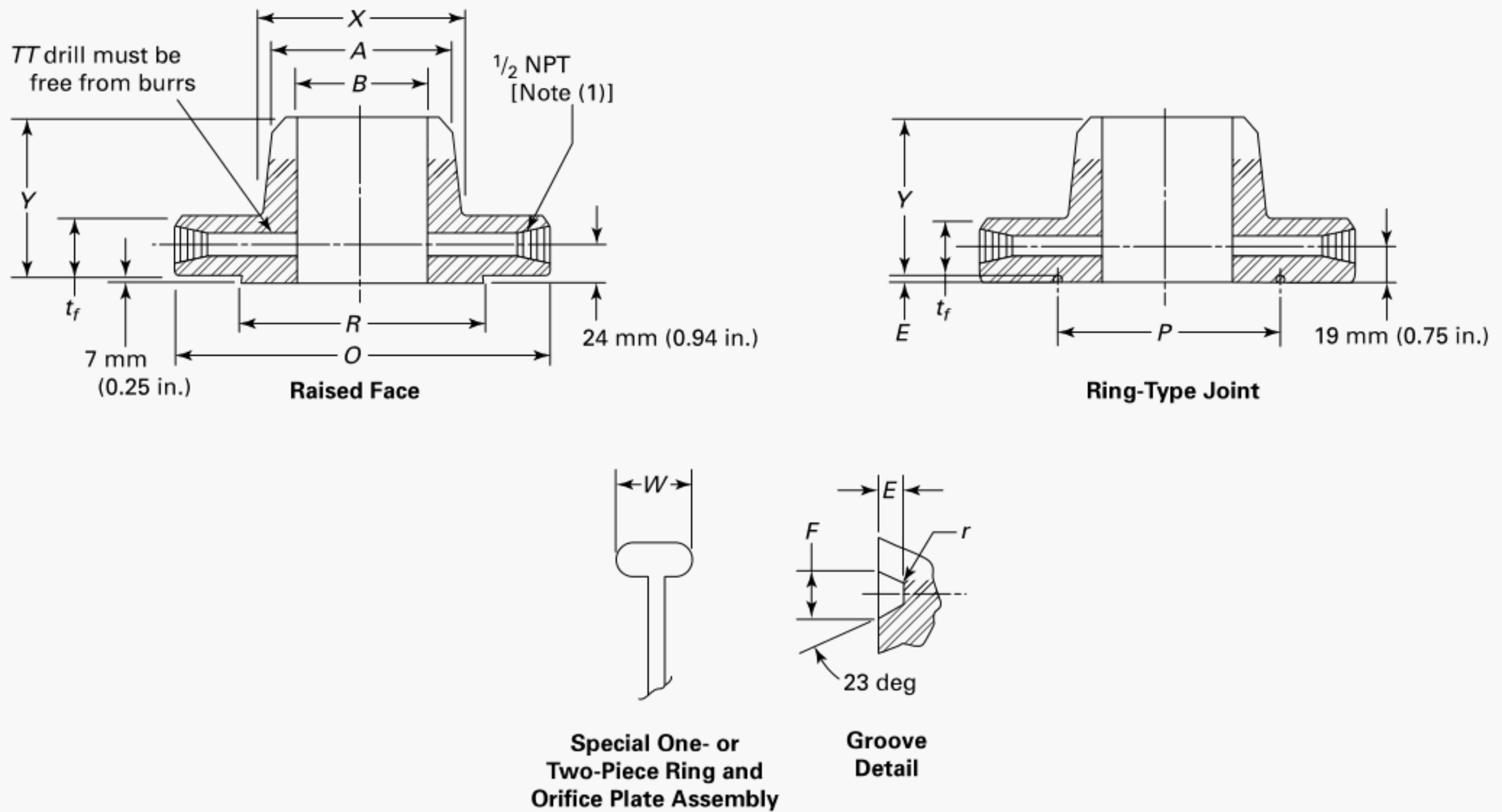
GENERAL NOTES:

- (a) Dimensions are in millimeters (inches). For bolts and bolt holes, dimensions are in inches.
- (b) All other dimensions are in accordance with ASME B16.5.
- (c) Ring joint flanges larger than NPS 12 will require angular meter taps as shown in [Figure 9.1-2](#).

NOTES:

- (1) Other NPT sizes may be furnished if required.
- (2) In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- (3) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 6 mm (0.25 in.) for NPS 3 to NPS 12 and 10 mm (0.38 in.) for NPS 14 to NPS 24. Bolt lengths for ring-type joint flanges include allowance of 15 mm (0.62 in.) for NPS 3 to NPS 10 and 19 mm (0.75 in.) for NPS 12.
- (4) For NPS 2½ and smaller, use Class 1500.
- (5) Bore is to be specified by the purchaser.

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**Table 5-4 Class 1500 Orifice Flanges, Welding Neck**

