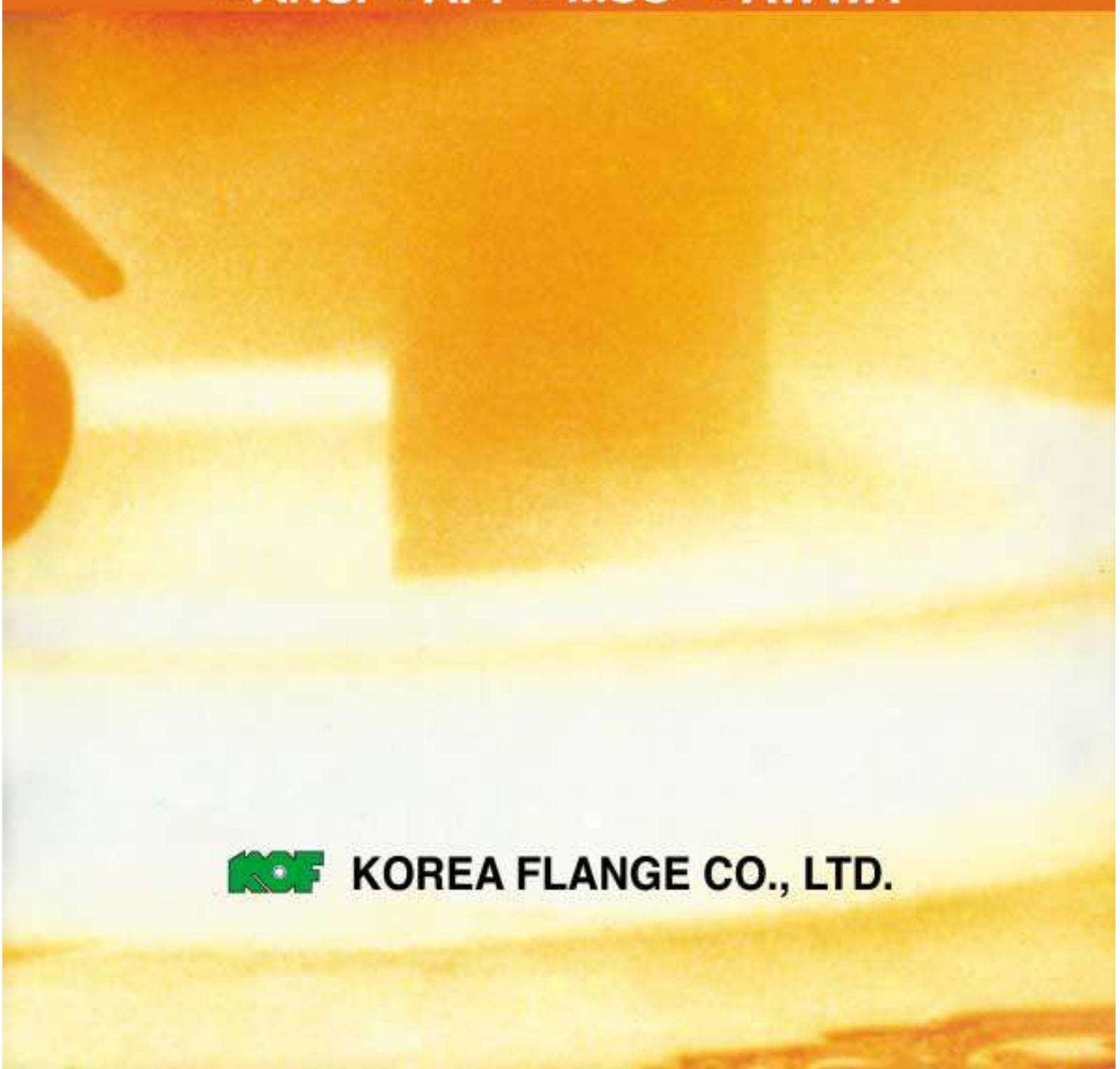
KOFCO KOREA FLANGE CO., LTD.

KOFCO

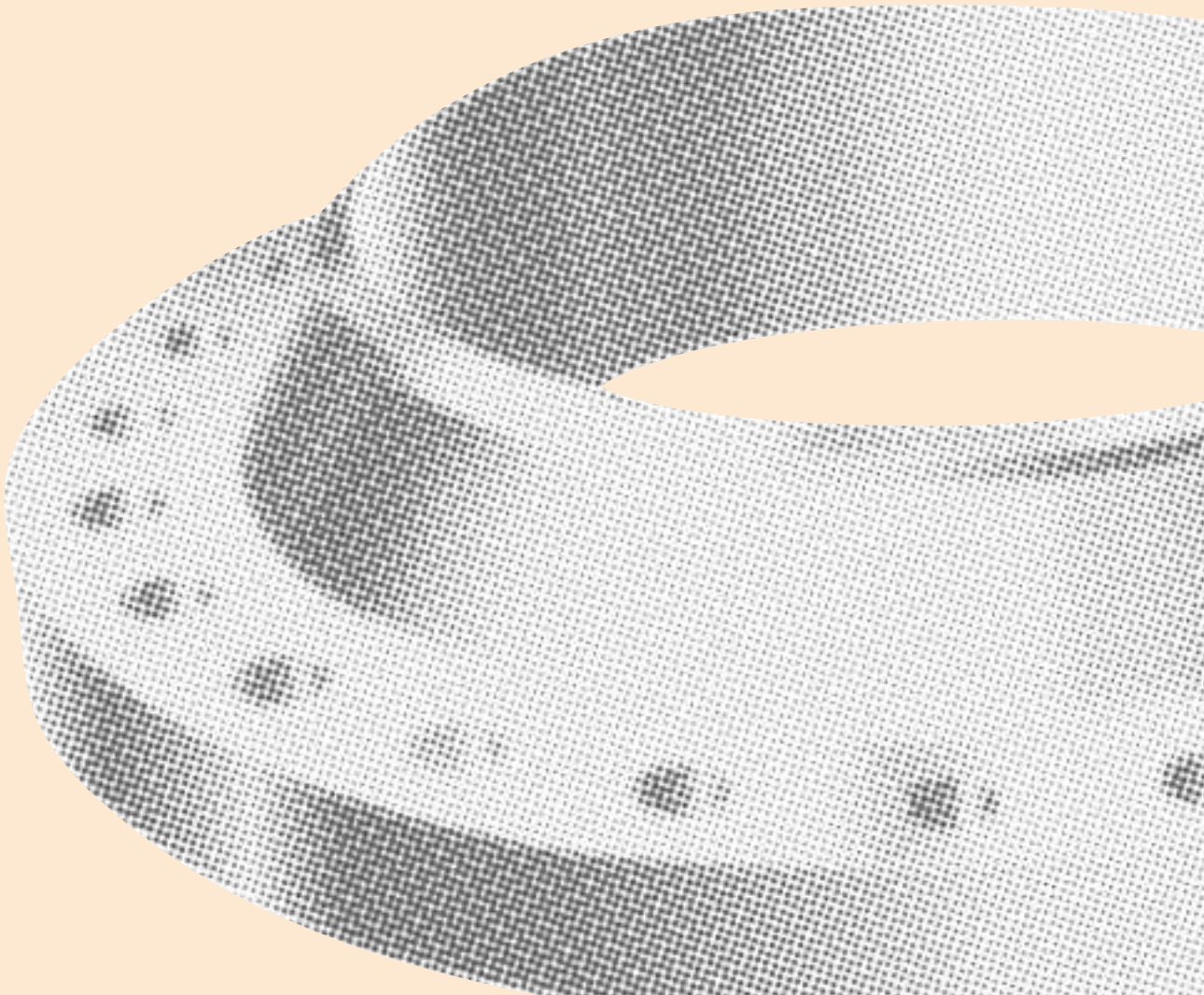
●ANSI ●API ●MSS ●AWWA

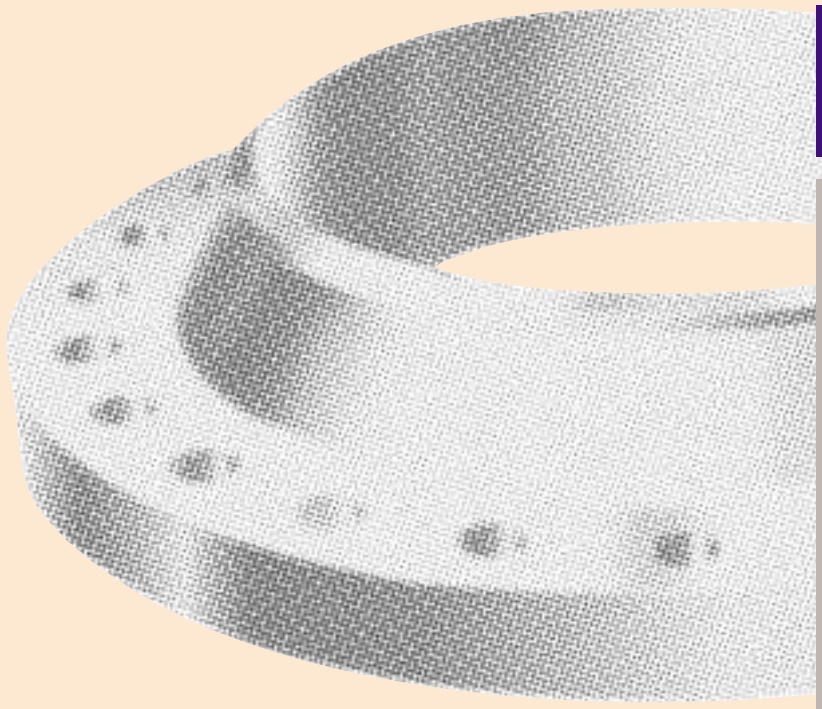


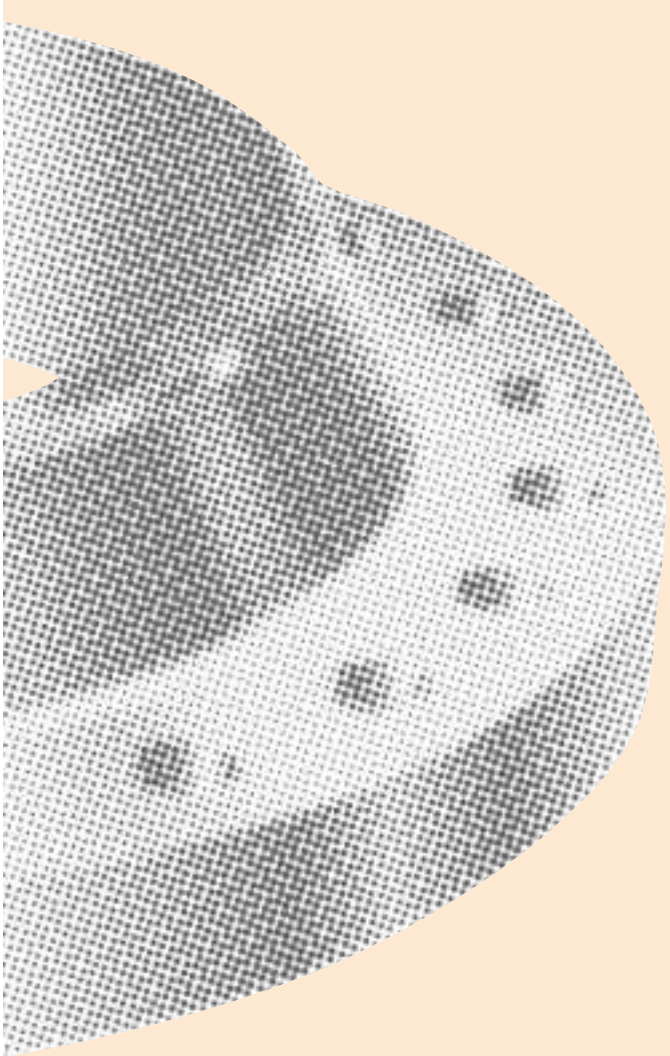
KOF KOREA FLANGE CO., LTD.

AVAILABLE FOR YOUR BETTER PIPING!

Manufacturer of Better Flanges
Steel Plate Flanges
Forged Steel Flanges
Non-Ferrous Flanges
in Accordance with ANSI, API, MSS, AWWA
Other Special Steel & Forged Flanges







CONTENTS

ISO-9002

We, KOREA FLANGE CO., LTD., are certified for the quality management system from ISO in fitting industries.

ISO 9000 series is the representative for international qulity system and foreign trades. Our desire for quality and technical advancement has overcome the steep export barrier. We have proved worldwide again for qulity by securing in certificate of approval for ISO 9002. We will do our best to produce the barrier products and to improve technical development.

Lloyd's Register
Quality Assurance

CERTIFICATE OF APPROVAL

This is to Certify that the Quality Management System of

Korea Flange Co. Ltd
Ulsan, Korea

has been approved by Lloyd's Register Quality Assurance Limited to the following quality management system standards:

ISO 9002-1987 EN 29002-1987
KS A9002:1992 CSA Z299.2-85

The Quality Management System is applicable to:

Manufacture of flanges including machining, forging and associated testing.

Approval Certificate No. 920003

Original Approval: 6th April 1993
Current Certificate: 6th April 1993
Certificate Expiry: 29th February 1996

on behalf of LRQA

Registration Number 001

The approval is subject to company maintaing its system to the required standards, which will be monitored by LRQA.

FORM L0194 (8/90) The use of the Accreditation Mark indicates Accreditation in the respect of those activities covered by the Accreditation Certificate Number 001.

What is ISO 9000 Series?

This is the quality assurance standard that established by ISO (International Standardization Organization). ISO 9000 series has become the prerequisite for successful international trades.

FORWARD

It is a great pleasure for me to introduce to our friends and customers Korea Flange Co., Ltd.(KOFCO), an affiliate of the Hyundai Group, largest business conglomerate in Korea.

Since its establishment in 1974, KOFCO has supplied a wide spectrum of quality products for its customers around the world. KOFCO is recognized among clients for the excellence of quality and technology.

Our highest standard of technology coupled with the up-to-date productions facilities enables KOFCO to win an unrivaled reputation.Major production facilities include the latest model of forging shops, multispindle drilling machines, CNC lathes, spectrometers, coordinate measuring machines, plasma cutters, billet shears and many other equipment.

By utilizing its up-to-date production facilities and skilled manpower, KOFCO commenced the fabrication of various steel structures for shipbuilding in 1977. On the basis of this experience and accumulate technology, KOFCO has fabricate large steel structures and industrial machinery required for petrochemical plants, power plants, industrial plants and many other construction projects.

Equipped with the most modern machinery, KOFCO also produces a variety automobile parts which are C/V joints, front ass'y, commercial auto parts.

KOFCO's quality assurance and computerized production systems are so excellent as to meet the demanding requirements of clients.

KOFCO will continue its efforts to satisfy customer's demand by supplying top quality products and services. We look forward to your continued encouragement and support in the years ahead.

Sincerely Yours,

D. H. Gwak

President

Research & Develop

We, Korea Flange Co., Ltd., always provide our customers with high quality products which conform to international codes and standards.

Under the strict Quality Assurance System at We, Korea Flange Co., Ltd. every production complies to all applicable specifications and drawings. Our excellent quality control engineers control all processes from initial inquiry to design, material purchase, manufacturing and testing.

Our ultra modern laboratory facilities for the Quality Assurance include spectrometers for material analysis, universal test machines for physical property testing, coordinate measuring machines for multi dimension check, air emission spectrometers, ultrasonic testers and metallic micro-scopes. Such latest equipment is manned by superb engineers and well-trained technicians.

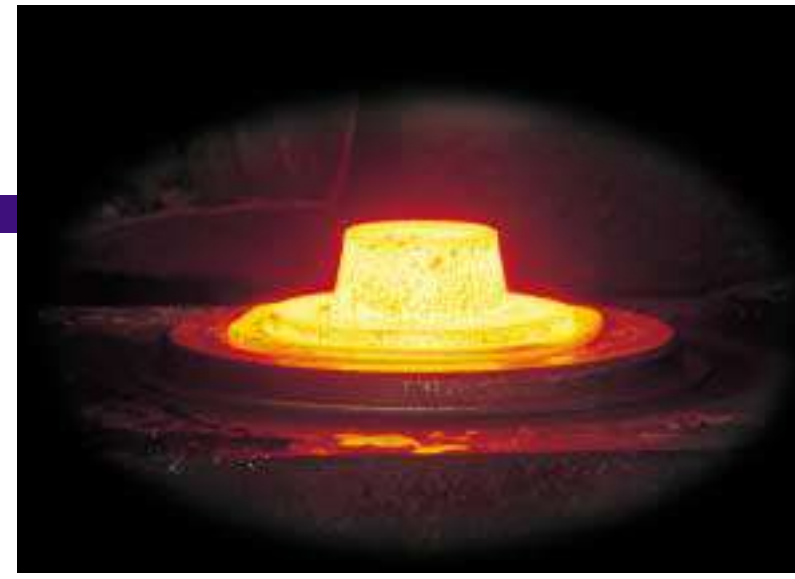
KOFCO is proud of its superlative Quality Assurance system designed to meet the requirements of its customers.


BAIRD

FLANGE PRODUCTION

In the No. 1 shop, lathe machining, drilling, coating and packing are performed while cutting, forging and heat treatment are carried out in the No. 2 shop. The two shops are completely equipped with a full range of modern equipment. Our major equipment are air-drop hammers, forging presses, ring roll mill machine, multi-spindle drill machines, automatic lathes, CNC lathes, plasma cutters, billet shears, heat treatment furnaces and many other computerized systems.
KOFCO produces high quality products taking advantage of these facilities and accumulated technology.

Korea Flange will continue it total effort to supply top quality products for worldwide clients.



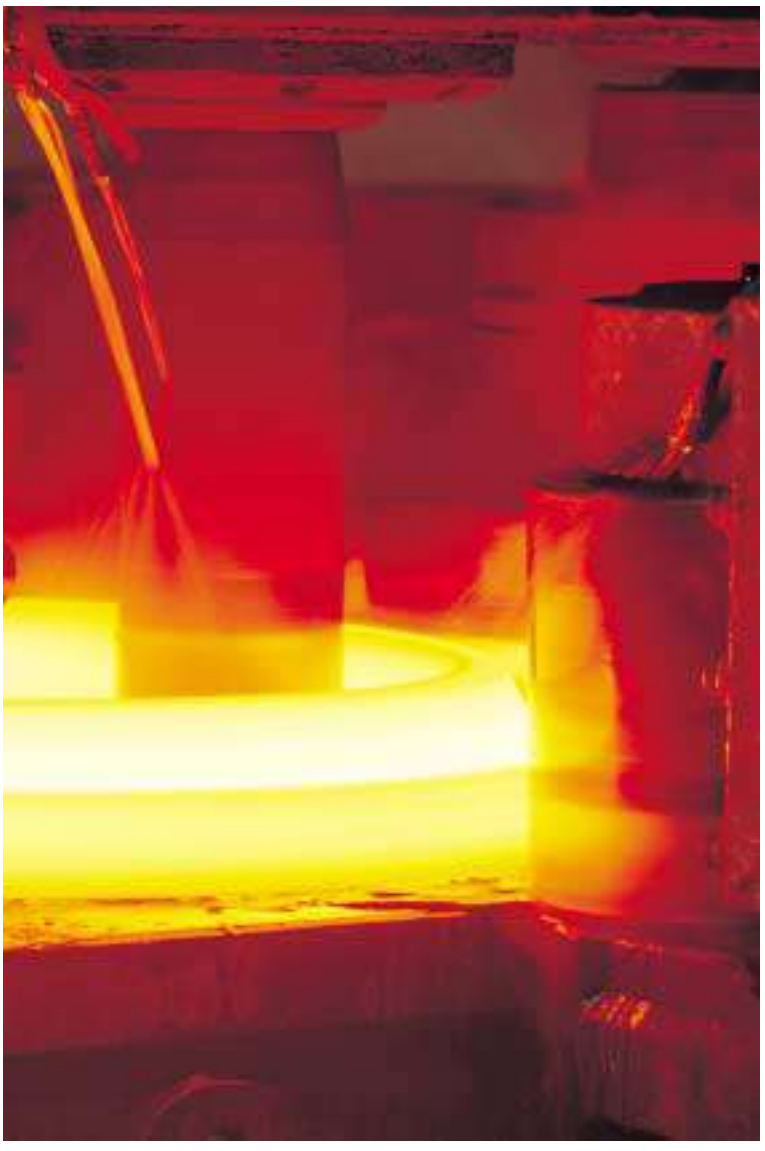
QUALITY ASSURANCE

Korea Flange Co., Ltd. is fully equipped with the most up-to-date facilities and staffed with excellent engineers and technicians to produce top quality products that meet the demanding requirements of clients.

Since its establishment in 1974, Korea Flange has specialized in the production of a wide range of flanges and fittings using accumulated technology and strict quality assurance system.

Our technology and products are earning an excellent reputation from customers around the world. Korea Flange has obtained quality certificates from international organizations such as Shell International Petroleum, Exxon, USCG, Lloyd's Register of Shipping, ARAMCO Overseas Company, Nippon Kaiji Kyokai, Lloyd's Register Quality Assurance(for ISO 9002) and many other authorities.

Our products include carbon steel, non-ferrous and lined flanges to the specifications of ANSI, AWWA, API and MSS, as well as many other special flanges.



KOFCO FLANGE

Welding Neck Flanges

The welding neck flange is normally referred to as the “high hub” flange. It is designed to transfer stresses to the pipe, there by reducing high stress concentrations at the base of the flange. The welding neck flange is the best designed butt-welded flange of those currently available because of its inherent structural value. It is expensive because of the designed.

Threaded(Screwed) Flanges

The threaded flange is similar to the slip-on flange, but the bore is threaded. Its chief merit is that it can be assembled without welding, explaining its use in low pressure services at ordinary atmospheric temperatures, and in highly explosive areas where welding create a hazard.

Slip-on Flanges

The slip-on flange has a low hub because the pipe slips into the flange prior to welding. It is welded both inside and out to provide sufficient strength and prevent leakage. Slip on flanges are all bored slightly larger than the O. D. of the matching pipe. They are preferred over welding neck flanges by many users due to their lower initial cost, but final installation cost is probably not much less than that of the welding neck flange because of the additional welding involved.

Lap Joint Flanges

The lap joint flange is practically identical to a slip-on flange except it has a radius at the intersection of the bore and flange face. This radius is necessary to have the flange accommodate a lap joint stub end. Normally, a lap joint flange and the lap joint stub end are mated together in an assembly system.

Build Flanges

The build flange is a flange without a bore. It is used to close off the ends of a piping system and/or a pressure vessel opening. It also permits easy access to the interior of a line or vessel once it has been sealed and must be reopened.

Socket Welding Flanges

The socket welding flange is similar to a slip-on flange except it has a bore and a counterbore dimension. The counterbore is slightly larger than the O. D. of the matching pipe, allowing the pipe to be inserted into the flange similar to a slip-on flange. The diameter oh the smaller bore is the same as the I. D. of the matching pipe. A restriction is built into the bottom of the bore which sets as a shoulder for the pipe to rest on. This eliminates any restriction in flow when using a socket welding flange.

ANSI FLANGES

- Class 150 Flanges
- Class 300 Flanges
- Class 400 Flanges
- Class 600 Flanges
- Class 900 Flanges
- Class 1500 Flanges
- Class 2550 Flanges

KOFCO Standard Marking

NOMINAL SIZE

CLASS

NOMINAL
WALL THICKNESS

ANSI STANDARD

TRADE MARK

HEAT CODE

YEAR

MATERIAL DESIGNATION

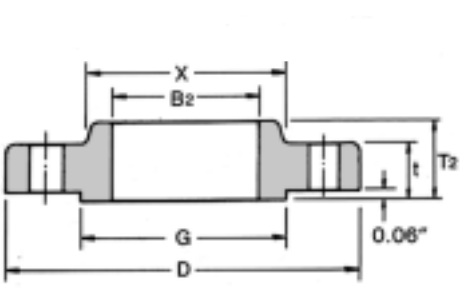
ANSI

API

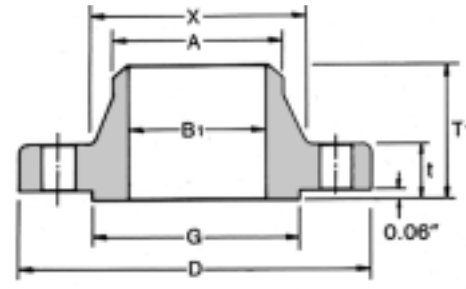
MSS

AWWA

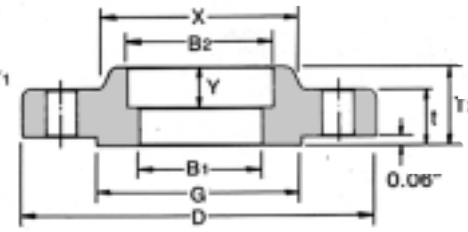
CLASS 150 FLANGES



SLIP-ON



WELDING NECK



SOCKET WELDING

ANSI B16.5 FORGED FLANGES

Dimensions in inches

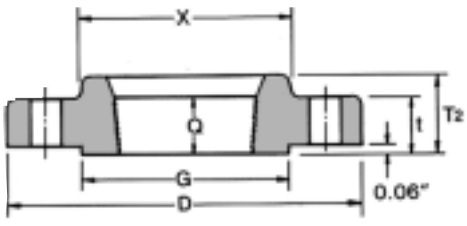
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE			LENGTH THRU HUB			Diam. of Hub at Bevel	Radius of Fillet	Thread Length
					Welding Neck Socket Welding	Slip-on Socket Welding	Lap Joint	Welding Neck	Slip-on Threaded Socket Welding	Lap Joint			
	D	t	G	X	B_1	B_2	B_3	T_1	T_2	T_3	A	R	Q
½	3.50	0.44	1.38	1.19	0.62	0.88	0.90	1.88	0.62	0.62	0.84	0.12	0.62
¾	3.88	0.50	1.69	1.50	0.82	1.09	1.11	2.06	0.62	0.62	1.05	0.12	0.62
1	4.25	0.56	2.00	1.94	1.05	1.36	1.38	2.19	0.69	0.69	1.32	0.12	0.69
1¼	4.62	0.62	2.50	2.31	1.38	1.70	1.72	2.25	0.81	0.81	1.66	0.19	0.81
1½	5.00	0.69	2.88	2.56	1.61	1.95	1.97	2.44	0.88	0.88	1.90	0.25	0.88
2	6.00	0.75	3.62	3.06	2.07	2.44	2.46	2.50	1.00	1.00	2.38	0.31	1.00
2½	7.00	0.88	4.12	3.56	2.47	2.94	2.97	2.75	1.12	1.12	2.88	0.31	1.12
3	7.50	0.94	5.00	4.25	3.07	3.57	3.60	2.75	1.19	1.19	3.50	0.38	1.19
3½	8.50	0.94	5.50	4.81	3.55	4.07	4.10	2.81	1.25	1.25	4.00	0.38	1.25
4	9.00	0.94	6.19	5.31	4.03	4.57	4.60	3.00	1.31	1.31	4.50	0.44	1.31
5	10.00	0.94	7.31	6.44	5.05	5.66	5.69	3.50	1.44	1.44	5.56	0.44	1.44
6	11.00	1.00	8.50	7.56	6.07	6.72	6.75	3.50	1.56	1.56	6.63	0.50	1.56
8	13.50	1.12	10.62	9.69	7.98	8.72	8.75	4.00	1.75	1.75	8.63	0.50.	1.75
10	16.00	1.19	12.75	12.00	10.02	10.88	10.92	4.00	1.94	1.94	10.75	0.50	1.94
12	19.00	1.25	15.00	14.38	12.00	12.88	12.92	4.50	2.19	2.19	12.75	0.50	2.19
14	21.00	1.38	16.25	15.75	13.25	14.14	14.18	5.00	2.25	3.12	14.00	0.50	2.25
16	23.50	1.44	18.50	18.00	15.25	16.16	16.19	5.00	2.50	3.44	16.00	0.50	2.50
18	25.00	1.56	21.00	19.88	17.25	18.18	18.20	5.50	2.69	3.81	18.00	0.50	2.69
20	27.50	1.69	23.00	22.00	19.25	20.20	20.25	5.69	2.88	4.06	20.00	0.50	2.88
24	32.00	1.88	27.25	26.12	23.25	24.25	24.25	6.00	3.25	4.38	24.00	0.50	3.25

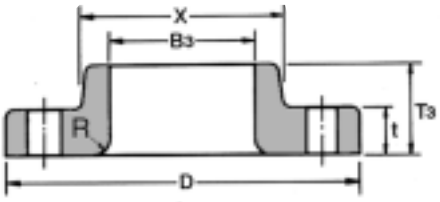
Notes:

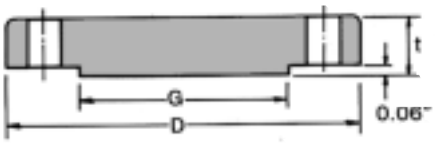
(1) For the 'Bore' (B_1) other than Standard Wall Thickness, refer to page 61.

(2) Class 150 flanges except Lap Joint will be furnished with 0.06" raised face, which is included in 'Thickness' (t) and 'Length through Hub' (T_1), (T_2).

(3) For Slip-on, Threaded, Socket Welding and Lap Joint Flanges, the hubs can be shaped either vertical from base to top or tapered within the limits of 7 degrees.







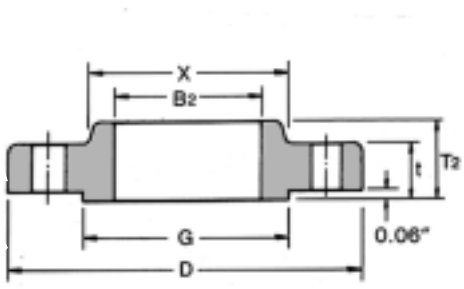
THREADED LAP JOINT BLIND

Dimensions in inches

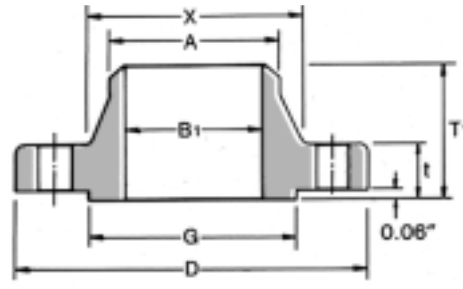
Depth of Socket	DRILLING			BOLTING				APPROXIMATE WEIGHT										Nominal Pipe Size
	Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	Machine Bolt Length	Stud Bolt Length		Welding Neck		Slip-on and Threaded		Lap Joint		Blind		Socket Welding		
Y					Raised Face	Raised Face	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
0.38	2.38	4	0.62	½	2.00	2.25	–	0.51	1.10	0.47	1.00	0.51	1.00	0.47	1.00	0.47	1.00	½
0.44	2.75	4	0.62	½	2.00	2.50	–	0.73	1.60	0.58	1.30	0.64	1.40	0.63	1.40	0.59	1.30	¾
0.50	3.12	4	0.62	½	2.25	2.50	3.00	1.07	2.40	0.86	1.90	0.93	1.80	0.94	2.10	0.87	1.90	1
0.56	3.50	4	0.62	½	2.25	2.75	3.25	1.40	3.10	1.08	2.40	1.16	2.00	1.23	2.70	1.11	2.40	1¼
0.62	3.88	4	0.62	½	2.50	2.75	3.25	1.81	4.00	1.41	3.10	1.51	3.30	1.62	3.60	1.45	3.20	1½
0.69	4.75	4	0.75	⅝	2.75	3.25	3.75	2.59	5.70	2.26	5.00	2.38	5.20	2.64	5.80	2.33	5.00	2
0.75	5.50	4	0.75	⅝	3.00	3.50	4.00	4.28	9.40	3.43	7.60	3.60	7.90	4.06	9.00	3.55	7.80	2½
0.81	6.00	4	0.75	⅝	3.00	3.50	4.00	5.18	11.40	3.87	8.50	4.04	8.90	4.90	10.80	4.02	8.90	3
0.88	7.00	8	0.75	⅝	3.00	3.50	4.00	5.45	12.00	4.99	11.00	4.99	11.00	5.90	13.00	4.99	11.00	3½
0.94	7.50	8	0.75	⅝	3.00	3.50	4.00	7.32	16.10	5.75	12.70	5.96	13.00	7.41	16.30	5.99	13.20	4
0.94	8.50	8	0.88	¾	3.25	3.75	4.25	8.91	19.60	6.22	13.70	6.44	14.00	8.76	19.30	6.68	14.70	5
1.06	9.50	8	0.88	¾	3.25	4.00	4.50	11.26	24.80	7.38	16.30	7.59	16.70	11.31	24.90	7.99	17.60	6
1.25	11.75	8	0.88	¾	3.50	4.25	4.75	17.68	39.00	12.36	27.30	12.66	27.90	19.92	43.90	13.29	29.30	8
1.31	14.25	12	1.00	⅞	4.00	4.50	5.00	24.79	54.70	17.10	37.70	16.78	37.00	29.39	64.80	19.50	43.00	10
1.56	17.00	12	1.00	⅞	4.00	4.75	5.25	38.98	85.90	27.68	61.00	28.30	62.40	43.70	96.30	29.03	64.00	12
1.63	18.75	12	1.12	1	4.50	5.25	5.75	51.71	114.00	35.20	77.60	41.50	91.50	59.42	140.00	38.56	85.00	14
1.75	21.25	16	1.12	1	4.50	5.25	5.75	64.41	142.00	42.18	93.00	52.98	116.80	77.11	170.00	44.49	98.00	16
1.94	22.75	16	1.25	1⅛	5.00	5.75	6.25	74.84	165.00	49.71	109.60	59.00	130.00	94.80	209.00	54.43	120.00	18
2.13	25.00	20	1.25	1⅛	5.50	6.25	6.75	89.36	197.00	65.50	140.00	72.12	159.00	123.38	272.00	70.31	155.00	20
2.50	29.50	20	1.38	1¼	6.00	6.75	7.25	119.66	263.80	90.50	199.50	99.02	218.30	188.24	415.00	95.25	210.00	24

(4) Blind Flanges may be made with the same hub as that used for Slip-on Flanges or without hub.
(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, spot facing is carried out accoraing to MSS SP-9, without reducing thickness (t)
(6) Depth of Socket (Y) is covered by ANSI B16.5 only in sizes through 3 inch, over 3 inch is at the manufacturer's option.

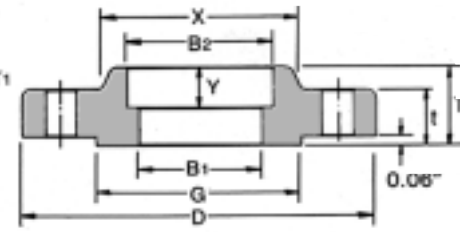
CLASS 300 FLANGES



SLIP-ON



WELDING NECK



SOCKET WELDING

ANSI B16.5 FORGED FLANGES

Dimensions in inches

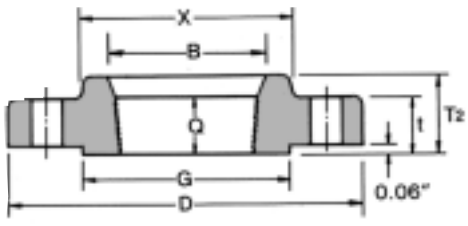
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE				LENGTH THRU HUB			Diam. of Hub at Bevel	Radius of Fillet	Thread Length
					Welding Neck Socket Welding	Slip-on Socket Welding	Lap Joint	Counter Bore Min. Threaded Min.	Welding Neck	Slip-on Threaded Socket Welding	Lap Joint			
	D	t	G	X	B_1	B_1	B_1	B	T_1	T_1	T_1	A	R	Q
½	3.75	0.56	1.38	1.50	0.62	0.88	0.90	0.93	2.06	0.88	0.88	0.84	0.12	0.62
¾	4.62	0.62	1.69	1.88	0.82	1.09	1.11	1.14	2.25	1.00	1.00	1.05	0.12	0.62
1	4.88	0.69	2.00	2.12	1.05	1.36	1.38	1.41	2.44	1.06	1.06	1.32	0.12	0.69
1¼	5.25	0.75	2.50	2.50	1.38	1.70	1.72	1.75	2.56	1.06	1.06	1.66	0.19	0.81
1½	6.12	0.81	2.88	2.75	1.61	1.95	1.97	1.99	2.69	1.19	1.19	1.90	0.25	0.88
2	6.50	0.88	3.62	3.31	2.07	2.44	2.46	2.50	2.75	1.31	1.31	2.38	0.31	1.12
2½	7.50	1.00	4.12	3.94	2.47	2.94	2.97	3.00	3.00	1.50	1.50	2.88	0.31	1.25
3	8.25	1.12	5.00	4.62	3.07	3.57	3.60	3.63	3.12	1.69	1.69	3.50	0.38	1.25
3½	9.00	1.19	5.50	5.25	3.55	4.07	4.10	4.13	3.19	1.75	1.75	4.00	0.38	1.44
4	10.00	1.25	6.19	5.75	4.03	4.57	4.60	4.63	3.38	1.88	1.88	4.50	0.44	1.44
5	11.00	1.38	7.31	7.00	5.05	5.66	5.69	5.69	3.88	2.00	2.00	5.56	0.44	1.69
6	12.50	1.44	8.50	8.12	6.07	6.72	6.75	6.75	3.88	2.06	2.06	6.63	0.50	1.81
8	15.00	1.62	10.62	10.25	7.98	8.72	8.75	8.75	4.38	2.44	2.44	8.63	0.50	2.00
10	17.50	1.88	12.75	12.62	10.02	10.88	10.92	10.88	4.62	2.62	3.75	10.75	0.50	2.19
12	20.50	2.00	15.00	14.75	12.00	12.88	12.92	12.94	5.12	2.88	4.00	12.75	0.50	2.38
14	23.00	2.12	16.25	16.75	13.25	14.14	14.18	14.19	5.62	3.00	4.38	14.00	0.50	2.50
16	25.50	2.25	18.50	19.00	15.25	16.16	16.19	16.19	5.75	3.25	4.75	16.00	0.50	2.69
18	28.00	2.38	21.00	21.00	17.25	18.18	18.20	18.19	6.25	3.50	5.12	18.00	0.50	2.75
20	30.50	2.50	23.00	23.12	19.25	20.20	20.25	20.19	6.38	3.75	5.50	20.00	0.50	2.88
24	36.00	2.75	27.25	27.62	23.25	24.25	24.25	24.19	6.62	4.19	6.00	24.00	0.50	3.25

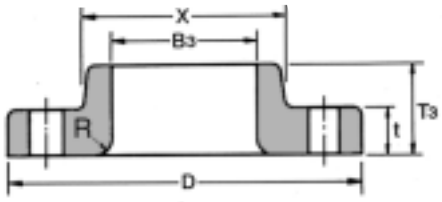
Notes:

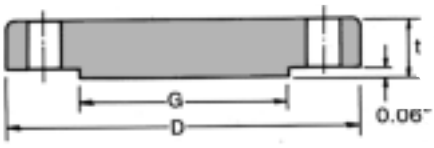
(1) For the 'Bore' (B_1) other than Standard Wall Thickness, refer to page 61.

(2) Class 300 flanges except Lap Joint will be furnished with 0.06" raised face, which is included in 'Thickness' (t) and 'Length through Hub' (T_1), (T_2).

(3) For Slip-on, Threaded, Socket Welding and Lap Joint Flanges, the hubs can be shaped either vertical from base to or tapered within the limits of 7 degrees.







THREADED

LAP JOINT

BLIND

Dimensions in inches

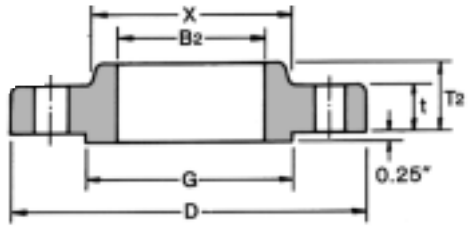
Depth of Socket	DRILLING			BOLTING				APPROXIMATE WEIGHT										Nominal Pipe Size
	Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	Machine Bolt Length	Stud Bolt Length		Welding Neck		Slip-on and Threaded		Lap Joint		Blind		Socket Welding		
Y					Raised Face	Raised Face	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
0.38	2.62	4	0.62	½	2.25	2.50	3.00	0.78	1.70	0.62	1.40	0.61	1.30	0.62	1.40	0.62	1.40	½
0.44	3.25	4	0.75	⅝	2.50	3.00	3.50	1.34	3.00	1.15	2.50	1.15	2.50	1.16	2.50	1.19	2.60	¾
0.50	3.50	4	0.75	⅝	2.50	3.00	3.50	1.64	3.60	1.39	3.10	1.38	3.00	1.42	3.00	1.44	3.20	1
0.56	3.88	4	0.75	⅝	2.75	3.25	3.75	2.06	4.50	1.67	3.70	1.66	3.70	1.79	3.90	1.73	3.80	1¼
0.62	4.50	4	0.88	¾	3.00	3.50	4.00	3.06	6.70	2.53	5.60	2.52	5.60	2.68	5.90	2.62	5.80	1½
0.69	5.00	8	0.75	⅝	3.00	3.50	4.00	3.40	7.50	2.80	6.20	2.79	6.20	3.09	6.80	2.94	6.50	2
0.75	5.88	8	0.88	¾	3.25	4.00	4.50	5.31	11.70	4.25	9.40	4.22	9.30	4.75	10.50	4.49	9.90	2½
0.81	6.62	8	0.88	¾	3.50	4.25	4.75	7.32	16.10	5.81	12.80	5.78	12.70	6.79	14.90	6.20	13.70	3
0.88	7.25	8	0.88	¾	3.75	4.25	5.00	8.17	18.00	7.72	17.00	7.72	17.00	9.53	21.00			3½
0.94	7.88	8	0.88	¾	3.75	4.50	5.00	11.30	24.90	10.13	22.30	10.07	22.20	12.00	26.50			4
0.94	9.25	8	0.88	¾	4.25	4.75	5.25	15.12	33.30	12.58	27.70	12.52	27.60	15.96	35.20			5
1.06	10.62	12	0.88	¾	4.25	4.75	5.50	19.68	43.40	16.04	35.40	15.95	35.20	21.20	46.70			6
1.25	13.00	12	1.00	⅞	4.75	5.50	6.00	30.48	67.20	24.50	54.00	24.37	53.70	34.60	76.30			8
1.31	15.25	16	1.12	1	5.50	6.25	6.75	43.74	96.40	34.16	75.30	39.92	88.00	55.34	122.00			10
1.56	17.75	16	1.25	1⅛	5.75	6.75	7.25	64.41	142.00	51.26	113.00	58.70	129.40	78.90	174.00			12
1.63	20.25	20	1.25	1⅛	6.25	7.00	7.50	88.30	194.70	72.12	159.00	83.46	184.00	107.05	236.00			14
1.75	22.50	20	1.38	1¼	6.50	7.50	8.00	112.94	249.00	90.40	199.30	106.14	234.00	139.25	307.00			16
1.94	24.75	24	1.38	1¼	6.75	7.75	8.25	138.34	305.00	109.00	240.30	133.95	295.30	176.90	396.00			18
2.13	27.00	24	1.38	1¼	7.25	8.00	8.75	167.37	369.00	136.00	300.00	157.65	347.60	223.17	492.00			20
2.50	32.00	24	1.62	1½	8.00	9.00	10.00	235.41	519.00	204.00	449.70	240.40	530.00	342.00	754.00			24

(4) Blind Flanges may be made with the same hub as that used for Slip-on Flanges or without hub.

