

ASME B16.36-2015
(Revision of ASME B16.36-2009)

Orifice Flanges

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AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers

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**The American Society of
Mechanical Engineers**

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.

Requests for interpretations or suggestions for revisions should be sent to the Secretary, B16 Committee, Two Park Avenue, New York, NY 10016-5990. As an alternative, inquiries may be submitted via e-mail to: SecretaryB16@asme.org.

This revision was approved by the American National Standards Institute on February 24, 2015.

ASME B16 COMMITTEE

Standardization of Valves, Flanges, Fittings, and Gaskets

(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

As an alternative, inquiries may be submitted via e-mail to: SecretaryB16@asme.org.

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 for the purpose of providing 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, 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 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.

The request for 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.
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. 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 this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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 that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B16 Standards Committee.

ASME B16.36-2015

SUMMARY OF CHANGES

Following approval by the B16 Committee and ASME, and after public review, ASME B16.36-2015 was approved by the American National Standards Institute on February 24, 2015.

ASME B16.36-2015 includes editorial changes, revisions, and corrections, which are identified by a margin designator, **(15)**, placed next to the affected area.

<i>Page</i>	<i>Location</i>	<i>Change</i>
1	1	First paragraph revised
	2.4	Revised
	4.1	Revised
4	Table 1	In illustration and throughout table, "weld" revised to read "welding"
5	Table 2	In General Note (b), "weld" revised to read "welding"
12	Table I-1	In illustration and throughout table, "weld" revised to read "welding"
13	Table I-2	In General Note (b), "weld" revised to read "welding"

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ORIFICE FLANGES

(15) 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, 600, 900, 1500, and 2500. U.S. Customary units are presented in Mandatory Appendix I.
- (b) slip-on and threaded Class 300.
- (c) welding neck flanges Class 400 in U.S. Customary units in Mandatory Appendix II.

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 III.

2.2 Quality Systems

Nonmandatory requirements relating to the product manufacturer's Quality System Program are described in Nonmandatory Appendix A.

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 or in separate tables. 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. Except for Class 400, the values in U.S. Customary units are in Mandatory Appendix I. The main text of this Standard does not contain requirements for Class 400 welding neck flanges; however, Mandatory Appendix II does contain requirements for this class, expressed in U.S. Customary units only.

(15) 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

(a) Class, followed by a dimensionless number, is the designation for pressure-temperature ratings as follows: Classes 300 600 900 1500 2500.

(b) Class 400 is retained in the U.S. Customary tables.

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

(a) 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. Assembly of multiple pieces into the finished product by welding or other means is not permitted by this Standard.

(15)

(b) For materials manufactured to editions of the material specification other than those listed in Mandatory Appendix III of ASME B16.5, refer to para. 4.3.

4.2 Bolting

Bolting material recommendations are given in ASME B16.5. For materials manufactured to editions of the material specification other than those listed in Mandatory Appendix III of ASME B16.5, refer to para. 4.3.

4.3 Materials Manufactured to Other Editions

Materials may meet the requirements of material specification editions other than those listed in Mandatory Appendix III of ASME B16.5, 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 Mandatory Appendix III of ASME B16.5 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 1 through 5, Tables I-1 through I-5, and Mandatory Appendix II 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

8.1 Gasket Thickness

Flange dimensions are based on the use of 1.5 mm (0.06 in.) thick gaskets.

8.2 Flange Gaskets Requiring Dimensional Changes

When the location of the pressure tap with respect to the orifice plate is critical to the service and metering

conditions, its location may be altered to accommodate other than 1.5 mm (0.06 in.) thick gaskets or ring-type joint gaskets whose thickness may vary from that listed in Tables 2 through 5 or those listed in Tables I-2 through I-5 or Mandatory Appendix II.

The alteration of location may also be accomplished by the removal of 2 mm (0.06 in.) from the raised face of the flange. If an original 2 mm (0.06 in.) high raised face is removed, the user is cautioned to limit the outside diameter of the gasket or orifice plate to the tabulated *R* dimension.

9 PRESSURE TAPS

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 Fig. 1.

For ring joint flanges listed in Tables 2 through 5, Tables I-2 through I-5, and Mandatory Appendix II, where radial taps will interfere with the ring groove, angular meter taps, as illustrated in Fig. 2, will be required. Each pressure tap hole shall be equipped with a pipe plug.

9.2 Location

9.2.1 Measurement. The 24 mm (0.94 in.) dimension for raised face and 19 mm (0.75 in.) for ring joint shall be measured at the bore.

9.2.2 Identification. For ring joint flanges requiring alteration of pressure tap location due to interference with the ring groove other than methods provided in this Standard, such alteration shall be identified per agreement between purchaser and manufacturer.

9.3 Pipe Connection

Unless otherwise specified, pressure tap holes may be either tapped ½ NPT in accordance with ASME B1.20.1 or ½ NPS socket connection in accordance with ASME B16.11.

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 Fig. 3.

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.

11 FLANGE DIMENSIONS

Dimensions are listed in Tables 1, 2, 3, 4, and 5 for metric, and Tables I-1, I-2, I-3, I-4, and I-5, and Mandatory Appendix II for U.S. Customary.

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 to 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 hole¹ from flange face shall be

- (a) ± 0.5 mm (± 0.02 in.) for flanges smaller than NPS 4
- (b) ± 0.8 mm (± 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.

¹ See para. 9.2.

