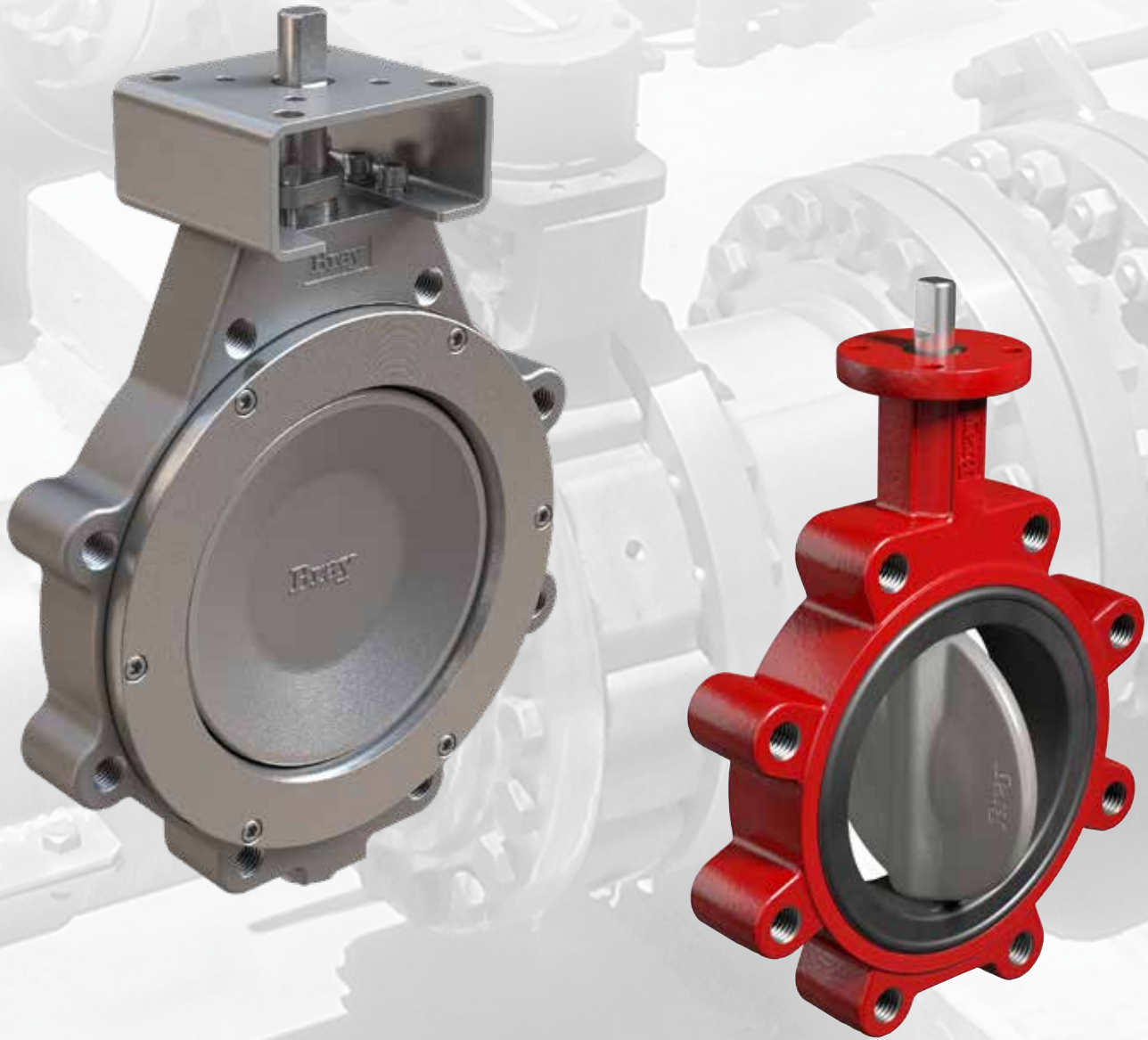


RESILIENT SEATED AND DOUBLE OFFSET VALVES
TYPICAL FLANGE BOLTING with Washers



 **Bray**[®]

BRAY.COM

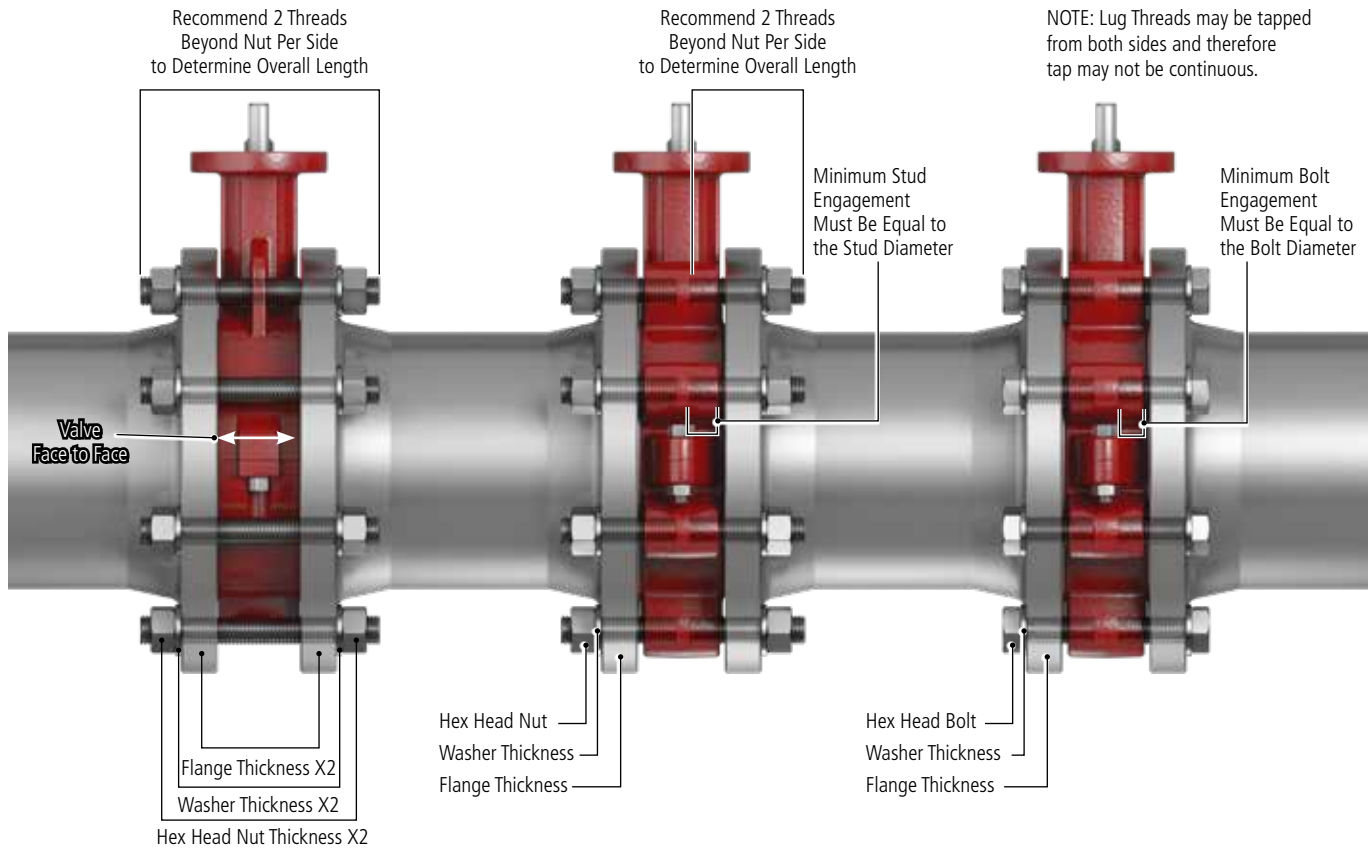
THE HIGH PERFORMANCE COMPANY

Examples of Typical Valve to Flange Bolting

When bolting the valve into the line, use standard bolting torque as recommended by applicable piping standards. Additional force from the flange bolts is not required. Minimum bolt engagement must be equal to the diameter of the bolt.