Nominal Pipe Size	Outside Diameter of Raised Face, <i>R</i>	Outside Diameter of Flange, <i>O</i>	Minimum Thickness of Flange, <i>t<sub>f</sub></i>	Length Through Hub, <i>Y</i>	Ring-Type Joint					Special Oval Ring Height, <i>W</i>
					Groove Number	Pitch Diameter, <i>P</i>	Groove Depth, <i>E</i>	Groove Width, <i>F</i>	Radius at Bottom, <i>r</i>	
1	50.8 (2.00)	150 (5.88)	38.1 (1.50)	83 (3.25)	R16	50.80 (2.000)	6.35 (0.250)	8.74 (0.344)	0.8 (0.03)	25.4 (1.00)
1½	73.0 (2.88)	180 (7.00)	38.1 (1.50)	89 (3.50)	R20	68.27 (2.688)	6.35 (0.250)	8.74 (0.344)	0.8 (0.03)	25.4 (1.00)
2	92.1 (3.62)	215 (8.50)	38.1 (1.50)	102 (4.00)	R24	95.25 (3.750)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
2½	104.8 (4.12)	245 (9.62)	41.3 (1.62)	105 (4.12)	R27	107.95 (4.250)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
3	127.0 (5.00)	265 (10.50)	47.7 (1.88)	117 (4.62)	R35	136.53 (5.375)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
4	157.2 (6.19)	310 (12.25)	54.0 (2.12)	124 (4.88)	R39	161.93 (6.375)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
6	215.9 (8.50)	395 (15.50)	82.6 (3.25)	171 (6.75)	R46	211.14 (8.312)	9.52 (0.375)	13.49 (0.531)	1.5 (0.06)	28.6 (1.12)
8	269.9 (10.62)	485 (19.00)	92.1 (3.62)	213 (8.38)	R50	269.88 (10.625)	11.13 (0.438)	16.66 (0.656)	1.5 (0.06)	33.3 (1.31)
10	323.8 (12.75)	585 (23.00)	108.0 (4.25)	254 (10.00)	R54	323.85 (12.750)	11.13 (0.438)	16.66 (0.656)	1.5 (0.06)	33.3 (1.31)
12	381.0 (15.00)	675 (26.50)	123.9 (4.88)	283 (11.12)	R58	381.00 (15.000)	14.27 (0.562)	23.01 (0.906)	1.5 (0.06)	39.7 (1.56)
14	412.8 (16.25)	750 (29.50)	133.4 (5.25)	298 (11.75)	R63	419.10 (16.500)	15.88 (0.625)	26.97 (1.062)	2.4 (0.09)	44.4 (1.75)
16	469.9 (18.50)	825 (32.50)	146.1 (5.75)	311 (12.25)	R67	469.90 (18.500)	17.48 (0.688)	30.18 (1.188)	2.4 (0.09)	50.8 (2.00)
18	533.4 (21.00)	915 (36.00)	162.0 (6.38)	327 (12.88)	R71	533.40 (21.000)	17.48 (0.688)	30.18 (1.188)	2.4 (0.09)	50.8 (2.00)
20	584.2 (23.00)	985 (38.75)	177.8 (7.00)	356 (14.00)	R75	584.20 (23.000)	17.48 (0.688)	33.32 (1.312)	2.4 (0.09)	54.0 (2.12)
24	692.2 (27.25)	1 170 (46.00)	203.2 (8.00)	406 (16.00)	R79	692.15 (27.250)	20.62 (0.812)	36.53 (1.438)	2.4 (0.09)	58.7 (2.31)

**Table 5-4 Class 1500 Orifice Flanges, Welding Neck**

Diameter of Hub, <i>X</i>	Hub Diameter Beginning of Chamfer, <i>A</i>	Bore, <i>B</i>	Diameter of Pressure Connection, <i>TT</i>	Drilling Template				Length of Stud Bolts [(2), (3)]		
				Diameter of Bolt Circle	Number of Holes	Diameter of Holes	Diameter of Bolts	Raised Face	Ring Joint	Nominal Pipe Size
52 (2.06)	33.5 (1.32)	(4)	6.4 ( $\frac{1}{4}$ )	101.6 (4.00)	4	1 (1.00)	$\frac{7}{8}$	150 (6.00)	160 (6.25)	1
70 (2.75)	48.3 (1.90)	(4)	6.4 ( $\frac{1}{4}$ )	123.8 (4.88)	4	$1\frac{1}{8}$ (1.12)	1	160 (6.25)	165 (6.50)	$1\frac{1}{2}$
105 (4.12)	60.3 (2.38)	(4)	6.4 ( $\frac{1}{4}$ )	165.1 (6.50)	8	1 (1.00)	$\frac{7}{8}$	150 (6.00)	165 (6.50)	2
124 (4.88)	73.0 (2.88)	(4)	6.4 ( $\frac{1}{4}$ )	190.5 (7.50)	8	$1\frac{1}{8}$ (1.12)	1	165 (6.50)	180 (7.00)	$2\frac{1}{2}$
133 (5.25)	88.9 (3.50)	(4)	9.5 ( $\frac{3}{8}$ )	203.2 (8.00)	8	$1\frac{1}{4}$ (1.25)	$1\frac{1}{8}$	185 (7.25)	185 (7.25)	3
162 (6.38)	114.3 (4.50)	(4)	12.7 ( $\frac{1}{2}$ )	241.3 (9.50)	8	$1\frac{3}{8}$ (1.38)	$1\frac{1}{4}$	205 (8.00)	215 (8.50)	4
229 (9.00)	168.3 (6.63)	(4)	12.7 ( $\frac{1}{2}$ )	317.5 (12.50)	12	$1\frac{1}{2}$ (1.50)	$1\frac{3}{8}$	265 (10.50)	280 (11.00)	6
292 (11.50)	219.1 (8.63)	(4)	12.7 ( $\frac{1}{2}$ )	393.7 (15.50)	12	$1\frac{3}{4}$ (1.75)	$1\frac{5}{8}$	300 (11.75)	310 (12.25)	8
368 (14.50)	273.0 (10.75)	(4)	12.7 ( $\frac{1}{2}$ )	482.6 (19.00)	12	2 (2.00)	$1\frac{7}{8}$	345 (13.50)	355 (14.00)	10
451 (17.75)	323.8 (12.75)	(4)	12.7 ( $\frac{1}{2}$ )	571.6 (22.50)	16	$2\frac{1}{8}$ (2.12)	2	380 (15.00)	400 (15.75)	12
495 (19.50)	355.6 (14.00)	(4)	12.7 ( $\frac{1}{2}$ )	635.0 (25.00)	16	$2\frac{3}{8}$ (2.38)	$2\frac{1}{4}$	415 (16.25)	445 (17.50)	14
552 (21.75)	406.4 (16.00)	(4)	12.7 ( $\frac{1}{2}$ )	704.8 (27.75)	16	$2\frac{5}{8}$ (2.62)	$2\frac{1}{2}$	450 (17.75)	485 (19.00)	16
597 (23.50)	457.2 (18.00)	(4)	12.7 ( $\frac{1}{2}$ )	774.7 (30.50)	16	$2\frac{7}{8}$ (2.88)	$2\frac{3}{4}$	500 (19.75)	535 (21.00)	18
641 (25.25)	508.0 (20.00)	(4)	12.7 ( $\frac{1}{2}$ )	831.8 (32.75)	16	$3\frac{1}{8}$ (3.12)	3	545 (21.50)	570 (22.50)	20
762 (30.00)	609.6 (24.00)	(4)	12.7 ( $\frac{1}{2}$ )	990.6 (39.00)	16	$3\frac{5}{8}$ (3.62)	$3\frac{1}{2}$	620 (24.50)	660 (26.00)	24

**Table 5-4 Class 1500 Orifice Flanges, Welding Neck (Cont'd)**

GENERAL NOTES:

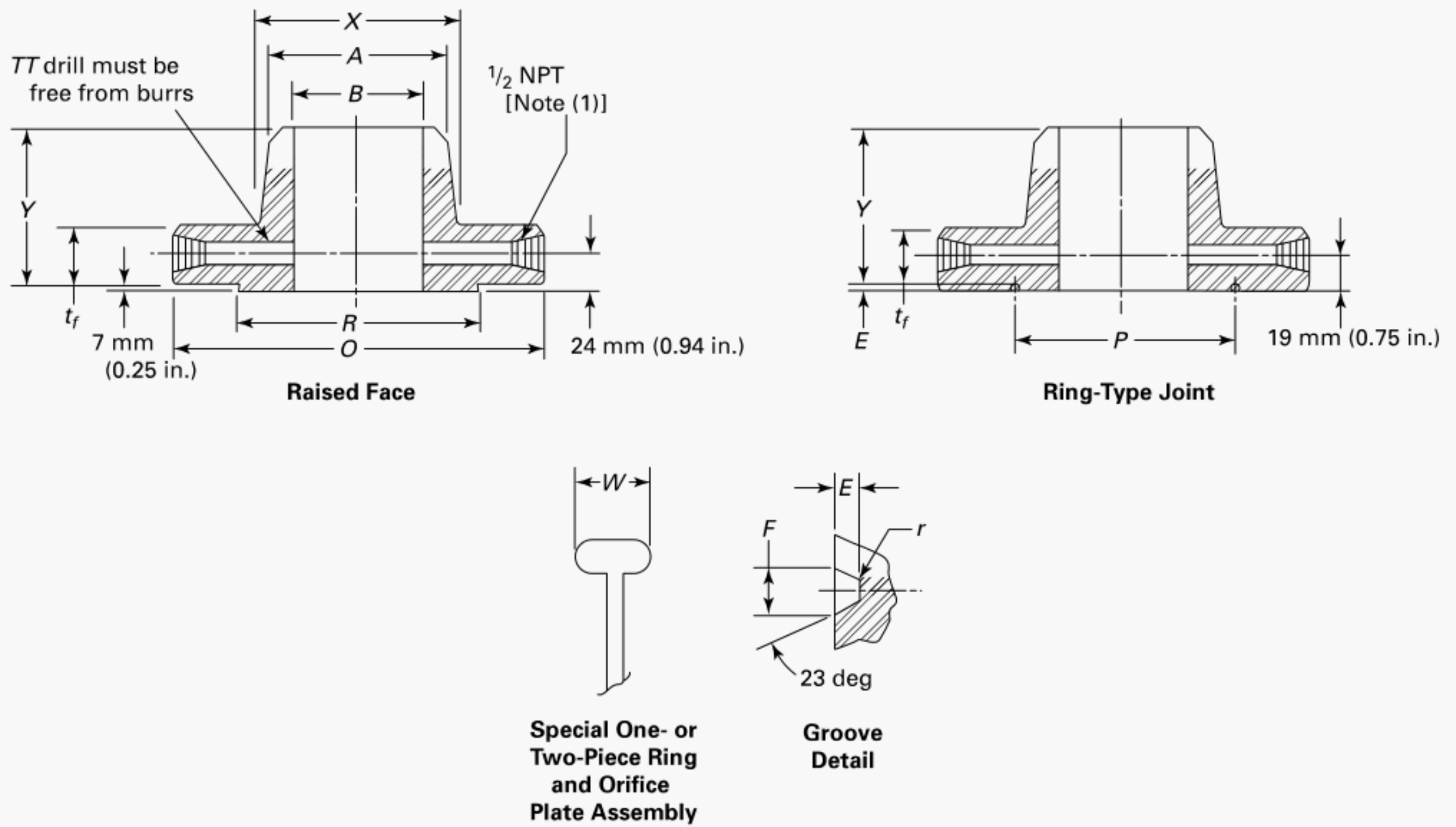
- (a) Dimensions are in millimeters (inches). For bolt and bolt holes, dimensions are in inches.
- (b) All other dimensions are in accordance with ASME B16.5.
- (c) Ring joint flanges larger than NPS 6 will require angular meter taps shown in [Figure 9.1-2](#).

NOTES:

- (1) Other NPT sizes may be furnished if required.
- (2) In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- (3) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 6 mm (0.25 in.) for NPS 1 to NPS 12 and 10 mm (0.38 in.) for NPS 14 to NPS 24. Bolt lengths for ring-type joint flanges include allowance of 15 mm (0.62 in.) for NPS 1 to NPS 6.
- (4) Bore is to be specified by the purchaser.



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**Table 5-5 Class 2500 Orifice Flanges, Welding Neck**

Nominal Pipe Size	Outside Diameter of Raised Face, <i>R</i>	Outside Diameter of Flange, <i>O</i>	Minimum Thickness of Flange, <i>t<sub>f</sub></i>	Length Through Hub, <i>Y</i>	Ring-Type Joint					
					Groove Number	Pitch Diameter, <i>P</i>	Groove Depth, <i>E</i>	Groove Width, <i>F</i>	Radius at Bottom, <i>r</i>	Special Oval Ring Height, <i>W</i>
1	50.8 (2.00)	160 (6.25)	38.1 (1.50)	92 (3.62)	R18	60.33 (2.375)	6.35 (0.250)	8.74 (0.344)	0.8 (0.03)	25.4 (1.00)
1½	73.0 (2.88)	205 (8.00)	44.5 (1.75)	111 (4.38)	R23	82.55 (3.250)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
2	92.1 (3.62)	235 (9.25)	50.8 (2.00)	127 (5.00)	R26	101.60 (4.000)	7.92 (0.312)	11.91 (0.469)	0.8 (0.03)	27.0 (1.06)
2½	104.8 (4.12)	265 (10.50)	57.2 (2.25)	143 (5.62)	R28	111.13 (4.375)	9.53 (0.375)	13.49 (0.531)	1.5 (0.06)	30.2 (1.19)
3	127.0 (5.00)	305 (12.00)	66.7 (2.62)	168 (6.62)	R32	127.00 (5.000)	9.53 (0.375)	13.49 (0.531)	1.5 (0.06)	30.2 (1.19)
4	157.2 (6.19)	355 (14.00)	76.2 (3.00)	190 (7.50)	R38	157.18 (6.188)	11.13 (0.438)	16.66 (0.656)	1.5 (0.06)	33.3 (1.31)
6	215.9 (8.50)	485 (19.00)	108.0 (4.25)	273 (10.75)	R47	228.60 (9.000)	12.70 (0.500)	19.84 (0.781)	1.5 (0.06)	36.5 (1.44)
8	269.9 (10.62)	550 (21.75)	127.0 (5.00)	318 (12.50)	R51	279.40 (11.000)	14.27 (0.562)	23.01 (0.906)	1.5 (0.06)	39.7 (1.56)
10	323.8 (12.75)	675 (26.50)	165.1 (6.50)	419 (16.50)	R55	342.90 (13.500)	17.48 (0.688)	30.18 (1.188)	2.4 (0.09)	47.6 (1.88)
12	381.0 (15.00)	760 (30.00)	184.2 (7.25)	464 (18.25)	R60	406.40 (16.000)	17.48 (0.688)	33.32 (1.312)	2.4 (0.09)	50.8 (2.00)