Fig. 1 Corner Taps

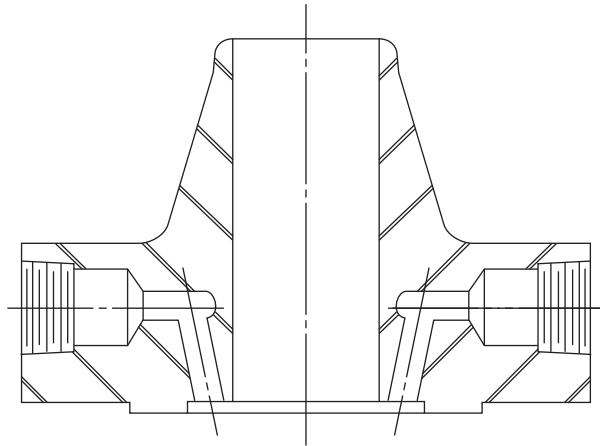


Fig. 2 Angular Meter Tap for RTJ Flanges

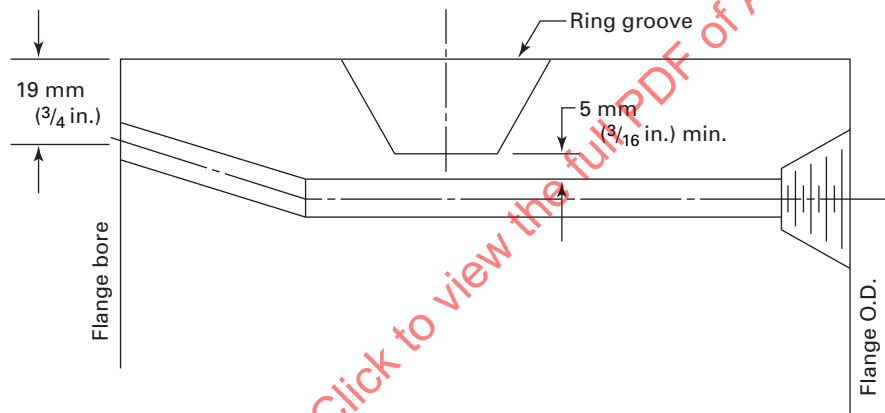


Fig. 3 Jack Bolts

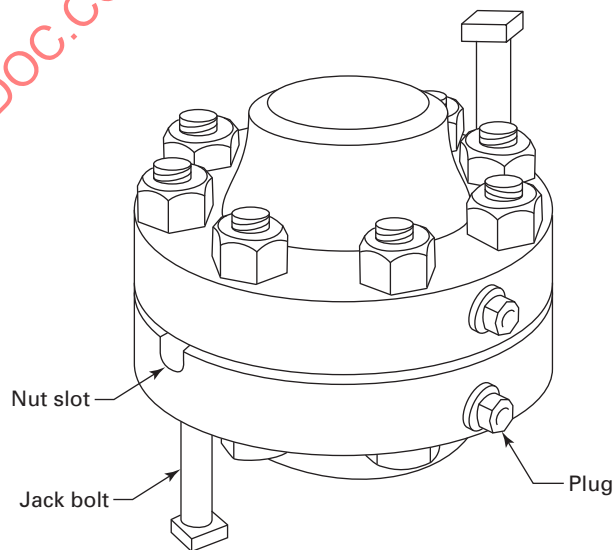
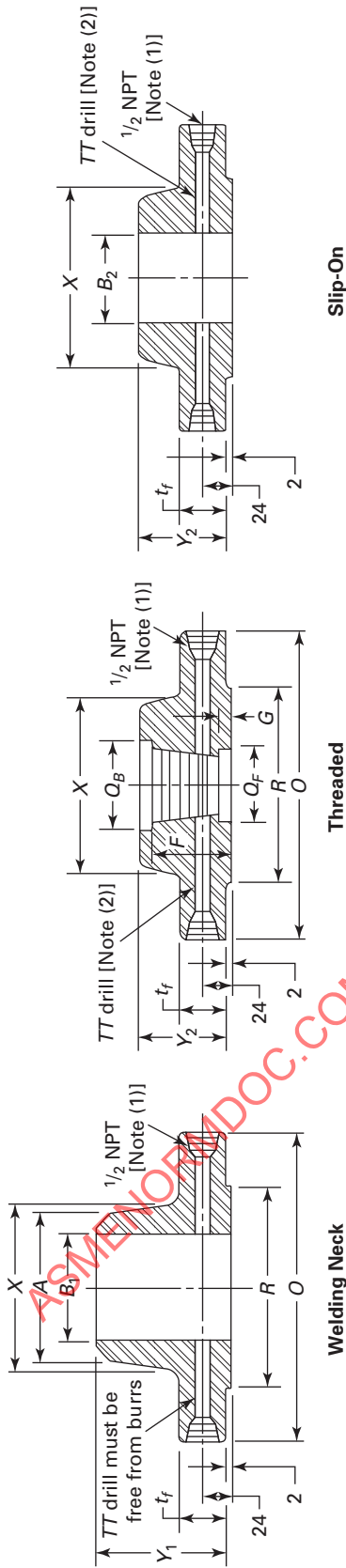