CAUTION: To ensure proper installation refer to appropriate table within this guide for specific valve drilling information.

NOTES: Double flange style bolting not shown. Lug Threads may be tapped from both sides and therefore tap may not be continuous.



Wafer Valve

Through Stud Length

Valve Face to Face	+ Flange Thickness X2	+ Washer Thickness X2	+ Nut Thickness X2	= Length of Stud
				(Plus 2 Threads for Studs)

FLANGES WITH RAISED FACES - ADD IN THE THICKNESS OF THE RAISED FACE

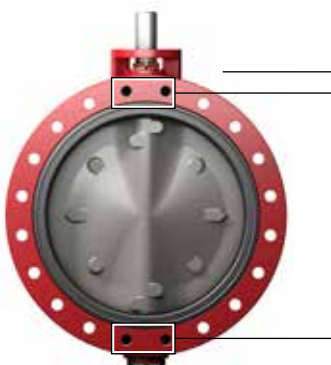
Lug Valve

Hex Head Bolt Length

Washer Thickness	+ Flange Thickness	+ Minimum Bolt Engagement Equal to the Bolt Diameter	= Length of Bolt
------------------	--------------------	--	------------------

Stud Length

Washer Thickness	+ Nut Thickness	+ Flange Thickness	+ Minimum Stud Engagement Equal to the Stud Diameter	= Length of Stud
				(Plus 2 Threads for Studs)



CAUTION: Tapped holes at neck locations DO NOT permit thru holes.

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Washer thickness as per ASME B18.22.1 Type A.

Flange thickness as per ASME B16.5 or ASME B 16.47 Class A.

Note:

Bray Controls is issuing these recommendations only as a guide to installation. This recommendation is based on the full compliance of all materials supplied to their appropriate specifications. Since many of the components are not manufactured by Bray we can take no responsibility for any damage caused during installation.

**S20/21, S22/23,
S30/31, S32/33, S35/36
Recommended Flange Torques**

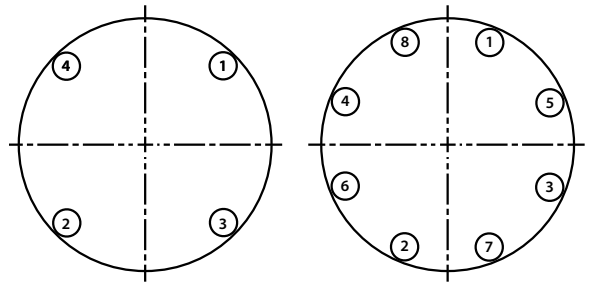
Flange Size Range		Fastener Size		Recommended Torques*	
in	mm	in	mm	lb-ft	Nm
2" - 4"	50-100	3/8	16	35	50
5" - 8"	125-200	3/4	19	45	60
10" - 12"	250-300	7/8	22	75	100
14" - 16"	350-400	1	25	110	150
18" - 20"	450-500	1 1/8	29	200	270
22" - 30"	550-750	1 1/4	32	250	340
32" - 48"	800-1200	1 1/2	38	430	585
52" - 72"	1300-1800	1 3/4	45	715	970
84"	2200	2	51	1175	1595
90" - 96"	2250-2400	2 1/4	57	1675	2270

* Assumes well lubricated fastener selected to a grade sufficiently strong for the corresponding torque rating. Torque value is a general recommendation. Specific applications may require additional torque on flange fastener. Do not exceed 110% of recommended value.