**Table 5-5 Class 2500 Orifice Flanges, Welding Neck**

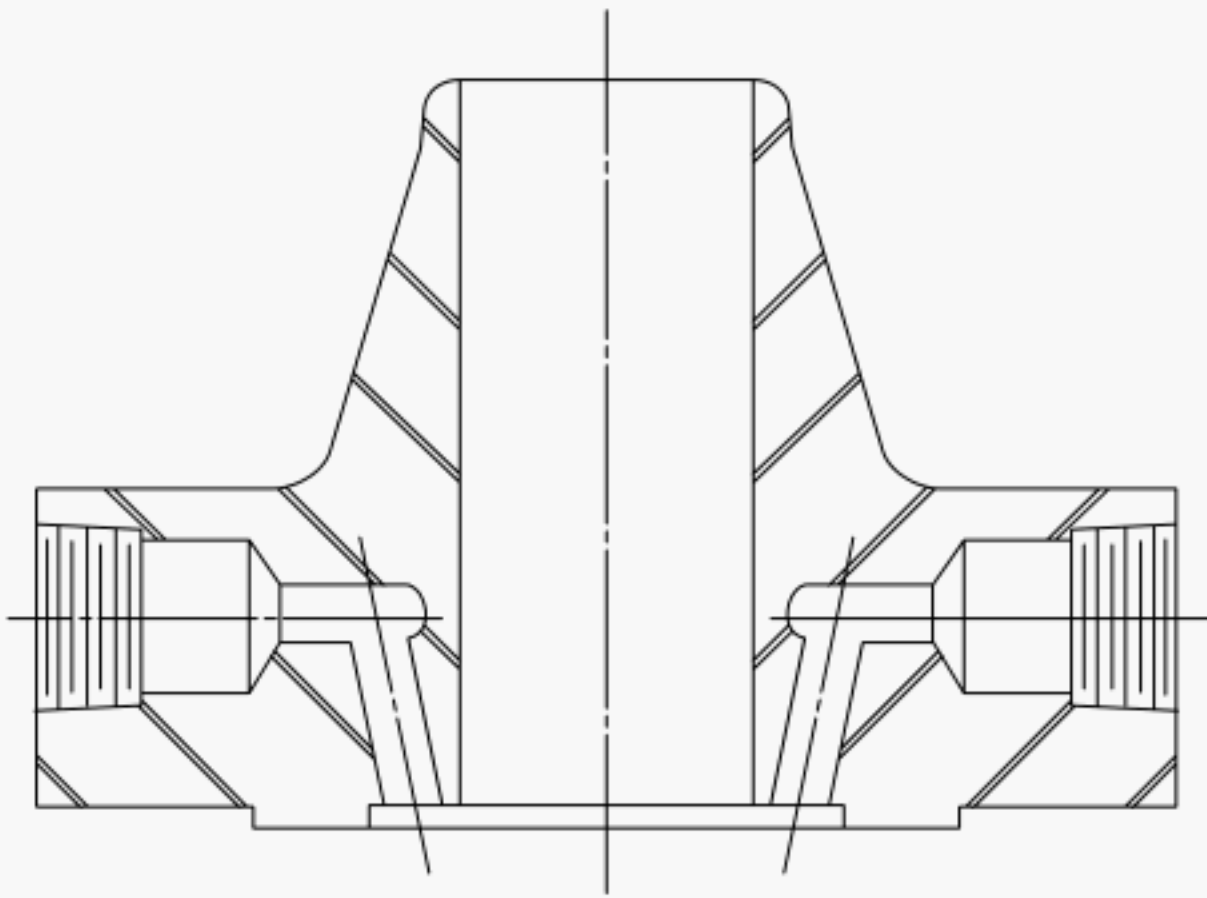
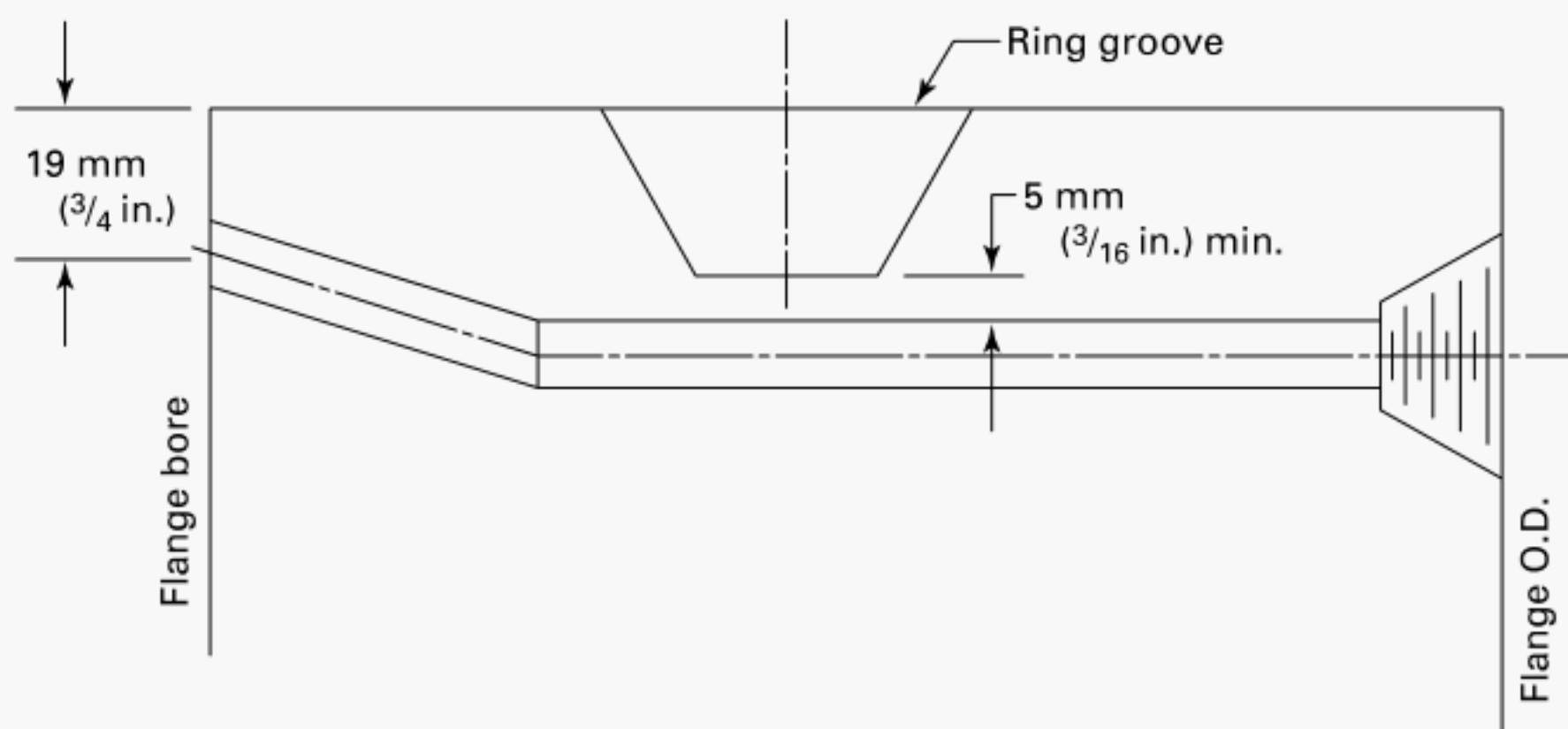
Diameter of Hub, <i>X</i>	Hub Diameter Beginning of Chamfer, <i>A</i>	Bore, <i>B</i>	Diameter of Pressure Connection, <i>TT</i>	Drilling Template				Length of Stud Bolts [(2), (3)]		
				Diameter of Bolt Circle	Number of Holes	Diameter of Holes	Diameter of Bolts	Raised Face	Ring Joint	Nominal Pipe Size
57 (2.25)	33.5 (1.32)	(4)	6.4 ( $\frac{1}{4}$ )	108.0 (4.25)	4	1 (1.00)	$\frac{7}{8}$	150 (6.00)	160 (6.25)	1
79 (3.12)	48.3 (1.90)	(4)	6.4 ( $\frac{1}{4}$ )	146.0 (5.75)	4	1 $\frac{1}{4}$ (1.25)	1 $\frac{1}{8}$	180 (7.00)	190 (7.50)	1 $\frac{1}{2}$
95 (3.75)	60.3 (2.38)	(4)	6.4 ( $\frac{1}{4}$ )	171.4 (6.75)	8	1 $\frac{1}{8}$ (1.12)	1	185 (7.25)	195 (7.75)	2