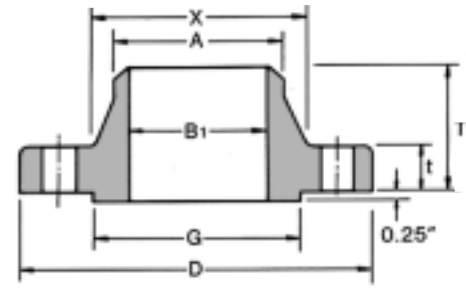
(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, spot facing is carried out according to MSS SP-9, without reducing thickness (t).

(6) Depth of Socket (Y) is covered by ANSI B16.5 only is sizes through 3 inch, over 3 inch is at the manufacturer's option.

CLASS 400 FLANGES



SLIP-ON



WELDING NECK

ANSI B16.5 FORGED FLANGES

Dimensions in inches

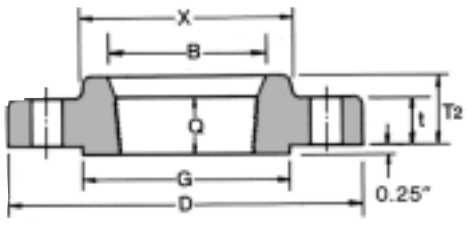
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE				LENGTH THRU HUB			Diam. of Hub at Bevel
					Welding Neck	Slip-on	Lap Joint	Counter Bore Min.	Welding Neck	Slip-on and Threaded	Lap Joint	
	D	t	G	X	B_1	B_2	B_3	B	T_1	T_2	T_3	A
½	3.75	0.56	1.38	1.50	See Note (1) To be specified by purchaser.	0.88	0.90	0.93	2.06	0.88	0.88	0.84
¾	4.62	0.62	1.69	1.88		1.09	1.11	1.14	2.25	1.00	1.00	1.05
1	4.88	0.69	2.00	2.12		1.36	1.38	1.41	2.44	1.06	1.06	1.32
1¼	5.25	0.81	2.50	2.50		1.70	1.72	1.75	2.62	1.12	1.12	1.66
1½	6.12	0.88	2.88	2.75		1.95	1.97	1.99	2.75	1.25	1.25	1.90
2	6.50	1.00	3.62	3.31		2.44	2.46	2.50	2.88	1.44	1.44	2.38
2½	7.50	1.12	4.12	3.94		2.94	2.97	3.00	3.12	1.62	1.62	2.88
3	8.25	1.25	5.00	4.62		3.57	3.60	3.63	3.25	1.81	1.81	3.50
3½	9.00	1.38	5.50	5.25		4.07	4.10	4.13	3.38	1.94	1.94	4.00
4	10.00	1.38	6.19	5.75		4.57	4.60	4.63	3.50	2.00	2.00	4.50
5	11.00	1.50	7.31	7.00		5.66	5.69	5.69	4.00	2.12	2.12	5.56
6	12.50	1.62	8.50	8.12		6.72	6.75	6.75	4.06	2.25	2.25	6.63
8	15.00	1.88	10.62	10.25		8.72	8.75	8.75	4.62	2.69	2.69	8.63
10	17.50	2.12	12.75	12.62		10.88	10.92	10.88	4.88	2.88	4.00	10.75
12	20.50	2.25	15.00	14.75		12.88	12.92	12.94	5.38	3.12	4.25	12.75
14	23.00	2.38	16.25	16.75		14.14	14.18	14.19	5.88	3.31	4.62	14.00
16	25.50	2.50	18.50	19.00		16.16	16.19	16.19	6.00	3.69	5.00	16.00
18	28.00	2.62	21.00	21.00		18.18	18.20	18.19	6.50	3.88	5.38	18.00
20	30.50	2.75	23.00	23.12		20.20	20.25	20.19	6.62	4.00	5.75	20.00
24	36.00	3.00	27.25	27.62		24.25	24.25	24.19	6.88	4.50	6.25	24.00

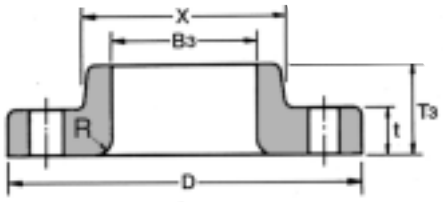
Notes:

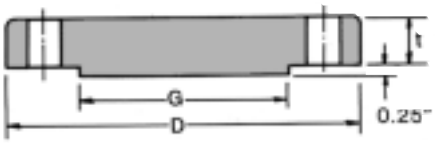
(1) For the inside diameter of pipes (corresponding to 'Bore' (B_1) of Welding Neck Flanges), refer to page 61.

(2) Class 400 flanges except Lap Joint will be furnished with 0.25" raised face which is not included in 'Thickness' (t) and 'Length through Hub' (T_1), (T_1).

(3) For Slip-on, Threaded and Lap Joint Flanges, the hubs can be shaped either vertical from base to top or tapered within the limits of 7 degrees.







THREADED

LAP JOINT

BLIND

Dimensions in inches

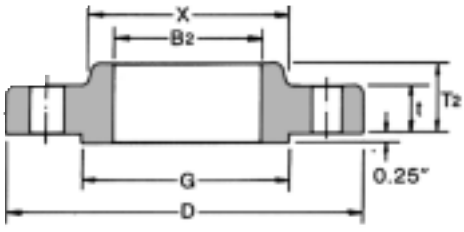
Radius of Fillet	Thread Length	DRILLING			BOLTING				APPROXIMATE WEIGHT								Nominal Pipe Size
						Stud Bolt Length			Welding Neck		Slip-on and Threaded		Lap Joint		Blind		
R	Q	Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	0.25" Raised Face	Male-Female Tongue-Groove	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
0.12	0.62	2.62	4	0.62	½	3.00	2.75	3.00	1.36	3.00	0.91	2.00	0.80	1.80	0.91	2.00	½
0.12	0.62	3.25	4	0.75	⅝	3.50	3.25	3.50	1.59	3.50	1.36	3.00	1.36	3.00	1.40	3.00	¾
0.12	0.69	3.50	4	0.75	⅝	3.50	3.25	3.50	1.81	4.00	1.59	3.50	1.59	3.50	1.70	3.80	1
0.19	0.81	3.88	4	0.75	⅝	3.75	3.50	3.75	2.50	5.50	2.10	4.60	2.04	4.50	2.27	5.00	1¼
0.25	0.88	4.50	4	0.88	¾	4.25	4.00	4.25	3.63	8.00	3.10	6.80	2.95	6.50	3.40	7.50	1½
0.31	1.12	5.00	8	0.75	⅝	4.25	4.00	4.25	4.54	10.00	3.63	8.00	3.63	8.00	4.40	9.70	2
0.31	1.25	5.88	8	0.88	¾	4.75	4.50	4.75	6.35	14.00	5.44	12.00	4.99	11.00	6.80	15.00	2½
0.38	1.38	6.62	8	0.88	¾	5.00	4.75	5.00	8.17	18.00	7.26	16.00	6.35	14.00	8.90	19.60	3
0.38	1.56	7.25	8	1.00	⅞	5.50	5.25	5.50	11.80	26.00	9.53	21.00	9.08	20.00	13.17	29.00	3½
0.44	1.44	7.88	8	1.00	⅞	5.50	5.25	5.50	13.61	30.00	10.89	24.00	9.98	22.00	14.40	31.70	4
0.44	1.69	9.25	8	1.00	⅞	5.75	5.50	5.75	17.69	39.00	14.07	31.00	13.15	29.00	19.50	43.00	5
0.50	1.81	10.62	12	1.00	⅞	6.00	5.75	6.00	22.23	49.00	19.98	44.00	16.78	37.00	27.67	61.00	6
0.50	2.00	13.00	12	1.12	1	6.75	6.50	6.75	35.38	78.00	30.40	67.00	26.16	59.00	45.36	100.00	8
0.50	2.19	15.25	16	1.25	1⅛	7.50	7.25	7.50	49.89	110.00	41.28	91.00	43.09	95.00	68.00	150.00	10
0.50	2.38	17.75	16	1.38	1¼	8.00	7.75	8.00	72.57	160.00	59.02	130.00	68.95	152.00	98.00	216.00	12
0.50	2.50	20.25	20	1.38	1¼	8.25	8.00	8.25	105.69	233.00	81.72	180.00	95.25	210.00	131.66	290.00	14
0.50	2.69	22.50	20	1.50	1⅜	8.75	8.50	8.75	133.36	294.00	106.69	235.00	127.00	280.00	167.00	368.00	16
0.50	2.75	24.75	24	1.50	1⅜	9.00	8.75	9.00	158.90	350.30	129.39	285.30	156.49	345.00	206.57	455.40	18
0.50	2.88	27.00	24	1.62	1½	9.50	9.25	9.75	193.00	425.50	152.00	335.00	190.51	420.00	261.00	575.40	20
0.50	3.25	32.00	24	1.88	1¾	10.50	10.25	11.00	281.48	620.50	231.54	510.50	278.96	615.00	395.00	870.80	24

(4) Blind Flanges may be made with the same hub as that used for Slip-on Flanges or without hub.

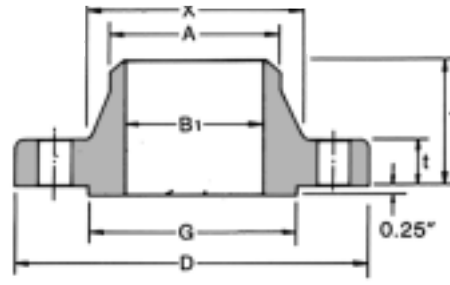
(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, ~~as~~ of facing is carried out according to MSS SP-9, without reducing thickness (t).

(6) Dimensions of sizes ½" through 3-½" are the same as for Class 600 Flanges

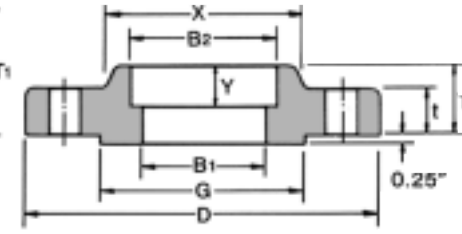
CLASS 600 FLANGES



SLIP-ON



WELDING NECK



SOCKET WELDING

ANSI B16.5 FORGED FLANGES

Dimensions in inches

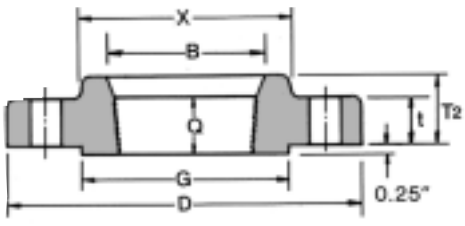
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE				LENGTH THRU HUB			Diam. of Hub at Bevel	Radius of Fillet	Thread Length
					Welding Neck Socket Welding	Slip-on Socket Welding	Lap Joint	Counter Bore Min.	Welding Neck	Slip-on Threaded Socket Welding	Lap Joint			
	D	t	G	X	B_1	B_2	B_3	B	T_1	T_2	T_3	A	R	Q
½	3.75	0.56	1.38	1.50	See Note (1) To be specified by purchaser.	0.88	0.90	0.93	2.06	0.88	0.88	0.84	0.12	0.62
¾	4.62	0.62	1.69	1.88		1.09	1.11	1.14	2.25	1.00	1.00	1.05	0.12	0.62
1	4.88	0.69	2.00	2.12		1.36	1.38	1.41	2.44	1.06	1.06	1.32	0.12	0.69
1¼	5.25	0.81	2.50	2.50		1.70	1.72	1.75	2.62	1.12	1.12	1.66	0.19	0.81
1½	6.12	0.88	2.88	2.75		1.95	1.97	1.99	2.75	1.25	1.25	1.90	0.25	0.88
2	6.50	1.00	3.62	3.31		2.44	2.46	2.50	2.88	1.44	1.44	2.38	0.31	1.12
2½	7.50	1.12	4.12	3.94		2.94	2.97	3.00	3.12	1.62	1.62	2.88	0.31	1.25
3	8.25	1.25	5.00	4.62		3.57	3.60	3.63	3.25	1.81	1.81	3.50	0.38	1.38
3½	9.00	1.38	5.50	5.25		4.07	4.10	4.13	3.38	1.94	1.94	4.00	0.38	1.56
4	10.75	1.50	6.19	6.00		4.57	4.60	4.63	4.00	2.12	2.12	4.50	0.44	1.62
5	13.00	1.75	7.31	7.44		5.66	5.69	5.69	4.50	2.38	2.38	5.56	0.44	1.88
6	14.00	1.88	8.50	8.75		6.72	6.75	6.75	4.62	2.62	2.62	6.63	0.50	2.00
8	16.50	2.19	10.62	10.75		8.72	8.75	8.75	5.25	3.00	3.00	8.63	0.50	2.25
10	20.00	2.50	12.75	13.50		10.88	10.92	10.88	6.00	3.38	4.38	10.75	0.50	2.56
12	22.00	2.62	15.00	15.75		12.88	12.92	12.94	6.12	3.62	4.62	12.75	0.50	2.75
14	23.75	2.75	16.25	17.00		14.14	14.18	14.19	6.50	3.69	5.00	14.00	0.50	2.88
16	27.00	3.00	18.50	19.50		16.16	16.19	16.19	7.00	4.19	5.50	16.00	0.50	3.06
18	29.25	3.25	21.00	21.50		18.18	18.20	18.19	7.25	4.62	6.00	18.00	0.50	3.12
20	32.00	3.50	23.00	24.00		20.20	20.25	20.19	7.50	5.00	6.50	20.00	0.50	3.25
24	37.00	4.00	27.25	28.25		24.25	24.25	24.19	8.00	5.50	7.25	24.00	0.50	3.62

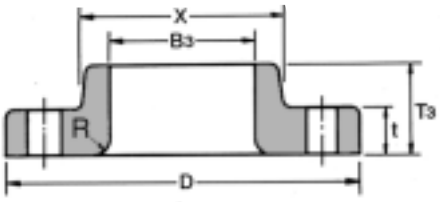
Notes:

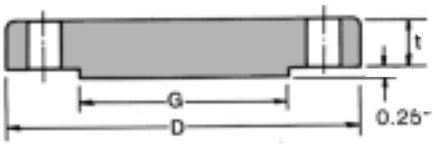
(1) For the inside diameter of pipes (corresponding to "Bore" (B_1) of Welding Neck Flanges), refer to page 61.

(2) Class 600 flanges except Lap Joint will be furnished with 0.25" raised face, which is not included in "Thickness" (t) and "Length through Hub" (T_1), (T_2).

(3) For Slip-on, Threaded, Lap Joint and Socket Welding Flanges, the hubs can be shaped either vertical from base to top or tapered within the limits of 7 degrees.







THREADED LAP JOINT BLIND

Dimensions in inches

Depth of Socket Y	DRILLING			BOLTING				APPROXIMATE WEIGHT										Nominal Pipe Size
					Stud Bolt Length			Welding Neck		Slip-on and Threaded		Lap Joint		Blind		Socket Welding		
	Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	0.25" Raised Face	Male-Female Tongue-Groove	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
0.38	2.62	4	0.62	½	3.00	2.75	3.00	0.90	2.00	0.91	2.00	0.80	1.80	0.91	2.00	0.91	2.00	½
0.44	3.25	4	0.75	⅝	3.50	3.25	3.50	1.59	3.50	1.40	3.00	1.36	3.00	1.40	3.00	1.36	3.00	¾
0.50	3.50	4	0.75	⅝	3.50	3.25	3.50	1.90	4.00	1.70	3.70	1.59	3.50	1.81	4.00	1.81	4.00	1
0.56	3.88	4	0.75	⅝	3.75	3.50	3.75	2.49	5.50	2.27	5.00	2.04	4.50	2.40	5.30	2.60	5.70	1¼
0.62	4.50	4	0.88	¾	4.25	4.00	4.25	3.63	8.00	3.10	6.80	2.95	6.50	3.40	7.50	3.18	7.00	1½
0.69	5.00	8	0.75	⅝	4.25	4.00	4.25	4.54	10.00	3.63	8.00	3.63	8.00	4.40	9.70	3.90	8.60	2
0.75	5.88	8	0.88	¾	4.75	4.50	4.75	6.35	14.00	5.44	12.00	4.99	11.00	6.80	15.00	5.90	13.00	2½
0.81	6.62	8	0.88	¾	5.00	4.75	5.00	8.16	18.00	7.26	16.00	6.35	14.00	8.90	19.60	7.40	16.30	3
0.88	7.25	8	1.00	⅞	5.50	5.25	5.50	11.80	26.00	9.53	21.00	9.08	20.00	13.17	29.00			3½
0.94	8.50	8	1.00	⅞	5.75	5.50	5.75	16.78	37.00	14.97	33.00	14.06	31.00	18.60	41.00			4
0.94	10.50	8	1.12	1	6.50	6.25	6.50	30.87	68.00	28.50	62.80	27.50	60.60	30.84	68.00			5
1.06	11.50	12	1.12	1	6.75	6.50	6.75	36.77	80.00	36.32	80.00	35.38	78.00	38.00	83.80			6
1.25	13.75	12	1.25	1⅛	7.50	7.25	7.75	50.80	112.00	44.00	97.00	50.80	112.00	62.20	137.00			8
1.31	17.00	16	1.38	1¼	8.50	8.25	8.50	86.26	190.00	76.20	168.00	74.00	163.00	102.00	224.90			10
1.56	19.25	20	1.38	1¼	8.75	8.50	8.75	102.51	226.00	97.52	215.00	108.86	240.00	132.00	291.00			12
1.63	20.75	20	1.50	1⅜	9.25	9.00	9.25	121.56	268.00	102.00	224.80	111.00	244.70	158.00	348.30			14
1.75	23.75	20	1.62	1½	10.00	9.75	10.00	177.06	290.00	149.82	330.20	165.71	365.30	224.73	495.40			16
1.94	25.75	20	1.75	1⅝	10.75	10.50	10.75	215.65	475.40	180.10	412.30	194.00	427.70	285.00	628.30			18
2.13	28.50	24	1.75	1⅝	11.25	11.00	11.50	267.86	590.50	231.54	510.50	258.78	570.50	365.00	804.70			20
2.50	33.00	24	2.00	1⅞	13.00	12.75	13.25	372.00	820.00	330.00	725.50	362.00	798.00	533.45	1176.0			24

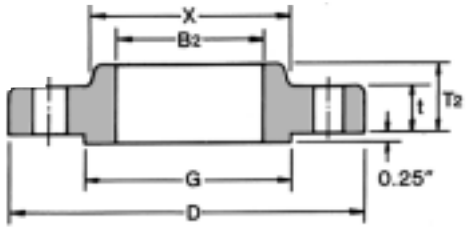
(4) Blind Flanges may be made with the same hub as that used for Slip-on Flanges or without hub.

(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, spot facing is carried out according to MSS SP-9, without reducing thickness (t).

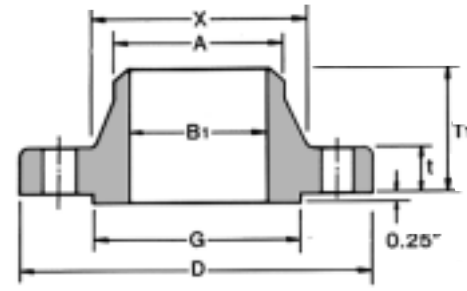
(6) Dimensions of sizes ½" through 3½" are the same as for Class 400 Flanges.

(7) Depth of Socket (Y) is covered by ANSI B16.5 only in sizes through 3 inch, over 3 inch is at the manufacturer's option.

CLASS 900 FLANGES



SLIP-ON



WELDING NECK

ANSI B16.5 FORGED FLANGES

Dimensions in inches

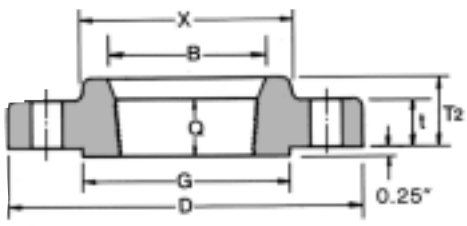
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE				LENGTH THRU HUB			Diam. of Hub at Bevel
					Welding Neck	Slip-on	Lap Joint	Counter Bore Min.	Welding Neck	Slip-on and Threaded	Lap Joint	
	D	t	G	X	B_1	B_1	B_1	B	T_1	T_1	T_1	A
½	4.75	0.88	1.38	1.50	See Note (1) To be specified by purchaser.	0.88	0.90	0.93	2.38	1.25	1.25	0.84
¾	5.12	1.00	1.69	1.75		1.09	1.11	1.14	2.75	1.38	1.38	1.05
1	5.88	1.12	2.00	2.06		1.36	1.38	1.41	2.88	1.62	1.62	1.32
1¼	6.25	1.12	2.50	2.50		1.70	1.72	1.75	2.88	1.62	1.62	1.66
1½	7.00	1.25	2.88	2.75		1.95	1.97	1.99	3.25	1.75	1.75	1.90
2	8.50	1.50	3.62	4.12		2.44	2.46	2.50	4.00	2.25	2.25	2.38
2½	9.62	1.62	4.12	4.88		2.94	2.97	3.00	4.12	2.50	2.50	2.88
3	9.50	1.50	5.00	5.00		3.57	3.60	3.63	4.00	2.12	2.12	3.50
4	11.50	1.75	6.19	6.25		4.57	4.60	4.63	4.50	2.75	2.75	4.50
5	13.75	2.00	7.31	7.50		5.66	5.69	5.69	5.00	3.12	3.12	5.56
6	15.00	2.19	8.50	9.25		6.72	6.75	6.75	5.50	3.38	3.38	6.63
8	18.50	2.50	10.62	11.75		8.72	8.75	8.75	6.38	4.00	4.50	8.63
10	21.50	2.75	12.75	14.50		10.88	10.92	10.88	7.25	4.25	5.00	10.75
12	24.00	3.12	15.00	16.50		12.88	12.92	12.94	7.88	4.62	5.62	12.75
14	25.25	3.38	16.25	17.75		14.14	14.18	14.19	8.38	5.12	6.12	14.00
16	27.75	3.50	18.50	20.00		16.16	16.19	16.19	8.50	5.25	6.50	16.00
18	31.00	4.00	21.00	22.25		18.18	18.20	18.19	9.00	6.00	7.50	18.00
20	33.75	4.25	23.00	24.50		20.20	20.25	20.19	9.75	6.25	8.25	20.00
24	41.00	5.50	27.25	29.50		24.25	24.25	24.19	11.50	8.00	10.50	24.00

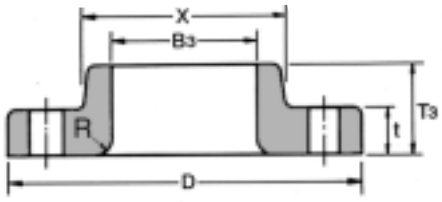
Notes:

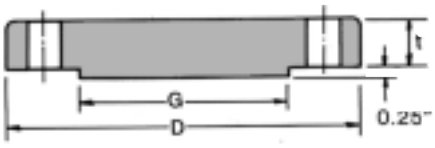
(1) For the inside diameter of pipes (corresponding to 'Bore' (B_1) of Welding Neck Flanges), refer to page 61.

(2) Class 900 flanges except Lap Joint will be furnished with 0.25" raised face, which is not included in "Thickness" (t) and 'Length through Hub' (T_1), (T_2).

(3) For Slip-on, Threaded and Lap Joint Flanges, the hubs can be shaped either vertical from base to top or tapered within the limits of 7 degrees.







THREADED

LAP JOINT

BLIND

Dimensions in inches

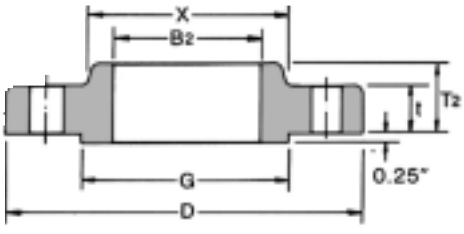
Radius of Fillet	Thread Length	DRILLING			BOLTING				APPROXIMATE WEIGHT								Nominal Pipe Size
						Stud Bolt Length			Welding Neck		Slip-on and Threaded		Lap Joint		Blind		
R	Q	Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	0.25" Raised Face	Male-Female Tongue-Groove	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
0.12	0.88	3.25	4	0.88	⅜	4.25	4.00	4.25	2.10	4.60	1.81	4.00	1.81	4.00	1.90	4.20	½
0.12	1.00	3.50	4	0.88	⅜	4.50	4.25	4.50	2.72	6.00	2.40	5.30	2.30	5.00	2.70	6.00	¾
0.12	1.12	4.00	4	1.00	⅜	5.00	4.75	5.00	3.86	8.50	3.41	7.50	3.40	7.50	4.09	9.00	1
0.19	1.19	4.38	4	1.00	⅜	5.00	4.75	5.00	4.54	10.00	4.10	9.00	4.09	9.00	4.54	10.00	1¼
0.25	1.25	4.88	4	1.12	1	5.50	5.25	5.50	5.90	13.00	5.45	12.00	5.40	11.90	5.90	13.00	1½
0.31	1.50	6.50	8	1.00	⅜	5.75	5.50	5.75	10.89	24.00	9.98	22.00	9.53	21.00	11.34	25.00	2
0.31	1.88	7.50	8	1.12	1	6.25	6.00	6.25	16.33	36.00	15.80	34.80	13.15	29.00	16.00	35.30	2½
0.38	1.62	7.50	8	1.00	⅜	5.75	5.50	5.75	15.00	33.00	11.80	26.00	11.34	25.00	13.17	29.00	3
0.44	1.88	9.25	8	1.25	1⅛	6.75	6.50	6.75	23.13	51.00	23.20	51.00	22.60	48.50	24.50	54.00	4
0.44	2.12	11.00	8	1.38	1¼	7.50	7.25	7.50	38.50	84.90	37.65	83.00	36.74	81.00	39.46	87.00	5
0.50	2.25	12.50	12	1.25	1⅛	7.50	7.25	7.75	49.89	110.00	48.30	106.50	47.50	104.70	51.50	113.50	6
0.50	2.50	15.50	12	1.50	1⅜	8.75	8.50	8.75	79.45	175.00	75.00	166.30	86.00	189.60	89.00	106.20	8
0.50	2.81	18.50	16	1.50	1⅜	9.25	9.00	9.25	118.04	260.00	111.13	245.00	125.64	277.00	131.54	290.00	10
0.50	3.00	21.00	20	1.50	1⅜	10.00	9.75	10.00	157.00	346.00	146.00	321.80	167.00	368.00	187.00	412.30	12
0.50	3.25	22.00	20	1.62	1½	10.75	10.50	11.50	181.60	400.40	172.36	380.00	180.07	397.00	224.07	494.00	14
0.50	3.38	24.25	20	1.75	1⅝	11.25	11.00	11.75	224.73	495.50	192.95	425.40	211.11	465.40	272.40	600.50	16
0.50	3.50	27.00	20	2.00	1⅞	12.75	12.50	13.25	308.72	680.60	272.40	600.50	295.10	650.60	385.90	850.80	18
0.50	3.62	29.50	20	2.12	2	13.75	13.50	14.25	376.82	830.70	331.42	730.60	367.74	810.70	488.00	1076.0	20
0.50	4.00	35.50	20	2.62	2½	17.25	17.00	18.00	685.00	1510.0	632.00	1393.3	700.00	1543.0	905.00	1995.0	24

(4) Blind Flanges may be made with the same hub as that used for Slip-on Flanges or without hub.

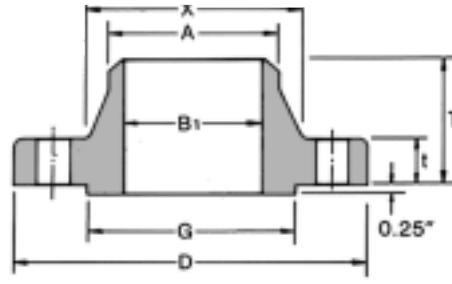
(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, spot facing is carried out according to MSS SP-9, without reducing thickness (t).

(6) Dimensions of sizes ½" through 2½" are the same as for Class 1500 Flanges.

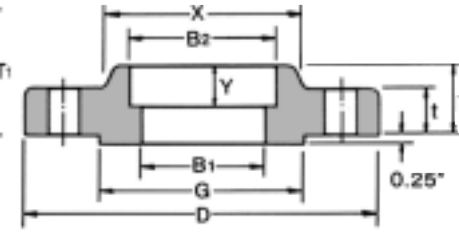
CLASS 1500 FLANGES



SLIP-ON



WELDING NECK



SOCKET WELDING

ANSI B16.5 FORGED FLANGES

Dimensions in inches

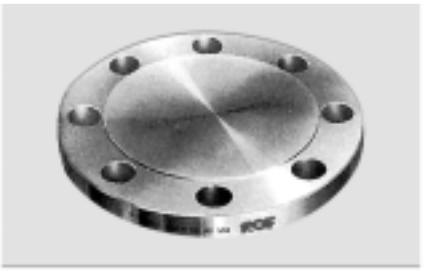
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE				LENGTH THRU HUB			Diam. of Hub at Bevel	Radius of Fillet	Thread Length
					Welding Neck Socket Welding	Slip-on Socket Welding	Lap Joint	Counter Bore Min.	Welding Neck	Slip-on Threaded Socket-Welding	Lap Joint			
	D	t	G	X	B_1	B_2	B_3	B	T_1	T_2	T_3	A	R	Q
½	4.75	0.88	1.38	1.50	See Note (1) To be specified by purchaser.	0.88	0.90	0.93	2.38	1.25	1.25	0.84	0.12	0.88
¾	5.12	1.00	1.69	1.75		1.09	1.11	1.14	2.75	1.38	1.38	1.05	0.12	1.00
1	5.88	1.12	2.00	2.06		1.36	1.38	1.41	2.88	1.62	1.62	1.32	0.12	1.12
1¼	6.25	1.12	2.50	2.50		1.70	1.72	1.75	2.88	1.62	1.62	1.66	0.19	1.19
1½	7.00	1.25	2.88	2.75		1.95	1.97	1.99	3.25	1.75	1.75	1.90	0.25	1.25
2	8.50	1.50	3.62	4.12		2.44	2.46	2.50	4.00	2.25	2.25	2.38	0.31	1.50
2½	9.62	1.62	4.12	4.88		2.94	2.97	3.00	4.12	2.50	2.50	2.88	0.31	1.88
3	10.50	1.88	5.00	5.25		3.57	3.60	3.63	4.62	2.88	2.88	3.50	0.38	2.00
4	12.25	2.12	6.19	6.38		4.57	4.60	4.63	4.88	3.56	3.56	4.50	0.44	2.25
5	14.75	2.88	7.31	7.75		5.66	5.69	5.69	6.12	4.12	4.12	5.56	0.44	2.50
6	15.50	3.25	8.50	9.00		6.72	6.75	6.75	6.75	4.69	4.69	6.63	0.50	2.75
8	19.00	3.62	10.62	11.50		8.72	8.75	8.75	8.38	5.62	5.62	8.63	0.50	3.00
10	23.00	4.25	12.75	14.50		10.88	10.92	10.88	10.00	6.25	7.00	10.75	0.50	3.31
12	26.50	4.88	15.00	17.75		12.88	12.92	12.94	11.12	7.12	8.62	12.75	0.50	3.62
14	29.50	5.25	16.25	19.50		14.14	14.18	14.19	11.75		9.50	14.00	0.50	
16	32.50	5.75	18.50	21.75		16.16	16.19	16.19	12.25	–	10.25	16.00	0.50	–
18	36.00	6.38	21.00	23.50		18.18	18.20	18.19	12.88	–	10.88	18.00	0.50	–
20	38.75	7.00	23.00	25.25		20.20	20.25	20.19	14.00	–	11.50	20.00	0.50	–
24	46.00	8.00	27.25	30.00		24.25	24.25	24.19	16.00	–	13.00	24.00	0.50	–

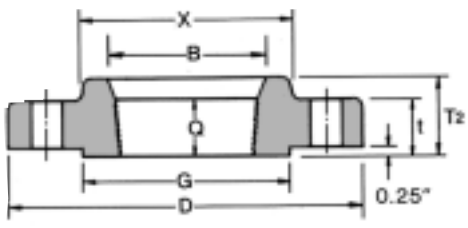
Notes:

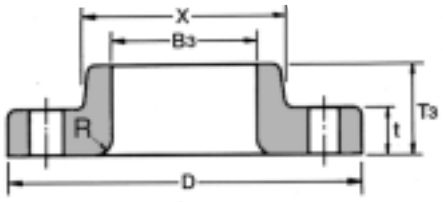
(1) For the inside diameter of pipes (corresponding to "Bore" (B_1) of Welding Neck Flanges), refer to page 61.

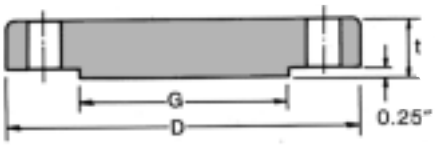
(2) Class 1500 falnges except Lap Joint will be furnished with 0.25" raised face, which is not included in "Thickness" (t) and "Length through Hub" (T_1), (T_2).

(3) For Slip-on, Threaded, Lap Joint and Socket Welding Flanges, the hubs can be shaped either vertical from base to top or tapered within the limits 7 degrees.









THREADED LAP JOINT BLIND

Dimensions in inches

Depth of Socket	DRILLING			BOLTING				APPROXIMATE WEIGHT										Nominal Pipe Size
					Stud Bolt Length			Welding Neck		Slip-on and Threaded		Lap Joint		Blind		Socket Welding		
Y	Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	0.25" Raised Face	Male-Female Tongue-Groove	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
0.38	3.25	4	0.88	¾	4.25	4.00	4.25	2.10	4.60	1.80	4.00	1.80	4.00	1.90	4.00	1.81	4.00	½
0.44	3.50	4	0.88	¾	4.50	4.25	4.50	2.72	6.00	2.27	5.00	2.27	5.00	2.72	6.00	2.81	6.20	¾
0.50	4.00	4	1.00	⅞	5.00	4.75	5.00	3.86	8.50	3.40	7.50	3.40	7.50	4.08	9.00	3.61	8.00	1
0.56	4.38	4	1.00	⅞	5.00	4.75	5.00	4.54	10.00	4.10	9.00	4.09	10.80	4.30	9.50	4.99	11.00	1¼
0.62	4.88	4	1.12	1	5.50	5.25	5.50	5.90	13.00	5.45	12.00	5.40	11.90	5.90	13.00	6.76	14.90	1½
0.69	6.50	8	1.00	⅞	5.75	5.50	5.75	10.89	24.00	10.50	23.00	9.53	21.00	11.30	25.00	10.89	24.00	2
0.75	7.50	8	1.12	1	6.25	6.00	6.25	16.34	36.00	15.80	34.80	13.15	29.00	16.00	35.30	16.34	36.00	2½
0.81	8.00	8	1.25	1⅛	7.00	6.75	7.00	21.79	48.00	21.77	48.00	17.24	38.00	21.79	48.00			3
0.94	9.50	8	1.38	1¼	7.75	7.50	7.75	31.30	69.00	31.00	68.40	29.00	63.90	33.11	73.00			4
0.94	11.50	8	1.62	1½	9.75	9.50	9.75	59.02	130.00	58.80	129.60	54.00	119.00	60.00	132.30			5
1.06	12.50	12	1.50	1⅜	10.25	10.00	10.50	74.91	165.00	74.00	163.00	62.00	136.70	75.00	165.30			6
1.25	15.50	12	1.75	1⅜	11.50	11.25	12.75	123.83	273.00	117.73	258.00	129.73	236.00	136.98	302.00			8
1.31	19.00	12	2.00	1⅝	13.25	13.00	13.50	205.93	454.00	197.49	435.40	220.19	485.40	229.97	507.00			10
1.56	22.50	16	2.12	2	14.75	14.50	15.25	306.00	674.60	264.00	582.00	286.02	630.60	316.00	696.70			12
1.63	25.00	16	2.38	2¼	16.00	15.75	16.75	416.00	917.00	–	–	404.06	890.80	421.00	928.00			14
1.75	27.75	16	2.62	2½	17.50	17.25	18.50	567.50	1250.00	–	–	522.10	1151.00	559.00	1232.70			16
1.94	30.50	16	2.88	2¾	19.50	19.25	20.75	736.00	1622.60	–	–	669.65	1476.30	761.00	1677.70			18
2.13	32.75	16	3.12	3	21.25	21.00	22.25	929.00	2048.00	–	–	805.85	1776.60	967.00	2131.80			20
2.50	39.00	16	3.62	3½	24.25	24.00	25.50	1504.00	3315.70	–	–	1285.55	2834.00	1568.00	3456.80			24

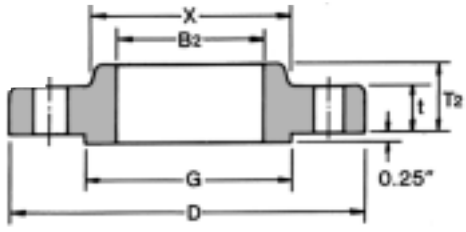
(4) Blind Flanges may be made with the same hub as that used for Slip-on Flanges or without hub.

(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, and facing is carried out according to MSS SP-9, without reducing thickness (t).

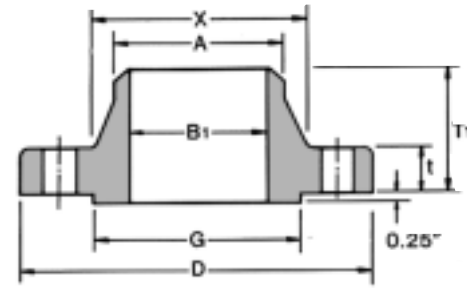
(6) Dimensions of sizes ½" through 2½" are the same as for Class 900 Flanges.

(7) Depth of Socket (Y) is covered by ANSI B16.5 only in sizes through 2½ inch, over 2½ inch is at the manufacturer's option.

CLASS 2500 FLANGES



SLIP-ON



WELDING NECK

ANSI B16.5 FORGED FLANGES

Dimensions in inches

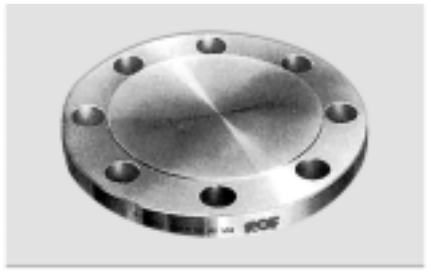
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE				LENGTH THRU HUB			Diam. of Hub at Bevel	Radius of Fillet	Thread Length
					Welding Neck	Slip-on	Lap Joint	Counter Bore Min.	Welding Neck	Slip-on and Threaded	Lap Joint			
	D	t	G	X	B_1	B_2	B_3	B	T_1	T_2	T_3	A	R	Q
½	5.25	1.19	1.38	1.69	To be specified by purchaser.	0.88	0.90	0.93	2.88	1.56	1.56	0.84	0.12	1.12
¾	5.50	1.25	1.69	2.00		1.09	1.11	1.14	3.12	1.69	1.69	1.05	0.12	1.25
1	6.25	1.38	2.00	2.25		1.36	1.38	1.41	3.50	1.88	1.88	1.32	0.12	1.38
1¼	7.25	1.50	2.50	2.88		1.70	1.72	1.75	3.75	2.06	2.06	1.66	0.19	1.50
1½	8.00	1.75	2.88	3.12		1.95	1.97	1.99	4.38	2.38	2.38	1.90	0.25	1.75
2	9.25	2.00	3.62	3.75		2.44	2.46	2.50	5.00	2.75	2.75	2.38	0.31	2.00
2½	10.50	2.25	4.12	4.50		2.94	2.97	3.00	5.62	3.12	3.12	2.88	0.31	2.25
3	12.00	2.62	5.00	5.25		3.57	3.60	3.63	6.62	3.62	3.62	3.50	0.38	2.50
4	14.00	3.00	6.19	6.50		4.57	4.60	4.63	7.50	4.25	4.25	4.50	0.44	2.75
5	16.50	3.62	7.31	8.00		5.66	5.69	5.69	9.00	5.12	5.12	5.56	0.44	3.00
6	19.00	4.25	8.50	9.25		6.72	6.75	6.75	10.75	6.00	6.00	6.63	0.50	3.25
8	21.75	5.00	10.62	12.00		8.72	8.75	8.75	12.50	7.00	7.00	8.63	0.50	3.75
10	26.50	6.50	12.75	14.75		10.88	10.92	10.88	16.50	9.00	9.00	10.75	0.50	4.25
12	30.00	7.25	15.00	17.38		12.88	12.92	12.94	18.25	10.00	10.00	12.75	0.50	4.75

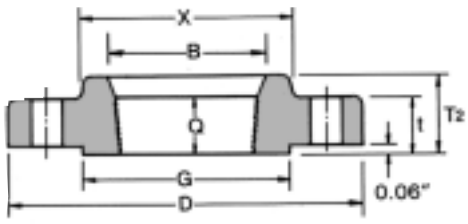
Notes:

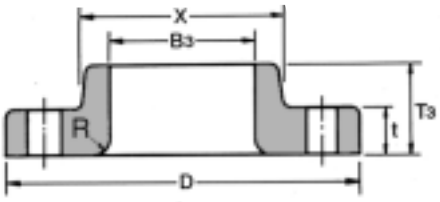
(1) For the inside diameter of pipes (corresponding to 'Bore' (B_1) of Welding Neck Flanges), refer to page 61

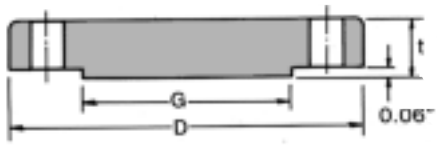
(2) Class 2500 flanges except Lap Joint will be furnished with 0.25" raised face, which is not included in 'Thickness' (t) and 'Length through Hub' (T_1), (T_2).

(3) For Slip-on, Threaded and Lap Joint Flanges, the hubs can be shaped either vertical from base to top or tapered within the limits of 7 degrees.