WASHER THICKNESS					
Size	in	mm	Size	in	mm
3/8	0.13	3	1 1/4	0.17	4
3/4	0.15	4	1 3/8	0.18	5
7/8	0.17	4	1 1/2	0.18	5
1	0.17	4	1 5/8	0.18	5
1 1/8	0.17	4	1 3/4	0.18	5

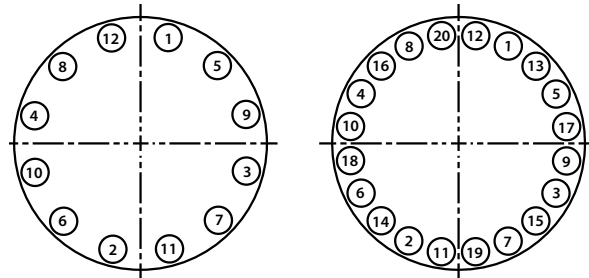
FIGURE 1

4 Bolt and 8 Bolt Flanges



- Lubricate, hand tighten, then **SNUG** up bolts
- **Round 1** - Tighten to 25% of final torque
- **Round 2** - Tighten to 50% of final torque
- **Round 3** - Tighten to 100% of final torque

12 Bolt Flanges and Above



- Lubricate, hand tighten, then **SNUG** up bolts
- **Round 1** - Tighten to 20% of final torque
- **Round 2** - Tighten to 40% of final torque
- **Round 3** - Tighten to 80% of final torque
- **Round 4** - Tighten to 100% of final torque

NOTES:

Refer to Bray Resilient BFV Technical Manual for additional flange bolt tensioning data.

For Series 4X, refer to gasket manufacturers recommended fastener torque.

Do not exceed flange manufacturers' recommended fastener torque.

Tighten in star pattern, progressively increasing fastener torque as per **Figure 1**.

SERIES 20 | WAFER



Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
1	25	1/2-13UNC	3.75	95	4
1 1/2	30	1/2-13UNC	4.25	108	4
2	50	5/8-11UNC	5.00	127	4
2 1/2	65	5/8-11UNC	5.50	140	4
3	80	5/8-11UNC	5.50	140	4
4	100	5/8-11UNC	5.75	146	8
5	125	3/4-10UNC	6.25	159	8
6	150	3/4-10UNC	6.50	165	8
8	200	3/4-10UNC	7.00	178	8
10	250	7/8-9UNC	7.50	191	12
12	300	7/8-9UNC	8.00	203	12
14	350	1-8UNC	8.75	222	12
16	400	1-8UNC	9.75	248	16
18	450	1 1/8-7UNC	10.50	267	16
20	500	1 1/8-7UNC	11.50	292	20

SERIES 21 | LUG



Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
1	25	1/2-13UNC	2.00	51	8
1 1/2	30	1/2-13UNC	2.25	57	8
2	50	5/8-11UNC	2.50	64	8
2 1/2	65	5/8-11UNC	2.75	70	8
3	80	5/8-11UNC	2.75	70	8
4	100	5/8-11UNC	2.75	70	16
5	125	3/4-10UNC	3.00	76	16
6	150	3/4-10UNC	3.00	76	16
8	200	3/4-10UNC	3.25	83	16
10	250	7/8-9UNC	3.50	89	24
12	300	7/8-9UNC	3.75	95	24
14	350	1-8UNC	4.00	102	24
16	400	1-8UNC	4.50	114	32
18	450	1 1/8-7UNC	4.75	121	32
20	500	1 1/8-7UNC	5.25	133	40

Hex Head Bolts		
in	mm	Qty
1.25	32	8
1.25	32	8
1.50	38	8
1.75	44	8
1.75	44	8
2.00	51	16
2.00	51	16
2.00	51	16
2.00	51	16
2.25	57	16
2.50	64	24
2.50	64	24
2.50	64	24
2.75	70	24
3.00	76	32
3.25	83	32
3.75	95	40

OR

Deadend Service requires half the number of bolts and nuts

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.

Washer thickness as per ASME B18.22.1 Type A.
 Flange thickness as per ASME B16.5 Class 150.