Table 1 Class 300 Orifice Flanges, Welding Neck, Threaded, and Slip-On



Welding Neck

Threaded

Slip-On

Nom- inal Pipe Size	Outside Diameter of Raised Face, R	Outside Diameter of Flange, O	Minimum Thickness of Flange, t _F	Length Through Hub		Diameter of Hub, X	Hub Diameter Beginning of Chamfer (W.N.), A	Diameter of Counterbore		Counterbore Depth (From Face)	Bore		Diameter of Pressure Connection, TT	Drilling Template			Bolt Length [(3), (4)]			
				Slip-On and Threaded, Y ₂	Welding Neck, Y ₁			Back, Q _B	Face, Q _F		Slip-On, B ₂	Welding Neck, B ₁		Bolt Circle	Number of Holes	Diameter of Holes	Diameter of Bolts	Machine Bolts	Stud Bolts	
1	50.8	125	36.6	46	81	54	33.4	35.8	33.0	36.5	19.0	34.5	(5)	6.4	88.9	4	11/16	5/8	115	125
1½	73.0	155	36.6	46	84	70	48.3	50.5	48.0	37.3	18.3	49.5	(5)	6.4	114.3	4	13/16	¾	120	135
2	92.1	165	36.6	48	84	84	60.3	63.5	59.9	38.1	17.5	61.9	(5)	6.4	127.0	8	11/16	5/8	115	125
2½	104.8	190	36.6	49	87	100	73.0	76.2	72.1	44.4	14.3	74.6	(5)	6.4	149.2	8	13/16	¾	120	135
3	127.0	210	36.6	51	87	117	88.9	92.2	87.9	46.0	14.3	90.7	(5)	9.5	168.3	8	13/16	¾	120	135
4	157.2	255	36.6	52	90	146	114.3	117.6	113.0	47.6	14.3	116.1	(5)	12.7	200.0	8	13/16	¾	120	135
6	215.9	320	36.6	52	98	206	168.3	171.4	166.9	47.6	7.9	170.7	(5)	12.7	269.9	12	7/8	¾	120	135
8	269.9	380	39.7	60	110	260	219.1	222.2	217.2	55.6	11.1	221.5	(5)	12.7	330.2	12	1	7/8	125	145
10	323.8	445	46.1	65	116	321	273.0	(6)	(6)	(6)	(6)	276.2	(5)	12.7	387.4	16	1½	1	145	165
12	381.0	520	49.3	71	129	375	323.8	(6)	(6)	(6)	(6)	327.0	(5)	12.7	450.8	16	1¼	1½	160	180
14	412.8	585	52.4	75	141	425	355.6	(6)	(6)	(6)	(6)	359.2	(5)	12.7	514.4	20	1¼	1½	165	185
16	469.9	650	55.6	81	144	483	406.4	(6)	(6)	(6)	(6)	410.5	(5)	12.7	571.5	20	1¾	1¾	180	195
18	533.4	710	58.8	87	157	533	457.0	(6)	(6)	(6)	(6)	461.8	(5)	12.7	628.6	24	1½	1¾	185	205
20	584.2	775	62.0	94	160	587	508.0	(6)	(6)	(6)	(6)	513.1	(5)	12.7	685.8	24	1¾	1¾	190	215
24	692.2	915	68.3	105	167	702	610.0	(6)	(6)	(6)	(6)	616.0	(5)	12.7	812.8	24	1¾	1½	210	240

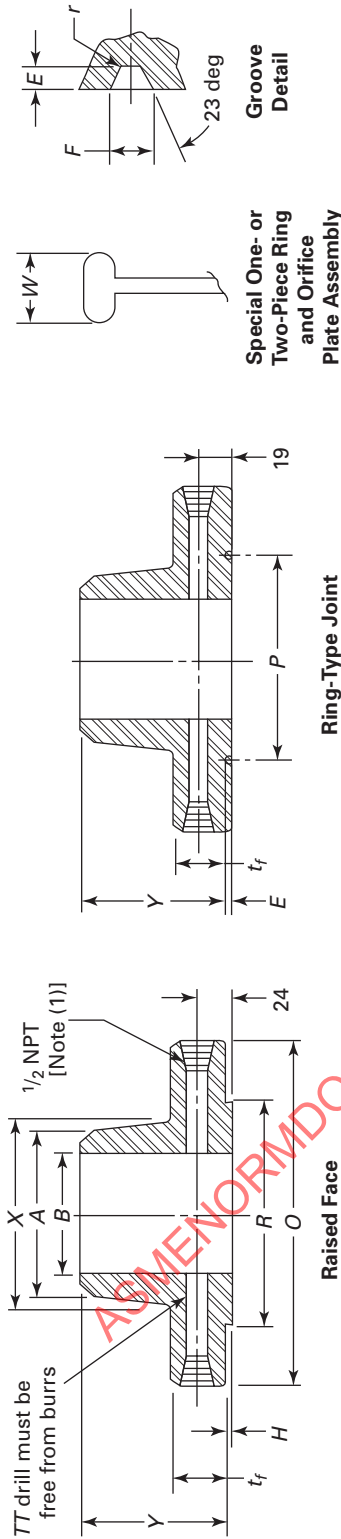
GENERAL NOTES:

- Dimensions are in millimeters, except for bolts and bolt holes. Reference Mandatory Appendix I for U.S. Customary.
- Welding neck flanges NPS 3 and smaller are dimensionally identical to Class 600 flanges and may be so marked.
- All other dimensions are in accordance with ASME B16.5.

NOTES:

- Other NPT sizes may be furnished if required.
- For slip-on and threaded flanges, verify that TT drilling extends to inside diameter of pipe after assembly and is free from burrs.
- 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.
- In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- Bore diameter of welding neck flanges is to be specified by the purchaser.
- Threaded flanges are furnished in NPS 1 to NPS 8 only.