THREADED **LAP JOINT** **BLIND**

Dimensions in inches

DRILLING			BOLTING Stud Bolt Length				APPROXIMATE WEIGHT								Nominal Pipe Size
							Welding Neck		Slip-on and Threaded		Lap Joint		Blind		
Bolt Circle Diam.	Number of Holes	Diam. of Holes	Diam. of Bolts	0.25" Raised Face	Male-Female Tongue-Groove	Ring Joint	Kg	lb.	Kg	lb.	Kg	lb.	Kg	lb.	
3.50	4	0.88	¾	4.75	4.50	4.75	3.18	7.00	3.18	7.00	3.00	6.60	3.18	7.00	½
3.75	4	0.88	¾	5.00	4.75	5.00	4.08	9.00	4.08	9.00	3.63	8.00	4.54	10.00	¾
4.25	4	1.00	⅞	5.50	5.25	5.50	5.45	12.00	5.44	12.00	4.99	11.00	5.44	12.00	1
5.12	4	1.12	1	6.00	5.75	6.00	9.07	20.00	8.16	18.00	7.26	16.00	8.16	18.00	1¼
5.75	4	1.25	1⅛	6.75	6.50	6.75	11.35	25.00	11.00	24.30	9.99	22.00	10.44	23.00	1½
6.75	8	1.12	1	7.00	6.75	7.00	19.07	42.00	17.25	38.00	16.80	37.00	17.71	39.00	2
7.75	8	1.25	1⅛	7.75	7.50	8.00	23.61	52.00	24.97	55.00	24.06	53.00	25.42	56.00	2½
9.00	8	1.38	1¼	8.75	8.50	9.00	42.68	94.00	37.68	83.00	36.32	80.00	39.04	86.00	3
10.75	8	1.62	1½	10.00	9.75	10.25	64.00	141.00	58.00	127.90	54.48	120.00	60.38	133.00	4
12.75	8	1.88	1¾	11.75	11.50	12.25	110.68	244.00	95.25	210.00	92.53	204.00	101.15	223.00	5
14.50	8	2.12	2	13.50	13.25	14.00	176.46	378.00	146.51	323.00	143.01	315.30	156.63	345.30	6
17.25	12	2.12	2	15.00	14.75	15.50	261.27	576.00	219.99	485.00	213.38	470.40	240.62	530.50	8
21.25	12	2.62	2½	19.25	19.00	20.00	484.43	1068.00	419.57	925.00	408,60	900.80	465.36	1026.00	10
24.38	12	2.88	2¾	21.25	21.00	22.00	692.35	1526.30	590.20	1301.00	572.95	1263.00	664.06	1464.00	12

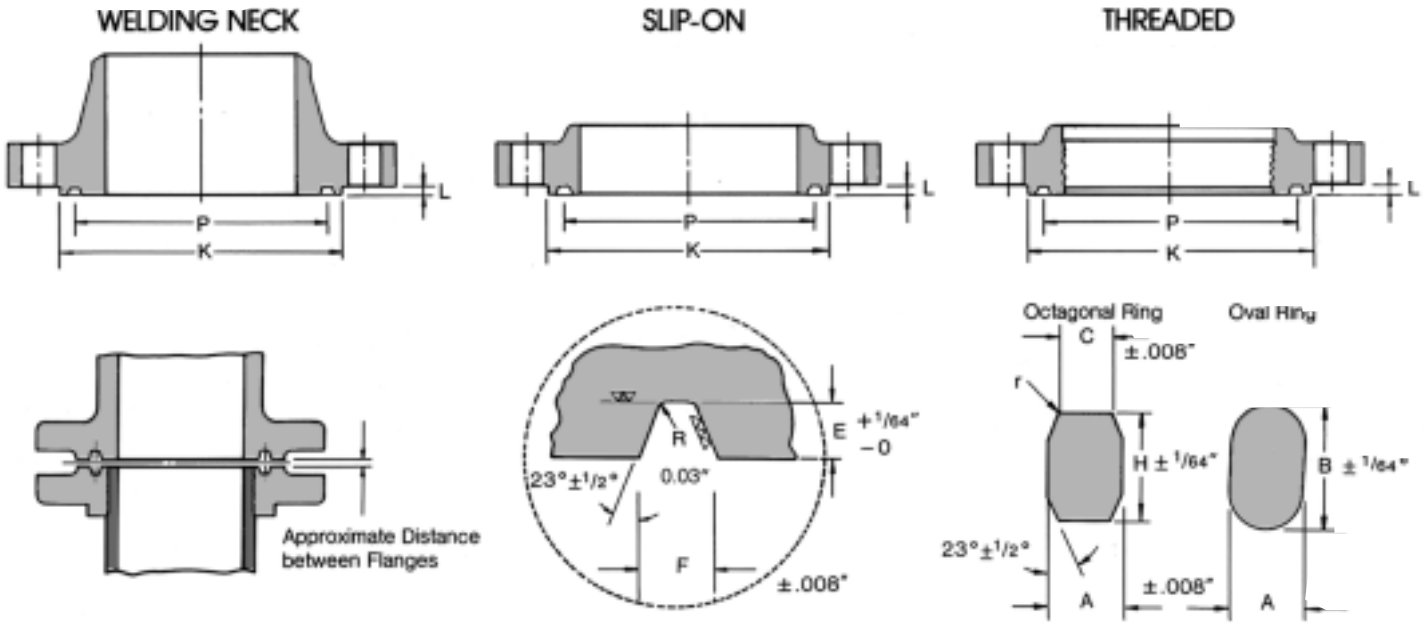
(4) Blind Flanges may be made with the same hub as that used for Slip-on Flange or without hub.
(5) The gasket surface and backside (bearing surface for bolting) are made parallel within 1 degree. To accomplish parallelism, spot facing is carried out according to MSS SP-9, without reducing thickness (t).
(6) Class 2500 Slip-on Flanges are not covered by ANSI B16.5, slip-on flanges are at the manufacturer's option.

RING JOINT FLANGES

- Class 150 Flanges
- Class 300-400-600 Flanges
- Class 900 Flanges
- Class 1500 Flanges
- Class 2500 Flanges

CLASS 150 FLANGES

RING JOINT FLANGES FACING DIMENSIONS



ANSI B16.5 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	Pitch Diam. of Ring and Groove	Width of Ring	HEIGHT OF RING		Width of Flat on Octagonal Rings	Width of Groove	Depth of Groove	Diameter of Raised Face for Ring Joint or Lapped	Ring Number	Approximate Distance Between Flanges of Ring Joints When Ring is Compressed
			Oval	Octagonal						
	P	A	B	H	C	F	E (L*)	K (Min)		
1	1.875	0.313	0.563	0.500	0.206	0.344	0.250	2.50	R15	0.16
1¼	2.250	0.313	0.563	0.500	0.206	0.344	0.250	2.88	R17	0.16
1½	2.562	0.313	0.563	0.500	0.206	0.344	0.250	3.25	R19	0.16
2	3.250	0.313	0.563	0.500	0.206	0.344	0.250	4.00	R22	0.16
2½	4.000	0.313	0.563	0.500	0.206	0.344	0.250	4.75	R25	0.16
3	4.500	0.313	0.563	0.500	0.206	0.344	0.250	5.25	R29	0.16
3½	5.188	0.313	0.563	0.500	0.206	0.344	0.250	6.06	R33	0.16
4	5.875	0.313	0.563	0.500	0.206	0.344	0.250	6.75	R36	0.16
5	6.750	0.313	0.563	0.500	0.206	0.344	0.250	7.62	R40	0.16
6	7.625	0.313	0.563	0.500	0.206	0.344	0.250	8.62	R43	0.16
8	9.750	0.313	0.563	0.500	0.206	0.344	0.250	10.75	R48	0.16
10	12.000	0.313	0.563	0.500	0.206	0.344	0.250	13.00	R52	0.16
12	15.000	0.313	0.563	0.500	0.206	0.344	0.250	16.00	R56	0.16
14	15.625	0.313	0.563	0.500	0.206	0.344	0.250	16.75	R59	0.12
16	17.875	0.313	0.563	0.500	0.206	0.344	0.250	19.00	R64	0.12
18	20.375	0.313	0.563	0.500	0.206	0.344	0.250	21.50	R68	0.12
20	22.000	0.313	0.563	0.500	0.206	0.344	0.250	23.50	R72	0.12
24	26.500	0.313	0.563	0.500	0.206	0.344	0.250	28.00	R76	0.12

Notes:

Unless other wise specified by the customer, Ring Type Joint Flanges will be furnished in accordance with these details.

The depth of groove is added to the minimum flange thickness.

* Raised face "L" is equal to groove dimension "E" but is not subject to tolerances for "E"

** A plus tolerance of 3/64 in. for heights B and H is permitted providing the variation in the height of any given ring does not exceed 1/64 in. throughout its entire cirkcumference.

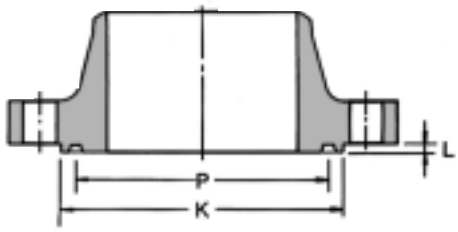
Dimension "R" is max.

Radius "r" is 1/16" for ring widths 7/8" and less and 3/32" for ring widths 1" and over.

CLASS 300-400-600 FLANGES

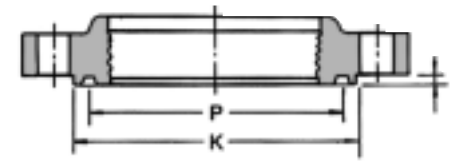
RING JOINT FLANGES FACING DIMENSIONS

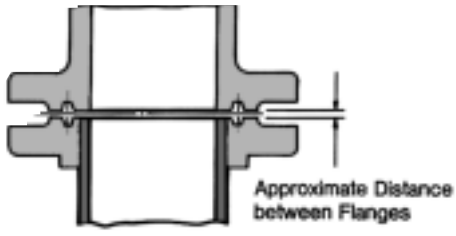
WELDING NECK

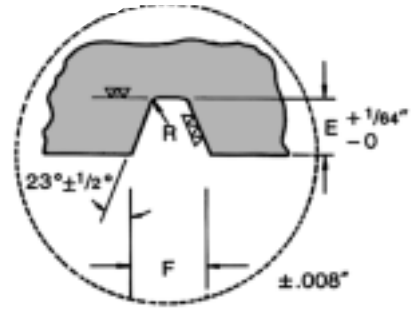


SLIP-ON

THREADED

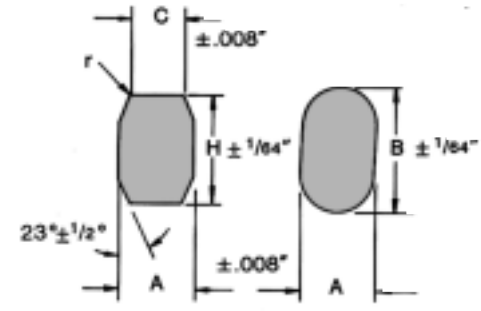






R = 0.03" ≤ NPS 16"
0.06" ≥ NPS 20"

Octagonal Ring Oval Ring



ANSI B16.5 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	Pitch Diam. of Ring and Groove	Width of Ring	HEIGHT OF RING		Width of Flat on Octagonal Rings	Width of Groove	Depth of Groove	Diameter of Raised Face for Ring Joint or Lapped	Ring Number	Approximate Distance Between Flanges of Ring Joints When Ring is Compressed		
			Oval	Octagonal								
	P	A	B	H	C	F	E (L*)	K (Min)		Class 300	Class 400	Class 600
½	1.344	0.250	0.438	0.375	0.170	0.281	0.219	2.00	R11	0.12	–	0.12
¾	1.688	0.313	0.563	0.500	0.206	0.344	0.250	2.50	R13	0.16	–	0.16
1	2.000	0.313	0.563	0.500	0.206	0.344	0.250	2.75	R16	0.16	–	0.16
1¼	2.375	0.313	0.563	0.500	0.206	0.344	0.250	3.13	R18	0.16	–	0.16
1½	2.688	0.313	0.563	0.500	0.206	0.344	0.250	3.56	R20	0.16	–	0.16
2	3.250	0.438	0.688	0.625	0.305	0.469	0.312	4.25	R23	0.22	–	0.19
2½	4.000	0.438	0.688	0.625	0.305	0.469	0.312	5.00	R26	0.22	–	0.19
3	4.875	0.438	0.688	0.625	0.305	0.469	0.312	5.75	R31	0.22	–	0.19
3½	5.188	0.438	0.688	0.625	0.305	0.469	0.312	6.25	R34	0.22	–	0.19
4	5.875	0.438	0.688	0.625	0.305	0.469	0.312	6.88	R37	0.22	0.22	0.19
5	7.125	0.438	0.688	0.625	0.305	0.469	0.312	8.25	R41	0.22	0.22	0.19
6	8.313	0.438	0.688	0.625	0.305	0.469	0.312	9.50	R45	0.22	0.22	0.19
8	10.625	0.438	0.688	0.625	0.305	0.469	0.312	11.88	R49	0.22	0.22	0.19
10	12.750	0.438	0.688	0.625	0.305	0.469	0.312	14.00	R53	0.22	0.22	0.19
12	15.000	0.438	0.688	0.625	0.305	0.469	0.312	16.25	R57	0.22	0.22	0.19
14	16.500	0.438	0.688	0.625	0.305	0.469	0.312	18.00	R61	0.22	0.22	0.19
16	18.500	0.438	0.688	0.625	0.305	0.469	0.312	20.00	R65	0.22	0.22	0.19
18	21.000	0.438	0.688	0.625	0.305	0.469	0.312	22.63	R69	0.22	0.22	0.19
20	23.000	0.500	0.750	0.688	0.341	0.531	0.375	25.00	R73	0.22	0.22	0.19
24	27.250	0.625	0.875	0.813	0.413	0.656	0.438	29.50	R77	0.25	0.25	0.22

Notes:

Unless otherwise specified by the customer, Ring Type Joint Flanges will be furnished in accordance with these details.

The depth of groove is added to the minimum flange thickness.

* Raised face "L" is equal to groove dimension "E" but is not subject to tolerances for "E".

- A plus tolerance of 3/64 in. for heights B and H is permitted providing the variation in the height of any given ring does not exceed 1/64 in. throughout its entire circumference.

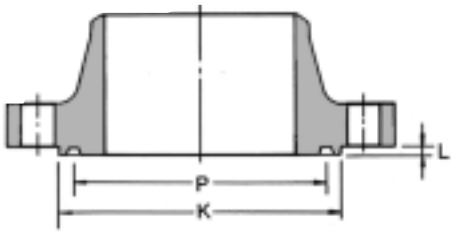
Dimension "R" is max.

Radius "r" is 1/16" for ring widths 7/8" and less and 3/32" for ring widths 1" and over.

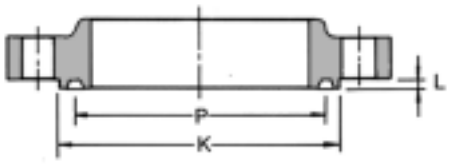
CLASS 900 FLANGES

RING JOINT FLANGES FACING DIMENSIONS

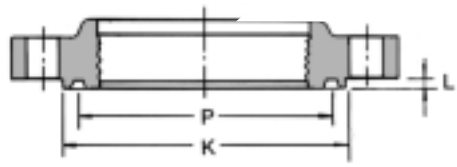
WELDING NECK

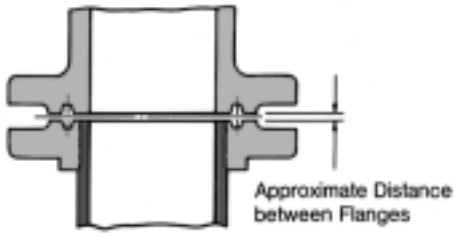


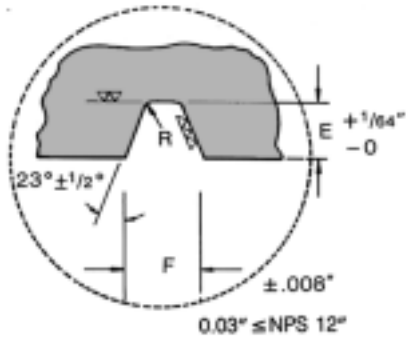
SLIP-ON



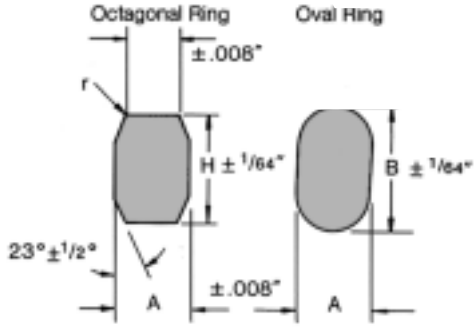
THREADED







R = 0.03" ≤ NPS 12"
0.06" = NPS 14" – 20"
0.09" = NPS 24"



Dimensions in inches

Nominal Pipe Size	Pitch Diam. of Ring and Groove	Width of Ring	HEIGHT OF RING		Width of Flat on Octagonal Rings	Width of Groove	Depth of Groove	Diameter of Raised Face for Ring Joint or Lapped	Ring Number	Approximate Distance Between Flanges of Ring Joints When Ring is Compressed
			Oval	Octagonal						
	P	A	B	H	C	F	E(L*)	K(Min)		
For size 2½ and smaller, use Class 1500 Ring Joint Flanges										
3	4.875	0.438	0.688	0.625	0.305	0.469	0.312	6.12	R31	0.16
4	5.875	0.438	0.688	0.625	0.305	0.469	0.312	7.12	R37	0.16
5	7.125	0.438	0.688	0.625	0.305	0.469	0.312	8.50	R41	0.16
6	8.313	0.438	0.688	0.625	0.305	0.469	0.312	9.50	R45	0.16
8	10.625	0.438	0.688	0.625	0.305	0.469	0.312	12.12	R49	0.16
10	12.750	0.438	0.688	0.625	0.305	0.469	0.312	14.25	R53	0.16
12	15.000	0.438	0.688	0.625	0.305	0.469	0.312	16.50	R57	0.16
14	16.500	0.625	0.875	0.813	0.413	0.656	0.438	18.38	R62	0.16
16	18.500	0.625	0.875	0.813	0.413	0.656	0.438	20.62	R66	0.16
18	21.000	0.750	1.000	0.938	0.438	0.781	0.500	23.38	R70	0.19
20	23.000	0.750	1.000	0.938	0.485	0.781	0.500	25.50	R74	0.19
24	27.250	1.000	1.313	1.250	0.681	1.062	0.625	30.38	R78	0.22

Notes:

Unless otherwise specified by the customer, Ring Type Joint Flanges will be furnished in accordance with these details.

The depth of groove is added to the minimum flange thickness.

* Raised face "L" is equal to groove dimension "E" but is not subject to tolerances for "E".

* A plus tolerance of 2/64 in. for heights B and H is permitted providing the variation in the height of any given ring does not exceed 1/64 in. throughout its entire circumference.

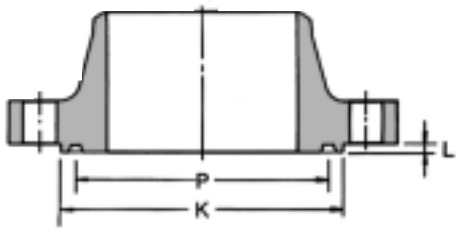
Dimension "R" is max.

Radius "r" is 1/16" for ring widths 7/8" and less and 2/32" for ring widths 1" and over.

CLASS 1500 FLANGES

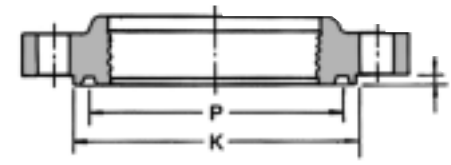
RING JOINT FLANGES FACING DIMENSIONS

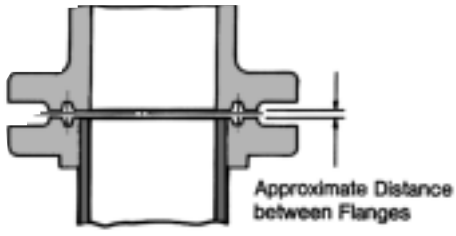
WELDING NECK

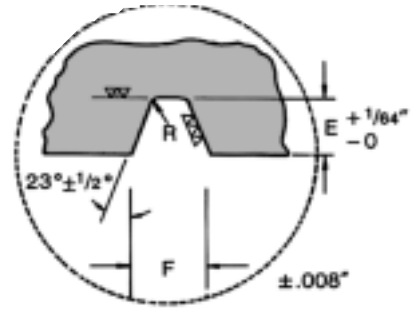


SLIP-ON

THREADED

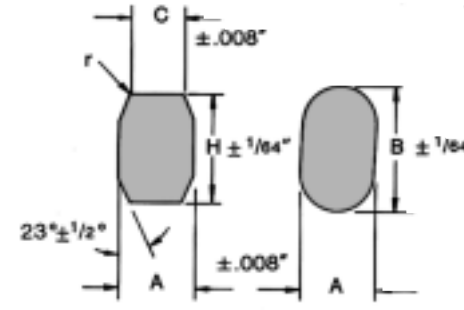






R = 0.03" ≤ NPS 5"
R = 0.06" = NPS 6" – 12"
R = 0.09" ≥ NPS 14"

Octagonal Ring Oval Ring



ANSI B16.5 FORGED FLANGES

Dimensions in inches

Nominal Pipe size	Pitch Diam. of Ring and Groove	Width of Ring	HEIGHT OF RING		Width of Flat on Octagonal Rings	Width of Groove	Depth of Groove	Diameter of Raised Face for Ring Joint or Lapped	Ring Number	Approximate Distance Between Flanges of Ring Joints When Ring is Compressed
			Oval	Octagonal						
	P	A	B	H	C	F	E (L*)	K (Min)		
½	1.563	0.313	0.563	0.500	0.206	0.344	0.250	2.38	R12	0.16
¾	1.750	0.313	0.563	0.500	0.206	0.344	0.250	2.63	R14	0.16
1	2.000	0.313	0.563	0.500	0.206	0.344	0.250	2.81	R16	0.16
1¼	2.375	0.313	0.563	0.500	0.206	0.344	0.250	3.19	R18	0.16
1½	2.688	0.313	0.563	0.500	0.206	0.344	0.250	3.63	R20	0.16
2	3.750	0.438	0.688	0.625	0.305	0.469	0.312	4.88	R24	0.12
2½	4.250	0.438	0.688	0.625	0.305	0.469	0.312	5.38	R27	0.12
3	5.375	0.438	0.688	0.625	0.305	0.469	0.312	6.63	R35	0.12
4	6.375	0.438	0.688	0.625	0.305	0.469	0.312	7.63	R39	0.12
5	7.625	0.438	0.688	0.625	0.305	0.469	0.312	9.00	R44	0.12
6	8.313	0.500	0.750	0.688	0.341	0.531	0.375	9.75	R46	0.12
8	10.625	0.625	0.875	0.813	0.413	0.656	0.438	12.50	R50	0.16
10	12.750	0.625	0.875	0.813	0.413	0.656	0.438	14.63	R54	0.16
12	15.000	0.875	1.125	1.063	0.583	0.906	0.562	17.25	R58	0.19
14	16.500	1.000	1.313	1.250	0.681	1.062	0.625	19.25	R63	0.22
16	18.500	1.125	1.438	1.375	0.780	1.188	0.688	21.50	R67	0.31
18	21.000	1.125	1.438	1.375	0.780	1.188	0.688	24.13	R71	0.31
20	23.000	1.250	1.563	1.500	0.879	1.313	0.688	26.50	R75	0.38
24	27.250	1.375	1.750	1.625	0.977	1.438	0.812	31.25	R79	0.44

Notes.

Unless otherwise specified by the customer, Ring Type Joint Flanges will be furnished in accordance with these details.

The depth of groove is added to the minimum flange thickness.

* Raised face "L" is equal to groove dimension "E" but is not subject to tolerances for "E".

^ A plus tolerance of 3/64 in. for heights B and H is permitted providing the variation in the height of any given ring does not exceed 1/64 in. throughout its entire circumference.

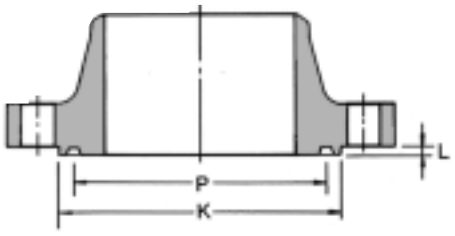
Dimension "R" is max.

Radius "r" is 1/16" for ring widths 7/8" and less and 3/32" for ring widths 1" and over.

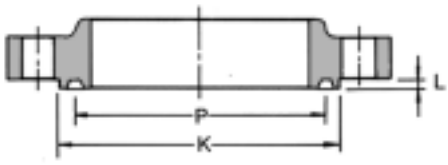
CLASS 2500 FLANGES

RING JOINT FLANGES FACING DIMENSIONS

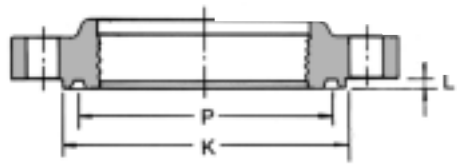
WELDING NECK

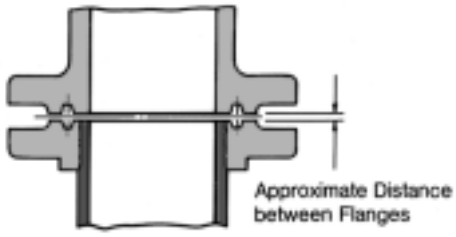


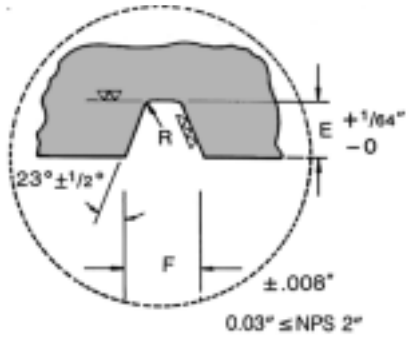
SLIP-ON



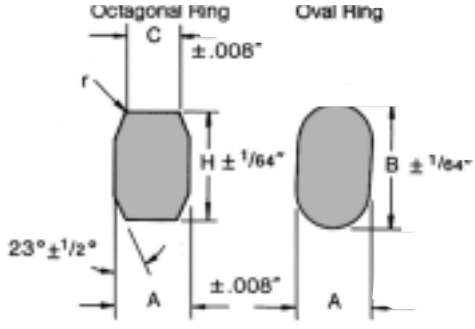
THREADED







0.03" ≤ NPS 2"
R = 0.06" = NPS 2½" – 8"
0.09" ≥ NPS 10"



Dimensions in inches

Nominal Pipe Size	Pitch Diam. of Ring and Groove	Width of Ring	HEIGHT OF RING		Width of Flat on Octagonal Rings	Width of Groove	Depth of Groove	Diameter of Raised Face for Ring Joint or Lapped	Ring Number	Approximate Distance Between Flanges of Ring Joints When Ring is Compressed
			Oval	Octagonal						
	P	A	B	H	C	F	E (L*)	K (Min)		
½	1.688	0.313	0.563	0.500	0.206	0.344	0.250	2.56	R13	0.16
¾	2.000	0.313	0.563	0.500	0.206	0.344	0.250	2.88	R16	0.16
1	2.375	0.313	0.563	0.500	0.206	0.344	0.250	3.25	R18	0.16
1¼	2.844	0.438	0.688	0.625	0.305	0.469	0.312	4.00	R21	0.12
1½	3.250	0.438	0.688	0.625	0.305	0.469	0.312	4.50	R23	0.12
2	4.000	0.438	0.688	0.625	0.305	0.469	0.312	5.25	R26	0.12
2½	4.375	0.500	0.750	0.688	0.341	0.531	0.375	5.88	R28	0.12
3	5.000	0.500	0.750	0.688	0.341	0.531	0.375	6.63	R32	0.12
4	6.188	0.625	0.875	0.813	0.413	0.656	0.438	8.00	R38	0.16
5	7.500	0.750	1.000	0.938	0.485	0.781	0.500	9.50	R42	0.16
6	9.000	0.750	1.000	0.938	0.485	0.781	0.500	11.00	R47	0.16
8	11.000	0.875	1.125	1.063	0.583	0.906	0.562	13.38	R51	0.19
10	13.500	1.125	1.438	1.375	0.780	1.188	0.688	16.75	R55	0.25
12	16.000	1.250	1.563	1.500	0.879	1.313	0.688	19.50	R60	0.31

Notes:

Unless otherwise specified by the customer, Ring Type Joint Flanges will be furnished in accordance with these details.

The depth of groove is added to the minimum flange thickness.

* Raised face "L" is equal to groove dimension "E" but is not subject to tolerances for "E".

* A plus tolerance of 3/64 in. for heights B and H is permitted providing the variation in the height of any given ring does not exceed 1/64 in. throughout its entire circumference.

Dimension "R" is max.

Radius "r" is 1/16" for ring widths 7/8" and less and 3/32" for ring widths 1" and over.

REDUCING FLANGES

THREADED AND SLIP-ON TYPES

HUB – For hub diameter (X) and height of hub above the back of the flange (N) refer to the list of standard flange specification of the same type and pressure and use the dimensions of a flange **one nominal pipe size smaller** than the nominal pipe size from which the reduction is being made.

FLANGE O.D., DRILLING TEMPLATE AND THICKNESS – Outside diameter, drilling template and flange thickness Q (see note on FACINGS) agree with the dimensions of a standard flange of the nominal pipe size from which the reduction is being made.

FACING – Facing dimensions also agree with the dimensions of a standard flange of the nominal pipe size from which the reduction is being made.
150 lb. and 300 lb. forged steel Threaded, Slip-On, Welding Neck and Blind flanges are furnished with American Standard 1/16" raised face which is included in flange thickness. Q. 400 lb., 600 lb., 900 lb., 1500 lb. and 2500 lb. flanges are supplied with American Standard 1/4" raised face which is not included in flange thickness (Q).

BORE OR TAPPING – The bore or tapping is machined to accept a pipe of the nominal pipe size to which the reduction is being made. For reduction to sizes smaller than shown, BLIND FLANGES are tapped or bored to specified nominal pipe size.

EXAMPLE:

A 300 lb. threaded flange used in reducing from a 6" to 3" nominal pipe size should be specified as a 3" × 12 1/2" - 300 lb. Threaded Reducing Flange. It would have the following dimensional characteristics:

Diameter of Hub (X) – 7".
Height of Hub (N) – 5/8".

Hub dimensions are those of a 5", 300 lb. Standard flange.
Outside Diameter – 12 1/2".
Thickness (Q) – 1 7/16".
Raised face – 1/16".

O.D., Flange Thickness Q., Raised Face and Drilling Template are those of a 6", 300 lb. Standard flange.
Tapping – 3" I.P.S.

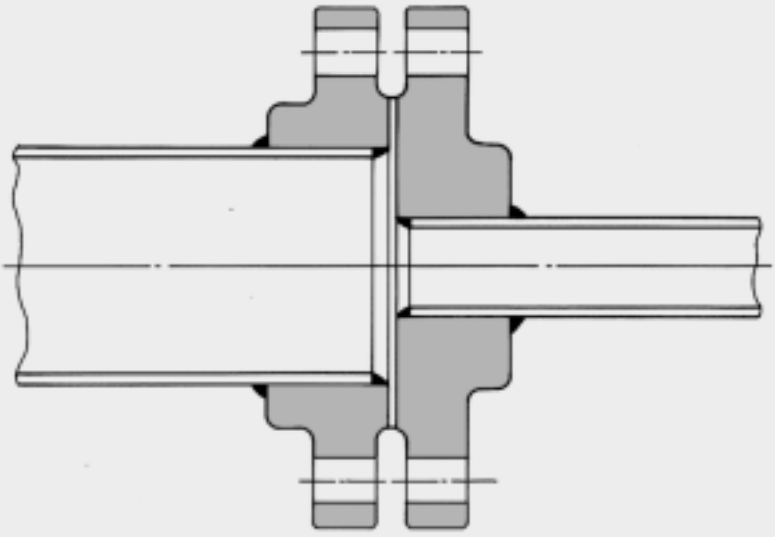
Flange is tapped to the nominal pipe size to which reduction is being made.

WELDING NECK TYPES

On Reducing Welding Neck Flanges, which are made only on special order, the hub dimensions agree with the hub dimensions of standard flanges of the size to which reduction is being made. Other flange dimensions, including the drilling template, agree with the standard dimensions of the size from which the reduction is being made.

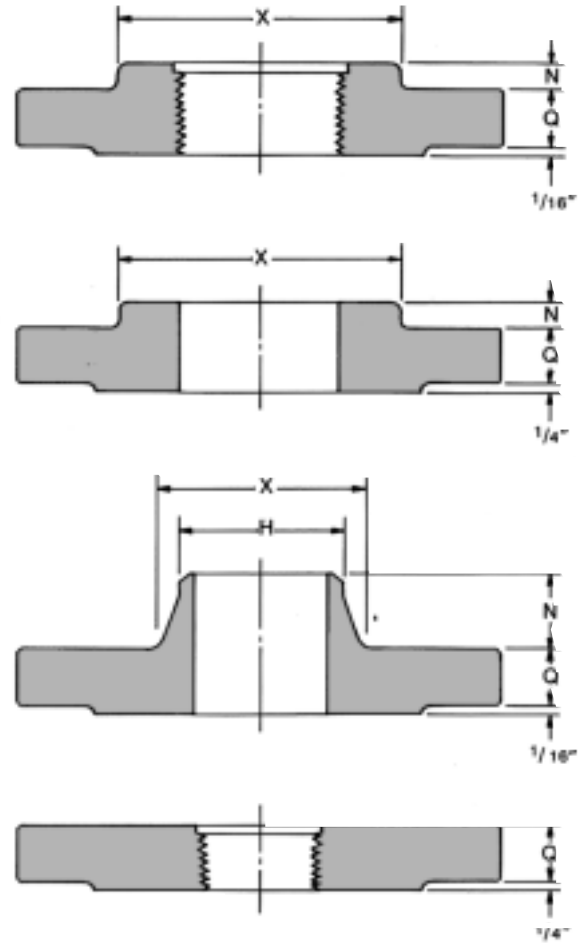
REDUCING FLANGES

THREADED—SLIP-ON—WELDING NECK



In ordering Reducing Flanges; specify (1) nominal pipe size of the tapping or bore to which the reduction is being made, (2) the outside diameter of the flange from which the reduction is being made and (3) pressure rating.

EXAMPLE:
A 300 lb. Reducing Flange for reducing from a 6" to a 3" nominal pipe size should be designated as a 3" × 12½"-300 lb. Reducing Flange. Whether Threaded, Slip-On, or Welding Neck type is desired must also be specified.



ANSI B16.5 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size to Which Reduction is to be Made to be Specified by Purchaser	Nominal Flange	OUTSIDE DIAMETER OF FLANGE FROM WHICH REDUCTION IS BEING MADE							Smallest Size Bore or Tapping Requiring Hub Flange
		150 lb. Standard	300 lb. Standard	400 lb. Standard	600 lb. Standard	900 lb. Standard	1500 lb. Standard	2500 lb. Standard	
	¾	3⅜	4⅝	4⅝	4⅝	5⅛	5⅛	5½	½
	1	4¼	4⅞	4⅞	4⅞	5⅜	5⅜	6¼	½
	1¼	4⅝	5¼	5¼	5¼	6¼	6¼	7¼	½
	1½	5	6⅛	6⅛	6⅛	7	7	8	½
	2	6	6½	6½	6½	8½	8½	9¼	1
	2½	7	7½	7½	7½	9⅝	9⅝	10½	1¼
	3	7½	8¼	8¼	8¼	9½	10½	12	1¼
	3½	8½	9	9	9	—	—	—	1½
	4	9	10	10	10¾	11½	12¼	14	1½
	5	10	11	11	13	13¾	14¾	16½	1½
	6	11	12½	12½	14	15	15½	19	2½
	8	13½	15	15	16½	18½	19	21¾	3
	10	16	17½	17½	20	21½	23	26½	3½
	12	19	20½	20½	22	24	26½	30	3½
	14	21	23	23	23¾	25¼	—	—	3½
	16	23½	25½	25½	27	27¾	—	—	4
	18	25	28	28	29¼	31	—	—	4
	20	27½	30½	30½	32	33¾	—	—	4
	24	32	36	36	37	41	—	—	4

Note:
For reductions to sizes smaller than shown, blind flanges are tapped or bored for specified nominal pipe size.

ORIFICE FLANGES

- ANSI Orifice Flange
- Class 300 Orifice Flanges
- Class 400 Orifice Flanges
- Class 600 Orifice Flanges
- Class 900-1500 Orifice Flanges
- Class 2500 Orifice Flanges

ANSI ORIFICE FLANGE
(ANSI B16.36) FORGED FLANGES

ORIFICE FLANGES are widely used in conjunction with orifice meters for measuring the rate of flow of liquids and gases. They are basically the same as standard welding neck, slip-on and screwed flanges except for the provision of radial, tapped holes in the flange ring for meter connections and additional bolts to act as jack screws to facilitate separating the flanges for inspection or replacement of the orifice plate.

NOTES:

1. JACK SCREW PROVISION

(1) Each flange shall have a machine bolt mounted in a hole drilled on the flange centerline at 90 deg. from the pressure taps, for use as a jackscrew. Machine bolt shall be regular, with one heavy hex. nut.

(2) A slot shall be provided in the flange 0.06 in. (1.6 mm) 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.

2. PRESSURE TAPS

(1) Each orific flange is provided with two pressure tap holes extending radially from the outside diameter of the flange to the inside diameter of the flange.

(2) The 0.94 in. (23.8 mm) locating dimension for raised face and 0.75 in. (19.1 mm) for ring joint shall be measured at the bore.

(3) Each pressure tap hole shall be equipped with a pipe plug.

3. FACING

The finish of facings shall be in accordance with MSS Standard Practice SP-6, Finishes for Contact Face of Connecting-End Flanges of Ferrous Valves and Fittings.

4. FLANGE THREADS

(1) Threaded flanges shall have an American National Standard taper pipe thread conforming to ANSI B2.1.

(2) The thread shall be concentric with the axis of the flange and variations in alignment shall not exceed 0.06 in. per foot.

(3) 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 degrees with the axis of the thread to afford easy entrance in making a joint. The chamfer shall be concentric with the thread.

(4) 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.

(5) 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 1/2 of the pitch of the thread.

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

5. TOLERANCES

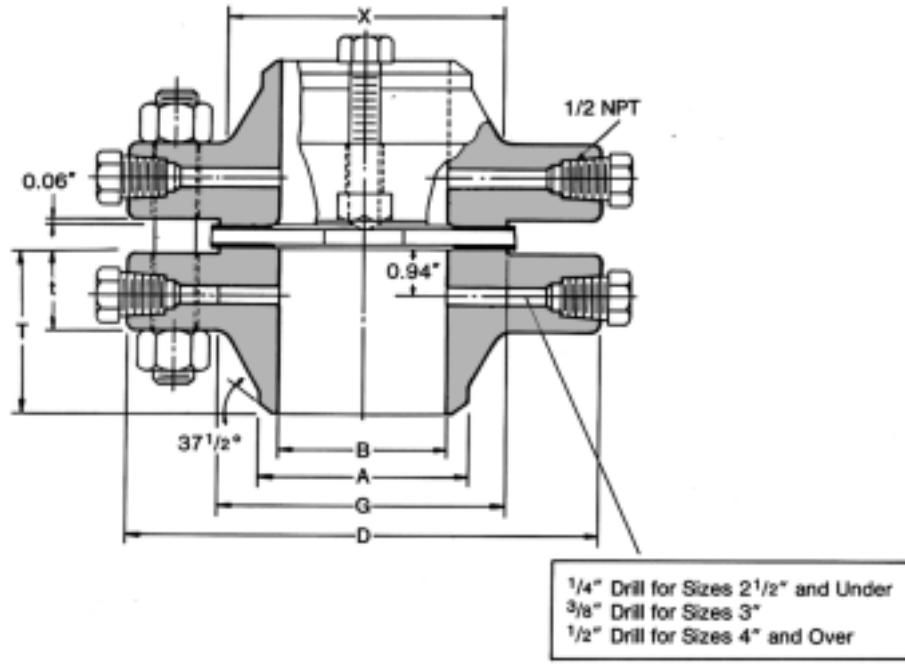
Tolerances on all dimensions shall be as shown in ANSI B16.5 except for those shown below.

(1) Tolerance on location of center of pressure tap hole[2] from flange face shall be:
   a. Flanges smaller than nominal size 4 $\pm$ 0.02 in. (0.5 mm)
   b. Flanges nominal size 4 and larger $\pm$ 0.03 in. (0.8 mm)

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

CLASS 300 ORIFICE FLANGES

WELDING NECK (RAISED FACE)



ANSI B16.36 FORGED FLANGES

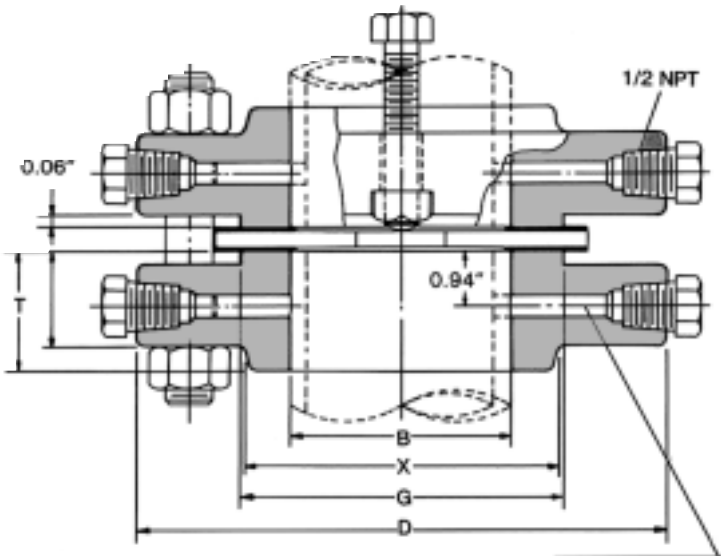
Dimensions in inches

Nominal Pipe Size	Outside Diam. of Flange	THICKNESS OF FLANGE (t)	Diam. of Hub at Base	Diam. of Raised Face	Diam. of Hub at Bevel	LENGTH THRU HUB (T)		BORE (B)	
		Raised Face				Welding Neck	Slip-on & Threaded	Welding Neck	Slip-on
	D		X	G	A	Raised Face	Raised Face		
1	4.88	1.50	2.12	2.00	1.32	3.25	1.88	1.05	1.36
1¼	5.25	1.50	2.50	2.50	1.66	3.31	1.81	1.38	1.70
1½	6.12	1.50	2.75	2.88	1.90	3.38	1.88	1.61	1.95
2	6.50	1.50	3.31	3.62	2.38	3.38	1.94	2.07	2.44
2½	7.50	1.50	3.94	4.12	2.88	3.50	2.00	2.47	2.94
3	8.25	1.50	4.62	5.00	3.50	3.50	2.06	3.07	3.57
4	10.00	1.50	5.75	6.19	4.50	3.62	2.12	4.03	4.57
5	11.00	1.50	7.00	7.31	5.56	4.00	2.12	5.05	5.66
6	12.50	1.50	8.12	8.50	6.63	3.94	2.12	6.07	6.72
8	15.00	1.62	10.25	10.62	8.63	4.38	2.44	7.98	8.72
10	17.50	1.88	12.62	12.75	10.75	4.62	2.62	10.02	10.88
12	20.50	2.00	14.75	15.00	12.75	5.12	2.88	12.00	12.88
14	23.00	2.12	16.75	16.25	14.00	5.62	3.00	13.25	14.14
16	25.50	2.25	19.00	18.50	16.00	5.75	3.25	15.25	16.16
18	28.00	2.38	21.00	21.00	18.00	6.25	3.50	17.25	18.18
20	30.50	2.50	23.12	23.00	20.00	6.38	3.75	19.25	20.20
24	36.00	2.75	27.62	27.25	24.00	6.62	4.19	23.25	24.25

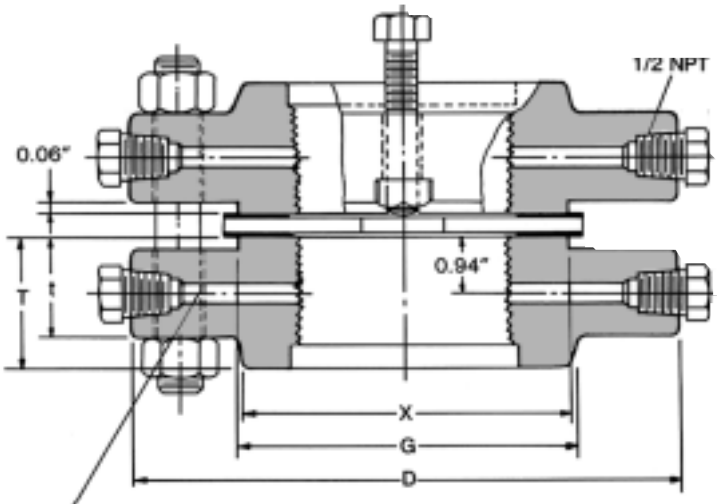
Notes:

(1) For the "Bore" (B) of Welding Neck Flanges other than Standard Weall Thickness, refer to 61.
(2) Class 300 Welding Neck Flanges of sizes 24" and smaller will be bored to match Standard Wall Pipe unless otherwise specified.
(3) Class 300 Orifice flanges will be furnished with 0.06" raised face, which is included in 'Thickness' (t) and 'Length through Hub' (T).
(4) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24.