SERIES 22 | WAFER

Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	5.25	133	4
2½	65	5/8-11UNC	5.50	140	4
3	80	5/8-11UNC	5.75	146	4
4	100	5/8-11UNC	6.00	152	8
6	150	¾-10UNC	6.50	165	8
8	200	¾-10UNC	7.00	178	8
10	250	7/8-9UNC	7.75	197	12
12	300	7/8-9UNC	8.25	210	12
14	350	1-8UNC	8.75	222	12
16	400	1-8UNC	9.75	248	16
18	450	1½-7UNC	10.75	273	16
20	500	1½-7UNC	11.50	292	20
24	600	1¼-7UNC	13.25	337	12
		Blind Bolts	5.00	127	16



SERIES 23 | LUG

Valve Size		Diameter/Thread	Studs			Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty
2	50	5/8-11UNC	2.75	70	8	1.75	44	8
2½	65	5/8-11UNC	2.75	70	8	2.00	51	8
3	80	5/8-11UNC	3.00	76	8	2.00	51	8
4	100	5/8-11UNC	3.00	76	16	2.00	51	8
6	150	¾-10 UNC	3.25	83	16	2.25	57	16
8	200	¾-10UNC	3.50	89	16	2.50	64	16
10	250	7/8-9UNC	3.75	95	24	2.75	70	24
12	300	7/8-9UNC	3.75	95	24	2.75	70	24
14	350	1-8UNC	4.25	108	24	3.00	76	24
16	400	1-8UNC	4.25	108	32	3.25	83	32
18	450	1½-7UNC	5.00	127	32	3.50	89	32
20	500	1½-7UNC	5.50	140	40	4.00	102	40
24	600	1¼-7UNC	6.75	171	24	3.75	95	24
		Blind Bolts	5.00	127	16	3.50	89	16

Deadend Service requires half the number of bolts and nuts

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.

Washer thickness as per ASME B18.22.1 Type A.
 Flange thickness as per ASME B16.5 Class 150.

SERIES 30 | WAFER



Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	5.00	127	4
2½	65	5/8-11UNC	5.50	140	4
3	80	5/8-11UNC	5.50	140	4
4	100	5/8-11UNC	5.75	146	8
5	125	¾-10UNC	6.25	159	8
6	150	¾-10UNC	6.50	165	8
8	200	¾-10UNC	7.00	178	8
10	250	7/8-9UNC	7.50	191	12
12	300	7/8-9UNC	8.00	203	12
14	350	1-8UNC	8.75	222	12
16	400	1-8UNC	9.75	248	16
18	450	1½-7UNC	10.50	267	16
20	500	1½-7UNC	11.50	292	20

SERIES 31 | LUG



Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	2.75	70	8
2½	65	5/8-11UNC	2.75	70	8
3	80	5/8-11UNC	2.75	70	8
4	100	5/8-11UNC	2.75	70	16
5	125	¾-10UNC	3.00	76	16
6	150	¾-10UNC	3.00	76	16
8	200	¾-10UNC	3.25	83	16
10	250	7/8-9UNC	3.50	89	24
12	300	7/8-9UNC	3.75	95	24
14	350	1-8UNC	4.00	102	24
16	400	1-8UNC	4.50	114	32
18	450	1½-7UNC	4.75	121	32
20	500	1½-7UNC	5.25	133	32
		Blind Bolts	4.50	114	8

Hex Head Bolts		
in	mm	Qty
1.50	38	8
1.75	44	8
1.75	44	8
1.75	44	16
2.00	51	16
2.00	51	16
2.25	57	16
2.50	64	24
2.50	64	24
2.75	70	24
3.25	83	32
3.25	83	32
4.00	102	32
3.00	76	8

OR

Deadend Service requires half the number of bolts and nuts

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION
Assumptions Made in Calculations
 Lengths rounded to the nearest 1/4" for maximum thread engagement. Washer thickness as per ASME B18.22.1 Type A.
 Nut thickness as per ASME B18.2.2 Heavy Hex. Flange thickness as per ASME B16.5 Class 150.