Table 2 Class 600 Orifice Flanges, Welding Neck



Nominal Pipe Size	Outside Diameter of Raised Face, R	Outside Diameter of Flange, O	Minimum Thick- ness of Flange, t_f	Length Through Hub, Y	Height of Raised Face, H	Ring-Type Joint						Hub Diameter of Beginning of Chamfer, X	Diam- eter of Pressure Connec- tion, T	Drilling Template				Length of Stud Bolts [(2), (3)]				
						Pitch Diameter, P	Groove Depth, F	Groove Width, W	Radius at Bottom, r	Special Oval Ring Height, W	Diameter of Holes											
											Groove Num- ber			Groove Num- ber	Bolt Circle	Raised Face						
1	50.8	125	36.6	81	2	R16	50.80	6.35	8.74	0.8	25.4	54	33.5	(4)	6.4	88.9	4	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{5}{8}$	125	140
1½	73.0	155	36.6	84	2	R20	68.27	6.35	8.74	0.8	25.4	70	48.3	(4)	6.4	114.3	4	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{3}{4}$	135	140
2	92.1	165	36.6	84	2	R23	82.55	7.92	11.91	0.8	27.0	84	60.3	(4)	6.4	127.0	8	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{5}{8}$	125	140
2½	104.8	190	36.6	87	2	R26	101.60	7.92	11.91	0.8	27.0	100	73.0	(4)	6.4	149.2	8	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{3}{4}$	135	145
3	127.0	210	36.6	87	2	R31	123.83	7.92	11.91	0.8	27.0	117	88.9	(4)	9.5	168.3	8	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{3}{4}$	135	145
4	157.2	275	38.1	102	7	R37	149.23	7.92	11.91	0.8	27.0	152	114.3	(4)	12.7	215.9	8	1	1	$\frac{7}{8}$	150	165
6	215.9	355	47.7	117	7	R45	211.12	7.92	11.91	0.8	27.0	222	168.3	(4)	12.7	292.1	12	$\frac{1}{8}$	$\frac{1}{8}$	1	180	190
8	269.9	420	55.6	133	7	R49	269.88	7.92	11.91	0.8	27.0	273	219.1	(4)	12.7	349.2	12	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$	195	210
10	323.8	510	63.5	152	7	R53	323.85	7.92	11.91	0.8	27.0	343	273.0	(4)	12.7	431.8	16	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$	220	235
12	381.0	560	66.7	156	7	R57	381.00	7.92	11.91	0.8	27.0	400	323.8	(4)	12.7	489.0	20	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{4}$	230	240
14	412.8	605	69.9	165	7	R61	419.10	7.92	11.91	0.8	27.0	432	355.6	(4)	12.7	527.0	20	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	240	255
16	469.9	685	76.2	178	7	R65	469.90	7.92	11.91	0.8	30.2	495	406.4	(4)	12.7	603.2	20	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{1}{2}$	260	275
18	533.4	745	82.6	184	7	R69	533.40	7.92	11.91	0.8	30.2	546	457.2	(4)	12.7	654.0	20	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{8}$	280	290
20	584.2	815	88.9	190	7	R73	584.20	9.53	13.49	1.5	31.8	610	508.0	(4)	12.7	723.9	24	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{4}$	300	320
24	692.2	940	101.6	203	7	R77	692.15	11.13	16.66	1.5	36.5	718	609.6	(4)	12.7	838.2	24	2	2	$\frac{1}{8}$	335	350

GENERAL NOTES:

- Dimensions are in millimeters, except for bolts and bolt holes. Reference Mandatory Appendix I for U.S. Customary.
 - Welding neck flanges NPS 3 and smaller are identical to Class 300 flanges except for bolting and may be used for such service.
 - All other dimensions are in accordance with ASME B16.5.
 - Ring joint flange in NPS 24 will require an angular meter tap as shown in Fig. 2.
- NOTES:
- Other NPT sizes may be furnished if required.
 - In conformance with ASME B16.5, stud bolt lengths do not include point heights.
 - 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.
 - Bore is to be specified by the purchaser.



For NPS $2\frac{1}{2}$ and smaller, use Class 1500.

(a) Dimensions are in millimeters, except for bolts and bolt holes. Reference Mandatory Appendix I for U.S. Customary.

(c) Ring joint flanges larger than NPS 12 will require angular meter taps as shown in Fig. 2.

(1) Other NPT sizes may be furnished if required.

(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.

Technical drawing of a Ring-Type Joint showing two views: a side view and a cross-sectional view.

Side View Dimensions:

- X : Total length of the raised face.
- A : Distance from the left end to the start of the groove.
- B : Width of the groove.
- Y : Distance from the right end to the start of the groove.
- O : Total length of the joint.

Cross-sectional View Dimensions:

- $\frac{1}{2}$ NPT: Thread specification for the groove.
- 24: Depth of the groove.
- 7: Width of the raised face.
- t_f : Thickness of the flange.
- R : Radius of the raised face.

Notes:

- Drill must be free from burrs.

Labels:

- Ring-Type Joint
- Raised Face

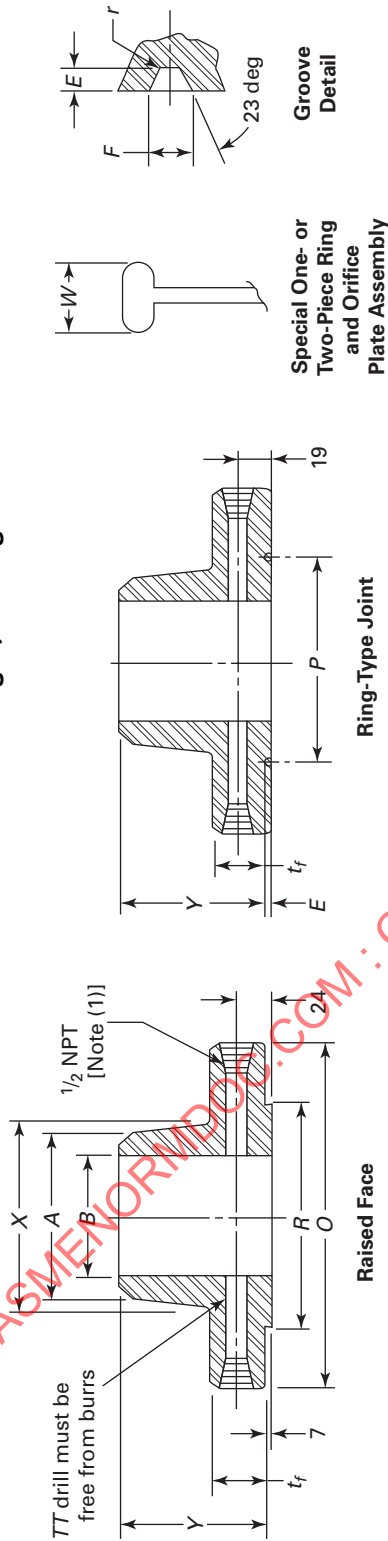
Nominal Pipe Size	Outside Diameter of Raised Face, R	Outside Diameter of Flange, O	Minimum Thick- ness of Flange, t _f	Length Through Hub, Y	Ring-Type Joint							Drilling Template				Length of Stud Bolts				
					Groove Num- ber	Pitch Diameter, P	Groove Depth, E	Groove Width, F	Radius at Bottom, r	Special Oval Ring Height, W	Diam- eter of Hub, X	Hub Diameter Beginning of Chamfer, A		Bore, B	Diam- eter of Pressure Connec- tion, T _T	Diam- eter of Bolt Circle	Num- ber of Holes	Diam- eter of Bolts	Ring Joint	
1	50.8	150	38.1	83	R16	50.80	6.35	8.74	0.8	25.4	52	33.5	(4)	6.4	101.6	4	1	7/8	150	160
1½	73.0	180	38.1	89	R20	68.27	6.35	8.74	0.8	25.4	70	48.3	(4)	6.4	123.8	4	1½	1	160	165
2	92.1	215	38.1	102	R24	95.25	7.92	11.91	0.8	27.0	105	60.3	(4)	6.4	165.1	8	1	7/8	150	165
2½	104.8	245	41.3	105	R27	107.95	7.92	11.91	0.8	27.0	124	73.0	(4)	6.4	190.5	8	1½	1	165	180
3	127.0	265	47.7	117	R35	136.53	7.92	11.91	0.8	27.0	133	88.9	(4)	9.5	203.2	8	1¼	1½	185	185
4	157.2	310	54.0	124	R39	161.93	7.92	11.91	0.8	27.0	162	114.3	(4)	12.7	241.3	8	1¾	1¼	205	215
6	215.9	395	82.6	171	R46	211.14	9.52	13.49	1.5	28.6	229	168.3	(4)	12.7	317.5	12	1½	1½	265	280
8	269.9	485	92.1	213	R50	269.88	11.13	16.66	1.5	33.3	292	219.1	(4)	12.7	393.7	12	1¾	1½	300	310
10	323.8	585	108.0	254	R54	323.85	11.13	16.66	1.5	33.3	368	273.0	(4)	12.7	482.6	12	2	1½	345	355
12	381.0	675	123.9	283	R58	381.00	14.27	23.01	1.5	39.7	451	323.8	(4)	12.7	571.6	16	2½	2	380	400
14	412.8	750	133.4	298	R63	419.10	15.88	26.97	2.4	44.4	495	355.6	(4)	12.7	635.0	16	2¾	2¼	415	445
16	469.9	825	146.1	311	R67	469.90	17.48	30.18	2.4	50.8	552	406.4	(4)	12.7	704.8	16	2¾	2½	450	485
18	533.4	915	162.0	327	R71	533.40	17.48	30.18	2.4	50.8	597	457.2	(4)	12.7	774.7	16	2¾	2¾	500	535
20	584.2	985	177.8	356	R75	584.20	17.48	33.32	2.4	54.0	641	508.0	(4)	12.7	831.8	16	3½	3	545	570
24	692.2	1170	203.2	406	R79	692.15	20.62	36.53	2.4	58.7	762	609.6	(4)	12.7	990.6	16	3¾	3½	620	660

(c) Ring joint flanges larger than NPS 6 will require angular meter taps shown in Fig. 2.

(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.