SLIP-ON



THREADED



1/4" Drill for Sizes 2 1/2" and Under
3/8" Drill for Sizes 3"
1/2" Drill for Sizes 4" and Over

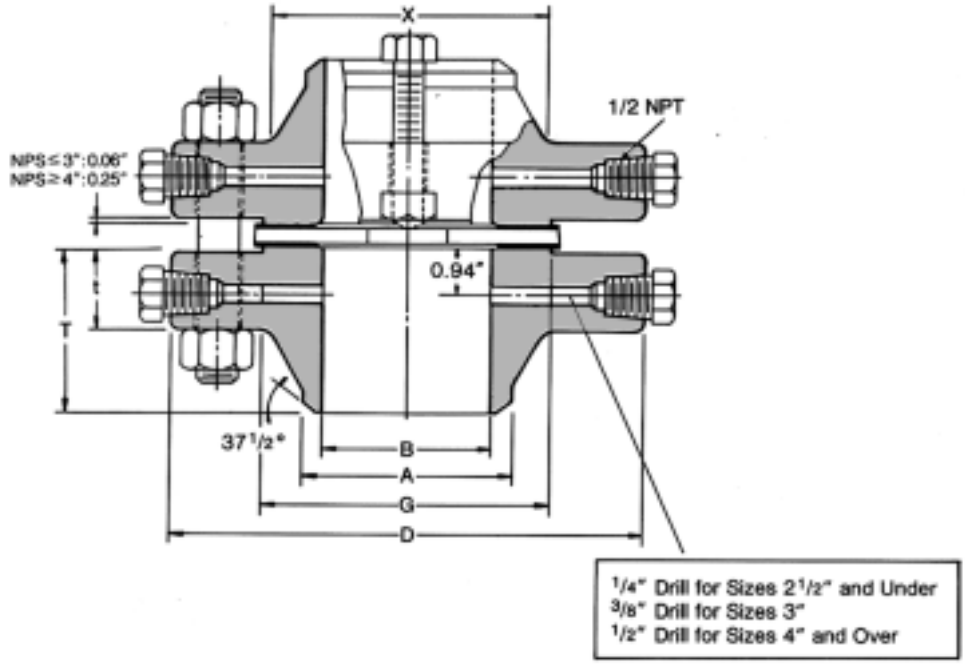
Dimensions in inches

Pitch Diam. of Ring and Groove	Ring Number	DEPTH OF JACK SCREW SLOT	JACK SCREW SIZE	DRILLING TEMPLATE					Nominal Pipe Size
P		Raised Face	Raised Face	Diam. of Bolt Circle	Number of Bolts	Diam. of Stud Bolts	Diam. of Bolt Holes	Length of Stud Bolts Raised Face	
2.000	R16	0.38	Jack screw sizes for 1" thru 24" are those as shown for length and diameter of bolts.	3.50	4	⅝	0.69	5.50	1
2.375	R18	0.38		3.88	4	⅝	0.69	6.00	1¼
2.688	R20	0.50		4.50	4	¾	0.81	6.00	1½
3.250	R23	0.38		5.00	8	⅝	0.69	6.00	2
4.000	R26	0.50		5.88	8	¾	0.81	6.00	2½
4.875	R31	0.50		6.62	8	¾	0.81	6.00	3
5.875	R37	0.50		7.88	8	¾	0.81	6.00	4
7.125	R41	0.50		9.25	8	¾	0.88	6.00	5
8.312	R45	0.50		10.62	12	¾	0.88	6.00	6
10.625	R49	0.62		13.00	12	⅞	1.00	6.25	8
12.750	R53	0.75		15.25	16	1	1.12	6.50	10
15.000	R57	0.88		17.75	16	1⅛	1.25	7.00	12
16.500	R61	0.88		20.25	20	1⅛	1.25	7.25	14
18.500	R65	1.00		22.50	20	1¼	1.38	7.75	16
21.000	R69	1.00		24.75	24	1¼	1.38	8.00	18
23.000	R73	1.00		27.00	24	1¼	1.38	8.50	20
27.250	R77	1.25		32.00	24	1½	1.62	9.50	24

(b) Unless otherwise specified, unions of 1" thru 24" furnished with carbon steel regular square headed bolts with semifinished American Standard heavy series hex nuts.

CLASS 400 ORIFICE FLANGES

WELDING NECK (RAISED FACE)



ANSI B16.36 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	Outside Diam. of Flange	THICKNESS OF FLANGE (t)		Diam. of Hub at Base	Diam. of Raised Face	Diam. of Hub at Bevel	LENGTH THRU HUB (T)				BORE (B)	
							Welding Neck		Slip-on & Threaded		Welding Neck	Slip-on
	D	Raised Face	Ring Joint	X	G	A	Raised Face	Ring Joint	Raised Face	Ring Joint		
1	4.88	1.50	1.25	2.12	2.00	1.32	3.25	3.00	1.88	1.62	See Note (1) To be specified by purchaser.	1.36
1¼	5.25	1.50	1.25	2.50	2.50	1.66	3.31	3.06	1.81	1.56		1.70
1½	6.12	1.50	1.25	2.75	2.88	1.90	3.38	3.12	1.88	1.62		1.95
2	6.50	1.50	1.25	3.31	3.62	2.38	3.38	3.12	1.94	1.69		2.44
2½	7.50	1.50	1.25	3.94	4.12	2.88	3.50	3.25	2.00	1.75		2.94
3	8.25	1.50	1.25	4.62	5.00	3.50	3.50	3.25	2.06	1.81		3.57
4	10.00	1.38	1.38	5.75	6.19	4.50	3.50	3.50	2.00	2.00		4.57
5	11.00	1.50	1.50	7.00	7.31	5.56	4.00	4.00	2.12	2.12		5.66
6	12.50	1.62	1.62	8.12	8.50	6.63	4.06	4.06	2.25	2.25		6.72
8	15.00	1.88	1.88	10.25	10.62	8.63	4.62	4.62	2.69	2.69		8.72
10	17.50	2.12	2.12	12.62	12.75	10.75	4.88	4.88	2.88	2.88		10.88
12	20.50	2.25	2.25	14.75	15.00	12.75	5.38	5.38	3.12	3.12		12.88
14	23.00	2.39	2.38	16.75	16.25	14.00	5.88	5.88				14.14
16	25.50	2.50	2.50	19.00	18.50	16.00	6.00	6.00				16.16
18	28.00	2.62	2.62	21.00	21.00	18.00	6.50	6.50				18.18
20	30.50	2.75	2.75	23.12	23.00	20.00	6.62	6.62				20.20
24	36.00	3.00	3.00	27.62	27.25	24.00	6.88	6.88				22.22

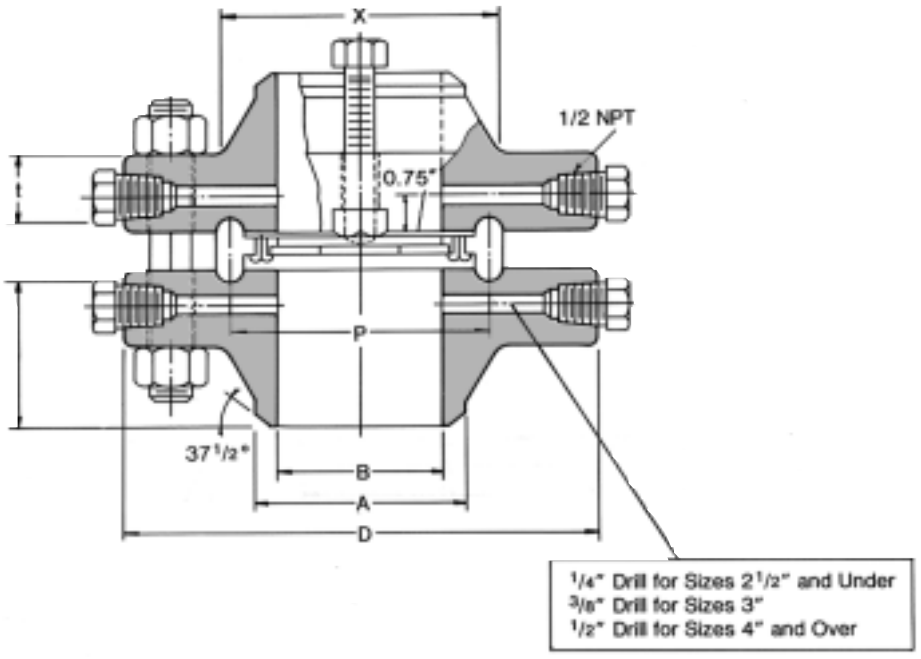
Notes:

(1) For the inside diameter of pipes (corresponding to "Bore" (B) of Welding Neck Flanges), refer to page 61.

(2) Class 400 flanges of sizes 3" and smaller with be furnished with 0.06" raised face, which is included in "Thickness" (t) and "Length through Hub" (T).
The 0.25" raised face for sizes 4" and larger is not included in (t) and (T).

(3) Each union includes two carbon steel jack screw bolts with hex nuts.

WELDING NECK (RING-TYPE JOINT)



Dimensions in inches

Pitch Diam. of Ring and Groove	Ring Number	DEPTH OF JACK SCREW SLOT		JACK SCREW SIZE		DRILLING TEMPLATE						Nominal Pipe Size
		Raised Face	Ring Joint	Raised Face	Ring Joint	Diam. of Bolt Circle	Number of Bolts	Diam. of Stud Bolts	Diam. of Bolt Holes	Length of Stud Bolts		
P										Raised Face	Ring Joint	
2.000	R16	0.38	0.25	⅝x4.00	⅝x4.75	3.50	4	⅝	0.69	5.00	5.75	1
2.375	R18	0.38	0.25	⅝x4.00	⅝x4.75	3.88	4	⅝	0.69	5.00	4.75	1¼
2.688	R20	0.50	0.25	¾x4.25	¾x5.00	4.50	4	¾	0.81	5.25	6.00	1½
3.250	R23	0.38	0.25	⅝x4.00	⅝x4.75	5.00	8	⅝	0.69	5.00	6.00	2
4.000	R26	0.50	0.25	¾x4.25	¾x5.00	5.88	8	¾	0.81	5.25	6.25	2½
4.875	R31	0.50	0.25	¾x4.25	¾x5.00	6.62	8	¾	0.81	5.25	6.25	3
5.875	R37	0.25	0.62	¾x3.00	¾x4.00	7.88	8	⅞	1.00	5.50	6.00	4
7.125	R41	0.25	0.62	¾x3.00	¾x4.00	9.25	8	⅞	1.00	5.75	6.25	5
8.312	R45	0.50	0.88	1x3.50	1x4.00	10.62	12	⅞	1.00	6.25	6.50	6
10.625	R49	0.50	0.88	1x3.50	1x4.50	13.00	12	1	1.12	6.75	7.25	8
12.750	R53	0.50	0.88	1x4.00	1x4.50	15.25	16	1⅛	1.25	7.50	8.00	10
15.000	R57	0.50	0.88	1x4.00	1x5.00	17.75	16	1¼	1.38	8.00	8.50	12
16.500	R61	0.50	0.88	1x4.25	1x5.00	20.25	20	1¼	1.38	8.25	9.00	14
18.500	R65	0.50	0.88	1x4.25	1x5.00	22.50	20	1⅜	1.50	8.75	9.25	16
21.000	R69	0.50	0.88	1x4.50	1x5.00	24.75	24	1⅜	1.50	9.25	9.50	18
23.000	R73	0.50	0.88	1x4.75	1x5.50	27.00	24	1½	1.62	9.75	10.25	20
27.250	R77	0.50	0.88	1x5.00	1x6.00	32.00	24	1¾	1.88	11.00	11.25	24

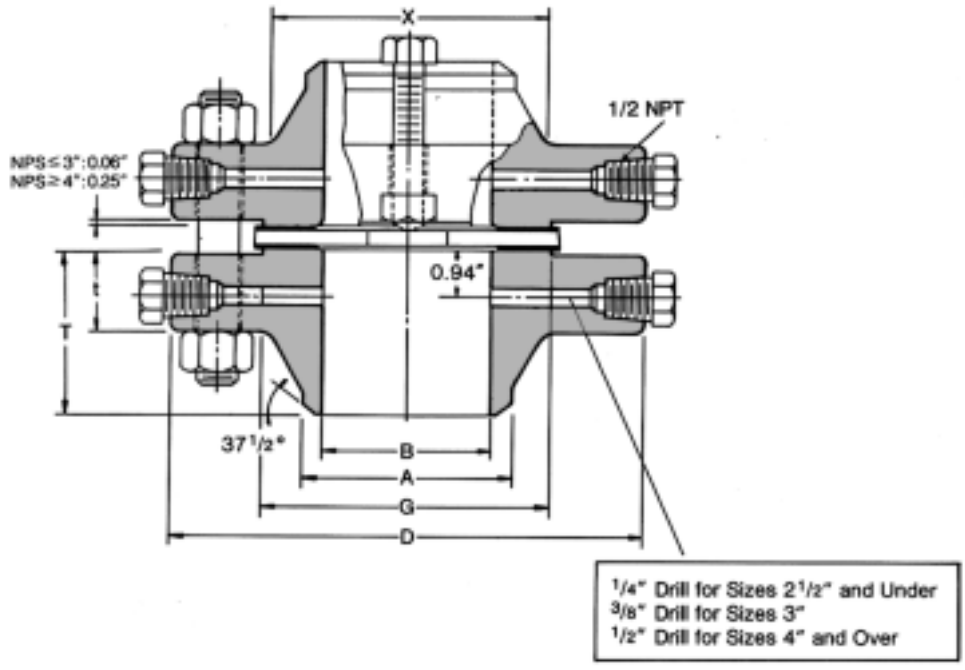
(4) Unless otherwise specified, raised face unions are furnished with alloy bolt studs per ASTM A193 Grade B7 with American Standard heavy series hex nuts ASTM A194 Class 2H.

(5) On ring joint flanges having a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When the depth of groove is 0.438" or greater, changes in drill size or method of drilling are necessary.

(6) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24. Bolt lengths for ring type joint flanges include allowance of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

CLASS 600 ORIFICE FLANGES

WELDING NECK (RAISED FACE)



ANSI B16.36 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	Outside Diam. of Flange	THICKNESS OF FLANGE (t)		Diam. of Hub at Base	Diam. of Raised Face	Diam. of Hub at Bevel	LENGTH THRU HUB (T)				BORE (B)	
							Welding Neck		Slip-on & Threaded			
		Raised Face	Ring Joint								Welding Neck	Slip-on
	D			X	G	A	Raised Face	Ring Joint	Raised Face	Ring Joint		
1	4.88	1.50	1.25	2.12	2.00	1.32	3.25	3.00	1.88	1.62	See Note (1) To be specified by purchaser.	1.36
1¼	5.25	1.50	1.25	2.50	2.50	1.66	3.31	3.06	1.81	1.56		1.70
1½	6.12	1.50	1.25	2.75	2.88	1.90	3.38	3.12	1.88	1.62		1.95
2	6.50	1.50	1.25	3.31	3.62	2.38	3.38	3.12	1.94	1.69		2.44
2½	7.50	1.50	1.25	3,94	4.12	2.88	3.50	3.25	2.00	1.75		2.94
3	8.25	1.50	1.25	4.62	5.00	3.50	3.50	3.25	2.06	1.81		3.57
4	10.75	1.50	1.50	6.00	6.19	4.50	4.00	4.00	2.12	2.12		4.57
5	13.00	1.75	1.75	7.44	7.31	5.56	4.50	4.50	2.38	2.38		5.66
6	14.00	1.88	1.88	8.75	8.50	6.63	4.62	4.62	2.62	2.62		6.72
8	16.50	2.19	2.19	10.75	10.62	8.63	5.25	5.25	3.00	3.00		8.72
10	20.00	2.50	2.50	13.50	12.75	10.75	6.00	6.00	3.38	3.38		10.88
12	22.00	2.62	2.62	15.75	15.00	12.75	6.12	6.12	3.62	3.62		12.88
14	23.75	2.75	2.75	17.00	16.25	14.00	6.50	6.50				
16	27.00	3.00	3.00	19.50	18.50	16.00	7.00	7.00				
18	29.25	3.25	3.25	21.50	21.00	18.00	7.25	7.25				
20	32.00	3.50	3.50	24.00	23.00	20.00	7.50	7.50				
24	37.00	4.00	4.00	28.25	27.25	24.00	8.00	8.00				

Notes:

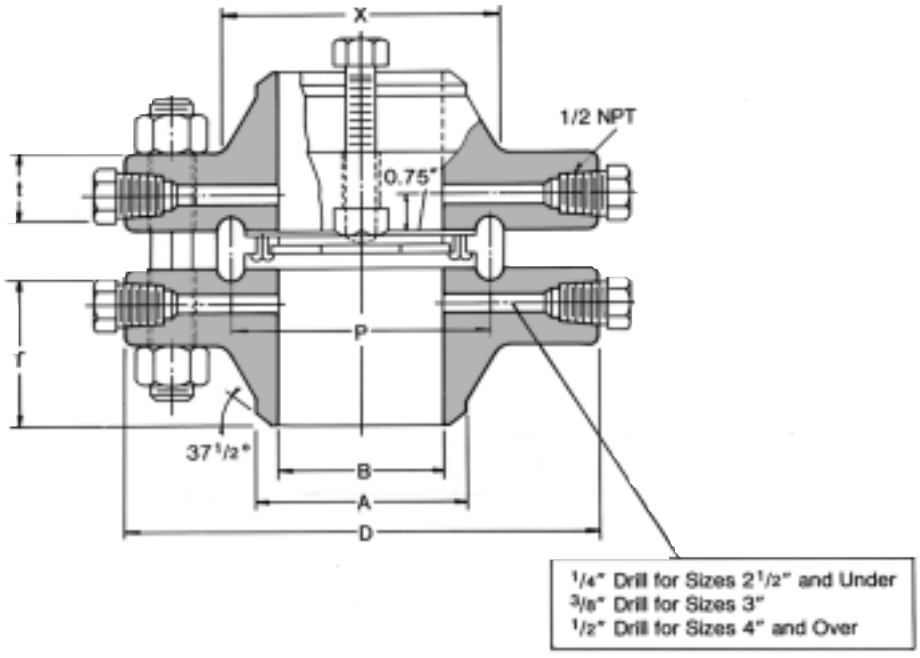
(1) For the inside diameter of pipes (corresponding to 'Bore' (B) of Welding Neck Flanges), refer to page 61.

(2) Class 600 flanges of sizes 3" and smaller will be furnished with 0.06" raised face, which is included in 'Thickness' (t) and 'Length through Hub' (T).
The 0.25" raised face for sizes 4" and larger is not included in (t) and (T).

(3) Each union includes two carbon steel jack screw bolts with hex nuts.

(4) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24. Bolt lengths for ring type joint flanges include allowance of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

WELDING NECK (RING-TYPE JOINT)



Dimensions in inches

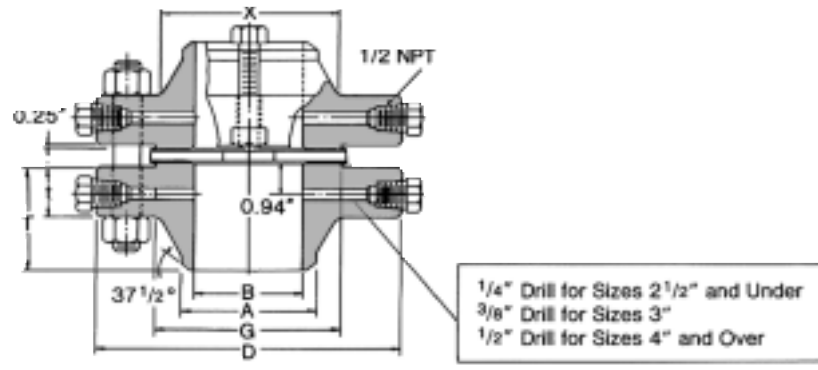
Pitch Diam. of Ring and Groove	Ring Number	DEPTH OF JACK SCREW SLOT		JACK SCREW SIZE		DRILLING TEMPLATE							Nominal Pipe Size
		Raised Face	Ring Joint	Raised Face	Ring Joint	Diam. of Bolt Circle	Number of Bolts	Diam. of Stud Bolts	Diam of Bolt Holes		Length of Stud Bolts		
P									RF	RTJ	Raised Face	Ring Joint	
2.000	R16	0.38	0.25	⅝×4.00	⅝×4.75	3.50	4	⅝	0.69	0.75	5.00	5.75	**1**
2.375	R18	0.38	0.25	⅝×4.00	⅝×4.75	3.88	4	⅝	0.69	—	5.00	5.75	**1¼**
2.688	R20	0.50	0.25	⅝×4.25	¾×5.00	4.50	4	¾	0.81	0.88	5.25	6.00	**1½**
3.250	R23	0.38	0.25	⅝×4.00	⅝×4.75	5.00	8	⅝	0.69	0.75	5.00	6.00	**2**
4.000	R26	0.50	0.25	¾×4.25	¾×5.00	5.88	8	¾	0.81	0.88	5.25	6.25	**2½**
4.875	R31	0.50	0.25	¾×4.25	¾×5.00	6.62	8	¾	0.81	0.88	5.25	6.25	**3**
5.875	R37	0.25	0.62	¾×3.00	¾×4.00	8.50	8	⅞	1.00	1.00	6.00	6.50	**4**
7.125	R41	0.25	0.62	¾×3.50	¾×4.50	10.50	8	1	1.12	1.12	5.50	7.00	**5**
8.312	R45	0.50	0.88	1×3.50	1×4.50	11.50	12	1	1.12	1.12	7.00	7.50	**6**
10.625	R49	0.50	0.88	1×4.00	1×4.75	13.75	12	1⅛	1.25	1.25	7.75	8.25	**8**
12.750	R53	0.50	0.88	1×4.00	1×5.00	17.00	16	1¼	1.38	1.38	8.75	9.25	**10**
15.000	R57	0.50	0.88	1×4.50	1×5.00	19.25	20	1¼	1.38	1.38	9.00	9.50	**12**
16.500	R61	0.50	0.88	1×5.00	1×5.50	20.75	20	1⅜	1.50	1.50	9.50	10.00	**14**
18.500	R65	0.50	0.88	1×5.00	1×5.50	23.75	20	1½	1.62	1.62	10.25	10.75	**16**
21.000	R69	0.50	0.88	1×5.00	1×5.75	25.75	20	1⅝	1.75	1.75	11.00	11.50	**18**
23.000	R73	0.50	0.88	1×6.00	1×6.25	28.50	24	1⅝	1.75	1.75	11.75	12.50	**20**
27.250	R77	0.50	0.88	1×6.00	1×7.00	33.00	24	1⅞	2.00	2.00	13.25	13.50	**24**

(5) Unless otherwise specified, raised face unions are furnished with alloy bolt studs per ASTM A193 Grade B7 with American Standard heavy series hex nuts ASTM A194 Class 2H.

(6) On ring joint flanges having a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When kthe depth of groove is 0.438" or greater, changes in drill size or method of drilling are necessary.

CLASS 900-1500 ORIFICE FLANGES

WELDING NECK
(RAISED FACE)



ANSI B16.36 FORGED FLANGES

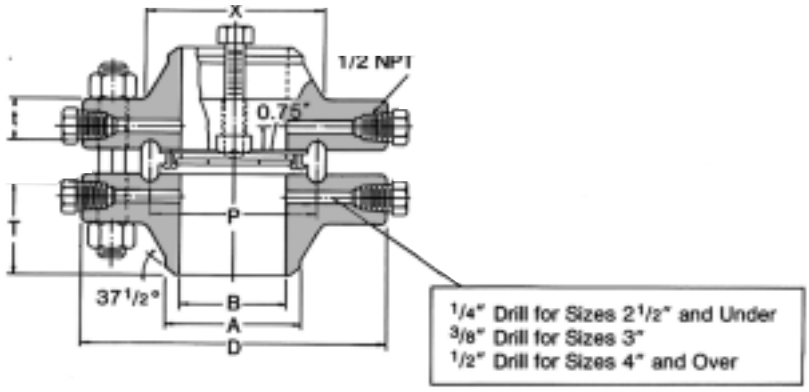
Dimensions in inches

Nominal Pipe Size	Outside Diam. of Flange	THICKNESS OF FLANGE (t)		Diam. of Hub at Base	Diam. of Raised Face	Diam. of Hub at Bevel	LENGTH THRU HUB (T)				BORE (B)	
							Welding Neck		Slip-on & Threaded		Welding Neck	Slip-on
		Raised Face	Ring Joint				Raised Face	Ring Joint	Raised Face	Ring Joint		
	D			X	G	A						
CLASS 900												
3	9.50	1.50	1.50	5.00	5.00	3.50	4.00	4.00	2.12	2.12	To be specified by purchaser.	3.57
4	11.50	1.75	1.75	6.25	6.19	4.50	4.50	4.50	2.75	2.75		4.57
5	13.75	2.00	2.00	7.50	7.31	5.56	5.00	5.00	3.12	3.12		5.66
6	15.00	2.19	2.19	9.25	8.50	6.63	5.50	5.50	3.38	3.38		6.72
8	18.50	2.50	2.50	11.75	10.62	8.63	6.38	6.38	4.00	4.00		8.72
10	21.50	2.75	2.75	14.50	12.75	10.75	7.25	7.25	4.25	4.25		10.88
12	24.00	3.12	3.12	16.50	15.00	12.75	7.88	7.88	4.62	4.62		12.88
14	25.25	3.38		17.75	16.25	14.00	8.38					
16	27.75	3.50		20.00	18.50	16.00	8.50					
18	31.00	4.00		22.25	21.00	18.00	9.00					
20	33.75	4.25		24.50	23.00	20.00	9.75					
24	41.00	5.50		29.50	27.25	24.00	11.50					
CLASS 1500												
1	5.88	1.50	1.50	2.06	2.00	1.32	3.25	3.25	1.88	1.75	To be specified by purchaser.	1.36
1¼	6.25	1.38	1.38	2.50	2.50	1.66	2.88	2.88	1.88	1.75		1.70
1½	7.00	1.50	1.50	2.75	2.88	1.90	3.50	3.50	1.88	1.75		1.95
2	8.50	1.50	1.50	4.12	3.62	2.38	4.00	4.00	2.25	2.25		2.44
2½	9.62	1.62	1.62	4.88	4.12	2.88	4.12	4.12	2.50	2.50		2.94
3	10.50	1.88	1.88	5.25	5.00	3.50	4.62	4.62	2.88	2.88		3.57
4	12.25	2.12	2.12	6.38	6.19	4.50	4.88	4.88	3.56	3.56		4.57
5	14.75	2.88	2.88	7.75	7.31	5.56	6.12	4.12	4.12	4.12		5.66
6	15.50	3.25	3.25	9.00	8.50	6.63	6.75	6.75	4.69	4.69		6.72
8	19.00	3.62	3.62	11.50	10.62	8.63	8.38	8.38	5.62	5.62		8.72
10	23.00	4.25	4.25	14.50	12.75	10.75	10.00	10.00	6.25	6.25		10.88
12	26.50	4.88	4.88	17.75	15.00	12.75	11.12	11.12	7.12	7.12		12.88
14	29.50	5.25		19.50	16.25	14.00	11.75					
16	32.50	5.75		21.75	18.50	16.00	12.25					
18	36.00	6.38		23.50	21.00	18.00	12.88					
20	38.75	7.00		25.25	23.00	20.00	14.00					
24	46.00	8.00		30.00	27.25	24.00	16.00					

Notes:

(1) For the inside diameter of pipes (corresponding to "Bore" (B) of Welding Neck Flanges), refer to page 61.
(2) Class 900 dimensions of size 1" through 2½" are the same as for Class 1500
(3) Class 900 and 1500 is not included in "Thickness" (t) and "Length through Hub" (T).
(4) Each union includes two carbon steel jack screw bolts with hex nuts.

WELDING NECK (RING-TYPE JOINT)



Dimensions in inches

Pitch Diam. of Ring and Groove P	Ring Number	DEPTH OF JACK SCREW SLOT		JACK SCREW SIZE		DRILLING TEMPLATE						Nominal Pipe Size
		Raised Face	Ring Joint	Raised Face	Ring Joint	Diam. of Bolt Circle	Number of Bolts	Diam. of Stud Bolts	Diam. of Bolt Holes	Length of Stud Bolts: Raised Face	Length of Stud Bolts: Ring Joint	
CLASS 900												
4.875	R31	0.38	0.62	¾x3.50	¾x4.00	7.50	8	⅞	1.00	6.00	6.50	**3**
5.875	R37	0.38	0.62	¾x3.50	¾x4.50	9.25	8	1⅛	1.25	7.00	7.50	**4**
7.125	R41	0.38	0.62	¾x3.50	¾x4.50	11.00	8	1¼	1.38	7.50	8.00	**5**
8.312	R45	0.62	0.88	1x4.50	1x4.75	12.50	12	1⅛	1.25	7.75	8.25	**6**
10.625	R49	0.62	0.88	1x4.50	1x5.00	15.50	12	1⅜	1.50	9.00	9.50	**8**
12.750	R53	0.62	0.88	1x4.50	1x5.25	18.50	16	1⅜	1.50	9.50	10.00	**10**
15.000	R57	0.62	0.88	1x4.50	1x5.50	21.00	20	1⅜	1.50	10.25	10.75	**12**
						22.00	20	1½	1.62	11.00		**14**
						24.25	20	1⅝	1.75	11.50		**16**
						27.00	20	1⅞	2.00	13.00		**18**
						29.50	20	2	2.12	14.00		**20**
						35.50	20	2⅛	2.62	17.50		**24**
CLASS 1500												
2.000	R16	0.25	0.50	⅝x3.00	⅝x3.50	4.00	4	⅞	1.00	6.00	6.25	**1**
2.375	R18	0.25	0.50	⅝x3.00	⅝x3.50	4.38	4	⅞	1.00	5.50	5.75	**1¼**
2.688	R20	0.25	0.50	⅝x3.00	⅝x3.50	4.88	4	1	1.12	6.25	6.50	**1½**
3.750	R24	0.25	0.50	⅝x3.00	⅝x4.00	6.50	8	⅞	1.00	6.00	6.50	**2**
4.250	R27	0.25	0.50	¾x3.00	¾x4.00	7.50	8	1	1.12	6.50	7.00	**2½**
5.375	R35	0.38	0.62	¾x3.50	¾x4.50	8.00	8	1⅛	1.25	7.25	7.75	**3**
6.375	R39	0.38	0.62	¾x3.50	¾x4.50	9.50	8	1¼	1.38	8.00	8.50	**4**
7.625	R44	0.38	0.62	¾x3.50	¾x4.50	11.50	8	1½	1.62	9.75	10.25	**5**
8.312	R46	0.62	0.88	1x6.00	1x6.50	12.50	12	1⅜	1.50	10.50	11.00	**6**
10.625	R50	0.62	0.88	1x6.50	1x6.50	15.50	12	1⅜	1.75	11.75	12.50	**8**
12.750	R54	0.62	0.88	1x6.50	1x7.00	19.00	12	1⅞	2.00	13.50	14.25	**10**
15.000	R58	0.62	0.88	1x6.50	1x8.00	22.50	16	2	2.12	15.00	16.00	**12**
						25.00	16	2¼	2.38	16.25		**14**
						27.75	16	2½	2.62	17.75		**16**
						30.50	16	2¾	2.88	19.75		**18**
						32.75	16	3	3.12	21.50		**20**
						39.00	16	3½	3.62	24.50		**24**

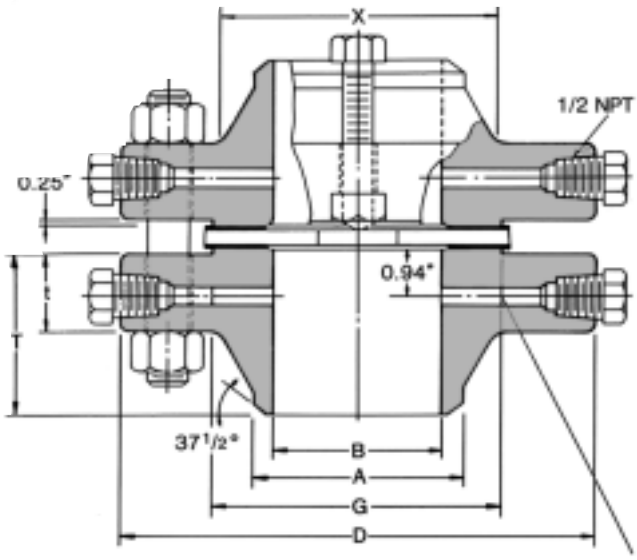
(5) Unless otherwise specified raised face unions are furnished with alloy bolt studs per ASTM A193 Grade B7 with American Standard heavy series hex nuts ASTM A194 Class 2H.

(6) On ring joint flanges having a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When the depth of groove is 0.438" or greater, changes in drill size or method of drilling are necessary.

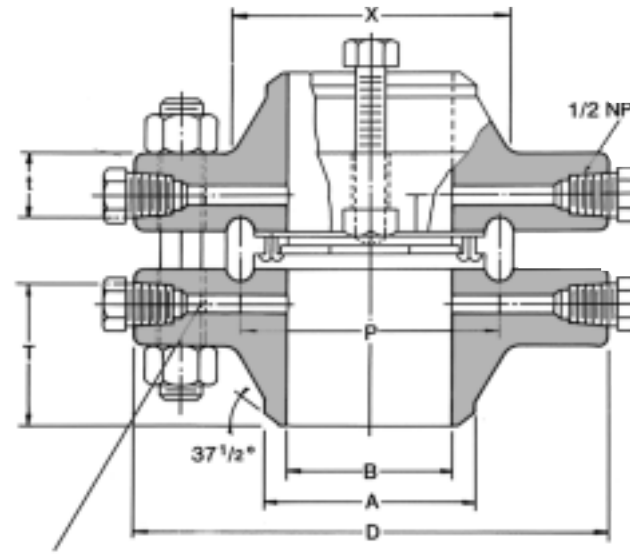
(7) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24. Bolt lengths for ring type joint flanges include allowance of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

CLASS 2500 ORIFICE FLANGES

WELDING NECK (RAISED FACE)



WELDING NECK (RING-TYPE JOINT)



1/4" Drill for Sizes 2 1/2" and Under
3/8" Drill for Sizes 3"
1/2" Drill for Sizes 4" and Over

ANSI B16.36 FORGED FLANGES

Dimensions in inches

Nomin. Pipe Size	O.D. of Flange Face	O.D. of Raised Flange	THK'S. of Hub Min.	Length Thru	Diam. of Hub	Diam. of Hub at Bevel	Bore	Ring Type Joint		DRILLING TEMPLATE				LENGTH OF STUD BOLTS	
								Pitch Diam.	Ring Number	Diam. of Bolt Circle	Number of Holes	Diam. of Holes	Diam. of Bolts	Raised Face	Ring Joint
	D	G	t	T	X	A	B	P							
1	6.25	2.00	1.50	3.62	2.25	1.32	See Note (1) To be specified by purchaser.	2.375	R18	4.25	4	1.00	⅞	6.00	6.25
1½	8.00	2.88	1.75	4.38	3.12	1.90		3.250	R23	5.75	4	1.25	1⅛	7.00	7.50
2	9.25	3.62	2.00	5.00	3.75	2.38		4.000	R26	6.75	8	1.12	1	7.25	7.75
2½	10.50	4.12	2.25	5.62	4.50	2.88		4.375	R28	7.75	8	1.25	1⅛	8.00	8.50
3	12.00	5.00	2.62	6.62	5.25	3.50		5.000	R32	9.00	8	1.38	1¼	9.00	9.50
4	14.00	6.19	3.00	7.50	6.50	4.50				10.75	8	1.62	1½	10.25	
6	19.00	8.50	4.25	10.75	9.25	6.63				14.50	8	2.12	2	13.75	
8	21.75	10.62	5.00	12.50	12.00	8.63				17.25	12	2.12	2	15.25	
10	26.50	12.75	6.50	16.50	14.75	10.75				21.25	12	2.62	2½	19.25	
12	30.00	15.00	7.25	18.25	17.38	12.75				24.38	12	2.88	2¾	21.25	

Notes:

(1) For the inside diameter of pipes (corresponding to 'Bore' (B) of Welding Neck Flange), refer to page 61.

(2) Class 2500 flanges will be furnished with 0.25" raised face, which is not included in 'Thickness' (t) and 'Length through Hub' (T).

(3) Each union includes two carbon steel jack screw bolts with hex nuts.

(4) Unless otherwise specified, raised face unions are furnished with allow bolt studs per ASTM A193 Grade B7 with American Standard heavy series hex nuts ASTM A194 Class 2H.

(5) On ring joint flanges having a groove depth 0.375" and less, the distance from the center line of the tap hole to the flange face is 0.750". When the depth of groove is 0.438" or greater, changes in drill size or melthod of drilling are necessary.

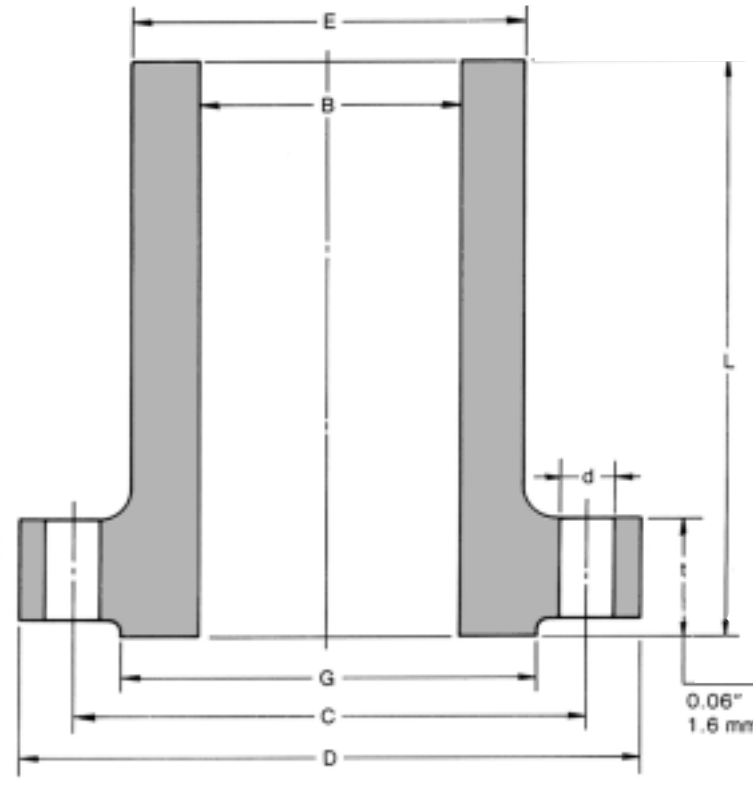
(6) Class 2500 Slip-on flanges are not covered by ANSI B16.5.

(7) Bolt lengths for raised face flanges include allowance for orifice and gasket thickness of 0.25" for sizes 4-12 and 0.38" for sizes 14-24. Bolt lengths for ring type joint flanges include allowance of 0.62" for sizes 4-10, 0.75" for sizes 12-18 and 0.88" for size 20.

LONG WELDING NECKS FLANGES

- Class 150 Flanges
- Class 300 Flanges
- Class 400 Flanges
- Class 600 Flanges
- Class 900 Flanges
- Class 1500 Flanges
- Class 2500 Flanges

CLASS 150 FLANGES
LONG WELDING NECKS



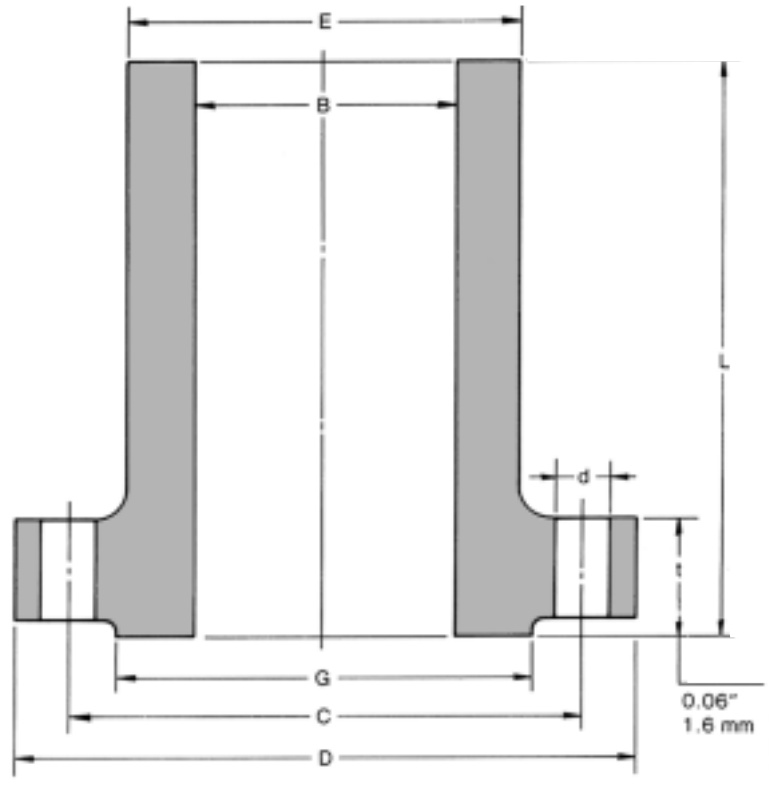
Dimensions in inches

Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of Raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		d
½	3.50	0.44	1.38	1.19	0.50	9.00	2.38	4	0.62
¾	3.88	0.50	1.69	1.50	0.75	9.00	2.75	4	0.62
1	4.25	0.56	2.00	2.00	1.00	9.00	3.12	4	0.62
1¼	4.62	0.62	2.50	2.38	1.25	9.00	3.50	4	0.62
1½	5.00	0.69	2.88	2.62	1.50	9.00	3.88	4	0.62
2	6.00	0.75	3.62	3.25	2.00	9.00	4.75	4	0.75
2½	7.00	0.88	4.12	3.75	2.50	9.00	5.50	4	0.75
3	7.50	0.94	5.00	4.25	3.00	9.00	6.00	4	0.75
3½	8.50	0.94	5.50	4.88	3.50	9.00	7.00	8	0.75
4	9.00	0.94	6.19	5.50	4.00	12.00	7.50	8	0.75
5	10.00	0.94	7.31	6.50	5.00	12.00	8.50	8	0.88
6	11.00	1.00	8.50	7.75	6.00	12.00	9.50	8	0.88
8	13.50	1.12	10.62	9.75	8.00	12.00	11.75	8	0.88
10	16.00	1.19	12.75	12.00	10.00	12.00	14.25	12	1.00
12	19.00	1.25	15.00	14.38	12.00	12.00	17.00	12	1.00
14	21.00	1.38	16.25	16.00	14.00	12.00	18.75	12	1.12
16	23.50	1.44	18.50	18.00	16.00	12.00	21.25	16	1.12
18	25.00	1.56	21.00	20.00	18.00	12.00	22.75	16	1.25
20	27.50	1.69	23.00	22.00	20.00	12.00	25.00	20	1.25
24	32.00	1.88	27.25	26.25	24.00	12.00	29.50	20	1.38

Notes:

(1) Bore (B) is the same as nominal pipe size.
(2) Welding necks longer than listed are available in all sizes on special order.