114 (4.50)	73.0 (2.88)	(4)	6.4 ( $\frac{1}{4}$ )	196.8 (7.75)	8	1 $\frac{1}{4}$ (1.25)	1 $\frac{1}{8}$	205 (8.00)	215 (8.50)	2 $\frac{1}{2}$
133 (5.25)	88.9 (3.50)	(4)	9.5 ( $\frac{3}{8}$ )	228.6 (9.00)	8	1 $\frac{3}{8}$ (1.38)	1 $\frac{1}{4}$	230 (9.00)	240 (9.50)	3
165 (6.50)	114.3 (4.50)	(4)	12.7 ( $\frac{1}{2}$ )	273.0 (10.75)	8	1 $\frac{5}{8}$ (1.62)	1 $\frac{1}{2}$	260 (10.25)	275 (10.75)	4
235 (9.25)	168.3 (6.63)	(4)	12.7 ( $\frac{1}{2}$ )	368.3 (14.50)	8	2 $\frac{1}{8}$ (2.12)	2	350 (13.75)	370 (14.50)	6
305 (12.00)	219.1 (8.63)	(4)	12.7 ( $\frac{1}{2}$ )	438.2 (17.25)	12	2 $\frac{1}{8}$ (2.12)	2	385 (15.25)	405 (16.00)	8
375 (14.75)	273.0 (10.75)	(4)	12.7 ( $\frac{1}{2}$ )	539.8 (21.25)	12	2 $\frac{5}{8}$ (2.62)	2 $\frac{1}{2}$	490 (19.25)	515 (20.25)	10
441 (17.38)	323.8 (12.75)	(4)	12.7 ( $\frac{1}{2}$ )	619.1 (24.38)	12	2 $\frac{7}{8}$ (2.88)	2 $\frac{3}{4}$	540 (21.25)	570 (22.50)	12