Table 5 Class 2500 Orifice Flanges, Welding Neck



Nominal Pipe Size	Outside Diameter of Raised Face, R	Outside Diameter of Flange, O	Minimum Thick- ness of Flange, t_f	Length Through Hub, Y	Ring-Type Joint										Diam- eter of Pres- sure Con- nect- ion, TT	Drilling Template			Length of Stud Bolts [(2), (3)]	
					Groove Num- ber	Pitch Diameter, P	Groove Depth, E	Groove Width, F	Radius at Bottom, r	Special		Diam- eter of Hub, X	Hub Diameter Beginning of Chamfer, A	Bore, B		Diam- eter of Bolt Circle	Num- ber of Holes	Diam- eter of Holes		
										Ring Height, W	Oval Ring Height, W									
1	50.8	160	38.1	92	R18	60.33	6.35	8.74	0.8	25.4	57	33.5	(4)	6.4	108.0	4	1	$\frac{7}{8}$	150	160
$1\frac{1}{2}$	73.0	205	44.5	111	R23	82.55	7.92	11.91	0.8	27.0	79	48.3	(4)	6.4	146.0	4	$1\frac{1}{4}$	$1\frac{1}{8}$	180	190
2	92.1	235	50.8	127	R26	101.60	7.92	11.91	0.8	27.0	95	60.3	(4)	6.4	171.4	8	$1\frac{1}{8}$	1	185	195
$2\frac{1}{2}$	104.8	265	57.2	143	R28	111.13	9.53	13.49	1.5	30.2	114	73.0	(4)	6.4	196.8	8	$1\frac{1}{4}$	$1\frac{1}{8}$	205	215
3	127.0	305	66.7	168	R32	127.00	9.53	13.49	1.5	30.2	133	88.9	(4)	9.5	228.6	8	$1\frac{3}{8}$	$1\frac{1}{4}$	230	240
4	157.2	355	76.2	190	R38	157.18	11.13	16.66	1.5	33.3	165	114.3	(4)	12.7	273.0	8	$1\frac{5}{8}$	$1\frac{1}{2}$	260	275
6	215.9	485	108.0	273	R47	228.60	12.70	19.84	1.5	36.5	235	168.3	(4)	12.7	368.3	8	$2\frac{1}{8}$	2	350	370
8	269.9	550	127.0	318	R51	279.40	14.27	23.01	1.5	39.7	305	219.1	(4)	12.7	438.2	12	$2\frac{1}{8}$	2	385	405
10	323.8	675	165.1	419	R55	342.90	17.48	30.18	2.4	47.6	375	273.0	(4)	12.7	539.8	12	$2\frac{5}{8}$	$2\frac{1}{2}$	490	515
12	381.0	760	184.2	464	R60	406.40	17.48	33.32	2.4	50.8	441	323.8	(4)	12.7	619.1	12	$2\frac{7}{8}$	$2\frac{3}{4}$	540	570

GENERAL NOTES:

- (a) Dimensions are in millimeters, except for bolts and bolt holes.
 (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 Fig. 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.

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MANDATORY APPENDIX I DIMENSIONAL DATA FOR CLASSES 300, 600, 900, 1500, AND 2500 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. Tables I-1 through I-5, included in this Appendix, provide dimensional data in U.S. Customary units for the following: Classes 300, 600, 900, 1500, and 2500 flanges.

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

Nom- inal Pipe Size	Outside Diameter of Raised Face, R	Minimum Thickness of Flange, t_f	Welding Neck			Threaded										Slip-On									
			Outside Diameter of Flange, O	Length Through Hub Slip-On and Threaded, Y ₂	Welding Neck, Y ₁	Hub Diameter Beginning of Chamfer of Hub, X (W.N.), A	Diameter of Counterbore		Counterbore Depth (From Face)		Bore		Diameter of Pressure Connection, TT	Drilling Template			Bolt Length [(3), (4)]								
							Q _B	Q _F	F	G	Slip-On, B ₂	Welding Neck, B ₁		Bolt Circle	Number of Holes	Diameter of Holes	Machine Bolts	Stud Bolts							
1	2.00	1.44	4.88	1.81	3.19	2.12	1.32	1.41	1.30	1.44	0.75	1.36	(5)	3.50	4	11/16	4.50	5.00							
1 1/2	2.88	1.44	6.12	1.81	3.31	2.75	1.90	1.99	1.89	1.47	0.72	1.95	(5)	4.50	4	13/16	4.75	5.25							
2	3.62	1.44	6.50	1.88	3.31	3.31	2.38	2.50	2.36	1.50	0.69	2.44	(5)	5.00	8	11/16	4.50	5.00							
2 1/2	4.12	1.44	7.50	1.94	3.44	3.94	2.88	3.00	2.84	1.75	0.56	2.94	(5)	5.88	8	13/16	4.75	5.25							
3	5.00	1.44	8.25	2.00	3.44	4.62	3.50	3.63	3.46	1.81	0.56	3.57	(5)	6.62	8	13/16	4.75	5.25							
4	6.19	1.44	10.00	2.06	3.56	5.75	4.50	4.63	4.45	1.88	0.56	4.57	(5)	7.88	8	13/16	4.75	5.25							
6	8.50	1.44	12.50	2.06	3.88	8.12	6.63	6.75	6.57	1.88	0.31	6.72	(5)	10.62	12	7/8	4.75	5.25							
8	10.62	1.56	15.00	2.38	4.31	10.25	8.63	8.75	8.55	2.19	0.44	8.72	(5)	13.00	12	1	5.00	5.75							
10	12.75	1.81	17.50	2.56	4.56	12.62	10.75	(6)	(6)	(6)	(6)	10.88	(5)	15.25	16	1 1/8	5.75	6.50							
12	15.00	1.94	20.50	2.81	5.06	14.75	12.75	(6)	(6)	(6)	(6)	12.88	(5)	17.75	16	1 1/4	6.25	7.00							
14	16.25	2.06	23.00	2.94	5.56	16.75	14.00	(6)	(6)	(6)	(6)	14.14	(5)	20.25	20	1 1/4	6.50	7.25							
16	18.50	2.19	25.50	3.19	5.69	19.00	16.00	(6)	(6)	(6)	(6)	16.16	(5)	22.50	20	1 3/8	7.00	7.75							
18	21.00	2.31	28.00	3.44	6.19	21.00	18.00	(6)	(6)	(6)	(6)	18.18	(5)	24.75	24	1 3/8	7.25	8.00							
20	23.00	2.44	30.50	3.69	6.31	23.12	20.00	(6)	(6)	(6)	(6)	20.20	(5)	27.00	24	1 3/8	7.50	8.50							
24	27.25	2.69	36.00	4.12	6.56	27.62	24.00	(6)	(6)	(6)	(6)	24.25	(5)	32.00	24	1 5/8	8.25	9.50							

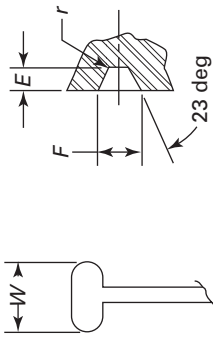
GENERAL NOTES:

- Dimensions are in inches.
- Welding neck flanges NPS 3 and smaller are dimensionally identical to Class 600 flanges and may be so marked.
- All other dimensions are in accordance with ASME B16.5.