CLASS 300 FLANGES
LONG WELDING NECKS



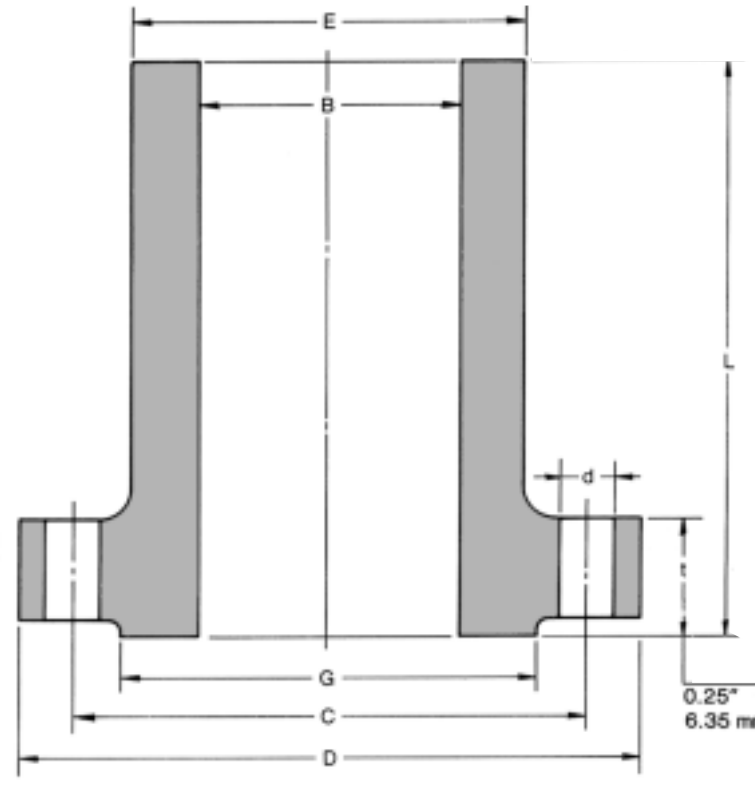
Dimensions in inches

Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of Raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		
½	3.75	0.56	1.38	1.50	0.50	9.00	2.62	4	0.62
¾	4.62	0.62	1.69	1.88	0.75	9.00	3.25	4	0.75
1	4.88	0.69	2.00	2.12	1.00	9.00	3.50	4	0.75
1¼	5.25	0.75	2.50	2.50	1.25	9.00	3.88	4	0.75
1½	6.12	0.81	2.88	2.75	1.50	9.00	4.50	4	0.88
2	6.50	0.88	3.62	3.31	2.00	9.00	5.00	8	0.75
2½	7.50	1.00	4.12	3.94	2.50	9.00	5.88	8	0.88
3	8.25	1.12	5.00	4.62	3.00	9.00	6.62	8	0.88
3½	9.00	1.19	5.50	5.25	3.50	9.00	7.25	8	0.88
4	10.00	1.25	6.19	5.75	4.00	12.00	7.88	8	0.88
5	11.00	1.38	7.31	7.00	5.00	12.00	9.25	8	0.88
6	12.50	1.44	8.50	8.12	6.00	12.00	10.62	12	0.88
8	15.00	1.62	10.62	10.25	8.00	12.00	13.00	12	1.00
10	17.50	1.88	12.75	12.62	10.00	12.00	15.25	16	1.12
12	20.50	2.00	15.00	14.75	12.00	12.00	17.75	16	1.25
14	23.00	2.12	16.25	16.75	14.00	12.00	20.25	20	1.25
16	25.50	2.25	18.50	19.00	16.00	12.00	22.50	20	1.38
18	28.00	2.38	21.00	21.00	18.00	12.00	24.75	24	1.38
20	30.50	2.50	23.00	23.12	20.00	12.00	27.00	24	1.38
24	36.00	2.75	27.25	27.62	24.00	12.00	32.00	24	1.62

Notes.

(1) Bore (B) is the same as nominal pipe size.
(2) Welding necks longer than listed are available in all sizes on special order.

CLASS 400 FLANGES
LONG WELDING NECKS



Dimensions in inches

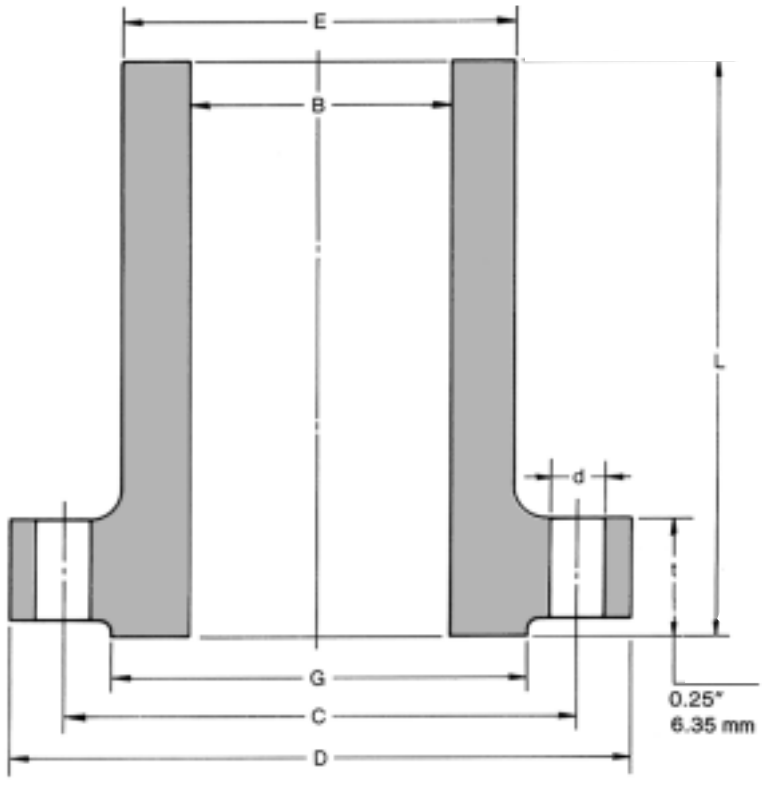
Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of Raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		d
1 1¼ 1½	Use Class 600 dimensions in these sizes.								
2 2½ 3 3½									
4	10.00	1.38	6.19	5.75	4.00	12.00	7.88	8	1.00
5	11.00	1.50	7.31	7.00	5.00	12.00	9.25	2	1.00
6	12.50	1.62	8.50	8.12	6.00	12.00	10.62	12	1.00
8	15.00	1.88	10.62	10.25	8.00	12.00	13.00	12	1.12
10	17.50	2.12	12.75	12.62	10.00	12.00	15.25	16	1.25
12	20.50	2.25	15.00	14.75	12.00	12.00	17.75	16	1.38
14	23.00	2.38	16.25	16.75	14.00	12.00	20.25	20	1.38
16	25.50	2.50	18.50	19.00	16.00	12.00	22.50	24	1.50
18	28.00	2.62	21.00	21.00	18.00	12.00	24.75	24	1.50
20	30.50	2.75	23.00	23.12	20.00	12.00	27.00	24	1.62
24	36.00	3.00	27.25	27.62	24.00	12.00	32.00	24	1.88

Notes:

(1) Bore (B) is the same as nominal pipe size.

(2) Welding necks longer than listed are available in all sizes on special order.

CLASS 600 FLANGES
LONG WELDING NECKS



Dimensions in inches

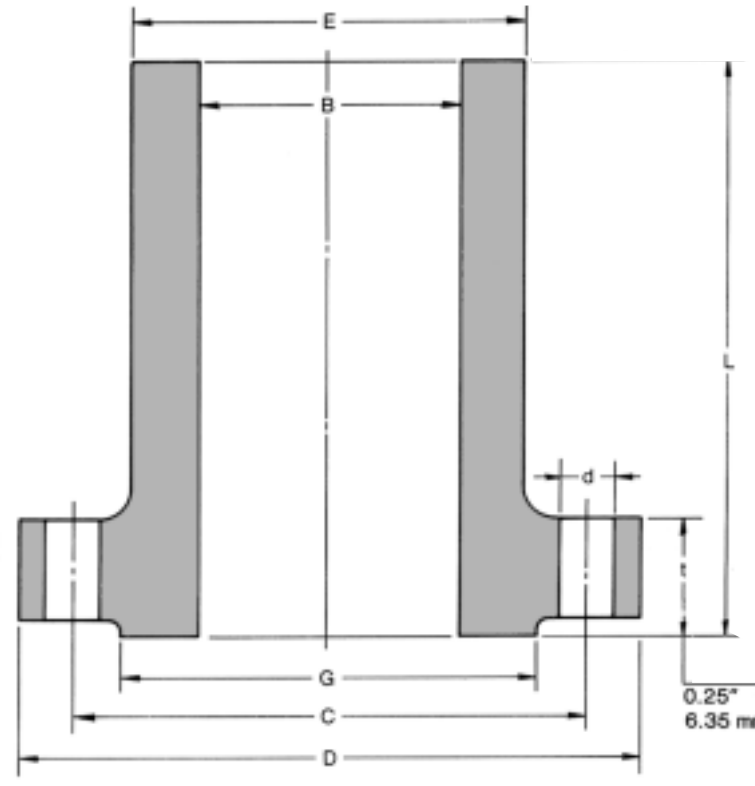
Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		d
1	4.88	0.69	2.00	2.12	1.00	9.00	3.50	4	0.75
1¼	5.25	0.81	2.50	2.50	1.25	9.00	3.88	4	0.75
1½	6.12	0.88	2.88	2.75	1.50	9.00	4.50	4	0.88
2	6.50	1.00	3.62	3.31	2.00	9.00	5.00	8	0.75
2½	7.50	1.12	4.12	3.94	2.50	9.00	5.88	8	0.88
3	8.25	1.25	5.00	4.62	3.00	9.00	6.62	8	0.88
3½	9.00	1.38	5.50	5.25	3.50	9.00	7.25	8	1.00
4	10.75	1.50	6.19	6.00	4.00	12.00	8.50	8	1.00
5	13.00	1.75	7.31	7.50	5.00	12.00	10.50	8	1.12
6	14.00	1.88	8.50	8.75	6.00	12.00	11.50	12	1.12
8	16.50	2.19	10.62	10.75	8.00	12.00	13.75	12	1.25
10	20.00	2.50	12.75	13.50	10.00	12.00	17.00	16	1.38
12	22.00	2.62	15.00	15.75	12.00	12.00	19.25	20	1.38
14	23.75	2.75	16.25	17.00	14.00	12.00	20.75	20	1.50
16	27.00	3.00	18.50	19.50	16.00	12.00	23.75	20	1.62
18	29.25	3.25	21.00	21.50	18.00	12.00	25.75	20	1.75
20	32.00	3.50	23.00	24.00	20.00	12.00	28.50	24	1.75
24	37.00	4.00	27.25	28.25	24.00	12.00	33.00	24	2.00

Notes:

(1) Bore (B) is the same as nominal pipe size.

(2) Welding necks longer than listed are available in all sizes on special order.

CLASS 900 FLANGES
LONG WELDING NECKS



Dimensions in inches

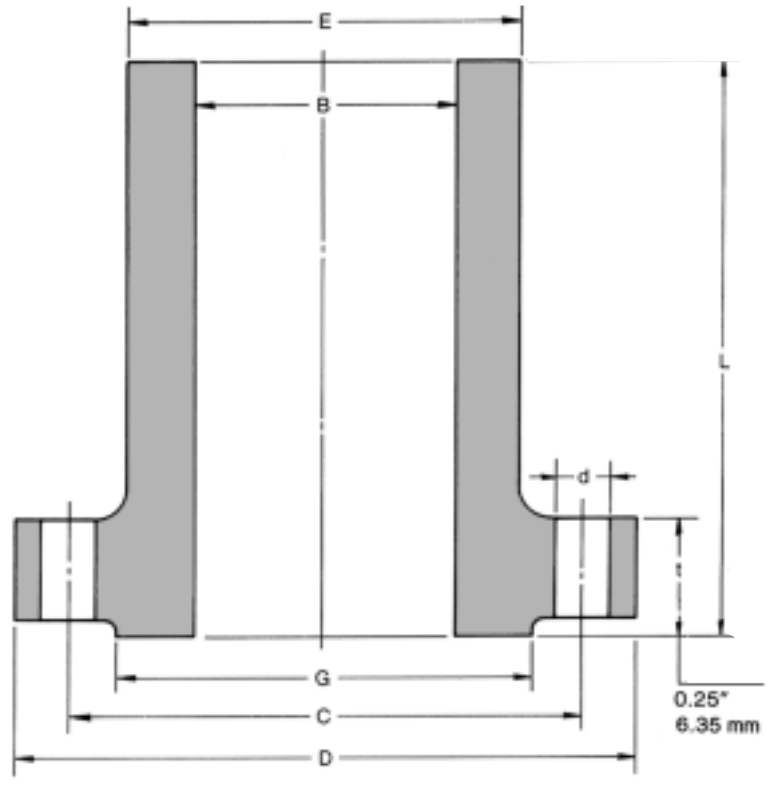
Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of Raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		d
1 1¼ 1½	Use Class 1500 dimensions in these sizes.								
2 2½									
3	9.50	1.50	5.00	5.00	3.00	12.00	7.50	8	1.00
4	11.50	1.75	6.19	6.25	4.00	12.00	9.25	8	1.25
5	13.75	2.00	7.31	7.50	5.00	12.00	11.00	8	1.38
6	15.00	2.19	8.50	9.25	6.00	12.00	12.50	12	1.25
8	18.50	2.50	10.62	11.75	8.00	12.00	15.50	12	1.50
10	21.50	2.75	12.75	14.50	10.00	16.00	18.50	16	1.50
12	24.00	3.12	15.00	16.50	12.00	16.00	21.00	20	1.50
14	25.25	3.38	16.25	17.75	14.00		22.00	20	1.62
16	27.75	3.50	18.50	20.00	16.00	To be specified by purchaser.	24.25	20	1.75
18	31.00	4.00	21.00	22.25	18.00		27.00	20	2.00
20	33.75	4.25	23.00	24.50	20.00		29.50	20	2.12
24	41.00	5.50	27.25	29.50	24.00		35.50	20	2.62

Notes:

(1) Bore (B) is the same as nominal pipe size.

(2) Welding necks longer than listed are available in all sizes on special order.

CLASS 1500 FLANGES
LONG WELDING NECKS



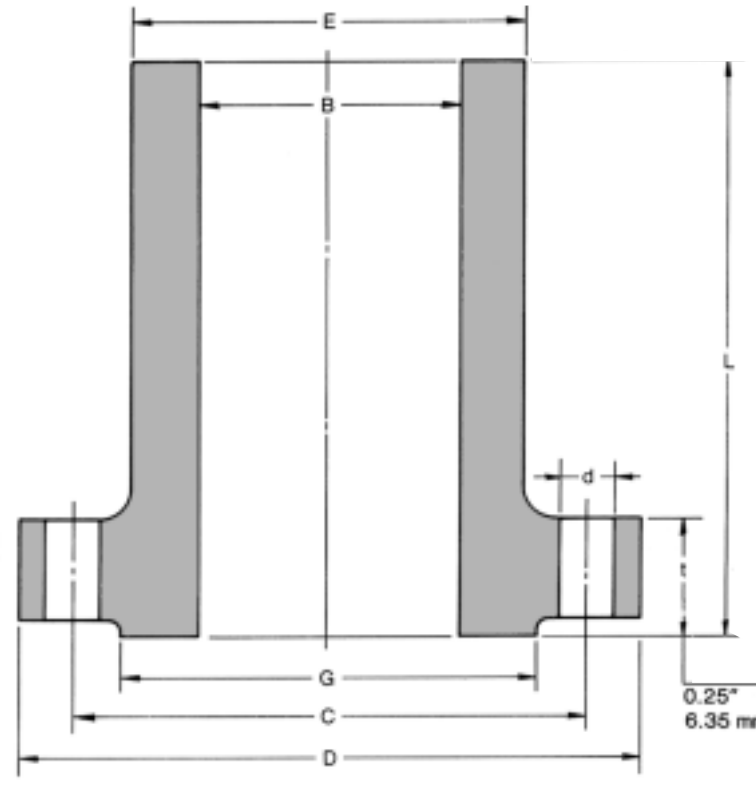
Dimensions in inches

Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of Raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		d
1	5.88	1.12	2.00	2.06	1.00	9.00	4.00	4	1.00
1¼	6.25	1.12	2.50	2.50	1.25	9.00	4.38	4	1.00
1½	7.00	1.25	2.88	2.75	1.50	9.00	4.88	4	1.12
2	8.50	1.50	3.62	4.12	2.00	9.00	6.50	8	1.00
2½	9.62	1.62	4.12	4.88	2.50	12.00	7.50	8	1.12
3	10.50	1.88	5.00	5.25	3.00	12.00	8.00	8	1.25
4	12.25	2.12	6.19	6.38	4.00	12.00	9.50	8	1.38
5	14.75	2.88	7.31	7.75	5.00	12.00	11.50	8	1.62
6	15.50	3.25	8.50	9.00	6.00	12.00	12.50	12	1.50
8	19.00	3.62	10.62	11.50	8.00	12.00	15.50	12	1.75
10	23.00	4.25	12.75	14.50	10.00	16.00	19.00	12	2.00
12	26.50	4.88	15.00	17.75	12.00	16.00	22.50	16	2.12
14	29.50	5.25	16.25	19.50	14.00		25.00	16	2.38
16	32.50	5.75	18.50	21.75	16.00	To be specified by purchaser.	27.75	16	2.62
18	36.00	6.38	21.00	23.50	18.00		30.50	16	2.88
20	38.75	7.00	23.00	25.25	20.00		32.75	16	3.12
24	46.00	8.00	27.25	30.00	24.00		39.00	16	3.62

Notes:

(1) Bore (B) is the same as nominal pipe size.
(2) Welding necks longer than listed are available in all sizes on special order.

CLASS 2500 FLANGES
LONG WELDING NECKS



Dimensions in inches

Nominal Pipe Size	Outside Diameter	Thickness of Flange Min.	O.D. of Raised Face	Hub Diameter at Bevel	Diameter of Bore	Length Through Hub	DRILLING		
							Diameter of Bolt Circle	Number of Holes	Diameter of Holes
	D	t	G	E	B	L	C		d
1	6.25	1.38	2.00	2.25	1.00	9.00	4.25	4	1.00
1¼	7.25	1.50	2.50	2.88	1.25	9.00	5.12	4	1.12
1½	8.00	1.75	2.88	3.12	1.50	9.00	5.75	4	1.25
2	9.25	2.00	3.62	3.75	2.00	9.00	6.75	8	1.12
2½	10.50	2.25	4.12	4.50	2.50	12.00	7.75	8	1.25
3	12.00	2.62	5.00	5.25	3.00	12.00	9.00	8	1.38
4	14.00	3.00	6.19	6.50	4.00	12.00	10.75	8	1.62
5	16.50	3.62	7.31	8.00	5.00	12.00	12.75	8	1.88
6	19.00	4.25	8.50	9.25	6.00	12.00	14.50	8	2.12
8	21.75	5.00	10.62	12.00	8.00	12.00	17.25	12	2.12
10	26.50	6.50	12.75	14.75	10.00	16.00	21.25	12	2.62
12	30.00	7.25	15.00	17.38	12.00	16.00	24.38	12	2.88

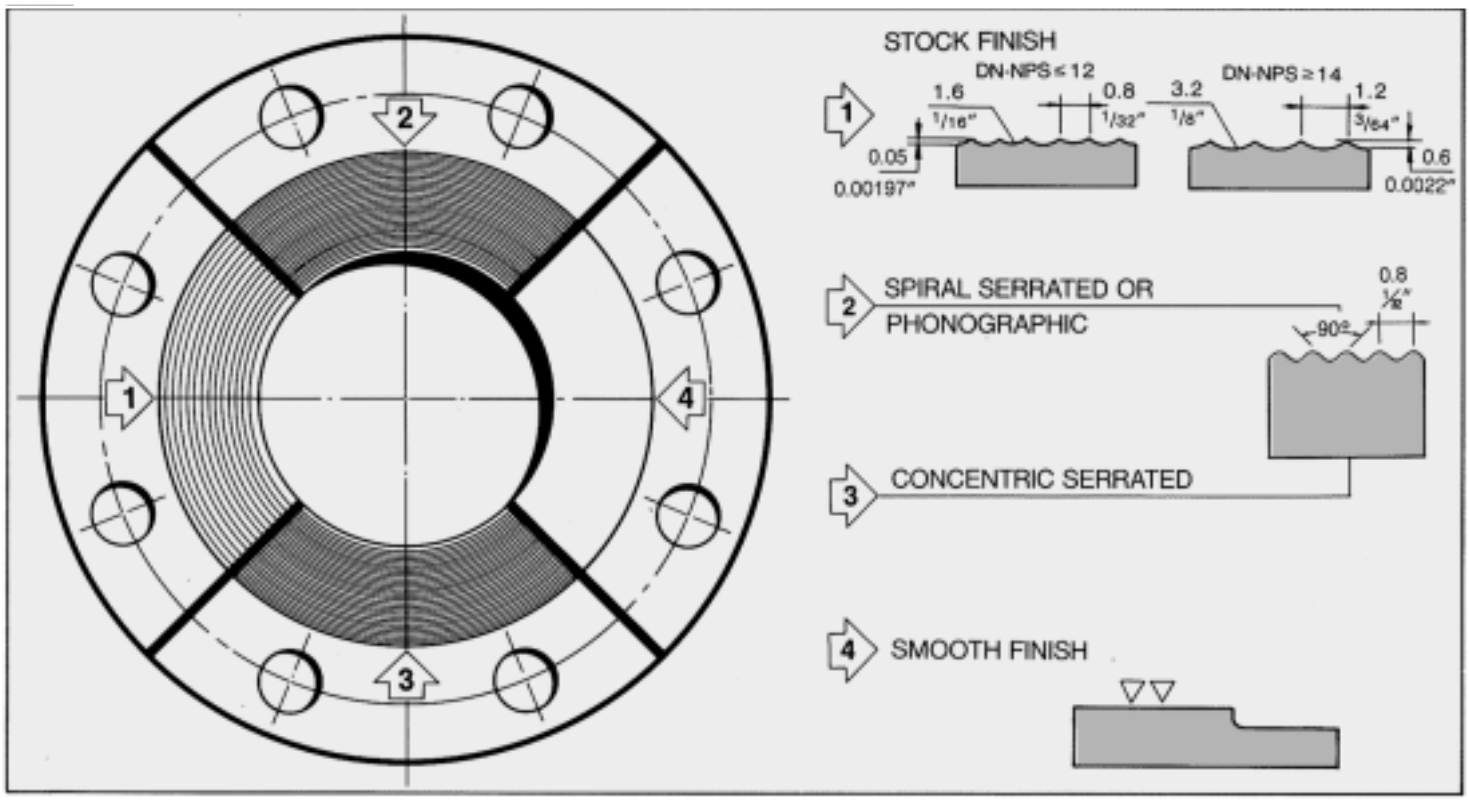
Notes:

(1) Bore (B) is the same as nominal pipe size.

(2) Welding necks longer than listed are available in all sizes on special order.

STANDARD FINISH

STANDARD FINISHES for Face of Flange (ANSI B16.5)



STOCK FINISH: The most widely used of any gasket finish, because, practically, is suitable for all ordinary service conditions. This is a continuous spiral groove. Flanges sizes 12" and smaller, are produced with a 1/32" round-nosed tool at a feed of 1/32" per revolution. For sizes 14" and larger, the finish is made with 1/8" round-nosed tool at a feed of 3/64" per revolution.

SPIRAL SERRATED OR PHONOGRAPHIC: This finish is produced by using a 90° round-nosed tool.

CONCENTRIC SERRATED: This finish a produced by using a 90° round-noise tool.

SMOOTH FINISH: The cutting tool employed shall have an approximate 0.06" radius. The resultant surface finish shall have a 125μ inch to 250μ inch (ANSI B16.5 para 6.4; 4.1)

1. **RAISED FACE, AND LARGE MALE AND FEMALE**
   Either a serrated-concentric or serrated-spiral finish having from 34 to 64 grooves per inch is used. The cutting tool employed has an approximate 0.06 in. radius. The resultant surface finish shall have a 125μ inch (3.2μm). to 500 μ inch (12.5μm) approximate roughness.

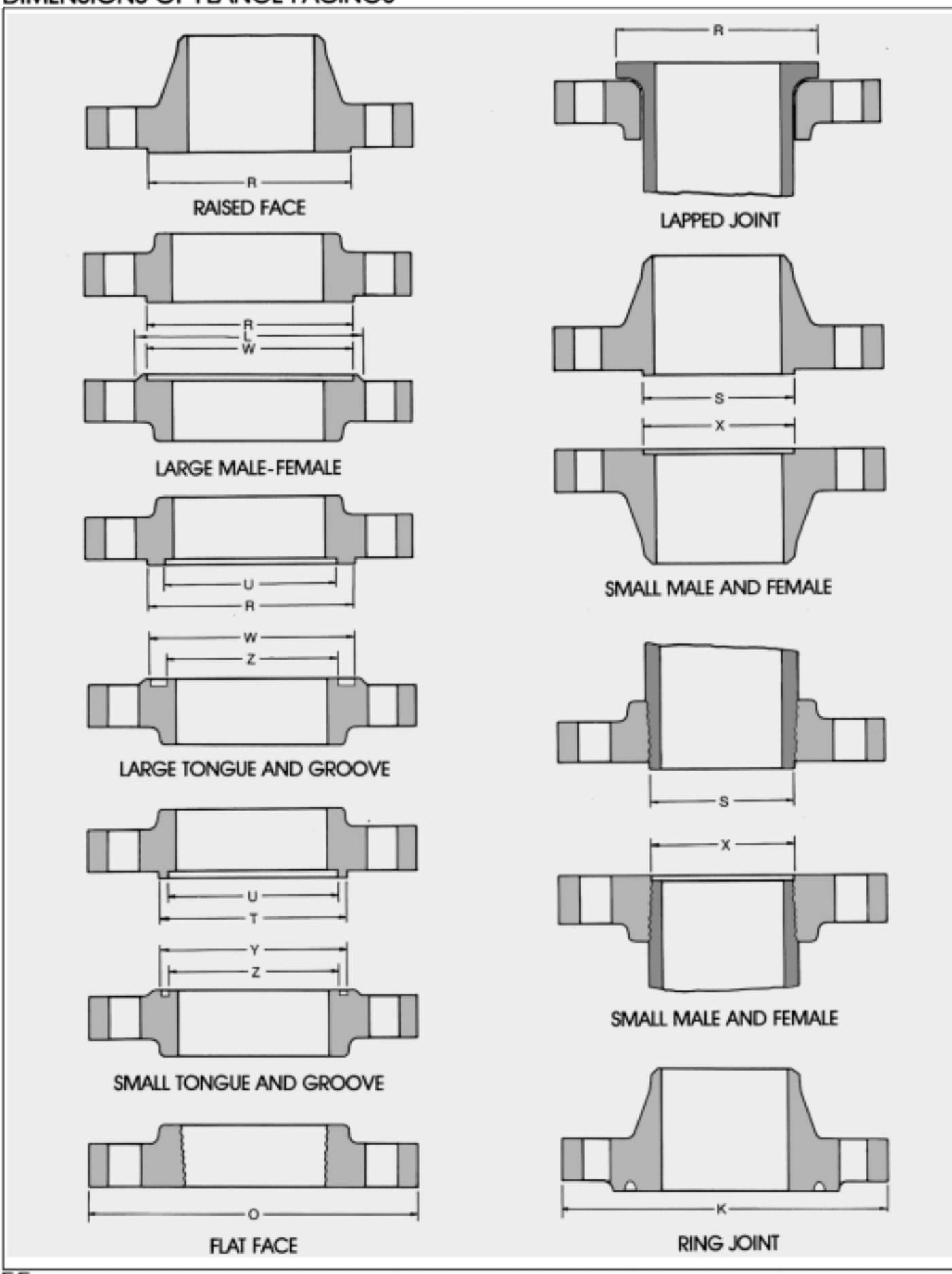
2. **TONGUE AND GROOVE, AND SMALL MAKE AND FEMALE**
   The gasket contact surface does not exceed 125μ in. (3.2 μm) roughness.

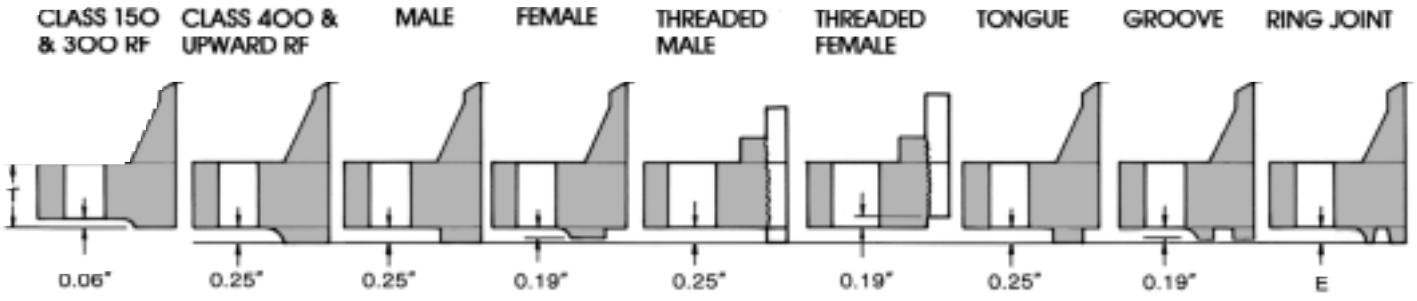
3. **RING JOINT**
   The inside wall surface of gasket groove does not exceed 63μ in (1.6 μm) roughness.

4. **BLIND**
   Blind flanges need not be faced in the center if, when this center part is raised, its diameter is at least 1 in. smaller than the inside diameter of fittings of the corresponding pressure class. When the center part is depressed, its diameter is not greater than the inside diameter of the corresponding pressure class fittings. Machining of the depressed center is not required.

FLANGES FACINGS

DIMENSIONS OF FLANGE FACINGS





ANSI B16.5 FORGED FLANGES

Dimensions in inches

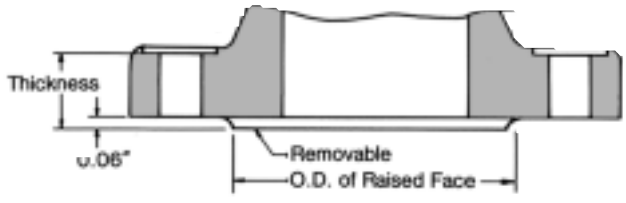
Nominal Pipe Size	OUTSIDE DIAMETER			I.D. of Large and Small Tongue	OUTSIDE DIAMETER				I.D. of Large and Groove	HEIGHT		Depth of Groove or Female
	Raised Face, Lapped, Large Male and Large Tongue	Small Male	Small Tongue		Large Female and Large Groove		Small Female	Small Groove		Raised Face and 300 ST'DS	Raised Face, Large and Small Male and Tongue Classes 400 2500 ST'DS	
	R	S	T	U	W	L	X	Y	Z			
½	1.38	0.72	1.38	1.00	1.44	1.81	0.78	1.44	0.94	0.06	0.25	0.19
¾	1.69	0.94	1.69	1.31	1.75	2.12	1.00	1.75	1.25	0.06	0.25	0.19
1	2.00	1.19	1.88	1.50	2.06	2.44	1.25	1.94	1.44	0.06	0.25	0.19
1¼	2.50	1.50	2.25	1.88	2.56	2.94	1.56	2.31	1.81	0.06	0.25	0.19
1½	2.88	1.75	2.50	2.12	2.94	3.31	1.81	2.56	2.06	0.06	0.25	0.19
2	3.62	2.25	3.25	2.88	3.69	4.06	2.31	3.31	2.81	0.06	0.25	0.19
2½	4.12	2.69	3.75	3.38	4.19	4.56	2.75	3.81	3.31	0.06	0.25	0.19
3	5.00	3.31	4.62	4.25	5.06	5.44	3.38	4.69	4.19	0.06	0.25	0.19
3½	5.50	3.81	5.12	4.75	5.56	5.94	3.88	5.19	4.69	0.06	0.25	0.19
4	6.19	4.31	5.69	5.19	6.25	6.62	4.38	5.75	5.12	0.06	0.25	0.19
5	7.31	5.38	6.81	6.31	7.38	7.75	5.44	6.88	6.25	0.06	0.25	0.19
6	8.50	6.38	8.00	7.50	8.56	8.94	6.44	8.06	7.44	0.06	0.25	0.19
8	10.62	8.38	10.00	9.38	10.69	11.06	8.44	10.06	9.31	0.06	0.25	0.19
10	12.75	10.50	12.00	11.25	12.81	13.19	10.56	12.06	11.19	0.06	0.25	0.19
12	15.00	12.50	14.25	13.50	15.06	15.44	12.56	14.31	13.44	0.06	0.25	0.19
14	16.25	13.75	15.50	14.75	16.31	16.69	13.81	15.56	14.69	0.06	0.25	0.19
16	18.50	15.75	17.62	16.75	18.56	18.94	15.81	17.69	16.69	0.06	0.25	0.19
18	21.00	17.75	20.12	19.25	21.06	21.44	17.81	20.19	19.19	0.06	0.25	0.19
20	23.00	19.75	22.00	21.00	23.06	23.44	19.81	22.06	20.94	0.06	0.25	0.19
24	27.25	23.75	26.25	25.25	27.31	27.69	23.81	26.31	25.19	0.06	0.25	0.19

Notes:

(1) Small male and female faces are not applicable to Slip-on Flange.

(2) Large male and female faces are not applicable to Class 150 Flanges.

(3) For flanges of Class 150 and 300 where they are to be bolted to ANSI Class 125 and 250 Cast-Iron Flanges or required with flat face, flat face can be made by removing raised face.

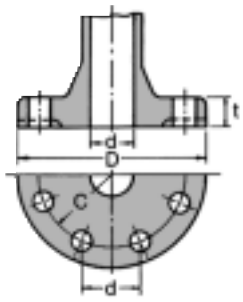


* Tolerances are ±0.03" for 0.06" RF and ±0.02" for 0.25" RF Large Male and Large Tongue.

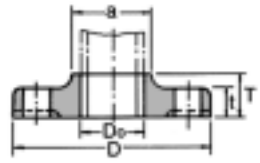
TOLERANCE

ANSI B16.5 FORGED FLANGES

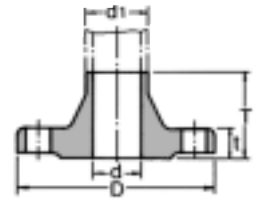
SOLID FLANGE



SLIP-ON FLANGE

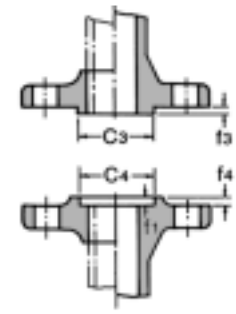


WELDING NECK FLANGE

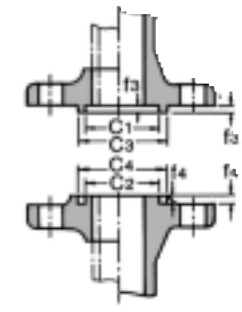


TYPE OF GASKET SURFACE

MALE & FEMALE TYPE



TONGUE & GROOVE TYPE



THREAD, SOCKET-WELDING, SLIP-ON, LAP JOINT AND BLIND.

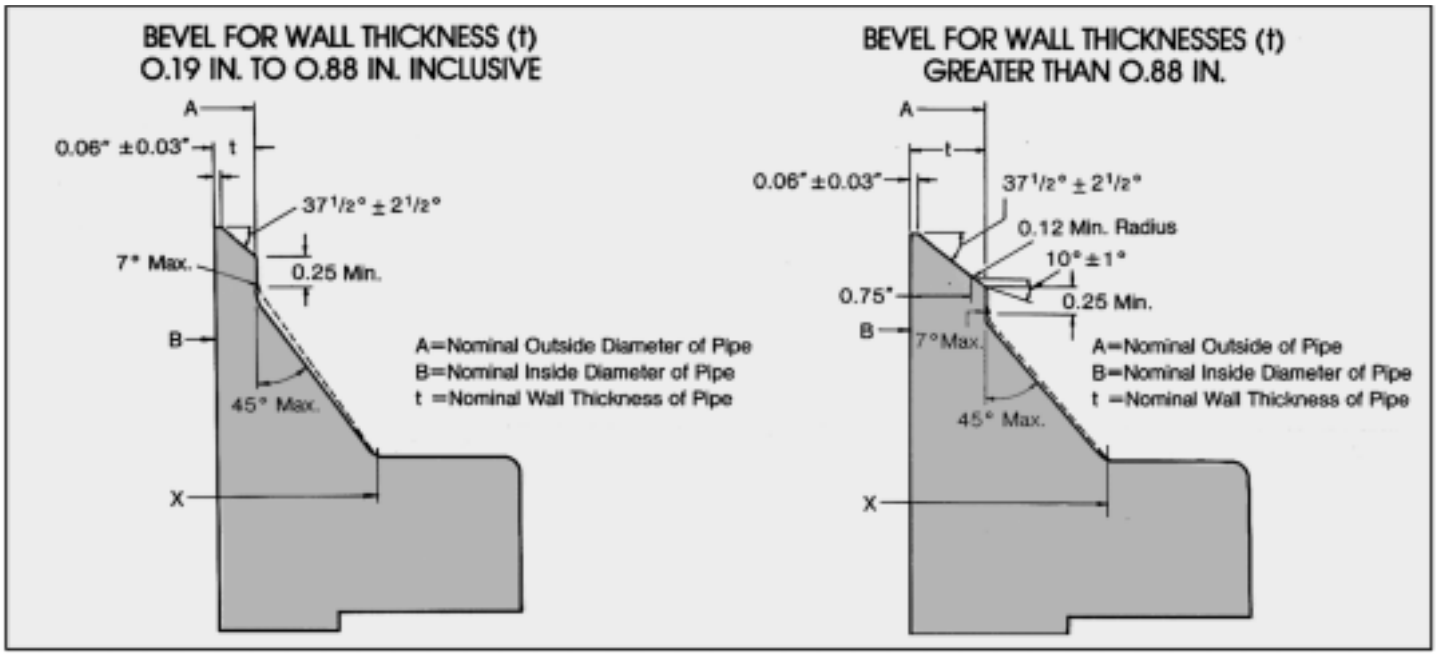
Outside Diameter	When O.D. is 24" or less	± 1/16" (1.6mm)*
	When O.D. is Over 24"	± 1/8" (3.2mm)*
Inside Diameter	Threaded	Within limits on boring gauge
	Socket-Welding, Slip-on and Lap joint	10" & Smaller + 1/32" (0.8mm), – 0" 12" & Larger + 1/16" (1.6mm), – 0"
Outside Diameter of Hub	5" and Smaller	+ 3/32" (2.4mm)* – 1/32" (0.8mm)
	6" and Larger	+ 5/32" (4.0mm) – 1/32" (0.8mm)
Diameter of Contact Face	1/16" Raised Face	± 1/32" (0.8mm)
	1/4" Raised Face Tongue & Groove Male, Female	± 1/64" (0.4mm)
Diameter of Counterbore	Same as for Inside Diameter	
Drilling	Bolt Circle	± 1/16" (1.6mm)
	Bolt Hole Spacing	± 1/32" (0.8mm)
	Eccentricity of Bolt Circle with Respect to Facing	2 1/2" Smaller 1/32" (0.8mm) Max. 3" & Larger 1/16" (1.6mm) Max.
	Eccentricity of Bolt Circle with Respect to Bore	1/32" (0.8mm) Max.*
	Eccentricity of Facing with Respect to Bore	1/32" (0.8mm) Max.*
Thickness	18" and Smaller	+ 1/8" (3.2mm), – 0"
	20" and Larger	+ 3/16" (4.8mm), – 0"
Length Thru Hub	10" and Smaller	± 1/16" (1.6mm)
	12" and Larger	± 1/8" (3.2mm)

WELDING NECK

Outside Diameter	When O.D. is 24" or Less	± 1/16" (1.6mm)*
	When O.D. is Over 24"	± 1/8" (3.2mm)*
Inside Diameter	10" and Smaller	± 1/32" (0.8mm)
	12" thru 18"	± 1/16" (1.6mm)
	20" and Larger	+ 1/8" (3.2mm) – 1/16" (1.6mm)
Diameter of Contact Face	1/16" Raised Face	± 1/32" (0.8mm)
	1/4" Raised Face Tongue & Groove Male, Female	± 1/64" (0.4mm)
Diameter of Hub at Base	When Hub Base is 24" or Smaller	± 1/16" (1.6mm)*
	When Hub Base is Over 24"	± 1/8" (3.2mm)*
Diameter of Hub at Point of Welding	5" and Smaller	+ 3/32" (2.4mm), – 1/32" (0.8mm)
	6" and Larger	+ 5/32" (4.0mm), – 1/32" (0.8mm)
Drilling	Bolt Circle	± 1/16" (1.6mm)
	Bolt Hole Spacing	± 1/32" (0.8mm)
	Eccentricity of Bolt Circle with Respect to Facing	2 1/2" & Smaller 1/32" (0.8mm) Max. 3" & Larger 1/16" (1.6mm) Max.
	Eccentricity of Bolt Circle with Respect to Bore	1/32" (0.8mm) Max.*
	Eccentricity of Facing with Respect to Bore	1/32" (0.8mm) Max.*
Thickness	18" and Smaller	+ 1/8" (3.2mm), – 0"
	20" and Larger	+ 3/16 (4.8mm), – 0"
Length Thru Hub	10" and Smaller	± 1/16" (1.6mm)
	12" and Larger	± 1/8" (3.2mm)

Note: * This tolerance is not covered in ANSI B16.5, but maker's option.