SERIES 32/33 - 35/36 BOLTING
With Washers **Revision 8**



SERIES 32/33 | WAFER

Valve Size		Diameter/Thread	Studs			OR	Blind Studs		
in	mm		in	mm	Qty		in	mm	Qty
24	600	1¼-7UNC	13.00	330	20	N/A	N/A	N/A	
26	650	1¼-7UNC	15.25	387	20	5.50	140	8	
28	700	1¼-7UNC	15.50	394	24	5.75	146	8	
30	750	1¼-7UNC	15.75	400	24	5.75	146	8	
32	800	1½-6UNC	17.75	451	24	6.50	165	8	
36	900	1½-6UNC	19.00	483	28	7.00	178	8	

SERIES 35/36 | DOUBLE FLANGE

Valve Size		Diameter/Thread	Studs			Hex Head Bolts			AND	Blind Studs			Blind Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty		in	mm	Qty	in	mm	Qty
22	550	1¼-7UNC	6.50	165	32	5.00	127	32	4.75	121	8	3.25	83	8	
24	600	1¼-7UNC	6.50	165	32	5.00	127	32	4.75	121	8	3.50	89	8	
26	650	1¼-7UNC	7.50	191	40	6.00	152	40	5.50	140	8	4.25	108	8	
28	700	1¼-7UNC	7.50	191	48	6.00	152	48	5.75	146	8	4.25	108	8	
30	750	1¼-7UNC	7.75	197	48	6.25	159	48	5.75	146	8	4.50	114	8	
32	800	1½-6UNC	9.00	229	48	7.00	178	48	6.75	171	8	4.75	121	8	
34	850	1½-6UNC	9.00	229	56	7.00	178	56	6.75	171	8	5.00	127	8	
36	900	1½-6UNC	9.25	235	56	7.50	191	56	7.00	178	8	5.25	133	8	
40	1000	1½-6UNC	9.25	235	64	7.75	197	64	7.00	178	8	5.25	133	8	
42	1050	1½-6UNC	10.25	260	64	8.50	216	64	7.25	184	8	5.50	140	8	
44	1100	1½-6UNC	10.50	267	72	8.75	222	72	7.50	191	8	5.75	146	8	
46	1150	1½-6UNC	10.50	267	72	9.00	229	72	7.50	191	8	5.75	146	8	
48	1200	1½-6UNC	10.75	273	80	9.00	229	80	7.75	197	8	6.00	152	8	
52	1300	1¾-8UN	12.00	305	80	10.00	254	80	8.50	216	8	6.50	165	8	
54	1350	1¾-8UN	12.25	311	80	10.25	260	80	8.75	222	8	6.75	171	8	
60	1500	1¾-8UN	12.75	324	96	10.75	273	96	9.25	235	8	7.25	184	8	
66	1650	1¾-8UN	10.25	260	96	8.25	210	96	6.50	165	8	4.50	114	8	
72	1800	1¾-8UN	10.50	267	104	8.75	222	104	6.75	171	16	4.75	121	16	
78	2000	2-8UN	11.25	286	112	9.25	235	112	7.25	184	16	5.00	127	16	
84	2200	2-8UN	11.50	292	112	9.25	235	112	7.50	191	16	5.25	133	16	
90	2250	2¼-8UN	12.50	318	120	10.25	260	120	8.00	203	16	5.50	140	16	
96	2400	2¼-8UN	13.25	337	120	11.00	279	120	8.25	210	16	5.75	146	16	



Blind Bolts

CAUTION: Tapped holes at neck locations **DO NOT** permit thru holes.