NOTES:

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

(15)

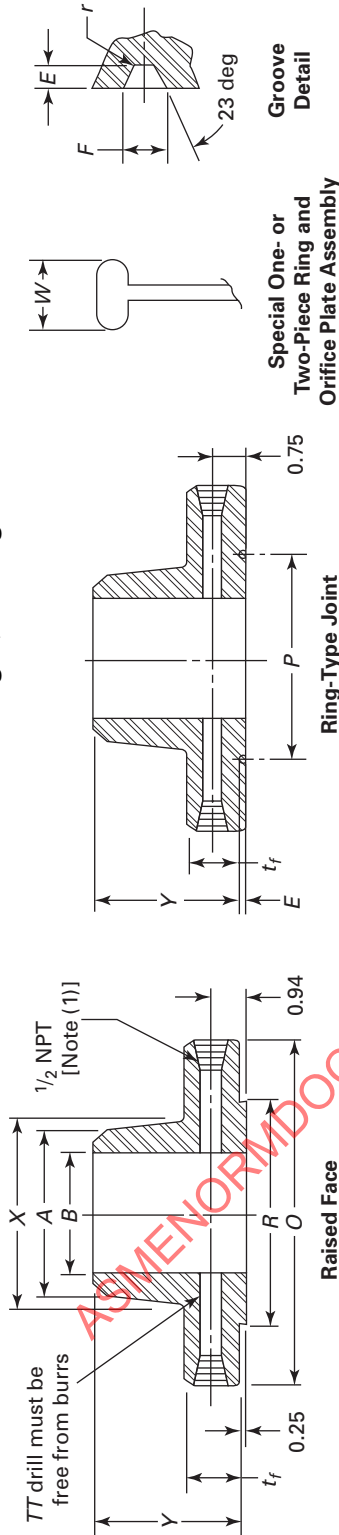


GENERAL NOTES:

- NOTES:

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

Table I-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 Thick- ness of Flange, <i>t_f</i>	Length Through Hub, <i>Y</i>	Ring-Type Joint										Drilling Template			Diam- eter of Pressure Con- nection, <i>TT</i>	Diam- eter of Bolts	Length of Stud Bolts [(2), (3)]											
					Groove Num- ber	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>	Hub Diameter Beginning of Chamfer, <i>A</i>	Bore, <i>B</i>	Diam- eter of Bolt Circle	Num- ber of Holes	Diam- eter of Holes															
1																															
1½																															
2																															
2½																															
For NPS 2½ and smaller, use Class 1500.																															
3	5.00	9.50	1.50	4.00	R31	4.875	0.312	0.469	0.03	1.06	5.00	6.25	4.50	(4)	¾	7.50	8	1.00	7/8	6.00	6.50										
4	6.19	11.50	1.75	4.50	R37	5.875	0.312	0.469	0.03	1.06	6.25	9.25	4.50	(4)	½	9.25	8	1.25	1 1/8	7.00	7.50										
6	8.50	15.00	2.19	5.50	R45	8.312	0.312	0.469	0.03	1.06	9.25	11.75	6.63	(4)	½	12.50	12	1.25	1 1/8	7.75	8.25										
8	10.62	18.50	2.50	6.38	R49	10.625	0.312	0.469	0.03	1.06	11.75	14.50	8.63	(4)	½	15.50	12	1.50	1 1/8	9.00	9.50										
10	12.75	21.50	2.75	7.25	R53	12.750	0.312	0.469	0.03	1.06	14.50	16.50	10.75	(4)	½	18.50	16	1.50	1 3/8	9.50	10.00										
12	15.00	24.00	3.12	7.88	R57	15.000	0.312	0.469	0.03	1.06	16.50	17.75	12.75	(4)	½	21.00	20	1.50	1 3/8	10.25	10.75										
14	16.25	25.25	3.38	8.38	R62	16.500	0.438	0.656	0.06	1.31	17.75	20.00	14.00	(4)	½	22.00	20	1.62	1 1/2	11.00	11.50										
16	18.50	27.75	3.50	8.50	R66	18.500	0.438	0.656	0.06	1.44	20.00	22.25	16.00	(4)	½	24.25	20	1.75	1 5/8	11.50	12.00										
18	21.00	31.00	4.00	9.00	R70	21.000	0.500	0.781	0.06	1.56	22.25	24.50	18.00	(4)	½	27.00	20	2.00	1 7/8	13.00	13.75										
20	23.00	33.75	4.25	9.75	R74	23.000	0.500	0.781	0.06	1.56	24.50	29.50	20.00	(4)	½	29.50	20	2.12	2	14.00	14.75										
24	27.25	41.00	5.50	11.50	R78	27.250	0.625	1.062	0.09	1.88	29.50	35.50	24.00	(4)	½	35.50	20	2.62	2 1/2	17.50	18.50										

For NPS 2 1/2 and smaller, use Class 1500.