WELDING ENDS
ANSI B16.5 FORGED FLANGES

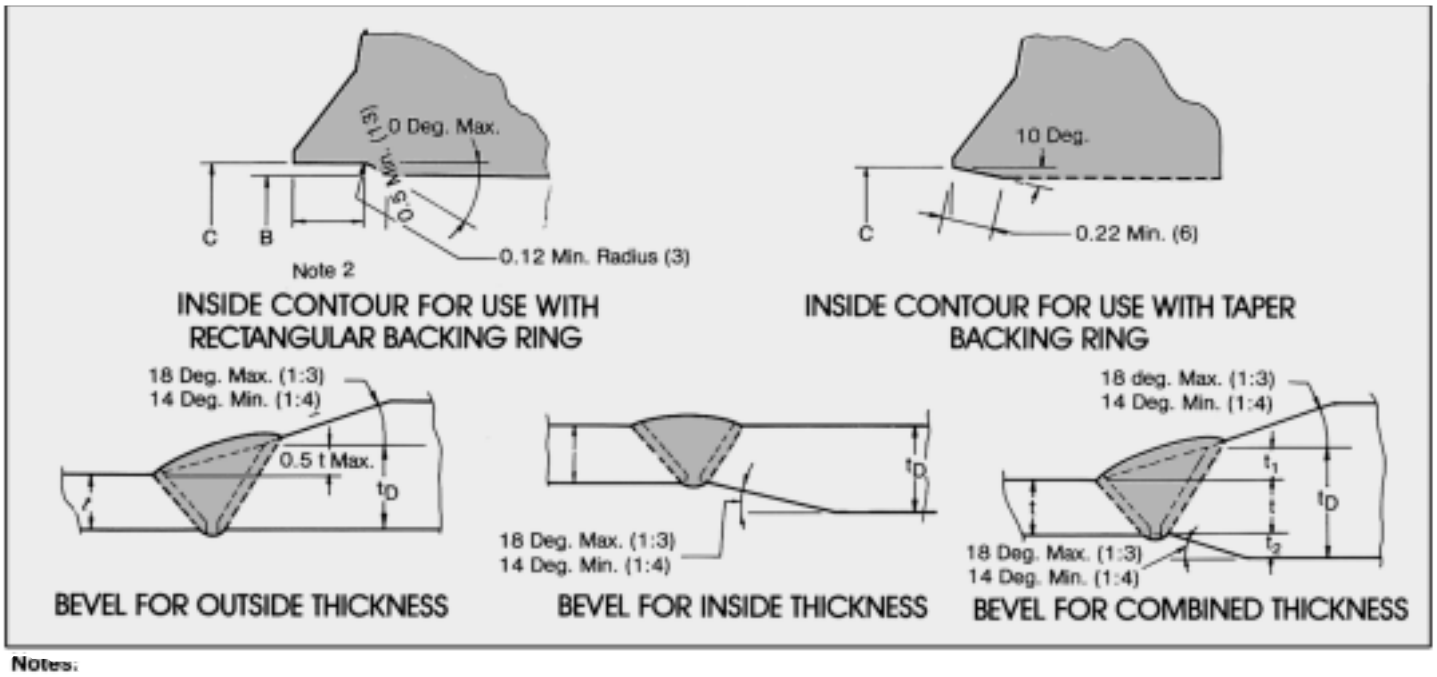


Notes:

When the thickness of the hub at the bevel is greater than that of the pipe to which the flange is joined and the additional thickness is provided on the outside diameter, a taper weld having a slop not exceeding 1 to 3 may be employed or, alternatively, the greater outside diameter may be tapered, at the same maximum slope or less, from a point on the welding bevel equal to the OD at the mating pipe. Similarly, when the greater thickness is provided on the inside of the flange, it shall be taper-bored from the welding end at a slope not exceeding 1 to 3.

When flanges covered by this standard are intended for services with light wall, higher strength pipe, the thickness of the hub at the bevel may be greater than that of the pipe to which the flange is joined. Under these conditions a single taper hub may be provided and the outside diameter of the hub at the base (Dimension X) may also be modified.

The additional thickness may be provided on either inside or outside or partially on each side, but the total additional thickness shall not exceed one-half times the nominal wall thickness of intended mating pipe.

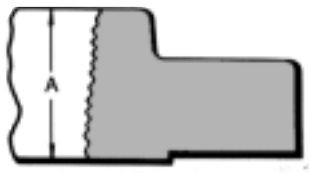


Notes:

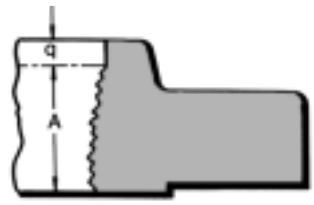
(1) When the materials joined have equal minimum specified yield strength, there shall be no restriction on the minimum slope.
(2) Neither t_1, t_2, nor their sum ($t_1 + t_2$) shall exceed 0.5t.
(3) When the minimum specified yield strengths of the sections to be joined are unequal, the value of to shall at least equal t times the ratio of minimum specified yield strength of the pipe to minimum specified yield strength of the flange.

THREAD

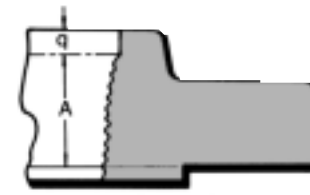
THREAD AND STANDARDS FOR ANSI FLANGES (ANSI B2.1)



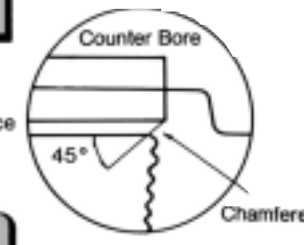
Class 150 Standard
with 0.06" Raised Face

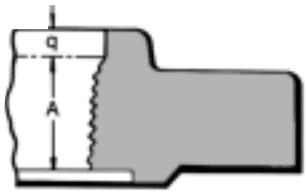


Class 300 Standard
with 0.06" Raised Face

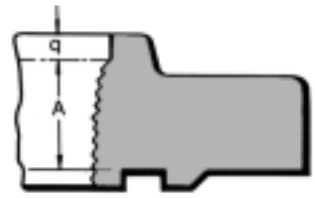


Class 400 Standard
and Heavier
with 0.25" Raised or Male Face

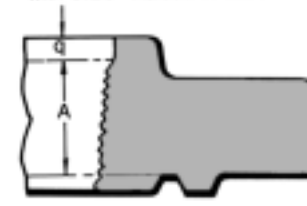




All Standards
with Female Face



All Standards
with Groove Face



All Standards
with Ring Joint Face

ANSI B16.5 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	A-THREAD LENGTHS, INCHES						
	Class 150	Class 300	Class 400	Class 600	Class 900	Class 1500	Class 2500
½	0.625	0.625	0.625	0.625	0.875	0.875	1.125
¾	0.625	0.625	0.625	0.625	1.000	1.000	1.250
1	0.688	0.688	0.688	0.688	1.125	1.125	1.375
1¼	0.813	0.813	0.813	0.813	1.188	1.186	1.500
1½	0.875	0.875	0.875	0.875	1.250	1.250	1.750
2	1.000	1.125	1.125	1.125	1.500	1.500	2.000
2½	1.125	1.250	1.250	1.250	1.875	1.875	2.250
3	1.186	1.250	1.375	1.375	1.625	2.000	2.500
3½	1.250	1.438	1.563	1.563	–	–	–
4	1.313	1.438	1.438	1.625	1.875	2.250	2.750
5	1.438	1.688	1.688	1.875	2.125	2.500	3.000
6	1.563	1.813	1.813	2.000	2.250	2.750	3.250
8	1.750	2.000	2.000	2.375	2.500	3.000	3.750
10	1.938	2.188	2.188	2.563	2.813	3.313	4.250
12	2.188	2.375	2.375	2.750	3.000	3.625	4.750
14	2.250	2.500	2.500	2.875	3.250	–	–
16	2.500	2.688	2.688	3.063	3.375	–	–
18	2.688	2.750	2.750	3.125	3.500	–	–
20	2.750	2.875	2.875	3.250	3.625	–	–
24	3.250	3.250	3.250	3.625	4.000	–	–

Notes:

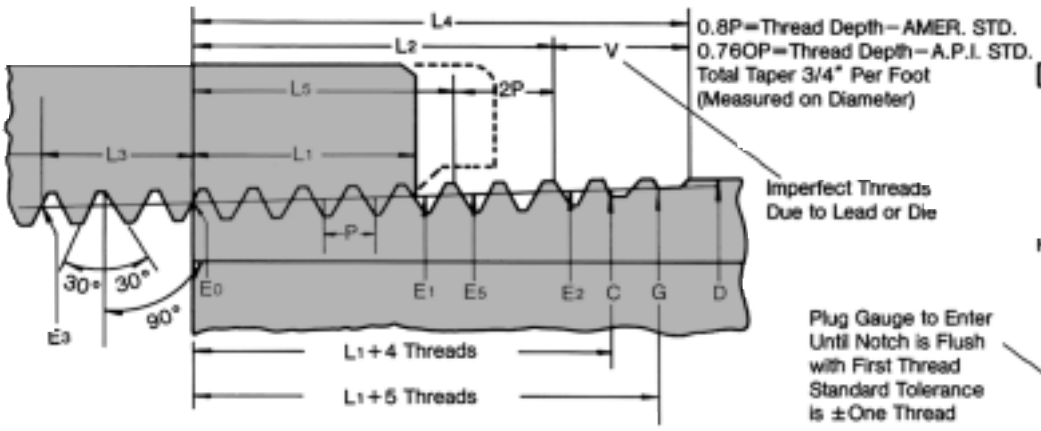
(1) Except flanges with Small Male/Female Face (on pipe end), threaded flanges, have an American National Standard taper pipe thread conforming to ANSI B2.1

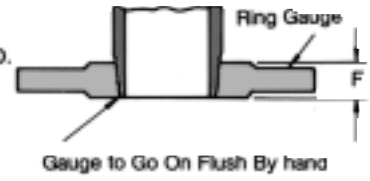
(2) The thread is concentric with the axis of the flange and variations in alignment do not exceed 0.06 in. per foot (0.5 percent).

(3) Class 150 flanges are made without counterbore. The threads are chamfered approximately to the major diameter of the thread at the back of the flange at an angle of approximately 45 degrees with the axis of the thread. The chamfer is concentric with the thread and included in the measurement of the thread length.

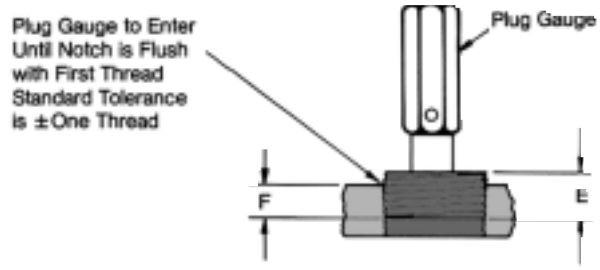
(4) Class 300 and higher pressure flanges are made with a counterbore at the back of the flange. The threads are chamfered to the diameter of the counterbore at an angle of approximately 45 degrees with the axis of the thread. The counterbore and chamfer are concentric with the thread.

(5) The minimum length of effective thread in reducing flanges is at least equal to dimension Q of the corresponding class of threaded flange as shown in the above tables. Threads do not necessarily extend to the face to the flange.





F=Thickness of Working Ring Gauge



C=Straight Pipe Thread Pitch Dia. for Locknut Connections

G=Minimum Pitch Dia. Straight Female Locknut Thread

ANSI B16.36 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	Outside Diameter of Pipe	Threads Per Inch	Pitch of Thread	Pitch Diameter Beginning of External Threads	Handtight Engagement		Effective Thread External		Wrench Make-Up Length for Internal Threaded		Overall Length External Thread
					Length	Pitch Diameter	Length	Pitch Diameter	Length	Pitch Diameter	
	D	N	P	E_s	L_1	E_1	L_7	E_7	L_7	E_7	L_4
½	0.840	14	0.0714	0.7584	0.320	0.7784	0.5337	0.7918	0.2143	0.7450	0.7815
¾	1.050	14	0.0714	0.9677	0.339	0.9889	0.5457	1.0018	0.2143	0.9543	0.7935
1	1.315	11½	0.0870	1.2136	0.400	1.2386	0.6828	1.2563	0.2609	1.1973	0.9845
1¼	1.660	11½	0.0870	1.5571	0.420	1.5834	0.7068	1.6013	0.2609	1.5408	1.0085
1½	1.900	11½	0.0870	1.7961	0.420	1.8223	0.7235	1.8413	0.2609	1.7798	1.0252
2	2.375	11½	0.0870	2.2690	0.436	2.2963	0.7565	2.3163	0.2609	2.2527	1.0582
2½	2.875	8	0.1250	2.7195	0.682	2.7622	1.1375	2.7906	0.2500	2.7039	1.5712
3	3.500	8	0.1250	3.3406	0.766	3.3885	1.2000	3.4156	0.2500	3.3250	1.6337
3½	4.000	8	0.1250	3.8375	0.821	3.8888	1.2500	3.9156	0.2500	3.8219	1.6837
4	4.500	8	0.1250	4.3344	0.844	4.3871	1.3000	4.4156	0.2500	4.3188	1.7337
4½	5.000	8	0.1250	4.8313	0.875	4.8859	1.3500	4.8418	–	–	–
5	5.563	8	0.1250	5.3907	0.937	5.4493	1.4063	5.4786	0.2500	5.3751	1.8400
6	6.625	8	0.1250	6.4461	0.958	6.5060	1.5125	6.5406	0.2500	6.4305	1.9462
7	7.625	8	0.1250	7.4398	1.000	7.5023	1.6125	7.4524	–	–	–
8	8.625	8	0.1250	8.4336	1.063	8.5000	1.7125	8.5406	0.2500	8.4180	2.1462
9	9.625	8	0.1250	9.4273	1.130	9.4980	1.8125	9.4415	–	–	–
10	10.750	8	0.1250	10.5453	1.210	10.6209	1.9250	10.6656	0.2500	10.5297	2.3587
11	11.750	8	0.1250	11.5391	1.285	11.6194	2.0250	11.5549	–	–	–
12	12.750	8	0.1250	12.5328	1.360	12.6178	2.1250	12.6656	0.2500	12.5172	2.5587
14	14.000	8	0.1250	13.7750	1.562	13.8726	2.2500	13.9156	0.2500	13.7594	2.6837
15	15.000	8	0.1250	14.7688	1.687	14.8742	2.3500	14.7872	–	–	–
16	16.000	8	0.1250	15.7625	1.812	15.8758	2.4500	15.9156	0.2500	15.7469	2.8837
17	17.000	8	0.1250	16.7563	1.900	16.8750	2.5500	16.7762	–	–	–
18	18.000	8	0.1250	17.7500	2.000	17.8750	2.6500	17.9156	0.2500	17.7344	3.0837
20	20.000	8	0.1250	19.7375	2.125	19.8703	2.8500	19.9156	0.2500	19.7219	3.2837
24	24.000	8	0.1250	23.7125	2.375	23.8609	3.2500	23.9156	0.2500	23.6969	3.6837

WELDED AND SEAMLESS PIPE CARBON AND ALLOY STEELS

ANSI B36.10

Dimensions in inches

Nominal Pipe Size	Outside Diam.	Wall I.D.	NOMINAL WALL THICKNESS AND INSIDE DIAMETER												
			Schedule 10	Schedule 20	Schedule 30	Standard Weight	Schedule 40	Schedule 60	Extra Strong	Schedule 80	Schedule 100	Schedule 120	Schedule 140	Schedule 160	D&L Ex. Strong
⅛	0.405	Wall	...	...	...	0.068	0.068	...	0.095	0.095	...	...	...	...	...
		I.D.	...	...	...	0.269	0.269	...	0.215	0.215	...	...	...	...	...
¼	0.540	Wall	...	...	...	0.088	0.088	...	0.119	0.119	...	...	...	...	...
		I.D.	...	...	...	0.364	0.364	...	0.302	0.302	...	...	...	...	...
⅜	0.675	Wall	...	...	...	0.091	0.091	...	0.126	0.126	...	...	...	...	...
		I.D.	...	...	...	0.493	0.493	...	0.423	0.423	...	...	...	...	...
½	0.840	Wall	...	...	...	0.109	0.109	...	0.147	0.147	...	...	...	0.187	0.294
		I.D.	...	...	...	0.622	0.622	...	0.546	0.546	...	...	...	0.466	0.252
¾	1.050	Wall	...	...	...	0.113	0.113	...	0.154	0.154	...	...	...	0.218	0.308
		I.D.	...	...	...	0.824	0.824	...	0.742	0.742	...	...	...	0.614	0.434
1	1.315	Wall	...	...	...	0.133	0.133	...	0.179	0.179	...	...	...	0.250	0.358
		I.D.	...	...	...	1.049	1.049	...	0.957	0.957	...	...	...	0.815	0.599
1¼	1.660	Wall	...	...	...	0.140	0.140	...	0.191	0.191	...	...	...	0.250	0.382
		I.D.	...	...	...	1.380	1.380	...	1.278	1.278	...	...	...	1.160	0.896
1½	1.900	Wall	...	...	...	0.145	0.145	...	0.200	0.200	...	...	...	0.281	0.400
		I.D.	...	...	...	1.610	1.610	...	1.500	1.500	...	...	...	1.338	1.100
2	2.375	Wall	...	...	...	0.154	0.154	...	0.218	0.218	...	...	...	0.343	0.436
		I.D.	...	...	...	2.067	2.067	...	1.939	1.939	...	...	...	1.689	1.503
2½	2.875	Wall	...	...	...	0.203	0.203	...	0.276	0.276	...	...	...	0.375	0.552
		I.D.	...	...	...	2.469	2.469	...	2.323	2.323	...	...	...	2.125	1.771
3	3.500	Wall	...	...	...	0.216	0.216	...	0.300	0.300	...	...	...	0.438	0.600
		I.D.	...	...	...	3.068	3.068	...	2.900	2.900	...	...	...	2.624	2.300
3½	4.000	Wall	...	...	...	0.226	0.226	...	0.318	0.318	...	...	...	...	0.636
		I.D.	...	...	...	3.548	3.548	...	3.364	3.364	...	...	...	...	2.728
4	4.500	Wall	...	...	...	0.237	0.237	...	0.337	0.337	...	0.438	...	0.531	0.674
		I.D.	...	...	...	4.026	4.026	...	3.826	3.826	...	3.624	...	3.438	3.152
5	5.563	Wall	...	...	...	0.258	0.258	...	0.375	0.375	...	0.500	...	0.625	0.750
		I.D.	...	...	...	5.047	5.047	...	4.813	4.813	...	4.563	...	4.313	4.063
6	6.625	Wall	...	...	...	0.280	0.280	...	0.432	0.432	...	0.562	...	0.718	0.864
		I.D.	...	...	...	6.065	6.065	...	5.761	5.761	...	5.501	...	5.189	4.897
8	8.625	Wall	...	0.250	0.277	0.322	0.322	0.406	0.500	0.500	0.593	0.718	0.812	0.906	0.875
		I.D.	...	8.125	8.071	7.981	7.981	7.813	7.625	7.625	7.439	7.189	7.001	6.813	6.875
10	10.750	Wall	...	0.250	0.307	0.365	0.365	0.500	0.500	0.593	0.718	0.843	1.000	1.125	...
		I.D.	...	10.250	10.136	10.020	10.020	9.750	9.750	9.564	9.314	9.064	8.750	8.500	...
12	12.750	Wall	...	0.250	0.330	0.375	0.406	0.562	0.500	0.687	0.843	1.000	1.125	1.312	...
		I.D.	...	12.250	12.090	12.000	11.938	11.626	11.750	11.376	11.064	10.750	10.500	10.126	...
14	14.000	Wall	0.250	0.312	0.375	0.375	0.438	0.593	0.500	0.750	0.937	1.093	1.250	1.406	...
		I.D.	13.500	13.375	13.250	13.250	13.124	12.814	13.000	12.500	12.126	11.814	11.500	11.188	...
16	16.000	Wall	0.250	0.312	0.375	0.375	0.500	0.656	0.500	0.843	1.031	1.218	1.438	1.593	...
		I.D.	15.500	15.375	15.250	15.250	15.000	14.688	15.000	14.314	13.938	13.564	13.124	12.814	...
18	18.000	Wall	0.250	0.312	0.438	0.375	0.562	0.750	0.500	0.937	1.156	1.375	1.562	1.781	...
		I.D.	17.500	17.375	17.124	17.250	16.876	16.500	17.000	16.126	15.688	15.250	14.876	14.438	...
20	20.000	Wall	0.250	0.375	0.500	0.375	0.593	0.812	0.500	1.031	1.281	1.500	1.750	1.968	...
		I.D.	19.500	19.250	19.000	19.250	18.814	18.376	19.000	17.938	17.438	17.000	16.500	16.064	...
24	24.000	Wall	0.250	0.375	0.562	0.375	0.687	0.968	0.500	1.218	1.531	1.812	2.062	2.343	...
		I.D.	23.500	23.250	22.875	23.250	22.626	22.064	23.000	21.564	20.938	20.376	19.876	19.314	...

► Not included in B36.10

The wall thickness shown represent nominal or average wall dimensions which are subject to a − 12½% mill tolerance.

Note that schedule 40 in. sizes 12" and larger and that schedule 80 in. sizes 10" and larger do not agree with schedules 40S and 80S of ANSI B36.19 nor with standard weight and extra strong respectively

WELDED AND SEAMLESS PIPE STAINLESS STEELS

ANSI B36.19

Dimensions in inches

Nominal Pipe Size	Outside Diameter	Wall Thickness Inside Diameter	NOMINAL WALL THICKNESS AND INSIDE DIAMETER			
			Schedule 5S*	Schedule 10S*	Schedule 40S	Schedule 80S
⅛	0.405	Wall	...	0.049	0.068	0.095
		I.D.	...	0.307	0.269	0.215
¼	0.540	Wall	...	0.065	0.088	0.119
		I.D.	...	0.410	0.364	0.302
⅜	0.675	Wall	...	0.065	0.091	0.126
		I.D.	...	0.545	0.493	0.423
½	0.840	Wall	0.065	0.083	0.109	0.147
		I.D.	0.710	0.674	0.622	0.546
¾	1.050	Wall	0.065	0.083	0.113	0.154
		I.D.	0.920	0.884	0.824	0.742
1	1.315	Wall	0.065	0.109	0.133	0.179
		I.D.	1.185	1.097	1.049	0.957
1¼	1.660	Wall	0.065	0.109	0.140	0.191
		I.D.	1.530	1.442	1.380	1.278
1½	1.900	Wall	0.065	0.109	0.145	0.200
		I.D.	1.770	1.682	1.610	1.500
2	2.375	Wall	0.065	0.109	0.154	0.218
		I.D.	2.245	2.157	2.067	1.939
2½	2.875	Wall	0.083	0.120	0.203	0.276
		I.D.	2.709	2.635	2.469	2.323
3	3.500	Wall	0.083	0.120	0.216	0.300
		I.D.	3.334	3.260	3.068	2.900
3½	4.000	Wall	0.083	0.120	0.226	0.318
		I.D.	3.834	3.760	3.548	3.364
4	4.500	Wall	0.083	0.120	0.237	0.337
		I.D.	4.334	4.260	4.026	3.826
5	5.563	Wall	0.109	0.134	0.258	0.375
		I.D.	5.345	5.295	5.047	4.813
6	6.625	Wall	0.109	0.134	0.280	0.432
		I.D.	6.407	6.357	6.065	5.761
8	8.625	Wall	0.109	0.148	0.322	0.500
		I.D.	8.407	8.329	7.981	7.625
10	10.750	Wall	0.134	0.165	0.365	0.500**
		I.D.	10.482	10.420	10.020	9.750**
12	12.750	Wall	0.156	0.180	0.375**	0.500**
		I.D.	12.438	12.390	12.000**	11.750**
14‡	14.000	Wall	0.156	0.188	...	...
		I.D.	13.688	13.624	...	...
16‡	16.000	Wall	0.165	0.188	...	...
		I.D.	15.670	15.624	...	...
18‡	18.000	Wall	0.165	0.188	...	...
		I.D.	17.670	17.624	...	...
20‡	20.000	Wall	0.188	0.218	...	...
		I.D.	19.624	19.564	...	...
24‡	24.000	Wall	0.218	0.250	...	...
		I.D.	23.564	23.500	...	...

The wall thickness shown represent nominal or average wall dimensions which are subject to a −12½% mill tolerance

‡Sizes 14" through 30" are not at publication date covered in B36.19, and dimensions listed are those commonly used in the industry.

*Schedule 5S and 10S wall thicknesses do not permit threading in accordance with ANSI B2.1.

**Note that schedule 40S and schedule 80S in these sizes do not agree with schedule 40 and schedule 80 of ANSI B36.10, and that they are identical to standard weight and extra strong respectively of ANSI B36.10

MATERIAL SPECIFICATIONS

ANSI B16.5 (ASTM STANDARD)

ASTM	Grade	Classification	CHEMICAL COMPOSITION								MECHANICAL PROPERTIES				
			C %	Mn %	P Max. %	S Max. %	Si %	Ni %	Cr %	Mo %	T.S. Min. psi (kg/mm²)	Y.S. Min. psi (kg/mm²)	EL. Min. %	Red. Min. %	HB
A-105*		Carbon Steel	MAX 0.35	0.60~1.05	0.040	0.050	MAX 0.35	MAX 0.40	MAX 0.30	MAX 0.12	70,000 (49.2)	36,000 (25.3)	22	30	MAX 187
A-181	60	Carbon Steel	MAX 0.35	MAX 0.90	0.050	0.050	MAX (0.35)				60,000 (42.2)	30,000 (21.1)	22	35	
A-181	70	Carbon Steel	MAX 0.35	MAX 0.90	0.050	0.050	MAX (0.35)				70,000 (49.2)	36,000 (25.3)	18	24	
A-182	F1	½ Mo	MAX 0.28	0.6~0.90	0.045	0.045	0.15~0.35			0.44~0.65	70,000 (49.2)	40,000 (28.1)	20	30	143~192
A-182	F5	5cr-½ Mo	MAX 0.15	0.30~0.60	0.030	0.030	MAX 0.50	MAX 0.50	4.0~6.00	0.44~0.65	70,000 (49.2)	40,000 (28.1)	20	35	143~217
A-182	F5a	5cr-½ Mo	MAX 0.25	MAX 0.6	0.040	0.030	MAX 0.50	MAX 0.50	4.0~6.0	0.44~0.65	90,000 (63.3)	65,000 (45.7)	22	50	187~248
A-182	F11-1	1¼Cr-½ Mo	0.05~0.15	0.30~0.60	0.030	0.030	0.50~1.00		1.00~1.50	0.44~0.65	60,000 (42.2)	30,000 (21.1)	20	45	121~174
A-182	F11-2	1¼Cr-½ Mo	0.10~0.20	0.30~0.80	0.040	0.040	0.5~1.00		1.00~1.50	0.44~0.65	70,000 (49.2)	40,000 (28.1)	20	30	143~207
A-182	F11-3	1¼Cr-½ Mo	0.10~0.20	0.30~0.80	0.040	0.040	0.5~1.00		1.00~1.50	0.44~0.65	75,000 (52.7)	45,000 (31.6)	20	30	156~207
A-182	F12-1	1Cr-½ Mo	0.05~0.15	0.30~0.60	0.045	0.045	MAX 0.5		0.80~1.25	0.44~0.65	60,000 (42.2)	30,000 (21.1)	20	45	121~174
A-182	F12-2	1Cr-½ Mo	0.10~0.20	0.30~0.80	0.040	0.040	0.10~0.60		0.80~1.25	0.44~0.65	70,000 (49.2)	40,000 (28.1)	20	30	143~207
A-182	F11	1¼Cr-½ Mo	0.10~0.20	0.30~0.60	0.040	0.040	0.5~1.00		1.00~1.50	0.44~0.65	70,000 (49.2)	40,000 (28.1)	20	30	143~207
A-182	F12	1Cr-½ Mo	0.10~0.20	0.30~0.80	0.040	0.040	0.1~0.6		0.8~1.25	0.44~0.65	70,000 (49.2)	40,000 (28.1)	20	30	143~207
A-182	F22	2¼Cr-1 Mo	MAX 0.15	0.30~0.60	0.040	0.040	MAX 0.50		2.00~2.50	0.87~1.13	75,000 (52.7)	45,000 (31.6)	20	30	156~207
A-182	F304	18Cr-8 Ni	MAX 0.08	MAX 2.00	0.040	0.030	MAX 1.00	8.00~11.00	18.00~20.00		75,000 (52.7)	30,000 (21.1)	30	50	
A-182	F304L	18Cr-8 Ni Low	MAX 0.035	MAX 2.00	0.040	0.030	MAX 1.00	8.00~13.00	18.00~20.00		70,000 (49.2)	25,000 (17.6)	30	50	
A-182	F316	18Cr-8 Ni Mo	MAX 0.08	MAX 2.00	0.040	0.030	MAX 1.00	10.00~14.00	16.00~18.00	2.00~3.00	75,000 (52.7)	30,000 (21.7)	30	50	
A-182	F316L	18Cr-8 Ni Mo-Low	MAX 0.035	MAX 2.00	0.040	0.030	MAX 1.00	10.00~15.00	16.00~18.00	2.00~3.00	65,000 (45.7)	25,000 (17.6)	30	50	
A-182	F321	18Cr-8 Ni Ti	MAX 0.08	MAX 2.00	0.030	0.030	MAX 1.00	9.00~12.00	Min 17.00		75,000 (52.7)	30,000 (21.1)	30	50	
A-182	F347	18Cr-8 Ni Cb	MAX 0.08	MAX 2.00	0.030	0.030	MAX 1.00	9.00~13.00	17.00~20.00		75,000 (52.7)	30,000 (21.1)	30	50	
A-350*	LF1	Carbon Steel	MAX 0.30	0.75~1.05	0.035	0.040	0.15~0.30	MAX 0.40	MAX 0.30	MAX 0.12	60,000~85,000 (42.2~59.7)	30,000 (21.1)	25	38	
A-350*	LF2	Carbon Steel	MAX 0.30	MAX 1.35	0.035	0.040	0.15~0.30	MAX 0.40	MAX 0.30	MAX 0.12	70,000~95,000 (49.2~66.8)	36,000 (25.3)	22	30	
A-350*	LF3	3½ Ni	MAX 0.20	MAX 0.90	0.035	0.040	0.20~0.35	3.25~3.75	MAX 0.30	MAX 0.12	70,000~95,000 (49.2~66.8)	37,500 (26.4)	22	35	

*OTHER ELEMENTS: copper (0.40% MAX.), Vanadium (0.03% MAX.), Columbium (0.02% MAX.)
*The sum of Cu, Ni, Cr and Mo shall not be exceed 1.00%
*The sum of Cr and Mo shall not be exceed 0.32%

The KOFCO'S AMERICAN STANDARD FLANGES are manufactured conforming to the ANSI B16.5 (Table 1A "LIST OF MATERIAL SPECIFICATIONS"), satisfying the above requirements

APPLICABLE ASTM SPECIFICATIONS

GROUP 1 MATERIALS		PRODUCT FORMS					
Material Group No.	Nominal Designation Steel	Forgings Spec.–Gr.	Notes	Castings Spec.–Gr.	Notes	Plates Spec.–Gr.	Notes
1.1	Carbon	A105 A350-LF2	(1)(3)	A216-WCB	(1)	A515-70 A516-70	(1) (1)
	C-Mn Si					A537-C1.1	
1.2	Carbon			A216-WCC A352-LCC	(1)		
	2-1/2 Ni			A352-LC2		A203-B	
	3-1/2 Ni	A350-LF3		A352-LC3		A302-E	
1.3	Carbon			A352-LCB	(1)	A203-A A203-D A515-65 A516-65	
1.4	Carbon	A350-LF1				A515-60 A516-60	(1)
1.5	C-1/2 Mo	A182-F1	(2)	A217-WC1 A352-LC1	(2)(4)	A204-A A204-B	(2) (2)
1.7	C-1/2 Mo					A204-C	(2)
	1/2 Cr-1/2 Mo	A182-F2					
	Ni-Cr-1/2 Mo			A217-WC4	(4)		
	Ni-Cr-1 Mo			A217-WC5	(4)		
1.9	1 Cr-1/2 Mo	A182-F12	(4)				
	1-1/4 Cr-1/2 Mo	A182-F11	(4)	A217-WC6	(4)	A387-11 C1.2	
1.10	2-1/4 Cr-1 Mo	A182-F22		A217-WC9	(4)	A387-22 C1.2	
1.13	5 Cr-1/2 Mo	A181-F5 A182-F5a		A217-C5	(4)		
1.14	9 Cr-1 Mo	A182-F9		A217-C12	(4)		

GROUP 2 MATERIALS		PRODUCT FORMS					
2.1	18 Cr-8 Ni	A182-F304	(5)	A351-CF3		A240-304	(5)(6)
	18 Cr-8 Ni	A182-F304H		A351-CF8	(5)	A240-304H	
2.2	16 Cr-12 Ni-2 Mo	A182-F316 A182-F316H	(5)			A240-316 A240-316H	(5)(6)
	18 Cr-13 Ni-3 Mo					A240-317	(5)(6)
	18 Cr-9 Ni-2 Mo			A351-CF3M A351-CF8M	(5)		
2.3	18 Cr-8 Ni	A182-F304L				A240-304L	
	16 Cr-12 Ni-2 Mo	A182-F316L				A240-316L	
2.4	18 Cr-10-Ni-Ti	A182-F321 A182-F321H	(5)			A240-321 A240-321H	(5)(6)
2.5	18 Cr-10 Ni-Cb	A182-F347 A182-F347H A182-F348 A182-F348H	(5) (5) 	A351-CF8C	(5)	A240-347 A240-347H A240-348 A240-348H	(5)(6) (5)(6)
2.6	25 Cr-12 Ni			A351-CH8 A351-CH20	(5) (5)		
	23 Cr-12 Ni					A240-309S	(5)(6)
2.7	25 Cr-20 Ni	A182-F310	(5)(9)	A351-CK20	(5)	A240-310S	(5)(6)(7)

General Notes:

(a) For temperature limitations see footnotes in Tables 2 and in Annex G.
(b) Plate materials are listed only for use as blind flanges (see 5.1). Additional plate materials listed in ANSI B16.34 may also be used, with corresponding B16.34 Standard Class ratings.
(c) Material Groups not listed in Table 1A are intended for use in valves. See ANSI B16.34.

Notes:

(1) Upon prolonged exposure to temperatures above about 800°F (425°C), the carbide phase of carbon steel may be converted to graphite.
(2) Upon prolonged exposure to temperatures above about 875°F (470°C), the carbide phase of carbon-molybdenum steel may be converted to graphite.
(3) Only killed steel shall be used above 850°F (455°C).
(4) Use normalized and tempered material only.
(5) At temperatures over 1000°F (540°C), use only when the carbon content is 0.04 percent or higher.
(6) For temperatures above 1000°F (540°C), use only if the material is heat treated by heating it to a temperature of at least 1900°F (1040°C) and quenching in water or rapidly cooling by other means.
(7) Service temperatures of 1050°F (565°C) and above should be used only when assurance is provided that grain size is not finer than ASTM No. 6.

PRESSURE-TEMPERATURE RATINGS

ANSI B16.5 FORGED FLANGES

CLASS 150

Materials / Temp. °F	A105 A350-LF2	A350 LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	285	290	235	265		290				275	275	230	275	275	260		100
200	260	260	215			260				235	240	195	235	245	230		200
300	230	230	210			230				205	215	175	210	225	220		300
400					200					180	195	160	190		200		400
500					170					170		145			170		500
600					140					140		140			140		600
650					125					125		125			125		650
700					110					110		110			110		700
750					95					95		95			95		750
800					80					80		80			80		800
850					65					65		65			65		850
900					50					50					50		900
950					35					35					35		950
1000					20					20					20		1000

CLASS 300

Materials / Temp. °F	A105 A350-LF2	A350-LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	740	750	620	695	750	750	750	750		720	720	600	720	720	670		100
200	675	750	560	680	750	710	715	750		600	620	505	610	635	605		200
300	655	730	550	655	730	675	675	730		530	560	455	545	590	570		300
400	635	705	530	640	705	660	650	705		470	515	415	495	555	535		400
500	600	665	500	620	665	640		665		435	480	380	460	520	505		500
600	550	605	455			605				415	450	360	435	490	480		600
650	535	590	450			590				410	445	350	430	480	465		650
700	535	570	450			570				405	430	345	420	470	455		700
750	505	505	445			530				400	425	335	415	460	445		750
800	410	410	370			510		500	510	395	415	330	415	455	435		800
850		270				485		440	485	390	405	320	410	445	425		850
900		170				450		355	450	385	395		405	430	415		900
950		105		280	345	380		260	370	375	385		385	385	385		950
1000		50		165	215	225	270	190	290	325	365		355	365	335	350	1000
1050					190	140	200	140	190	310	360		345	360	290	335	1050
1100						95	115	105	115	260	325		300	325	225	290	1100
1150						50	105	70	75	195	275		235	275	170	245	1150
1200						35	55	45	50	155	205		180	170	130	205	1200
1250										110	180		140	125	100	160	1250
1300										85	140		105	95	80	120	1300
1350										60	105		80	70	60	80	1350
1400										50	75		60	50	45	55	1400
1450										35	60		50	40	30	40	1450
1500										25	40		40	35	25	25	1500

CLASS 400

Materials / Temp. °F	A105 A350-LF2	A350-LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	990	1000	825	925	1000	1000	1000	1000		960	960	800	960	960	895		100
200	900	1000	750	905	1000	950	955	1000		800	825	675	815	850	805		200
300	875	970	730	870	970	895	905	970		705	745	605	725	785	760		300
400	845	940	705	855	940	880	865	940		630	685	550	660	740	710		400
500	800	885	665	830	885	855		885		585	635	510	610	690	670		500
600	730	805	610			805				555	600	480	585	655	635		600
650	715	785	600			785				545	590	470	570	640	620		650
700	710	755	600			755				540	575	460	560	625	610		700
750	670	670	590			710				530	565	450	555	615	595		750
800	550	550	495			675		665	675	525	555	440	550	610	580		800
850		355				650		585	650	520	540	430	545	590	565		850
900		230				600		470	600	510	525		540	575	555		900
950		140		375	460	505		350	495	500	515		515	515	515		950
1000		70		220	285	300	355	255	390	430	485		475	485	450	465	1000
1050					250	185	265	190	250	410	480		460	480	390	445	1050
1100						130	150	140	150	345	430		400	430	300	390	1100
1150						70	140	90	100	260	365		315	365	230	330	1150
1200						45	75	60	70	205	275		240	230	175	275	1200
1250										145	245		185	165	135	215	1250
1300										110	185		140	125	105	160	1300
1350										85	140		110	90	80	105	1350
1400										65	100		80	70	60	75	1400
1450										45	80		65	55	40	50	1450
1500										30	55		50	45	30	30	1500

CLASS 600

Materials / Temp. °F	A105 A350-LF2	A350-LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	1480	1500	1235	1390	1500	1500	1500	1500		1440	1440	1200	1440	1440	1345		100
200	1350	1500	1125	1360	1500	1425	1430	1500		1200	1240	1015	1220	1270	1210		200
300	1315	1455	1095	1305	1455	1345	1355	1455		1055	1120	910	1090	1175	1140		300
400	1270	1410	1060	1280	1410	1315	1295	1410		940	1030	825	990	1110	1065		400
500	1200	1330	995	1245	1330	1285	1280	1330		875	955	765	915	1035	1010		500
600	1095	1210	915			1210				830	905	720	875	985	955		600
650	1075	1175	895			1175				815	890	700	855	960	930		650
700	1065	1135	895			1135				805	865	685	840	935	910		700
750	1010	1010	885			1065				795	845	670	830	920	895		750
800	825	825	740			1015		995	1015	790	830	660	825	910	870		800
850		535				975		880	975	780	810	645	815	890	850		850
900		345				900		705	900	770	790		810	865	830		900
950		205		560	685	755		520	740	750	775		775	775	775		950
1000		105		330	425	445	535	385	585	645	725		715	725	670	700	1000
1050					380	275	400	280	380	620	720		695	720	585	665	1050
1100						190	225	205	225	515	645		605	645	445	585	1100
1150						105	205	140	150	390	550		475	550	345	495	1150
1200						70	110	90	105	310	410		365	345	260	410	1200
1250										220	365		280	245	200	325	1250
1300										165	275		210	185	160	240	1300
1350										125	205		165	135	115	160	1350
1400										90	150		125	105	90	110	1400
1450										70	115		95	80	60	75	1450
1500										50	85		75	70	50	50	1500

PRESSURE-TEMPERATURE RATINGS

ANSI B16.5 FORGED FLANGES

CLASS 900

Materials / Temp. °F	A105 F350-LF2	A350-LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	2220	2250	1850	2085	2250	2250	2250	2250		2160	2160	1800	2160	2160	2015		100
200	2025	2250	1685	2035	2250	2135	2150	2250		1800	1860	1520	1830	1910	1815		200
300	1970	2185	1640	1955	2185	2020	2030	2185		1585	1680	1360	1635	1765	1705		300
400	1900	2115	1585	1920	2115	1975	1945	2115		1410	1540	1240	1485	1665	1600		400
500	1795	1995	1495	1865	1995	1925	1920	1995		1310	1435	1145	1375	1555	1510		500
600	1640	1815	1370			1815				1245	1355	1080	1310	1475	1435		600
650	1610	1765	1345			1765				1225	1330	1050	1280	1440	1395		650
700	1600	1705	1345			1705				1210	1295	1030	1260	1405	1370		700
750	1510	1510	1325			1595		1490	1525	1195	1270	1010	1245	1385	1340		750
800	1235	1235	1110			1525		1315	1460	1180	1245	985	1240	1370	1305		800
850		805				1460		1060	1350	1165	1215	965	1225	1330	1275		850
900		515				1350				1150	1180		1215	1295	1245		900
950		310		845	1030	1130		780	1110	1125	1160		1160	1160	1160		950
1000		155		495	640	670	805	575	875	965	1090		1070	1090	1010	1050	1000
1050					565	410	595	420	565	925	1080		1040	1080	875	1000	1050
1100						290	340	310	340	770	965		905	965	670	875	1100
1150						155	310	205	225	585	825		710	825	515	740	1150
1200						105	165	135	155	465	620		545	515	390	620	1200
1250										330	545		420	370	300	485	1250
1300										245	410		320	280	235	360	1300
1350										185	310		245	205	175	235	1350
1400										145	225		185	155	135	165	1400
1450										105	175		145	125	95	115	1450
1500										70	125		115	105	70	70	1500

CLASS 1500

Materials / Temp. °F	A105 A350-LF2	A350-LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	3705	3750	3085	3470	3750	3750	3750	3750		3600	3600	3000	3600	3600	3360		100
200	3375	3750	2810	3395	3750	3560	3580	3750		3000	3095	2530	3050	3180	3025		200
300	3280	3640	2735	3260	3640	3365	3385	3640		2640	2795	2270	2725	2940	2845		300
400	3170	3530	2645	3200	3530	3290	3240	3530		2350	2570	2065	2470	2770	2665		400
500	2995	3325	2490	3105	3325	3210	3200	3325		2185	2390	1910	2290	2590	2520		500
600	2735	3025	2285			3025				2075	2255	1800	2185	2460	2390		600
650	2685	2940	2245			2940				2040	2220	1750	2135	2400	2330		650
700	2665	2840	2245			2840				2015	2160	1715	2100	2340	2280		700
750	2520	2520	2210			2660				1990	2110	1680	2075	2305	2230		750
800	2060	2060	1850			2540		2485	2540	1970	2075	1645	2065	2280	2170		800
850		1340				2435		2195	2435	1945	2030	1610	2040	2220	2125		850
900		860				2245		1765	2245	1920	1970		2030	2160	2075		900
950		515		1405	1715	1885		1305	1850	1870	1930		1930	1930	1930		950
1000		260		825	1065	1115	1340	960	1460	1610	1820		1785	1820	1680	1750	1000
1050					945	685	995	705	945	1545	1800		1730	1800	1460	1665	1050
1100						480	565	515	565	1285	1610		1510	1610	1115	1460	1100
1150						260	515	345	380	980	1370		1185	1370	860	1235	1150
1200						170	275	225	260	770	1030		910	855	650	1030	1200
1250										550	910		705	615	495	805	1250
1300										410	685		530	465	395	600	1300
1350										310	515		410	345	290	395	1350
1400										240	380		310	255	225	275	1400
1450										170	290		240	205	155	190	1450
1500										120	205		190	170	120	120	1500