**Table 5-5 Class 2500 Orifice Flanges, Welding Neck (Cont'd)****GENERAL NOTES:**

- (a) Dimensions are in millimeters (inches). For bolt and bolt holes, dimensions are in inches.
- (b) All other dimensions are in accordance with ASME B16.5.
- (c) Ring joint flanges larger than NPS 3 will require angular meter taps as shown in [Figure 9.1-2](#).

**NOTES:**

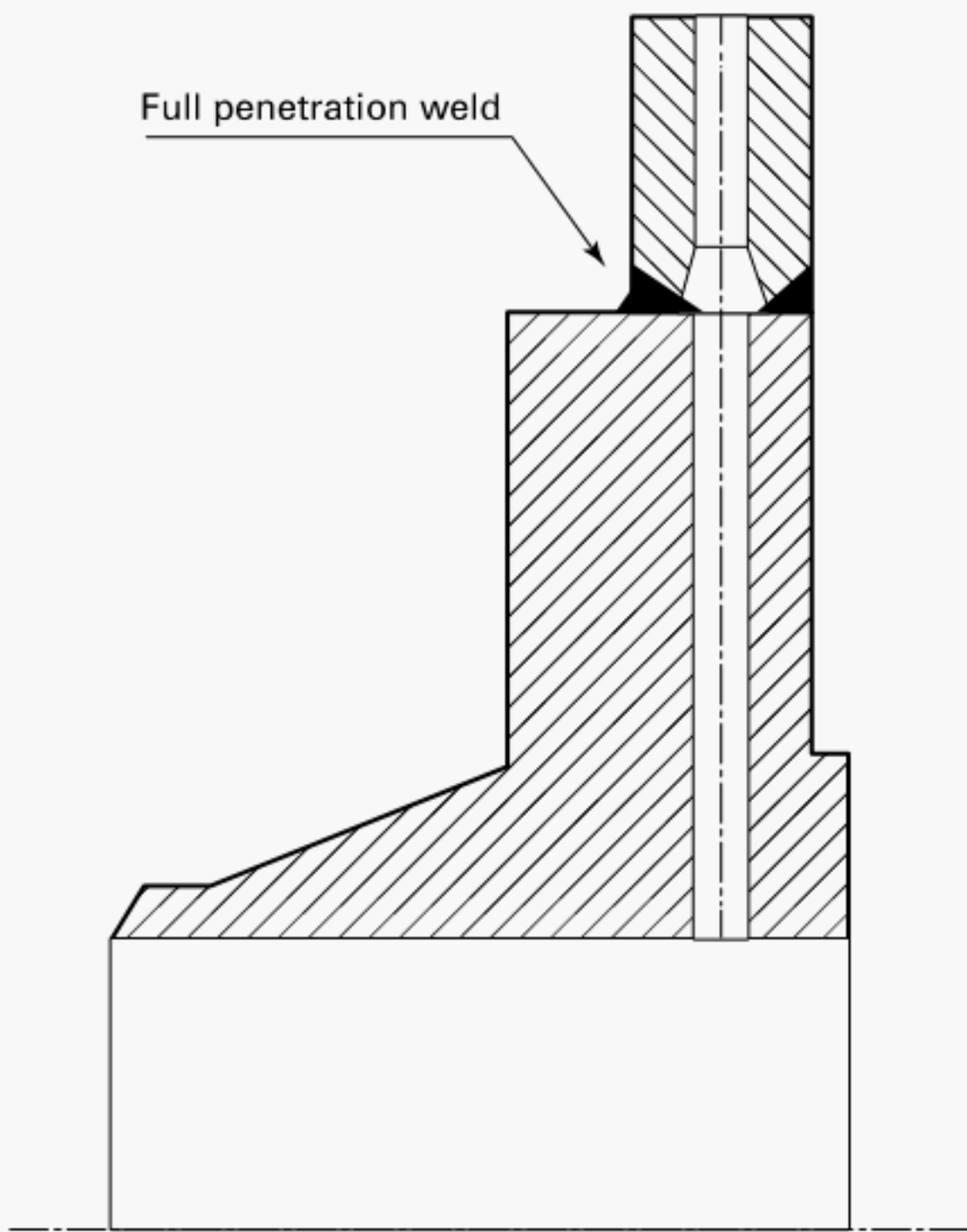
- (1) Other NPT sizes may be furnished if required.
- (2) In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- (3) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 6 mm (0.25 in.) for NPS 1 to NPS 12. Bolt lengths for ring-type joint flanges include allowance of 15 mm (0.62 in.) for NPS 1 to NPS 3.
- (4) Bore is to be specified by the purchaser.