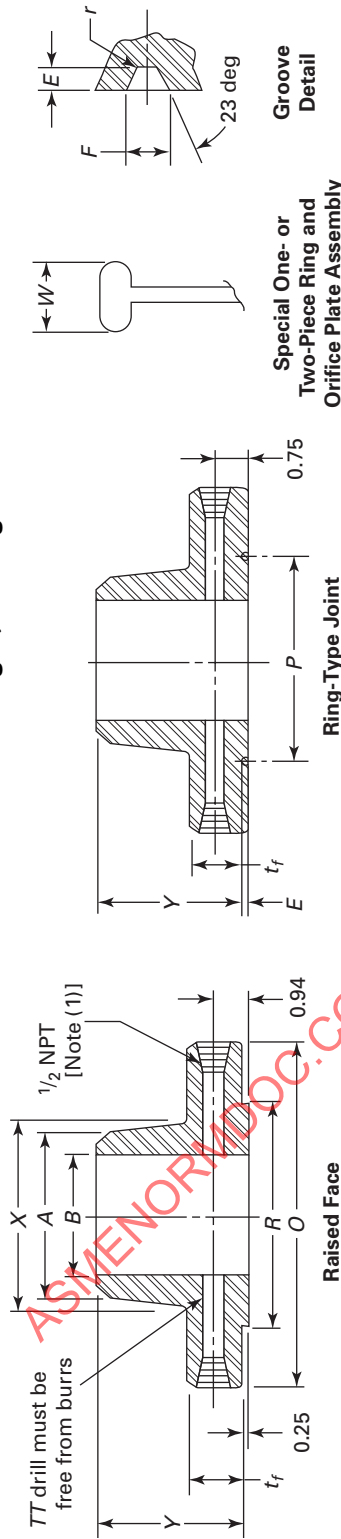
GENERAL NOTES:

- Dimensions are in inches.
- All other dimensions are in accordance with ASME B16.5.
- Ring joint flanges larger than NPS 12 will require angular meter taps as shown in Fig. 2.

NOTES:

- Other NPT sizes may be furnished if required.
- In conformance with ASME B16.5, stud bolt lengths do not include point heights.
- Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25 in. for NPS 3 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 3 to NPS 10 and 0.75 in. for NPS 12.
- Bore is to be specified by the purchaser.

Table I-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_f</i>	Length Through Hub, <i>Y</i>	Ring-Type Joint										Diameter of Pressure Connection, <i>TT</i>	Drilling Template			Length of Stud Bolts [(2), (3)]	
					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>	Diameter of Hub, <i>X</i>	Hub Diameter Beginning of Chamfer, <i>A</i>	Bore, <i>B</i>	Diameter of Bolt Circle		Number of Holes	Diameter of Holes			
1	2.00	5.88	1.50	3.25	R16	2.000	0.250	0.344	0.03	1.00	2.06	1.32	(4)	1/4	4.00	4	1.00	7/8	6.00	6.25
1½	2.88	7.00	1.50	3.50	R20	2.688	0.250	0.344	0.03	1.00	2.75	1.90	(4)	1/4	4.88	4	1.12	1	6.25	6.50
2	3.62	8.50	1.50	4.00	R24	3.750	0.312	0.469	0.03	1.06	4.12	2.38	(4)	1/4	6.50	8	1.00	7/8	6.00	6.50
2½	4.12	9.62	1.62	4.12	R27	4.250	0.312	0.469	0.03	1.06	4.88	2.88	(4)	1/4	7.50	8	1.12	1	6.50	7.00
3	5.00	10.50	1.88	4.62	R35	5.375	0.312	0.469	0.03	1.06	5.25	3.50	(4)	3/8	8.00	8	1.25	1½	7.25	7.25
4	6.19	12.25	2.12	4.88	R39	6.375	0.312	0.469	0.03	1.06	6.38	4.50	(4)	1/2	9.50	8	1.38	1¼	8.00	8.50
6	8.50	15.50	3.25	6.75	R46	8.312	0.375	0.531	0.06	1.12	9.00	6.63	(4)	1/2	12.50	12	1.50	1⅜	10.50	11.00
8	10.62	19.00	3.62	8.38	R50	10.625	0.438	0.656	0.06	1.31	11.50	8.63	(4)	1/2	15.50	12	1.75	1½	11.75	12.25
10	12.75	23.00	4.25	10.00	R54	12.750	0.438	0.656	0.06	1.31	14.50	10.75	(4)	1/2	19.00	12	2.00	1⅞	13.50	14.00
12	15.00	26.50	4.88	11.12	R58	15.000	0.562	0.906	0.06	1.56	17.75	12.75	(4)	1/2	22.50	16	2.12	2	15.00	15.75
14	16.25	29.50	5.25	11.75	R63	16.500	0.625	1.062	0.09	1.75	19.50	14.00	(4)	1/2	25.00	16	2.38	2¼	16.25	17.50
16	18.50	32.50	5.75	12.25	R67	18.500	0.688	1.188	0.09	2.00	21.75	16.00	(4)	1/2	27.75	16	2.62	2½	17.75	19.00
18	21.00	36.00	6.38	12.88	R71	21.000	0.688	1.188	0.09	2.00	23.50	18.00	(4)	1/2	30.50	16	2.88	2⅞	19.75	21.00
20	23.00	38.75	7.00	14.00	R75	23.000	0.688	1.312	0.09	2.12	25.25	20.00	(4)	1/2	32.75	16	3.12	3	21.50	22.50
24	27.25	46.00	8.00	16.00	R79	27.250	0.812	1.438	0.09	2.31	30.00	24.00	(4)	1/2	39.00	16	3.62	3½	24.50	26.00

GENERAL NOTES:

- Dimensions are in inches.
- All other dimensions are in accordance with ASME B16.5.
- Ring joint flanges larger than NPS 6 will require angular meter taps shown in Fig. 2.

NOTES:

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