CLASS 2500

Materials / Temp. °F	A105 A350-LF2	A350-LF3	A350-LF1	A182 F1	A182 F2	A182 F11 F12	A182 F22	A182 F5 F5a	A182 F9	F304 F304H	F316 F316H	F304L / F316L	F321 F321H	F347 F347H F348 F348H	(A240 309S)	F310	Temperature °F
-20 to 100	6170	6250	5145	5785	6250	6250	6250	6250		6000	6000	5000	6000	6000	5600		100
200	5625	6250	4680	5660	6250	5930	5965	6250		5000	5160	4220	5080	5300	5040		200
300	5470	6070	4560	5435	6070	5605	5640	6070		4400	4660	3780	4540	4900	4740		300
400	5280	5880	4405	5330	5880	5485	5400	5880		3920	4280	3440	4120	4620	4440		400
500	4990	5540	4150	5180	5540	5350	5330	5540		3640	3980	3180	3820	4320	4200		500
600	4560	5040	3805			5040				3460	3760	3000	3640	4100	3980		600
650	4475	4905	3740			4905				3400	3700	2920	3560	4000	3880		650
700	4440	4730	3740			4730				3360	3600	2860	3500	3900	3800		700
750	4200	4200	3685			4430				3320	3520	2800	3460	3840	3720		750
800	3430	3430	3085			4230		4145	4230	3280	3460	2740	3440	3800	3620		800
850		2230				4060		3660	4060	3240	3380	2680	3400	3700	3540		850
900		1430				3745		2945	3745	3200	3280		3380	3600	3460		900
950		860		2345	2860	3145		2170	3085	3120	3220		3220	3220	3220		950
1000		430		1370	1770	1860	2230	1600	2430	2685	3030		2970	3030	2800	2915	1000
1050					1570	1145	1660	1170	1570	2570	3000		2885	3000	2430	2770	1050
1100						800	945	860	945	2145	2685		2515	2685	1860	2430	1100
1150						430	860	570	630	1630	2285		1970	2285	1430	2060	1150
1200						285	460	370	430	1285	1715		1515	1430	1085	1715	1200
1250										915	1515		1170	1030	830	1345	1250
1300										685	1145		885	770	660	1000	1300
1350										515	860		685	570	485	660	1350
1400										400	630		515	430	370	460	1400
1450										285	485		400	345	260	315	1450
1500										200	345		315	285	200	200	1500

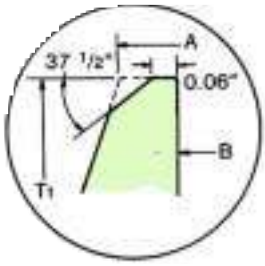
GUIDE TO MATERIAL LAYOUT & SPECIFICATIONS

Pipe	Weld Fittings	Screwed & Socket Fittings	Flanges	Valves
A-53	A-234 WPB	A-105, A-181 Gr. 60 or 70	A105, A-181 Gr. 60 or 70	A-105 A-216 WCB
A-106B	A-234 WPB	A-105 A-181 Gr. 60 or 70	A-105 A-181 Gr. 60 or 70	A105 A-216 WCB
A-312 T304	A-403 WP-304	A-182 F-304	A-182 F-304	a-182 F-304 CMO
A-312 T316	A-403 WP-316	A-182 F-316	A-182 F-316	A-182 F-316 CM 8MO
A-333 Gr. 1 or 6	A-420 WPL 1 & 6	A-350 LF-1	A-350 LF-1	A-350 LF-1 A-352 LCB
A-333 Gr. 3	A-420 WPL-3	A-350 LF-3	A-350 LF-3	A-350 LF-3 A-352 LC3
A-335 P-1	A-234 WP-1	A-182 F-1	A-182 F-1	A-217 WC-6
A-335 P-11	A-234 WP-11	A-182 F-11	A-182 F-11	A-182 F-11 A-217 WC-6
A-335 P-12	A-234 WP-12	A-182 F-12	A-182 F-12	A-217 WC-6
A-335 P-22	A-234 WP-22	A-182 F-22	A-182 F-22	A-182 F-22 A-217 WC-9
A-335 P-5	A-234 WP-5	A-182 F-5	A-182 F-5	A-182 F-5 A-216 WC-5
A335 P-7	A-234 WP-7	A-182 F-7	A-182 F-7	A-182 F-7 A-217 WC-12
A-335 P-9	A-234 WP-9	A-182 F-9	A-182 F-9	A-182 F-9 A-217 WC-12

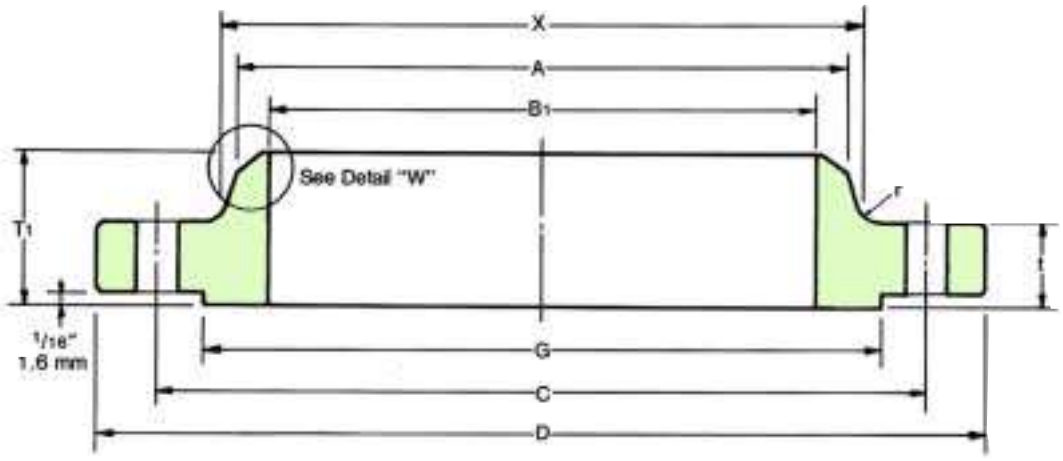
API FLANGES

- Class 75 Flanges
- Class 150 Flanges
- Class 300 Flanges
- Finish & Tolerance
- Material & Pressure Ratings

CLASS 75 FLANGES



Detail "W"
Typical Welding
and Preparation



API 605 FORGED FLANGES

Dimensions in inches

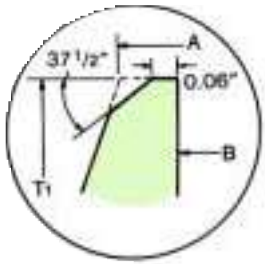
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE			Length Thru Hub	Diam. of Hub at Bevel	Radius at Base of Hub	DRILLING			Approxi-mate Weight Pounds (Kg)
					Wall Thickness									
					0.250"	0.375"	0.500"							
	D	t	G	X	B.			T.	A	r	C			
26	30.00	1.31	27.75	26.62	25.500	25.250	25.000	2.31	26.06	0.31	28.50	36	0.75	63.9 (29.01)
28	32.00	1.31	29.75	28.62	27.500	27.250	27.000	2.44	28.06	0.31	30.50	40	0.75	68.3 (31.01)
30	34.00	1.31	31.75	30.62	29.500	29.250	29.000	2.56	30.06	0.31	32.50	44	0.75	777.2 (35.05)
32	36.00	1.38	33.75	32.62	31.500	31.250	31.000	2.75	32.06	0.31	34.50	48	0.75	105.8 (48.03)
34	38.00	1.38	35.75	34.62	33.500	33.250	33.000	2.88	34.06	0.31	36.50	52	0.75	110.2 (50.03)
36	40.69	1.44	38.00	36.81	33.500	35.250	35.000	3.38	36.06	0.38	39.06	40	0.88	136.7 (62.06)
38	42.69	1.50	40.00	38.81	37.500	37.250	37.000	3.50	38.06	0.38	41.06	40	0.88	154.3 (70.05)
40	44.69	1.50	42.00	40.81	39.500	39.250	39.000	3.62	40.06	0.38	43.06	44	0.88	163.1 (74.05)
42	46.69	1.56	44.00	42.81	41.500	41.250	41.000	3.75	42.06	0.38	45.06	48	0.88	169.8 (77.09)
44	49.25	1.69	46.25	44.88	43.500	45.250	45.000	4.12	44.06	0.38	47.38	36	1.00	180.8 (82.08)
46	51.25	1.75	48.25	46.88	45.500	45.250	45.000	4.25	46.06	0.38	49.38	40	1.00	231.5(105.01)
48	53.25	1.81	50.25	48.88	47.500	47.250	47.000	4.38	48.06	0.38	51.38	44	1.00	264.6(120.03)
50	55.25	1.88	52.25	50.94	49.500	49.250	49.000	4.56	50.06	0.38	53.38	44	1.00	295.8(134.28)
52	57.38	1.88	54.25	52.94	51.500	51.250	51.000	4.75	52.06	0.38	55.50	48	1.00	313.2(142.18)
54	59.38	1.94	56.25	55.00	53.500	53.250	53.000	4.94	54.06	0.38	57.50	48	1.00	396.8(180.15)
56	62.00	2.00	58.50	57.12	55.500	55.250	55.000	5.31	56.06	0.44	59.88	40	1.12	406.6(184.58)
58	64.00	2.06	60.50	59.12	57.500	57.250	57.000	5.44	58.06	0.44	61.88	44	1.12	430.8(195.56)
60	66.00	2.19	62.50	61.12	59.500	59.250	59.000	5.69	60.06	0.44	63.88	44	1.12	463.0(210.20)

Notes:

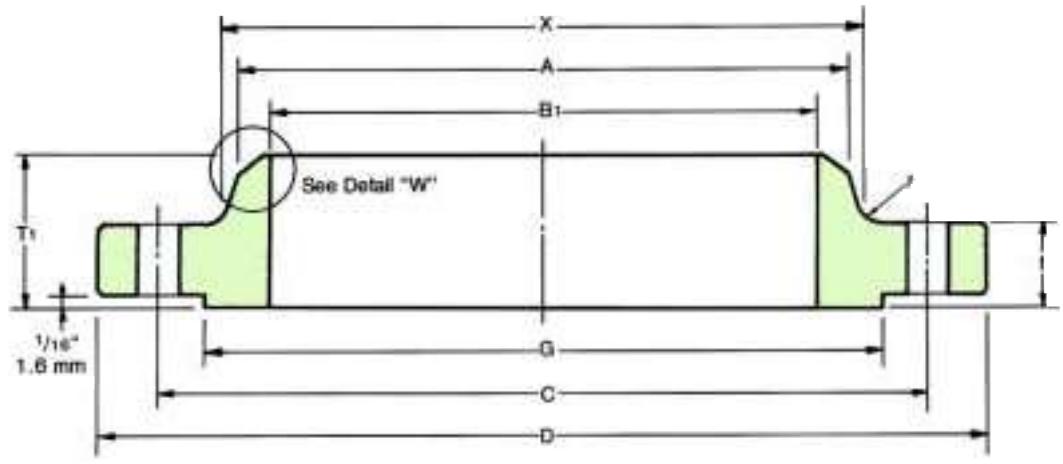
(1) "Bore" (B1) of flanges is shall be specified by the purchaser.

(2) Class 75 flanges will be furnished with 0.06" raised face, which is included in "Thickness" (t) and "Length through Hub" (T_1).

CLASS 150 FLANGES



Detail "W"
Typical Welding
end Preparation



API 605 FORGED FLANGES

Dimensions in inches

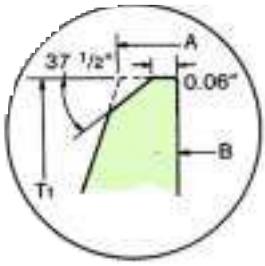
Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. of Base of Hub	BORE			Length Thru Hub	Diam. of Hub at Bevel	Radius at Base of Hub	DRILLING			Approxi-mate Weight Pounds (Kg)
					Wall Thickness						Bolt Circle Diam.	Number of Holes	Diam. of Holes	
					0.250"	0.375"	0.500"							
	D	t	G	X	B1			T1	A	r	C			
26	30.94	1.62	28.00	26.94	25.500	25.250	25.000	3.50	26.06	0.38	29.31	36	0.88	114.6 (52.03)
28	32.94	1.75	30.00	28.94	27.500	27.250	27.000	3.75	28.06	0.38	31.31	40	0.88	127.9 (58.07)
30	34.94	1.75	32.00	31.00	29.500	29.250	29.000	3.94	30.06	0.38	33.31	44	0.88	143.3 (65.06)
32	37.06	1.81	34.00	33.06	31.500	31.250	31.000	4.25	32.06	0.38	35.44	48	0.88	187.4 (85.08)
34	39.56	1.94	36.25	35.12	33.500	33.250	33.000	4.34	34.06	0.38	37.69	40	1.00	220.5(100.11)
36	41.62	2.06	38.25	37.19	35.500	35.250	35.000	4.62	36.06	0.38	39.75	44	1.00	253.5(115.09)
38	44.25	2.12	40.25	39.25	37.500	37.250	37.000	4.88	38.12	0.38	42.12	40	1.12	297.5(135.07)
40	46.25	2.19	42.50	41.31	39.500	39.250	39.000	5.06	40.12	0.38	44.12	44	1.12	330.7(150.14)
42	48.25	2.31	44.50	43.38	41.500	41.250	41.000	5.25	42.12	0.44	46.12	48	1.12	363.8(165.17)
44	50.25	2.38	46.50	45.38	43.500	43.250	43.000	5.38	44.12	0.44	48.12	52	1.12	440.9(200.17)
46	52.81	2.44	48.62	47.44	45.500	45.250	45.000	5.69	46.12	0.44	50.56	40	1.25	463.0(210.20)
48	54.81	2.56	50.75	49.50	47.500	47.250	47.000	5.88	48.12	0.44	52.56	44	1.25	529.1(240.21)
50	56.81	2.69	52.75	51.50	49.500	49.250	49.000	6.06	50.12	0.44	54.56	48	1.25	552.4(250.57)
52	58.81	2.75	54.75	53.56	51.500	51.250	51.000	6.19	52.12	0.44	56.56	52	1.25	585.9(265.77)
54	61.00	2.81	56.75	55.62	53.500	53.250	53.000	6.38	54.12	0.44	58.75	56	1.25	683.4(310.26)
56	63.00	2.88	58.75	57.69	55.500	55.250	55.000	6.56	56.12	0.56	60.75	60	1.25	674.8(306.08)
58	65.94	2.94	60.75	59.69	57.500	57.250	57.000	6.88	58.12	0.56	63.44	48	1.38	810.6(367.76)
60	67.94	3.00	63.00	61.81	59.500	59.250	59.000	7.06	60.12	0.56	65.44	52	1.38	903.9(410.37)

Notes.

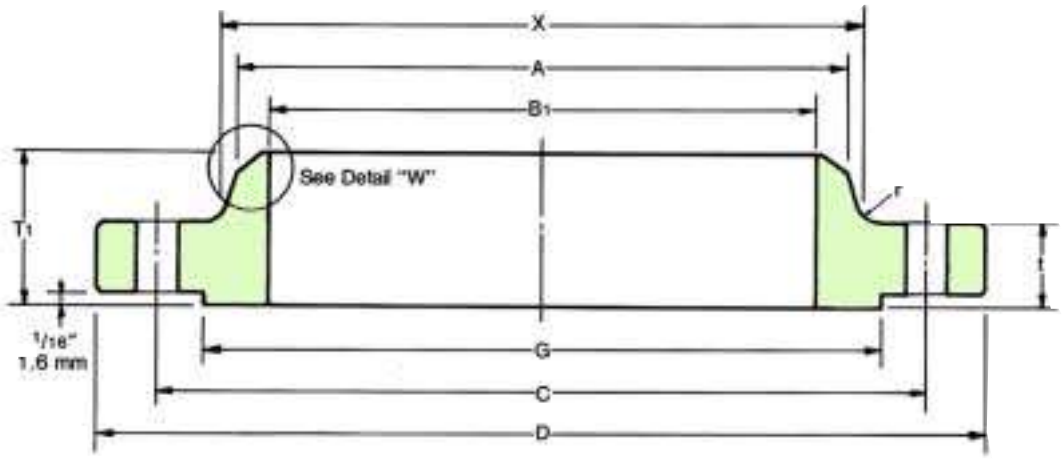
(1) "Bore" (B1) of flanges is shall be specified by the purchaser.

(2) Class 150 flanges will be furnished with 0.06" raised face, which is included in "Thickness" (t) and "Length through Hub" (T1).

CLASS 300 FLANGES



Detail "W"
Typical Welding
and Preparation



Dimensions in inches

Nominal Pipe Size	Outside Diam.	Thick-ness	O.D. of Raised Face	Diam. at Base of Hub	BORE			Length Thru Hub	Diam. of Hub at Bevel	Radius at Base of Hub	DRILLING			Approx-mate Weight Pounds (Kg)
					Wall Thickness						Bolt Circle Diam.	Number of Holes	Diam. of Holes	
					0.250"	0.375"	0.500"							
	D	t	G	X	B.			T.	A	r	C			
26	34.12	3.50	29.00	27.62	25.500	25.250	25.000	5.69	26.19	0.56	31.62	32	1.38	440.9 (200.17)
28	36.25	3.50	31.00	29.75	27.500	27.250	27.000	5.88	28.19	0.56	33.75	36	1.38	463.0 (210.20)
30	39.00	3.69	33.25	32.00	29.500	29.250	29.000	6.22	30.25	0.56	36.25	36	1.50	595.2 (270.22)
32	31.50	4.06	35.50	34.00	31.500	31.250	31.000	6.62	32.25	0.62	38.50	32	1.62	727.5 (330.29)
34	43.62	4.06	37.50	36.12	33.500	33.250	33.000	6.81	34.25	0.62	40.62	36	1.62	793.7 (360.34)
36	46.12	4.06	39.75	38.00	35.500	35.250	35.000	7.12	36.25	0.62	42.88	32	1.75	903.9 (410.37)
38	48.12	4.38	41.75	40.00	37.500	37.250	37.000	7.56	38.25	0.62	44.88	36	1.75	1256.6 (570.50)
40	50.12	4.56	43.88	42.00	39.500	39.250	39.000	7.81	40.25	0.62	46.88	40	1.75	1455.0 (660.57)
42	52.50	4.69	46.00	44.00	41.500	41.250	41.000	8.06	42.31	0.62	49.00	36	1.88	1587.3 (720.63)
44	54.50	5.00	48.00	46.19	43.500	43.250	43.000	8.44	44.31	0.62	51.00	40	1.88	1763.7 (800.72)
46	57.50	5.06	50.00	48.38	45.500	45.250	45.000	8.75	46.31	0.62	53.75	36	2.00	2138.5 (970.86)
48	59.50	5.06	52.25	50.31	47.500	47.250	47.000	8.81	48.31	0.62	55.75	40	2.00	2182.5 (990.86)
50	61.50	5.44	54.25	52.38	49.500	49.250	49.000	9.25	50.31	0.62	57.75	44	2.00	2308.2(1047.92)
52	63.50	5.62	56.25	54.44	51.500	51.250	51.000	9.56	52.31	0.62	59.75	48	2.00	2453.3(1113.79)
54	65.88	5.38	58.25	56.50	53.500	53.250	53.000	9.44	54.31	0.62	62.12	48	2.00	2557.3(1161.01)
56	69.50	6.06	60.50	58.81	55.500	55.250	55.000	10.56	56.31	0.69	65.00	36	2.38	2942.9(1336.07)
58	71.94	6.06	62.75	60.94	57.500	57.250	57.000	10.81	58.31	0.69	67.44	40	2.38	3144.5(1427.60)
60	73.94	5.94	65.00	62.94	59.500	59.250	59.000	10.69	60.31	0.69	69.44	40	2.38	3196.7(1451.30)

Notes:

(1) "Bore" (B_1) of flanges is shall be specified by the purchaser.

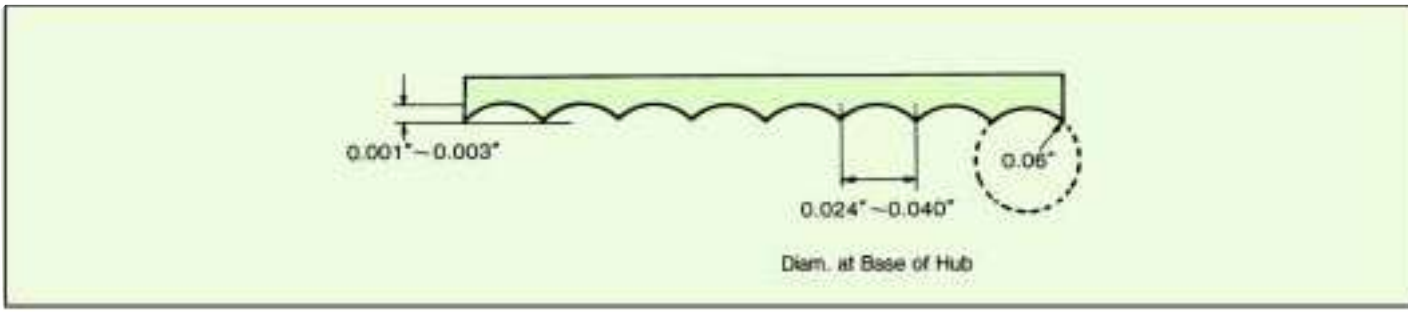
(2) Class 300 flanges will be furnished with 0.06" raised face, which is included in "Thickness" (t) and "Length through Hub" T_1.

FINISH & TOLERANCE

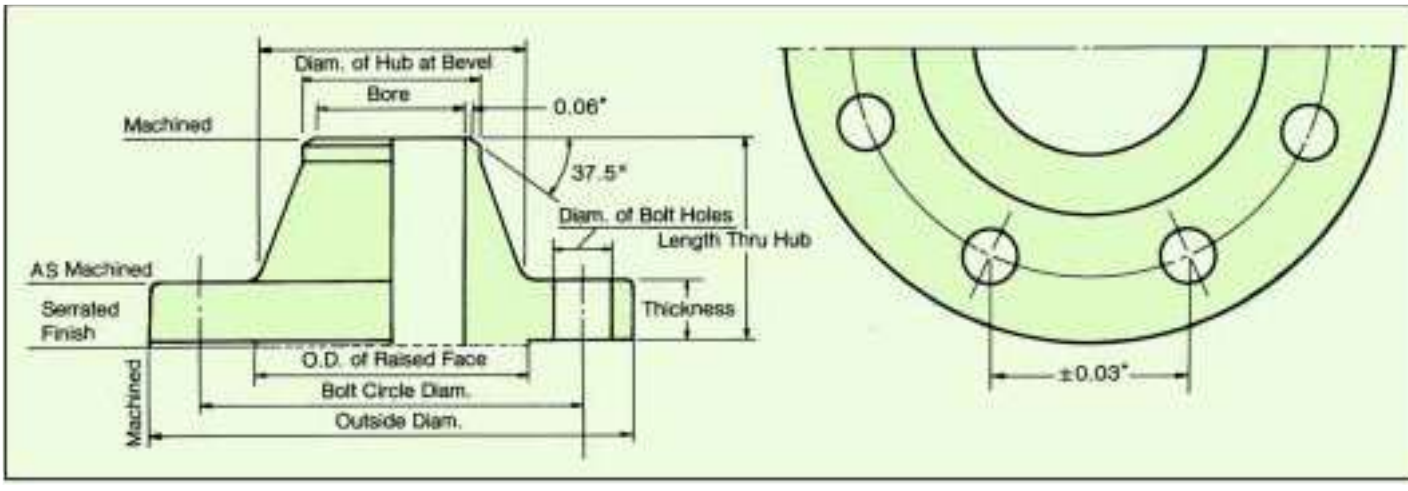
API 605 FORGED FLANGES

1. Standard Finishes for Contact Face of Flanges

The flange face shall have a serrated finish consisting of 20 to 40 grooves per inch, 0.002 in. to 0.005 in. deep, cut spirally or concentrically with a round-nose tool.



2. Dimensional Tolerances for API 605 Flanges



Dimension	Tolerance
Outside diameter of raised face	±0.03"
Flange thickness	+0.19", −0"
Length thru hub	±0.12"
Diam. of hub at bevel	+0.16", −0.03"
Bolt circle diameter	±0.06"
Center-to-center of adjacent bolt holes	±0.03"
Bore	+0.12", −0.06"
Outside diameter	±0.12"*
Diameter at base of hub	±0.12"*

Notes:

(1) Flanges shall have bearing surfaces for bolting that are parallel to the flange face within 1 degree. Any back facing or spot facing required to accomplish parallelism between the flange face and nut bearing surface on the back of the flange shall not reduce the flange thickness.

(2) Tolerances for the welding end of a welding neck flange shall be in conformance with ANSI B16.25.

(3) Other tolerances than specified the table shall be in accordance with ANSI B16.5.

(4) The flange shall be either back-faced or spot-faced at the bolt-holes on the flange back if the nut bearing surface at the back of the flange is not parallel with the flange face within the tolerances listed in Note (1), if the fillet at the nut interferes with the nut bearing surface or if the flange thickness exceeds the minimum required thickness by more than 0.19 inch (4.8 millimeters). The nut bearing surface is the spot-facing diameter at the bolt-holes as given in MSS SP-9. Spot-facing shall be in accordance with MSS SP-9.

(5) Tolerances marked * are not covered in API 605.

MATERIAL & PRESSURE RATINGS

API 6O5 FORGED FLANGES

Mechanical Properties

ASTM Specification Number	Tensile Strength	Yield Strength	Elongation	Reduction of Area	Brinell Hardness Number
	PSI	PSI	%	%	
A105	70,000 min.	36,000 min.	22 min.	30 min.	187 max.

Chemical Composition (%)

ASTM Specification Number	C	Mn	P (Max.)	S (Max.)	Si
A105	0.35 max.	0.60—1.05	0.040	0.050	0.35 max.

Pressure Temperature Rating

(1) Temperature (Degrees Fahrenheit)	(2) Pressure Rating (Pounds per Square Inch Gage)			(1) Temperature (Degrees Celsius)
	Nominal Pressure Rating			
	Class 75	Class 150	Class 300	
100	140	285	740	37.8
200	130	260	675	93.3
300	115	230	655	148.9
400	100	200	635	204.4
500	85	170	600	260.0
600	70	140	550	315.6
650	60	125	535	343.3
700		110	535	371.1
750		95	505	398.9
800		80	410	426.7
850		65	270	454.4
900		50	170	482.2
950		35	105	510.0
1000		20	50	537.8

Notes:

(1) Material temperature.

(2) Ratings are based on material specifications ASTM A105 and A216 WCB. Limitations on the use of these materials shall be per the applicable code.

MSS FLANGES

- Material Specifications
- Class 150 Flanges
- Class 300 Flanges
- Class 400 Flanges
- Class 600 Flanges
- Class 900 Flanges

MATERIAL SPECIFICATIONS

A. MATERIALS

a. The Steel used in the manufacture of these flanges shall be selected to meet the following requirements.

b. The F48 and higher grades of Class 400, 600 and 900 flanges shall be killed steel.

c. The steel used shall be suitable for field welding to other flanges, fittings, or pipe manufactured under ASTM specifications A105, A53, A106, A381, or API Standards 5L and 5LX.

d. The steel used shall have a maximum carbon content of 0.35 and a carbon equivalent computed by the following equation:

$$C_E = C + \frac{Mn}{6} + \frac{Si + Cr + Mo}{5} + \frac{Ni + Cu}{15}$$

that should not exceed 0.50%, based on check analysis. If the carbon equivalent factor exceeds 0.50 %, the acceptance of the flanges shall be based on agreement of customer.

e. The choice and used of alloying elements, combined with the elements within the limits prescribed in paragraph A. d. to give the required tensile properties prescribed in paragraph A. f. shall be made by KOFCO and included and reported in the chemical analysis to identify the type of steel.

f. The steel used shall have tensile properties conforming to the requirements prescribed in following table.

B. HEAT TREATMENT

The F42 and higher grades of flanges of all pressure classes and the class 400 and higher classes of Grade F36 flanges shall be normalized or quenched and tempered.

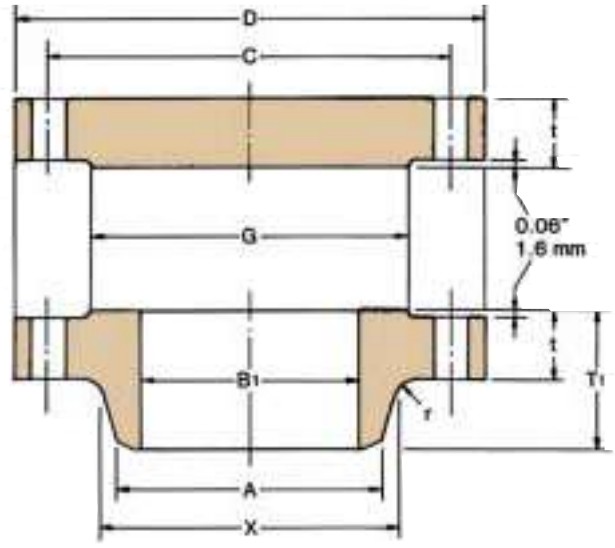
C. TEST SPECIMEN

The test specimens may be taken from the forgings or, at the manufacturers' option, from the billets or forging bar entering into the finished product, provided such test blank has undergone relatively the same forming and the equivalent heat treatment as the finished flange. The dimensions of the test blank must be such as to adequately reflect the heat treatment properties of the hub of the flange.

MSS SP44 FORGED FLANGES

Grade	Yield Point Min.		Tensile Strength Min.		Elongation in 2 in. Min. Recent
	KSI	MPa	KSI	MPa	
F36	36	248	60	414	20
F42	42	290	60	414	20
F46	46	317	60	414	20
F48	48	331	62	427	20
F50	50	345	64	441	20
F52	52	359	66	455	20
F56	56	386	68	469	20
F60	60	414	75	517	20
F65	65	448	77	531	18

CLASS 150 FLANGES



MSS SP44 FORGED FLANGES

Dimensions in inches

Nominal Pipe Size	Outside Diam.	Thickness	O.D. of Raised Face	Diam. at Base of Hub	BORE	
					Wall Thickness	
					0.375"	0.500"
	D	t	G	X	B_1	
12	19.00	1.25	15.00	14.38	12.00	11.75
14	21.00	1.38	16.25	15.75	13.25	13.00
16	23.50	1.44	18.50	18.00	15.25	15.00
18	25.00	1.56	21.00	19.88	17.25	17.00
20	27.50	1.69	23.00	22.00	19.25	19.00
22	29.50	1.81	25.25	24.00	21.25	21.00
24	32.00	1.88	27.25	26.12	23.25	23.00
26	34.25	2.69	29.50	26.62	25.25	25.00
28	36.50	2.81	31.50	28.62	27.25	27.00
30	38.75	2.94	33.75	30.75	29.25	29.00
32	41.75	3.19	36.00	32.75	31.25	31.00
34	43.75	3.25	38.00	34.75	33.25	33.00
36	46.00	3.56	40.25	36.75	35.25	35.00
38	48.75	3.44	42.25	39.00	37.25	37.00
40	50.75	3.56	44.25	41.00	39.25	39.00
42	53.00	3.81	47.00	43.00	41.25	41.00
44	55.25	4.00	49.00	45.00	43.25	43.00
46	57.25	4.06	51.00	47.12	45.25	45.00
48	59.50	4.25	53.50	49.12	47.25	47.00
50	61.75	4.38	55.50	51.25	49.25	49.00
52	64.00	4.56	57.50	53.25	51.25	51.00
54	66.25	4.75	59.50	55.25	53.25	53.00
56	68.75	4.88	62.00	57.38	55.25	55.00
58	71.00	5.06	64.00	59.38	57.25	57.00
60	73.00	5.19	66.00	61.38	59.25	59.00

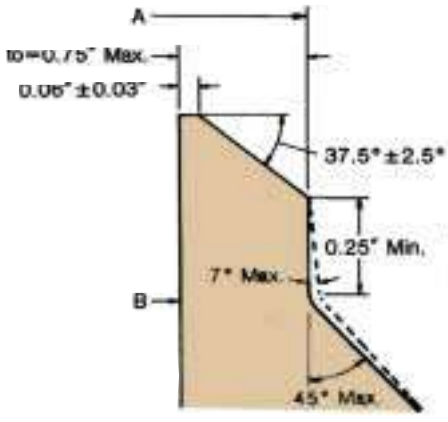
Notes:

(1) For the 'Bore' (B_1) other than wall thickness 0.375" and 0.500", refer to page 81.

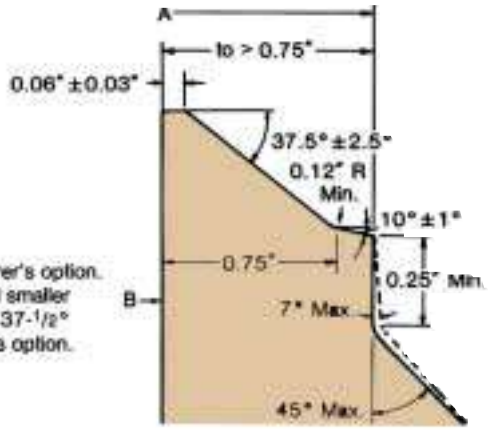
(2) Class 150 flanges will be furnished with 0.06" raised face, which is included in 'Thickness' (t) and 'Length through Hub' (T_1).

(3) Dimensional tolerance are in accordance with ANSI B16.5

WELDING-ENDS FOR WELDING-NECK FLANGES



Notes:
* Or 1 inch at manufacturer's option.
** Flanges sizes 24" and smaller may be furnished with 37-1/2° bevel at manufacturer's option.



BEVEL FOR WALL THICKNESS (to) * 0.75" IN. (20 mm) OR LESS.

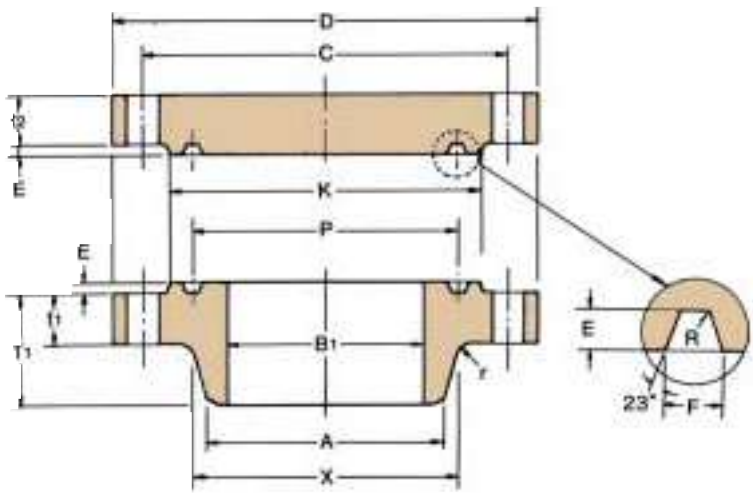
BEVER FOR WALL THICKNESS (to) GREATER THAN 0.75 IN. (20 mm)

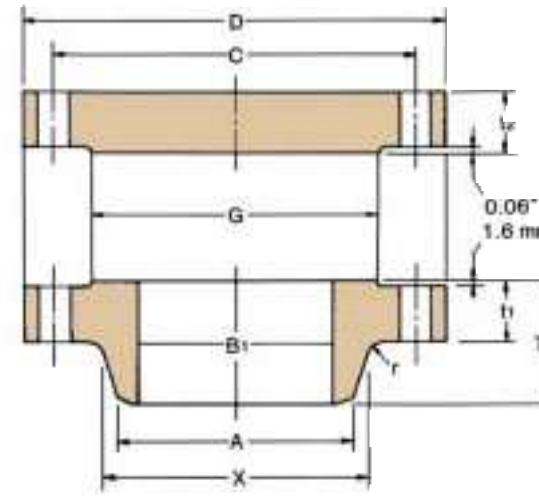
Dimensions in inches

Length thru Hub	Diam. of Hub Bevel	Radius of Fillet	DRILLING			Nominal Pipe Size
			Bolt Circle Diam.	Number of Holes	Diam. of Holes	
T,	A	r	C			
4.50	12.75	0.38	17.00	12	1.00	**12**
5.00	14.00	0.38	18.75	12	1.12	**14**
5.00	16.00	0.38	21.25	16	1.12	**16**
5.50	18.00	0.38	22.75	16	1.25	**18**
5.69	20.00	0.38	25.00	20	1.25	**20**
5.88	22.00	0.38	27.25	20	1.38	**22**
6.00	24.00	0.38	29.50	20	1.38	**24**
4.75	26.00	0.38	31.75	24	1.38	**26**
4.94	28.00	0.44	34.00	28	1.38	**28**
5.38	30.00	0.44	36.00	28	1.38	**30**
5.69	32.00	0.44	38.50	28	1.62	**32**
5.88	34.00	0.50	40.50	32	1.62	**34**
6.19	36.00	0.50	42.75	32	1.62	**36**
6.19	38.00	0.50	45.25	32	1.62	**38**
6.44	40.00	0.50	47.25	36	1.62	**40**
6.75	42.00	0.50	49.50	36	1.62	**42**
7.00	44.00	0.50	51.75	40	1.62	**44**
7.31	46.00	0.50	53.75	40	1.62	**46**
7.56	48.00	0.50	56.00	44	1.62	**48**
8.00	50.00	0.50	58.25	44	1.88	**50**
8.25	52.00	0.50	60.50	44	1.88	**52**
8.50	54.00	0.50	62.75	44	1.88	**54**
9.00	56.00	0.50	65.00	48	1.88	**56**
9.25	58.00	0.50	67.25	48	1.88	**58**
9.44	60.00	0.50	69.25	52	1.88	**60**

(4) Maximum Pressure Rating for raised face flanges is 285 psi (19.5 BARS) at atmospheric temperature.
(5) Flange dimensions of size 12" through 24" flanges (except 22") are in accordance with ANSI B16.5.

CLASS 300 FLANGES





MSS SP44 FORGED FLANGES

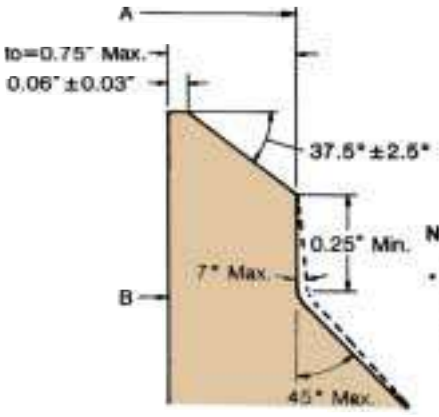
Dimensions in inches

Nominal Pipe Size	Outside Diam.	O.D. of Raised Face	Diam. at Base of Hub	Thickness		BORE		Length Thru Hub	Diam. of Hub at Bevel	Radius of Fillet
				Welding Neck	Blind	Wall Thickness 0.375"	Wall Thickness 0.500"			
	D	G	X	t_1	t_2	B_1		T_1	A	r
12	20.50	15.00	14.75	2.00	2.00	12.00	11.75	5.12	12.75	0.38
14	23.00	16.25	16.75	2.12	2.12	13.25	13.00	5.62	14.00	0.38
16	25.50	18.50	19.00	2.25	2.25	15.25	15.00	5.75	16.00	0.38
18	28.00	21.00	21.00	2.38	2.38	17.25	17.00	6.25	18.00	0.38
20	30.50	23.00	23.12	2.50	2.50	19.25	19.00	6.38	20.00	0.38
22	33.00	25.25	25.25	2.62	2.62	21.25	21.00	6.50	22.00	0.38
24	36.00	27.25	27.62	2.75	2.75	23.25	23.00	6.62	24.00	0.38
26	38.25	29.50	28.38	3.12	3.31	25.25	25.00	7.25	26.00	0.38
28	40.75	31.50	30.50	3.38	3.56	27.25	27.00	7.75	28.00	0.44
30	43.00	33.75	32.56	3.62	3.75	29.25	29.00	8.25	30.00	0.44
32	45.25	36.00	34.69	3.88	3.94	31.25	31.00	8.75	32.00	0.44
34	47.50	38.00	36.88	4.00	4.12	33.25	33.00	9.12	34.00	0.50
36	50.00	40.25	39.00	4.12	4.38	35.25	35.00	9.50	36.00	0.50
38	46.00	40.50	39.12	4.25	4.25	37.25	37.00	7.12		0.50
40	48.75	42.75	41.25	4.50	4.50	39.25	39.00	7.62		0.50
42	50.75	44.75	43.25	4.69	4.69	41.25	41.00	7.88	To be specified by purchaser.	0.50
44	53.25	47.00	45.25	4.88	4.88	43.25	43.00	8.12		0.50
46	55.75	49.00	47.38	5.06	5.06	45.25	45.00	8.50		0.50
48	57.75	51.25	49.38	5.25	5.25	47.25	47.00	8.81		0.50
50	60.25	53.50	51.38	5.50	5.50	49.25	49.00	9.12		0.50
52	62.25	55.50	53.38	5.69	5.69	51.25	51.00	9.38		0.50
54	65.25	57.75	55.50	6.00	6.00	53.25	53.00	9.94		0.50
56	67.25	59.75	57.62	6.06	6.06	55.25	55.00	10.25		0.50
58	69.25	62.00	59.62	6.25	6.25	57.25	57.00	10.50		0.50
60	71.25	64.00	61.62	6.44	6.44	59.25	59.00	10.75		0.50

Notes:

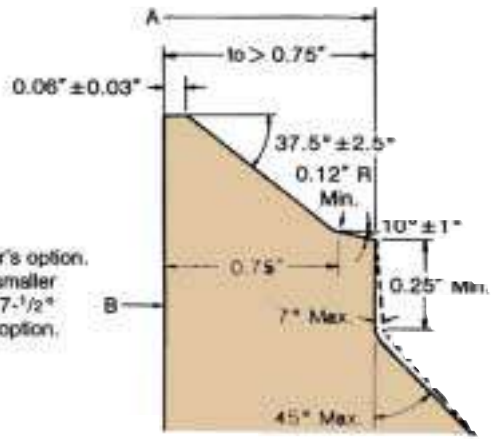
(1) For the 'Bore' (B_1) other than wall thickness 0.375" and 0.500", refer to page 61.
(2) Class 300 flanges will be furnished with 0.06" raised face, which is included in 'Thickness' (t) and 'Length through Hub' (T_1)
(3) Dimensional tolerances are in accordance with ANSI B16.5.

WELDING-ENDS FOR WELDING-NECK FLANGES



Notes:
* Or I inch at manufacturer's option.
** Flanges sizes 24" and smaller may be furnished with 37-1/2° bevel at manufacturer's option.

BEVEL FOR WALL THICKNESS (to)
* 0.75" IN. (20 mm) OR LESS.