**Figure 9.1-1 Corner Taps****Figure 9.1-2 Angular Meter Tap for RTJ Flanges**

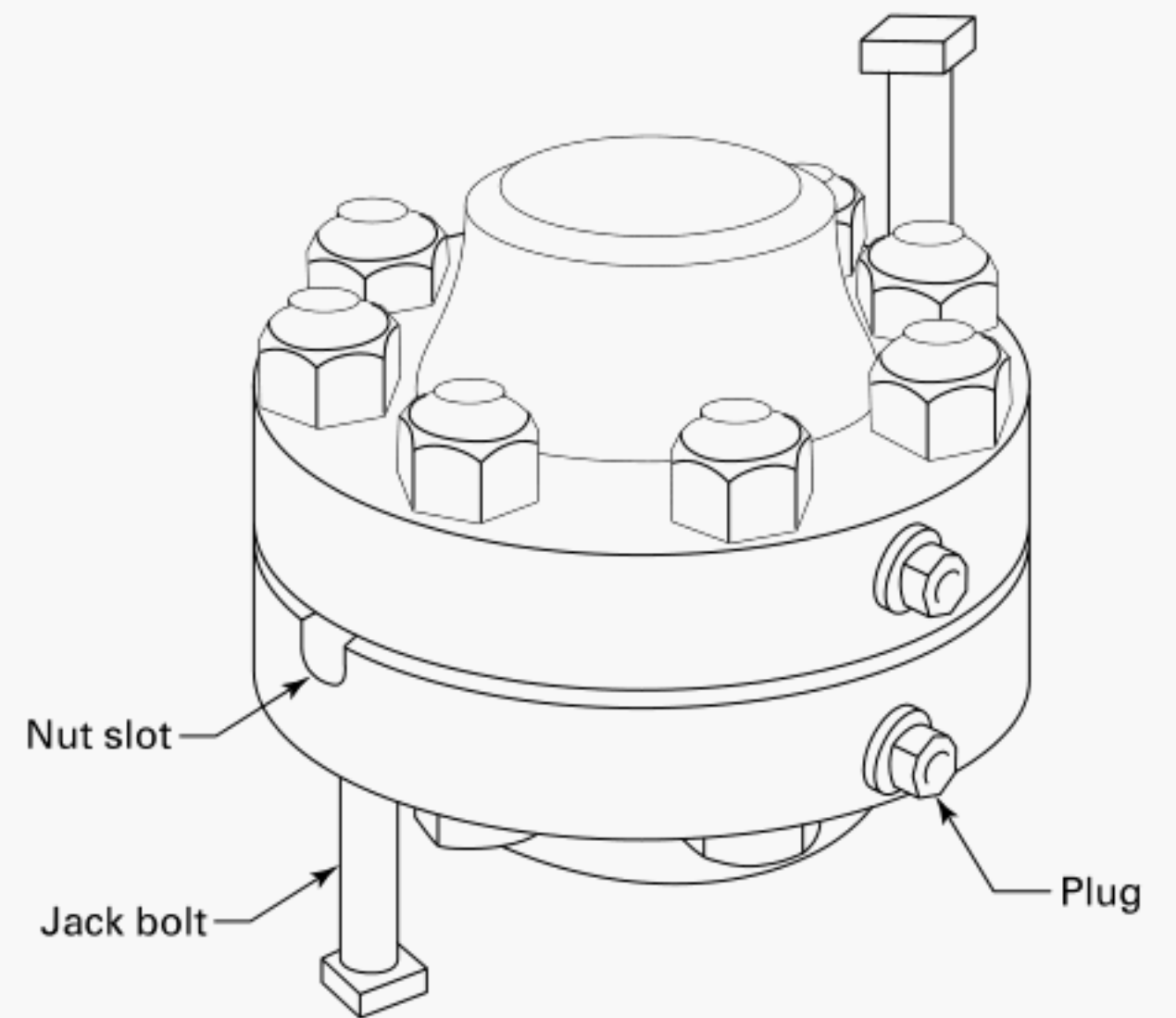


**Figure 9.3.2-1 Weld Attachment of NPS  $\frac{3}{4}$  Nipple to Flange**

(20)



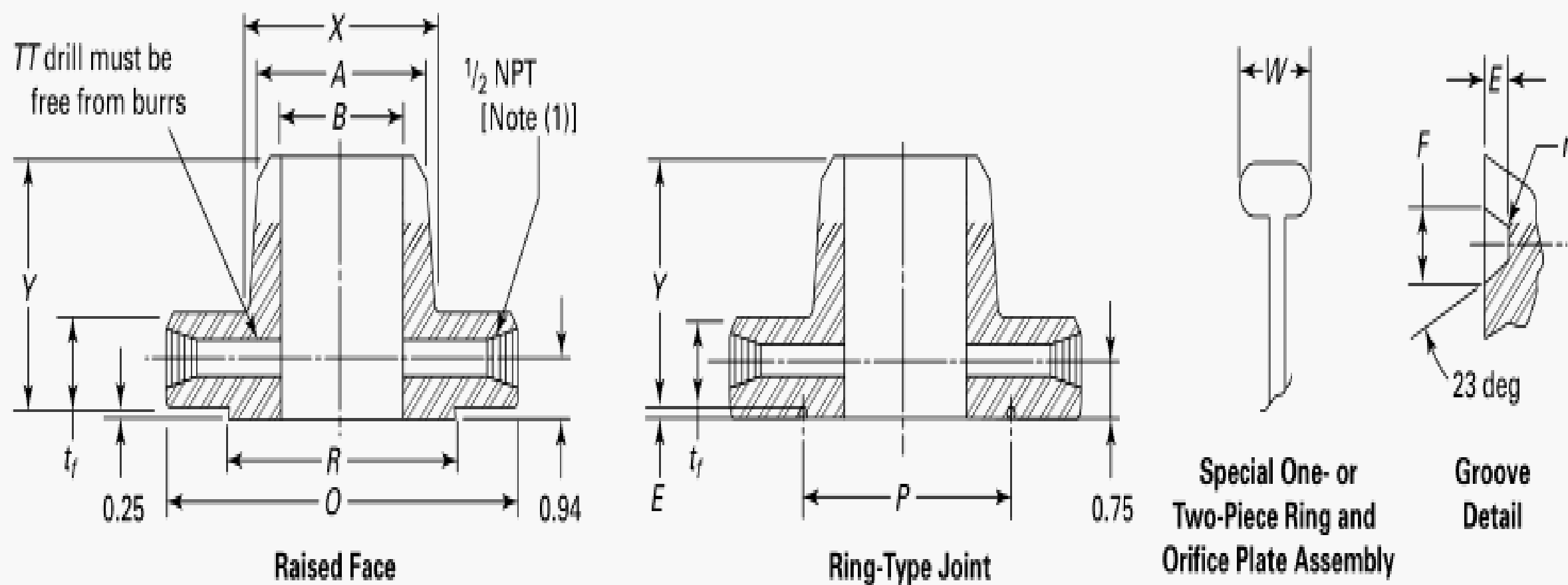
**Figure 10.1-1 Jack Bolts**



## **MANDATORY APPENDIX I DIMENSIONAL DATA FOR CLASS 400 FLANGES IN U.S. CUSTOMARY UNITS**

This Mandatory Appendix is an integral part of ASME B16.36, and is placed after the main text for convenience. [Table I-1](#), included in this Appendix, provides dimensional data in U.S. Customary units for Class 400 flanges.

Table I-1 Class 400 Orifice Flanges, Welding Neck



Nominal Pipe Size	Ring-Type Joint										Hub Diam- eter Begin- ning of Cham- fer, <i>A</i>	Bore, <i>B</i>	Drilling Template				Length of Stud Bolts [(2), (3)]			
	Outside Diameter of Raised Face, <i>R</i>	Outside Diameter of Flange, <i>O</i>	Minimum Thickness of Flange, <i>t<sub>f</sub></i>	Length Through Hub, <i>Y</i>	Groove Number	Pitch Diameter, <i>P</i>	Groove Depth, <i>E</i>	Groove Width, <i>F</i>	Radius at Bottom, <i>r</i>	Special Oval Ring Height, <i>W</i>			Diam- eter of Hub, <i>X</i>	Diameter of Pres- sure Convec- tion, <i>TT</i>	Diameter of Bolt Circle	Number of Holes	Diameter of Holes	Diameter of Bolts	Raised Face	Ring Joint
1	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
1½	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
2	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
2½	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
3	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
4	6.19	10.00	1.50	3.50	R37	5.875	0.312	0.469	0.03	1.06	5.75	4.50	(5)	½	7.88	8	1.00	7⁄8	5.50	6.00
6	8.50	12.50	1.62	4.06	R45	8.312	0.312	0.469	0.03	1.06	8.12	6.63	(5)	½	10.62	12	1.00	7⁄8	6.25	6.50
8	10.62	15.00	1.88	4.62	R49	10.625	0.312	0.469	0.03	1.06	10.25	8.63	(5)	½	13.00	12	1.12	1	6.75	7.25
10	12.75	17.50	2.12	4.88	R53	12.750	0.312	0.469	0.03	1.06	12.62	10.75	(5)	½	15.25	16	1.25	1⅛	7.50	8.00
12	15.00	20.50	2.25	5.38	R57	15.000	0.312	0.469	0.03	1.06	14.75	12.75	(5)	½	17.75	16	1.38	1¼	8.00	8.50
14	16.25	23.00	2.39	5.88	R61	16.500	0.312	0.469	0.03	1.06	16.75	14.00	(5)	½	20.25	20	1.38	1¼	8.25	9.00
16	18.50	25.50	2.50	6.00	R65	18.500	0.312	0.469	0.03	1.19	19.00	16.00	(5)	½	22.50	20	1.50	1⅜	8.75	9.25
18	21.00	28.00	2.62	6.50	R69	21.000	0.312	0.469	0.03	1.19	21.00	18.00	(5)	½	24.75	24	1.50	1⅜	9.25	9.50
20	23.00	30.50	2.75	6.62	R73	23.000	0.375	0.531	0.06	1.25	23.12	20.00	(5)	½	27.00	24	1.62	1½	9.75	10.25
24	27.25	36.00	3.00	6.88	R77	27.250	0.438	0.656	0.06	1.44	27.62	24.00	(5)	½	32.00	24	1.88	1¾	11.00	11.50