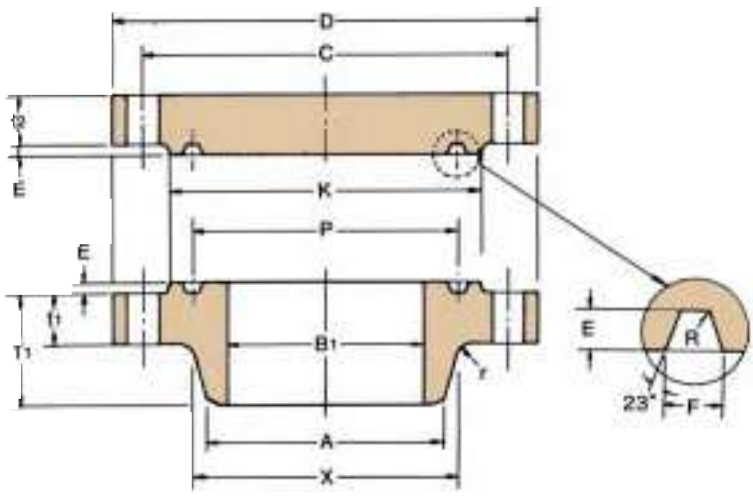
BEVEL FOR WALL THICKNESS (to)
GREATER THAN 0.75 IN. (20 mm)

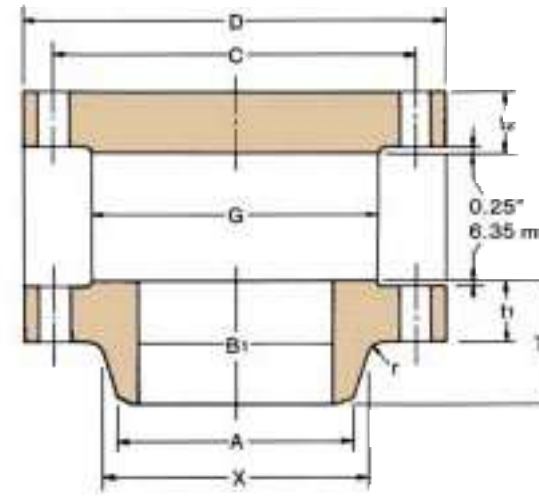
Dimensions in inches

DRILLING			Pitch Diam.	GROOVE DIMENSIONS			Diam. of Raised Face	Ring and Groove Number	Nominal Pipe Size
Bolt Circle	Number of Holes	Diam. of Holes		Width	Depth	Radius			
C			P	F	E	R	K		
17.75	16	1.25	15.000	0.469	0.312	0.03	16.25	R57	12
20.25	20	1.25	16.500	0.469	0.312	0.03	18.00	R61	14
22.50	20	1.38	18.500	0.469	0.312	0.03	20.00	R65	16
24.75	24	1.38	21.000	0.469	0.312	0.03	22.62	R69	18
27.00	24	1.38	23.000	0.531	0.375	0.06	25.00	R73	20
29.25	24	1.62	25.000	0.594	0.438	0.06	27.00	R81	22
32.00	24	1.62	27.250	0.656	0.438	0.06	29.50	R77	24
34.50	28	1.75	29.500	0.781	0.500	0.06	31.88	R93	26
37.00	28	1.75	31.500	0.781	0.500	0.06	33.88	R94	28
39.25	28	1.88	33.750	0.781	0.500	0.06	36.12	R95	30
41.50	28	2.00	36.000	0.906	0.562	0.06	38.75	R96	32
43.50	28	2.00	38.000	0.906	0.562	0.06	40.75	R97	34
46.00	32	2.12	40.250	0.906	0.562	0.06	43.00	R98	36
43.00	32	1.62							38
45.50	32	1.75							40
47.50	32	1.75							42
49.75	32	1.88							44
52.00	28	2.00							46
54.00	32	2.00							48
56.25	32	2.12							50
58.25	32	2.12							52
61.00	28	2.38							54
63.00	28	2.38							56
65.00	32	2.38							58
67.00	32	2.38							60

(4) Maximum Pressure Rating for raised face flanges is 740 psi (51 BARS) at atmospheric temperature.
(5) Flange dimensions of size 12" through 24" flanges (except 22") are in accordance with ANSI B16.5.
(6) For sizes 26" and larger, Diameter of Hub at Bevel (A) are in accordance with ASME Boiler and pressure vessel code.

CLASS 400 FLANGES





MSS SP44 FORGED FLANGES

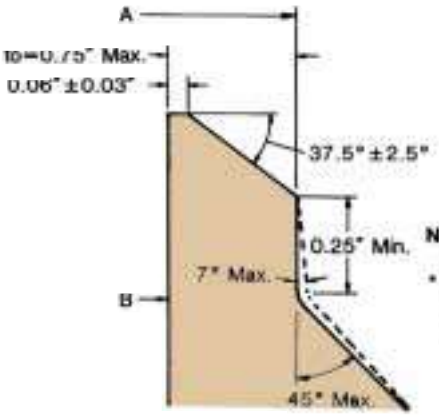
Dimensions in inches

Nominal Pipe Size	Outside Diam.	O.D. of Raised Face	Diam. at Base of Hub	Thickness		BORE		Length Thru	Diam. of Hub	Radius of Fillet
				Welding Neck	Blind	Wall Thickness 0.375"	Wall Thickness 0.500"			
	D	G	X	t_1	t_2	B_1		T_1	A	r
12	20.50	15.00	14.75	2.25	2.25	12.00	11.75	5.38	12.75	0.44
14	23.00	16.25	16.75	2.38	2.38	13.25	13.00	5.88	14.00	0.44
16	25.50	18.50	19.00	2.50	2.50	15.25	15.00	6.00	16.00	0.44
18	28.00	21.00	21.00	2.62	2.62	17.25	17.00	6.50	18.00	0.44
20	30.50	23.00	23.12	2.75	2.75	19.25	19.00	6.62	20.00	0.44
22	33.00	25.25	25.25	2.88	2.88	21.25	21.00	6.75	22.00	0.44
24	36.00	27.25	27.62	3.00	3.00	23.25	23.00	6.88	24.00	0.44
26	38.25	29.50	28.62	3.50	3.88	25.25	25.00	7.62	26.00	0.44
28	40.75	31.50	30.81	3.75	4.12	27.25	27.00	8.12	28.00	0.50
30	43.00	33.75	32.94	4.00	4.38	29.25	29.00	8.62	30.00	0.50
32	45.25	36.00	35.00	4.25	4.56	31.25	31.00	9.12	32.00	0.50
34	47.50	38.00	37.19	4.38	4.81	33.25	33.00	9.50	34.00	0.56
36	50.00	40.25	39.38	4.50	5.06	35.25	35.00	9.88	36.00	0.56
38	47.50	40.75	39.50	4.88	4.88	37.25	37.00	8.12	38.00	0.56
40	50.00	43.00	41.50	5.12	5.12	39.25	39.00	8.50	40.00	0.56
42	52.00	45.00	43.62	5.25	5.25	41.25	41.00	8.81	42.00	0.56
44	54.50	47.25	45.62	5.50	5.50	43.25	43.00	9.19	44.00	0.56
46	56.75	49.50	47.75	5.75	5.75	45.25	45.00	9.62	46.00	0.56
48	59.50	51.50	49.88	6.00	6.00	47.25	47.00	10.12	48.00	0.56
50	61.75	53.62	52.00	6.19	6.25	49.25	49.00	10.56	50.00	0.56
52	63.75	55.62	54.00	6.38	6.44	51.25	51.00	10.88	52.00	0.56
54	67.00	57.88	56.12	6.69	6.75	53.25	53.00	11.38	54.00	0.56
56	69.00	60.12	58.25	6.88	6.94	55.25	55.00	11.75	56.00	0.56
58	71.00	62.12	60.25	7.00	7.12	57.25	57.00	12.06	58.00	0.56
60	74.25	64.38	62.38	7.31	7.44	59.25	59.00	12.56	60.00	0.56

Notes:

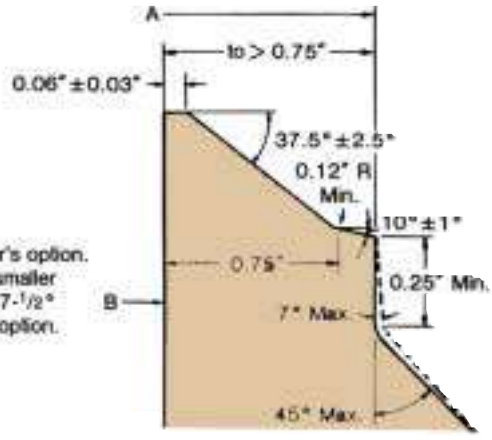
(1) For the 'Bore' (B_1) other than wall thickness 0.375" and 0.500", refer to page 61.
(2) Class 400 flanges will be furnished with 0.25" raised face, which is not included in 'Thickness' (t) and 'Length through Hub' (T_1).
(3) Dimensional tolerances are in accordance with ANSI B16.5.

WELDING-ENDS FOR WELDING-NECK FLANGES



BEVEL FOR WALL THICKNESS (to)
" 0.75" IN. (20 mm) OR LESS.

Notes:
*Or I inch at manufacturer's option.
**Flanges sizes 24" and smaller may be furnished with 37-1/2° bevel at manufacturer's option.



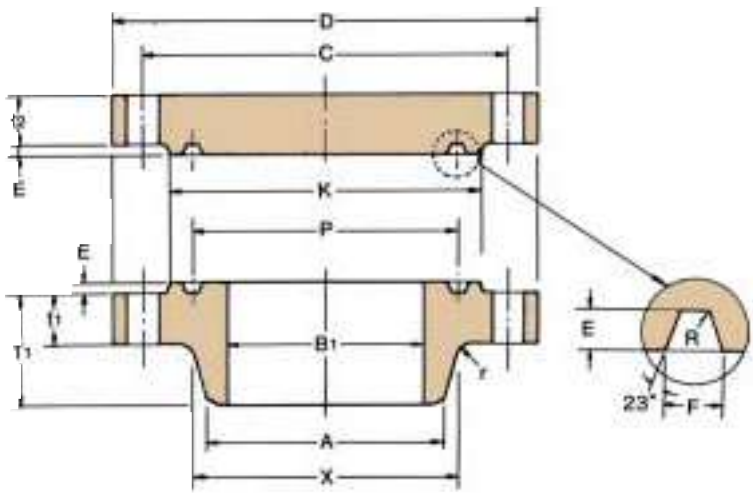
BEVEL FOR WALL THICKNESS (to)
GREATER THAN 0.75 IN. (20 mm)

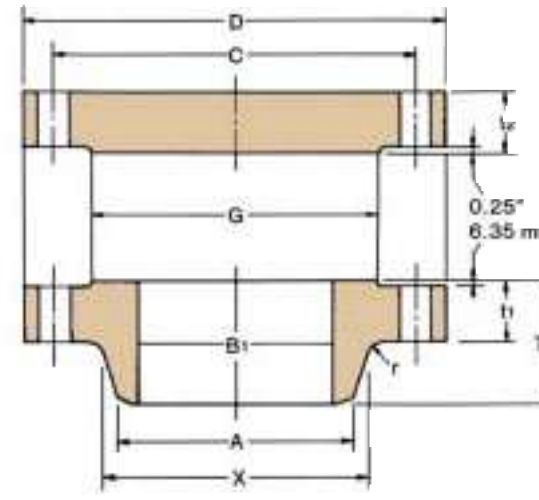
Dimensions in inches

DRILLING			Pitch Diam.	GROOVE DIMENSIONS			Diam. of Raised Face	Ring and Groove Number	Nominal Pipe Size
Bolt Circle Diam.	Number of Holes	Diam. of Holes		Width	Depth	Radius			
C			P	F	E	R	K		
17.75	16	1.38	15.000	0.469	0.312	0.03	16.25	R57	12
20.25	20	1.38	16.500	0.469	0.312	0.03	18.00	R61	14
22.50	20	1.50	18.500	0.469	0.312	0.03	20.00	R65	16
24.75	24	1.50	21.000	0.469	0.312	0.03	22.62	R69	18
27.00	24	1.62	23.000	0.531	0.375	0.06	25.00	R73	20
29.25	24	1.75	25.000	0.594	0.438	0.06	27.00	R81	22
32.00	24	1.88	27.250	0.656	0.438	0.06	29.50	R77	24
34.50	28	1.88	29.500	0.781	0.500	0.06	31.88	R93	26
37.00	28	2.00	31.500	0.781	0.500	0.06	33.88	R94	28
39.25	28	2.12	33.750	0.781	0.500	0.06	36.12	R95	30
41.50	28	2.12	36.000	0.906	0.562	0.06	38.75	R96	32
43.50	28	2.12	38.000	0.906	0.562	0.06	40.75	R97	34
46.00	32	2.12	40.250	0.906	0.562	0.06	43.00	R98	36
44.00	32	1.88							38
46.25	32	2.00							40
48.25	32	2.00							42
50.50	32	2.12							44
52.75	36	2.12							46
55.25	28	2.38							48
57.50	32	2.38							50
59.50	32	2.38							52
62.25	28	2.62							54
64.25	32	2.62							56
66.25	32	2.62							58
69.00	32	2.88							60

(4) Maximum Pressure Rating for raised face flanges is 985 psi (68 BARS) at atmospheric temperature.
(5) Flange dimensions of size 12" through 24" flanges (except 22") are in accordance with ANSI B16.5.
(6) For sizes 26" and larger, Diameter of Hub at Bevel (A) are in accordance with ASME boiler and pressure vessel code.

CLASS 600 FLANGES





MSS SP44 FORGED FLANGES

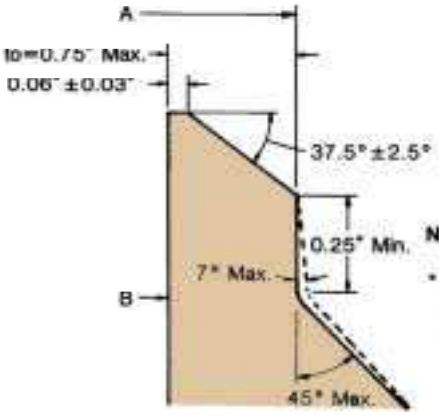
Dimensions in inches

Nominal Pipe Size	Outside Diam.	O.D. of Raised Face	Diam. at Base of Hub	Thickness		BORE		Length Thru Hub	Diam. of Hub at Bevel	Radius of Fillet
				Welding Neck	Blind	Wall Thickness 0.375"	Wall Thickness 0.500"			
	D	G	X	t_1	t_1	B_1		T_1	A	r
12	22.00	15.00	15.75	2.62	2.62	12.00	11.75	6.12	12.75	0.44
14	23.75	16.25	17.00	2.75	2.75	13.25	13.00	6.50	14.00	0.44
16	27.00	18.50	19.50	3.00	3.00	15.25	15.00	7.00	16.00	0.44
18	29.25	21.00	21.50	3.25	3.25	17.25	17.00	7.25	18.00	0.44
20	32.00	23.00	24.00	3.50	3.50	19.25	19.00	7.50	20.00	0.44
22	34.25	25.25	26.25	3.75	3.75	21.25	21.00	7.75	22.00	0.44
24	37.00	27.25	28.25	4.00	4.00	23.25	23.00	8.00	24.00	0.44
26	40.00	29.50	29.44	4.25	4.94	25.25	25.00	8.75	26.00	0.50
28	42.25	31.50	31.62	4.38	5.19	27.25	27.00	9.25	28.00	0.50
30	44.50	33.75	33.94	4.50	5.50	29.25	29.00	9.75	30.00	0.50
32	47.00	36.00	36.12	4.62	5.81	31.25	31.00	10.25	32.00	0.50
34	49.00	38.00	38.31	4.75	6.06	33.25	33.00	10.62	34.00	0.56
36	51.75	40.25	40.62	4.88	6.38	35.25	35.00	11.12	36.00	0.56
38	50.00	41.50	40.25	6.00	6.12	37.25	37.00	10.00	38.00	0.56
40	52.00	43.75	42.25	6.25	6.38	39.25	39.00	10.38	40.00	0.56
42	55.25	46.00	44.38	6.62	6.75	41.25	41.00	11.00	42.00	0.56
44	57.25	48.25	46.50	6.81	7.00	43.25	43.00	11.38	44.00	0.56
46	59.50	50.25	48.62	7.06	7.31	45.25	45.00	11.81	46.00	0.56
48	62.75	52.50	50.75	7.44	7.69	47.25	47.00	12.44	48.00	0.56
50	65.75	54.50	52.88	7.75	8.00	49.25	49.00	12.94	50.00	0.56
52	67.75	56.50	54.88	8.00	8.25	51.25	51.00	13.25	52.00	0.56
54	70.00	58.75	57.00	8.25	8.56	53.25	53.00	13.75	54.00	0.56
56	73.00	60.75	59.12	8.56	8.88	55.25	55.00	14.25	56.00	0.62
58	75.00	63.00	61.12	8.75	9.12	57.25	57.00	14.56	58.00	0.62
60	78.50	65.25	63.38	9.19	9.56	59.25	59.00	15.31	60.00	0.69

Notes:

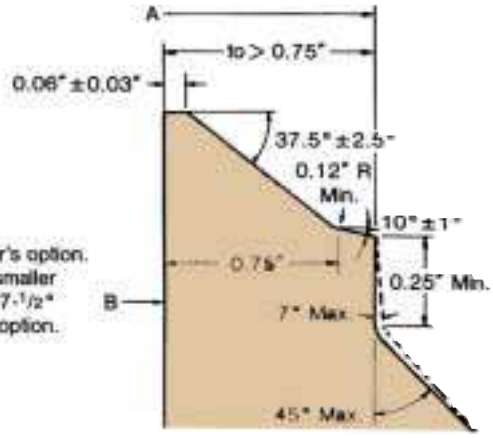
(1) For the 'Bore' (B_1) other than wall thickness 0.375" and 0.500", refer to page 61.
(2) Class 600 flanges will be furnished with 0.25" raised face, which is not included in 'Thickness' (t) and 'Length through Hub' (T_1).
(3) Dimensional tolerances are in accordance with ANSI B16.5

WELDING-ENDS FOR WELDING-NECK FLANGES



BEVEL FOR WALL THICKNESS (to)
* 0.75" IN. (20 mm) OR LESS.

Notes:
*Or 1 inch at manufacturer's option.
**Flanges sizes 24" and smaller may be furnished with 37-1/2° bevel at manufacturer's option.



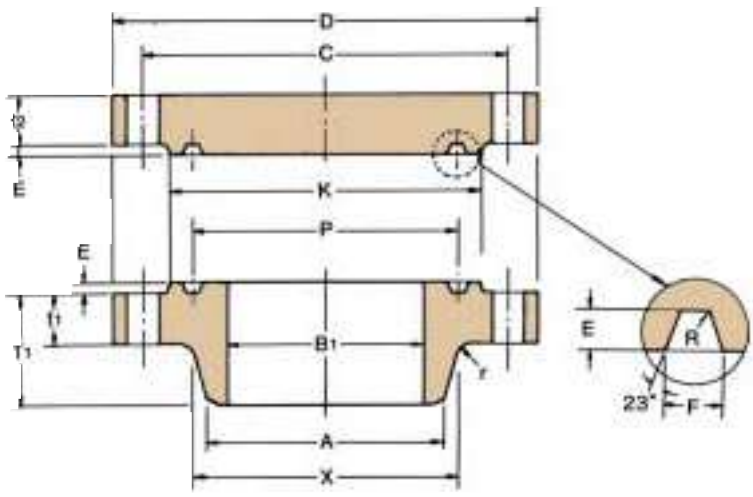
BEVEL FOR WALL THICKNESS (to)
GREATER THAN 0.75 IN. (20 mm)

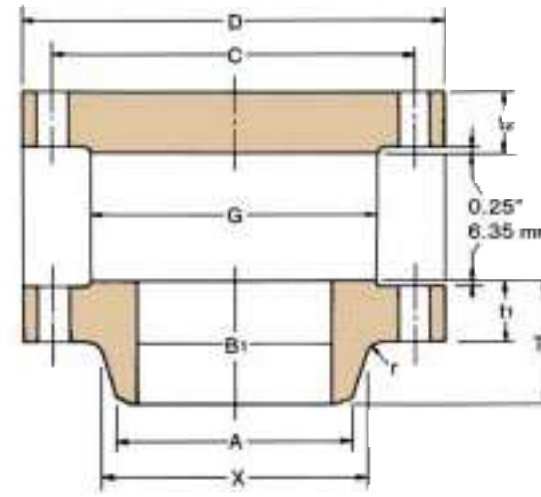
Dimensions in inches

DRILLING			Pitch Diam.	GROOVE DIMENSIONS			Diam. of Raised Face	Ring and Groove Number	Nominal Pipe Size
Bolt Circle Diam.	Number of Holes	Diam. of Holes		Width	Depth	Radius			
C			P	F	E	R	K		
19.25 20.75 23.75	20 20 20	1.38 1.50 1.62	15.000 16.500 18.500	0.469 0.469 0.469	0.312 0.312 0.312	0.03 0.03 0.03	16.25 18.00 20.00	R57 R61 R65	**12** **14** **16**
25.75 28.50 30.62	20 24 24	1.75 1.75 1.88	21.000 23.000 25.000	0.469 0.531 0.594	0.312 0.375 0.438	0.03 0.06 0.06	22.62 25.00 27.00	R69 R73 R81	**18** **20** **22**
33.00	24	2.00	27.250	0.656	0.438	0.06	29.50	R77	**24**
36.00 38.00	28 28	2.00 2.12	29.500 31.500	0.781 0.781	0.500 0.500	0.06 0.06	31.88 33.88	R93 R94	**26** **28**
40.25 42.50 44.50	28 28 28	2.12 2.38 2.38	33.750 36.000 38.000	0.781 0.906 0.906	0.500 0.562 0.562	0.06 0.06 0.06	36.12 38.75 40.75	R95 R96 R97	**30** **32** **34**
47.00 45.75 47.75	28 28 32	2.62 2.38 2.38	40.250	0.906	0.562	0.06	43.00	R98	**36** **38** **40**
50.50 52.50 54.75	28 32 32	2.62 2.62 2.62							**42** **44** **46**
57.50 60.00 62.00	32 28 32	2.88 3.12 3.12							**48** **50** **52**
64.25 66.75 68.75	32 32 32	3.12 3.38 3.38							**54** **56** **58**
71.75	28	3.62							**60**

(4) Maximum Pressure Rating for raised face flanges is 1480 psi (102.1 BARS) at atmospheric temperature.
(5) Flange dimensions of size 12" through 24" flanges (except 22") are in accordance with ANSI B16.5.
(6) For sizes 26" and larger, Diameter of Hub at Bevel (A) are in accordance with ASME Boiler and pressure vessel code.

CLASS 900 FLANGES





MSS SP44 FORGED FLANGES

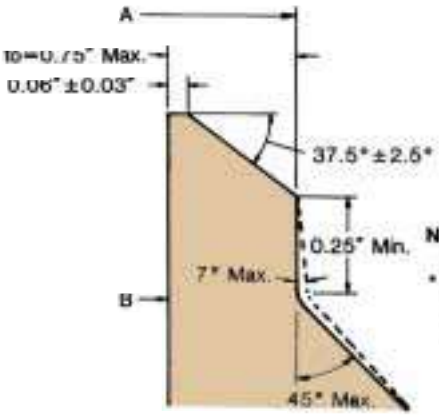
Dimensions in inches

Nominal Pipe Size	Outside Diam.	O.D. of Raised Face	Diam. at Base of Hub	Thickness		BORE		Length Thru Hub	Diam. of Hub at Bevel	Radius of Fillet
				Welding Neck	Blind	Wall Thickness				
						0.375"	0.500"			
	D	G	X	t_1	t_1	B_1		T_1	A	r
12	24.00	15.00	16.50	3.12	3.12	12.00	11.75	7.88	12.75	0.44
14	25.25	16.25	17.75	3.38	3.38	13.25	13.00	8.38	14.00	0.44
16	27.75	18.50	20.00	3.50	3.50	15.25	15.00	8.50	16.00	0.44
18	31.00	21.00	22.25	4.00	4.00	17.25	17.00	9.00	18.00	0.44
20	33.75	23.00	24.50	4.25	4.25	19.25	19.00	9.75	20.00	0.44
24	41.00	27.25	29.50	5.50	5.50	23.25	23.00	11.50	24.00	0.44
26	42.75	29.50	30.50	5.50	6.31	25.25	25.00	11.25	26.00	0.44
28	46.00	31.50	32.75	5.62	6.75	27.25	27.00	11.75	28.00	0.50
30	48.50	33.75	35.00	5.88	7.18	29.25	29.00	12.25	30.00	0.50
32	51.75	36.00	37.25	6.25	7.62	31.25	31.00	13.00	32.00	0.50
34	55.00	38.00	39.62	6.50	8.06	33.25	33.00	13.75	34.00	0.56
36	57.50	40.25	41.88	6.75	8.44	35.25	35.00	14.25	36.00	0.56
38	57.50	43.25	42.25	7.50	8.50	37.25	37.00	13.88	38.00	0.75
40	59.50	45.75	44.38	7.75	8.81	39.25	39.00	14.31	40.00	0.81
42	61.50	47.75	46.31	8.12	9.12	41.25	41.00	14.62	42.00	0.81
44	64.88	50.00	48.62	8.44	9.56	43.25	43.00	15.38	44.00	0.88
46	68.25	52.50	50.88	8.88	10.06	45.25	45.00	16.18	46.00	0.88
48	70.25	54.50	52.88	9.19	10.38	47.25	47.00	16.50	48.00	0.94

Notes.

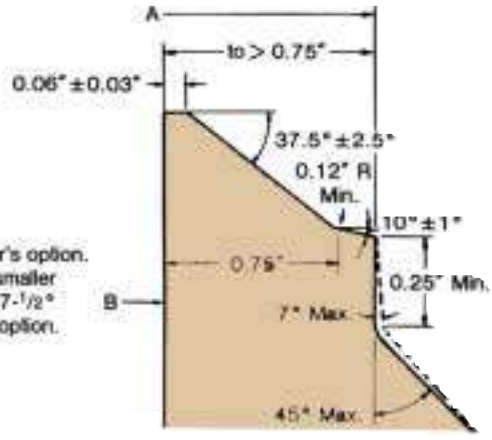
(1) For the 'Bore' (B_1) other than Wall Thickness 0.375" and 0.500", refer to page 61.
(2) Class 900 flanges will be furnished with 0.25" raised face, which is not included in 'Thickness' (t) and 'Length through Hub' (T_1).
(3) Dimensional tolerances are in accordance with ANSI B16.5.

WELDING-ENDS FOR WELDING-NECK FLANGES



BEVEL FOR WALL THICKNESS (to)
* 0.75" IN. (20 mm) OR LESS.

Notes:
*Or I inch at manufacturer's option.
**Flanges sizes 24" and smaller may be furnished with 37-1/2° bevel at manufacturer's option.



BEVEL FOR WALL THICKNESS (to)
GREATER THAN 0.75 IN. (20 mm)

Dimensions in inches

DRILLING			Pitch Diam.	GROOVE DIMENSIONS			Diam. of Raised Face	Ring and Groove. Number	Nominal Pipe Size
Bolt Circle Diam.	Number of Holes	Diam. of Holes		Width	Depth	Radius			
C			P	F	E	R	K		
21.00	20	1.50	15.000	0.469	0.312	0.03	16.50	R57	12
22.00	20	1.62	16.500	0.656	0.438	0.06	18.38	R62	14
24.25	20	1.75	18.500	0.656	0.438	0.06	20.62	R66	16
27.00	20	2.00	21.000	0.781	0.500	0.06	23.38	R70	18
29.50	20	2.12	23.000	0.781	0.500	0.06	25.50	R74	20
35.50	20	2.62	27.250	1.062	0.625	0.09	30.38	R78	24
37.50	20	2.88	29.500	1.188	0.688	0.09	32.75	R100	26
40.25	20	3.12	31.500	1.312	0.688	0.09	35.00	R101	28
42.75	20	3.12	33.750	1.312	0.688	0.09	37.25	R102	30
45.50	20	3.38	36.000	1.312	0.688	0.09	39.50	R103	32
48.25	20	3.62	38.000	1.438	0.812	0.09	42.00	R104	34
50.75	20	3.62	40.250	1.438	0.812	0.09	44.25	R105	36
50.75	20	3.62							38
52.75	24	3.62							40
54.75	24	3.62							42
57.62	24	3.88							44
60.50	24	4.12							46
62.50	24	4.12							48

(4) Maximum Pressure Rating for raised face flanges is 2220 psi (153.1 BARS) at atmospheric temperature.
(5) Flange dimensions of size 12" through 24" flanges are in accordance with ANSI B16.5.
(6) For sizes 26" and larger, Diameter of Hub at Bevel (A) are in accordance with ASME Boiler and pressure vessel code.

AWWA FLANGES

- General Specifications
- Class B & D Flanges Table 1
- Class D Flanges Table 2
- Class E Flanges Table 3

GENERAL SPECIFICATIONS
AWWA C207 FLANGES

1. Standard Finishes for Contact Face of AWWA Flange

Flanges of all classes shall be flat faced – that is, without projection or raised face. The dimensions given for thickness are minimum. The flanges shall be faced smooth or may have a serrated finish of approximately 32 serrations per inch, approximately 1/64 in. deep. Serrations may be either spiral or concentric.

2. Dimensional Tolerances for AWWA Flanges

Dimension		Tolerance in.
Bore		+ 1/16 – 0
Outside diameter		± 1/8
Thickness	18 in. and smaller	+ 1/8 – 0
	20 in. and larger	+ 3/16 – 0
Length through Hub		+ 3/16 – 1/16
Bolt Circle Diameter		± 1/16

Note: For other dimensional tolerances, see ANSI B16.5, page 57.

3. Bolting

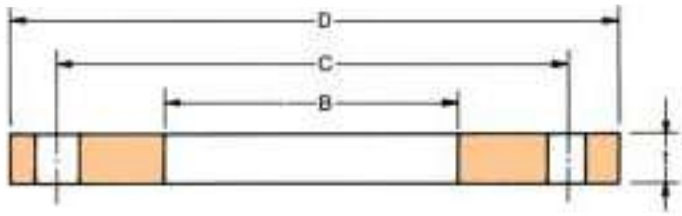
Bolts and nuts shall be carbon steel ASTM A307, Grades A or B. Bolts shall have regular unfinished square or hexagonal heads, and nuts shall have regular square or hexagonal dimensions all in accordance with ANSI B18.21 for wrench head bolts and nuts and wrench openings.
All bolts and nuts shall be threaded in accordance with ANSI B1.1 for screw threads, coarse-thread series, Class 2A and 2B fit.

4. Gaskets

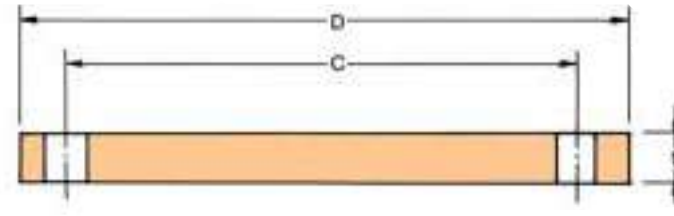
These standards are predicated on the user of either a cloth-inserted rubber gasket 1/16 in. thick or an absestos ring gasket that is either 1/16 in. or 1/8 in. thick, at the purchaser's option: The gasket shall extend from the inside diameter of the flange to at least the inside edge of the bolt holes, or it may.

CLASS B&D FLANGE
TABLE 2

AWWA Standard Steel Ring Flanges, Class B (86 psi) and Class D (175-150 psi)



SLIP-ON



BLIND

AWWA C207

Dimensions in inches

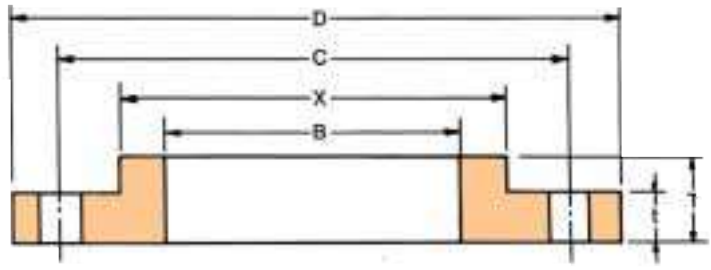
Nominal Pipe Size	Outside Diam.	Bore	Thickness		DRILLING		
					Bolt Circle Diam.	Number of Holes	Diam. of Bolt Holes
	D	B	Class B (t)	Class D (t)	C		
4	9	4.57	3/4	5/8	7 1/2	8	3/4
5	10	5.66	3/4	5/8	8 1/2	8	3/4
6	11	6.72	7/8	5/8	9 1/2	8	3/4
8	13 1/2	8.72	7/8	3/4	11 3/4	8	3/4
10	16	10.88	1	3/4	14 1/4	12	1
12	19	12.88	1	7/8	17	12	1
14	21	14.19	1	7/8	18 3/4	12	1 1/8
16	23 1/2	16.19	1	1	21 1/4	16	1 1/4
18	25	18.19	1 1/8	1 1/8	22 3/4	16	1 1/4
20	27 1/2	20.19	1 1/8	1 1/8	25	20	1 1/4
22	29 1/2	22.19	1 1/4	1 3/8	27 1/4	20	1 3/8
24	32	24.19	1 1/4	1 1/4	29 1/2	20	1 3/8
26	34 1/4	26.19	1 3/8	1 5/8	31 3/8	24	1 3/8
28	36 1/2	28.19	1 3/8	1 5/8	34	28	1 3/8
30	38 3/4	30.19	1 3/8	1 3/8	36	28	1 3/8
32	41 1/4	32.19	1 3/8	1 1/2	38 1/2	28	1 5/8
34	43 3/4	34.19	1 3/8	1 1/8	40 1/2	32	1 3/8
36	46	36.19	1	1 5/8	42 3/4	32	1 5/8
38	48 3/4	38.19	1	1 5/8	45 1/4	32	1 5/8
40	50 3/4	40.19	1	1 5/8	47 1/2	36	1 5/8
42	53	42.19	1 1/8	1 3/4	49 1/2	36	1 5/8
44	55 1/4	44.19	1 1/8	1 3/4	51 3/4	40	1 5/8
46	57 1/4	46.19	1 1/8	1 3/4	53 3/4	40	1 5/8
48	59 1/2	48.19	1 1/4	1 5/8	56	44	1 5/8
50	61 3/4	50.19	1 1/4	2	58 1/4	44	1 3/8
52	64	52.19	1 1/4	2	60 1/2	44	1 3/4
54	66 1/4	54.19	1 3/8	2 1/8	62 3/4	44	1 3/4
60	73	60.19	1 1/2	2 1/4	69 1/4	52	1 3/4
66	80	66.19	1 3/8	2 1/8	76	52	1 3/8
72	86 1/2	72.19	1 3/4	2 3/8	82 1/2	60	1 3/8
78	93	78.19	2	2 3/4	89	64	2 1/8
84	99 3/4	84.19	2	2 1/8	95 1/2	64	2 1/8
90	106 1/2	90.19	2 1/4	3	102	68	2 3/8
96	113 1/4	96.19	2 1/4	3 1/4	108 1/2	68	2 3/8
102	120	102.19	2 1/2	3 1/4	114 1/2	72	2 3/8
108	126 3/4	108.19	2 1/2	3 3/8	120 3/4	72	2 3/8
114	133 1/2	114.19	2 3/4	3 1/2	126 3/4	76	2 3/8
120	140 1/4	120.19	2 3/4	3 1/2	132 3/4	76	2 3/8

Notes:

(1) The "Bore" (B) shall be 3/16 in. larger than the nominal outside diameter of the pipe, unless otherwise specified.

CLASS B & D FLANGES
TABLE 3

AWWA Standard Steel Hub Flanges, Class B (86 psi) and Class D (175-150 psi)



SLIP-ON

AWWA C207

Dimensions in inches

Nominal Pipe Size	Outside Diam.	Bore	Thickness	Length Through Hub	Diam. of Hub at Base	DRILLING			
						Bolt Circle Diam.	Number of Holes	Diam. of Bolt Holes	
	D	B	t	T	X	C		Class B	Class D
4	9	4.57	½	¾	5⅝	7½	8	¾	¾
5	10	5.66	⅝	1¼	6⅝	8½	8	¾	⅞
6	11	6.72	⅝	1¼	7⅝	9½	8	¾	⅞
8	13½	8.72	⅝	1¼	9⅝	11¾	8	¾	⅞
10	16	10.88	⅞	1¼	12	14¼	12	¾	1
12	19	12.88	⅞	1¼	14⅜	17	12	¾	1
14	21	15.19	¾	1¼	15¾	18¾	12	⅞	1⅛
16	23½	16.19	¾	1¼	18	21¼	16	⅞	1⅛
18	25	18.19	¾	1¼	19⅞	22¾	16	⅞	1¼
20	27½	20.19	¾	1¼	22	25	20	⅞	1¼
22	29½	22.19	1	1¾	24¼	27¼	20	⅞	1⅜
24	32	24.19	1	1¾	26⅛	29½	20	⅞	1⅜
26	34¼	26.19	1	1¾	28⅛	31¾	24	⅞	1⅜
28	36½	28.19	1	1¾	30½	34	28	⅞	1⅜
30	38¾	30.19	1	1¾	32½	36	28	1	1⅜
32	41¼	32.19	1⅛	1¾	34½	38½	28	1	1⅜
34	43¾	34.19	1⅛	1¾	36¾	40½	32	1	1⅜
36	46	36.19	1⅛	1¾	38¾	42¾	32	1	1⅜
38	48¾	38.19	1⅛	1¾	40¾	45¼	32	1	1⅜
40	50¾	40.19	1⅛	1¾	43	47¼	36	1	1⅜
42	53	42.19	1¼	1⅞	45	49½	36	1⅛	1⅜
44	55¼	44.19	1¼	2¼	47	51¾	40	1⅛	1⅜
46	57¼	46.19	1¼	2¼	49	53¾	40	1⅛	1⅜
48	59½	48.19	1⅜	2½	51	56	44	1⅛	1⅜
50	61¾	50.19	1⅜	2½	53	58¼	44	1¼	1⅜
52	64	52.19	1⅜	2½	55	60½	44	1¼	1⅜
54	66¼	54.19	1⅜	2½	57	62¾	44	1⅜	1¼
60	73	60.19	1½	2¾	63	69¼	52	1⅜	1¼
66	80	66.19	1½	2¾	69	76	52	1⅜	1⅜
72	86½	72.19	1½	2¾	75	82½	60	1⅜	1⅜
78	93	78.19	1¾	3	81¼	89	64	1⅜	2¼
84	99¾	84.19	1¾	3	87½	95½	64	1⅜	2¼
90	106½	90.19	2	3¼	93¾	102	68	1⅜	2⅜
96	113¼	96.19	2	3¼	100	108½	68	1⅜	2⅜

Notes:

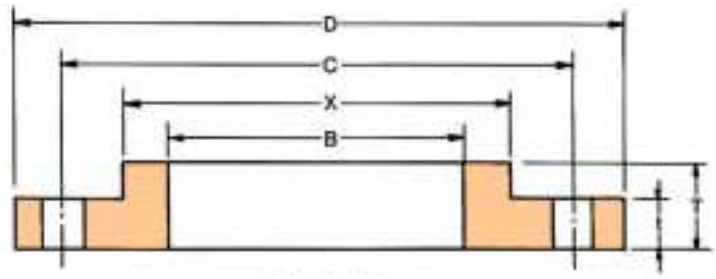
(1) For standard finishes for contact face, refer to page 54.

(2) For Slip-on Flanges, (Hub Type Flanges), the hubs can be shaped either vertical from base to top or tapered within the limits of 7 degrees.

(3) The 'Bore' (B) shall be 3/16 in. larger than the nominal outside diameter of the pipe, unless otherwise specified.

CLASS E FLANGES
TABLE 4

AWWA Standard Steel Hub Flanges, Class E (275 psi)



SLIP-ON

AWWA C207

Dimensions in inches

Nominal Pipe Size	Outside Diam.	Bore	Thickness	Length Through Hub	Diam. of Hub at Base	DRILLING		
						Bolt Circle Diam.	Number of Holes	Diam. of Bolt Holes
	D	B	t	T	X	C	-	-
4	9	4.57	15/16	1 5/16	5 5/16	7 1/2	8	3/4
5	10	5.66	15/16	1 1/4	6 1/16	8 1/2	8	3/4
6	11	6.72	1	1 5/16	7 5/16	9 1/2	8	3/4
8	13 1/2	8.72	1 1/16	1 3/4	9 5/16	11 3/4	8	3/4
10	16	10.88	1 3/16	1 5/16	12	14 1/4	12	1
12	19	12.88	1 1/4	2 3/16	14 3/16	17	12	1
14	21	15.19	1 3/8	2 1/4	15 5/16	18 3/4	12	1 1/8
16	23 1/2	16.19	1 7/16	2 1/2	18	21 1/4	16	1 1/8
18	25	18.19	1 3/8	2 5/16	19 3/4	22 3/4	16	1 1/4
20	27 1/2	20.19	1 1/2	2 3/8	22	25	20	1 1/4
22	29 1/2	22.19	1 5/8	3 1/16	24	27 1/4	20	1 3/8
24	32	24.19	1 7/8	3 1/4	26 1/8	29 1/2	20	1 3/8
26	34 1/4	26.19	2	3 3/8	28 1/2	31 3/4	24	1 3/8
28	36 1/2	28.19	2 1/16	3 7/16	30 3/4	34	28	1 3/8
30	38 3/4	30.19	2 1/8	3 1/2	32 3/4	36	28	1 3/8
32	41 1/8	32.19	2 1/4	3 5/8	35	38 1/2	28	1 5/8
34	43 1/4	34.19	2 5/16	3 5/16	37	40 1/2	32	1 5/8
36	46	36.19	2 3/8	3 3/4	39 1/4	42 3/4	32	1 5/8
38	48 1/4	38.19	2 3/8	3 3/4	41 1/4	45 1/4	32	1 5/8
40	50 1/4	40.19	2 1/2	3 7/8	43 1/4	47 1/4	36	1 5/8
42	53	42.19	2 5/8	4	46	49 1/2	36	1 5/8
44	55 1/4	44.19	2 3/8	4	48	51 3/4	40	1 5/8
46	57 1/4	46.19	2 5/8	4 1/16	50	53 3/4	40	1 5/8
48	59 1/2	48.19	2 3/4	4 1/8	52 1/4	56	44	1 5/8
50	61 3/4	50.19	2 3/4	4 1/8	54 1/2	58 1/4	44	1 7/8
52	64	52.19	2 7/8	4 1/4	56 1/2	60 1/2	44	1 7/8
54	66 1/4	54.19	3	4 3/8	58 3/4	62 3/4	44	1 7/8
60	73	60.19	3 1/8	4 1/2	65 1/4	69 1/4	52	1 7/8
66	80	66.19	3 3/8	4 5/8	71 1/2	76	52	1 7/8
72	86 1/2	72.19	3 1/2	5	78 1/2	82 1/2	60	1 7/8
78	93	78.19	3 3/8	5 3/8	84 1/2	89	64	2 1/8
84	99 1/4	84.19	3 3/4	5 3/8	90 1/2	95 1/2	64	2 1/8
90	106 1/2	90.19	4 1/4	5 3/4	96 3/4	102	68	2 3/8
96	113 1/4	96.19	4 1/4	5 3/4	102 3/4	108 1/2	68	2 3/8

Notes:

(1) The "Bore" (B) shall be 3/16 in. larger than the nominal outside diameter of the pipe, unless otherwise specified.

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KOREA FLANGE CO., LTD.

HEAD OFFICE & FACTORY Ⅰ:
194, Dongbu-Dong, Dong-ku, Ulsan, Korea
Tel: (052) 233-5511
Fax: (052) 233-5507

FACTORY Ⅱ:
887, Yeochon-Dong, Nam-Ku, Ulsan, Korea
Tel: (052) 273-5001
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Fax: (052) 232-1573

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