GENERAL NOTES:  
(a) Dimensions are in inches.  
(b) All other dimensions are in accordance with ASME B16.5.  
(c) Ring joint flange in NPS 24 will require an angular meter tap as shown in Figure 9.1-2.

**Table I-1 Class 400 Orifice Flanges, Welding Neck (Cont'd)**

- NOTES:
- (1) Other NPT sizes may be furnished if required.
  - (2) In conformance with ASME B16.5, stud bolt lengths do not include point heights.
  - (3) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25 in. for NPS 4 to NPS 12 and 0.38 in. for NPS 14 to NPS 24. Bolt lengths for ring-type joint flanges include allowance of 0.62 in. for NPS 4 to NPS 10, 0.75 in. for NPS 12 to NPS 18, and 0.88 in. for NPS 20.
  - (4) For NPS 3 and smaller, use Class 600.
  - (5) Bore is to be specified by the purchaser.



## MANDATORY APPENDIX II REFERENCES

(20)

The following is a list of publications referenced in this Standard. The latest editions of ASME publications are to be used.

ASME B1.20.1, Pipe Threaded, General Purpose (Inch)  
 ASME B16.5, Pipe Flanges and Flanged Fittings  
 ASME B16.11, Forged Fittings, Socket-Welding and Threaded  
 ASME B16.21, Nonmetallic Gaskets for Pipe Flanges  
 ASME B36.10M, Welded and Seamless Wrought Steel Pipe  
 ASME B31.1, Power Piping  
 ASME B31.3, Process Piping  
 ASME Boiler and Pressure Vessel Code: Section I, Power Boilers; Section II, Materials; Section III, Nuclear Power Plant Components; Section VIII, Divisions 1 and 2, Pressure Vessels

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 ([www.asme.org](http://www.asme.org))

ISO 9000:2005, Quality management systems — Fundamentals and vocabulary<sup>1</sup>

ISO 9001:2008, Quality management systems — Requirements<sup>1</sup>

ISO 9004:2000, Quality management systems — Guidelines for performance improvements<sup>1</sup>

Publisher: International Organization for Standardization (ISO), Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland ([www.iso.org](http://www.iso.org))

<sup>1</sup> May also be obtained from the American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036.

## NONMANDATORY APPENDIX A

### QUALITY SYSTEM PROGRAM

The products manufactured in accordance with this Standard shall be produced under a quality system program following the principles of an appropriate standard from the ISO 9000 series.<sup>1</sup> A determination of the need for registration, certification, or both, of the product manufacturer's quality system program by an independent organization shall be the responsibility of the manufacturer. The detailed documentation demon-

strating program compliance shall be available to the purchaser at the manufacturer's facility. A written summary description of the program utilized by the product manufacturer shall be available to the purchaser upon request. The product manufacturer is defined as the entity whose name or trademark appears on the product in accordance with the marking or identification requirements of this Standard.

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<sup>1</sup>The series is also available from the American National Standards Institute (ANSI) and the American Society for Quality (ASQ) as American National Standards that are identified by a prefix "Q," replacing the prefix "ISO." Each standard of the series is listed under References in [Mandatory Appendix II](#).

# B16 AMERICAN NATIONAL STANDARDS FOR PIPING, PIPE FLANGES, FITTINGS, AND VALVES

B16.1-2020	Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
B16.3-2016	Malleable Iron Threaded Fittings: Classes 150 and 300
B16.4-2016	Gray Iron Threaded Fittings: Classes 125 and 250
B16.5-2020	Pipe Flanges and Flanged Fittings: NPS ½ Through NPS 24 Metric/Inch Standard
B16.9-2018	Factory-Made Wrought Buttwelding Fittings
B16.10-2017	Face-to-Face and End-to-End Dimensions of Valves
B16.11-2016	Forged Fittings, Socket-Welding and Threaded
B16.12-2019	Cast Iron Threaded Drainage Fittings
B16.14-2018	Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads
B16.15-2018	Cast Copper Alloy Threaded Fittings
B16.18-2018	Cast Copper Alloy Solder Joint Pressure Fittings
B16.20-2017	Metallic Gaskets for Pipe Flanges
B16.21-2016	Nonmetallic Flat Gaskets for Pipe Flanges
B16.22-2018	Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
B16.23-2016	Cast Copper Alloy Solder Joint Drainage Fittings: DWV
B16.24-2016	Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500, and 2500
B16.25-2017	Buttwelding Ends
B16.26-2018	Cast Copper Alloy Fittings for Flared Copper Tubes
B16.29-2017	Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings — DWV
B16.33-2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS ½ Through NPS 2)
B16.34-2020	Valves — Flanged, Threaded, and Welding End
B16.36-2020	Orifice Flanges
B16.38-2012 (R2017)	Large Metallic Valves for Gas Distribution: Manually Operated, NPS 2½ (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum
B16.39-2019	Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300
B16.40-2019	Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
B16.42-2016	Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300
B16.44-2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems Up to 5 psi
B16.47-2020	Large Diameter Steel Flanges: NPS 26 Through NPS 60 Metric/Inch Standard
B16.48-2020	Line Blanks
B16.49-2017	Factory-Made, Wrought Steel, Buttwelding Induction Bends for Transportation and Distribution Systems
B16.50-2018	Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
B16.51-2018	Copper and Copper Alloy Press-Connect Pressure Fittings
B16.52-2018	Forged Nonferrous Fittings, Socket-Welding and Threaded (Titanium, Titanium Alloys, Aluminum, and Aluminum Alloys)

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