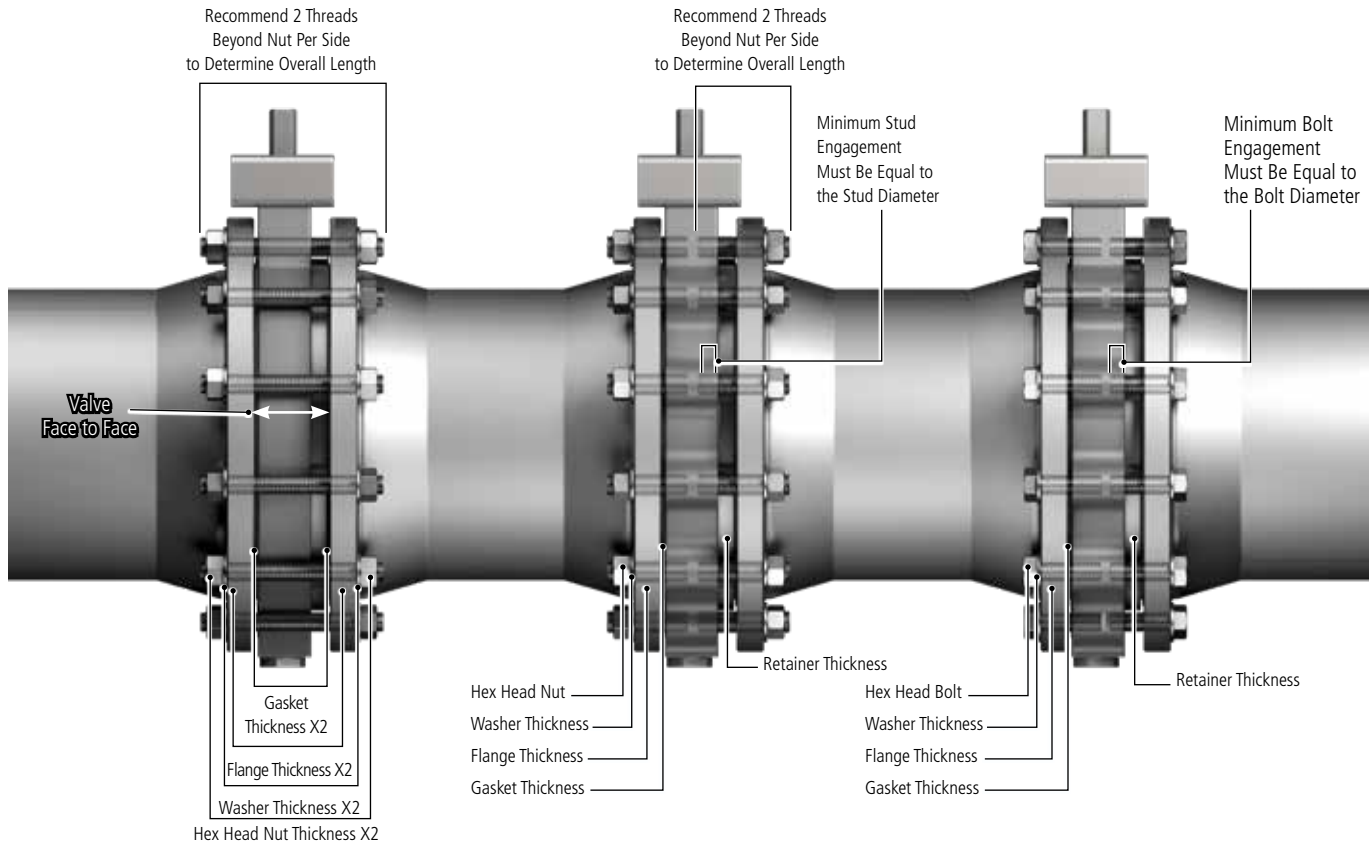
PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION
Assumptions Made in Calculations
 Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.
 Washer thickness as per ASME B18.22.1 Type A.
 Flange thickness as per ASME B16.47 Class 150 Series A, sizes 66" - 96" per AWWA C207 Class D.

Examples of Typical Valve to Flange Bolting

When bolting the valve into the line, use standard bolting torque as recommended by applicable piping standards. Additional force from the flange bolts is not required. Minimum bolt engagement must be equal to the diameter of the bolt.

CAUTION: To ensure proper installation refer to appropriate table within this guide for specific valve drilling information.

NOTES: Double flange style bolting not shown. Lug Threads may be tapped from both sides and therefore tap may not be continuous.



Wafer Valve

Through Stud Length

Valve Face to Face	+	Gasket Thickness X2	+	Flange Thickness X2	+	Washer Thickness X2	+	Nut Thickness X2	=	Length of Stud (Plus 2 Threads for Studs)
--------------------	---	---------------------	---	---------------------	---	---------------------	---	------------------	---	--

Lug Valve

Hex Head Bolt Length

Washer Thickness	+	Flange Thickness	+	Gasket Thickness	+	Minimum Bolt Engagement of One Bolt Diameter	+	Seat Retainer Ring Raised Face (Only for Retainer Ring Side)	=	Length of Bolt
------------------	---	------------------	---	------------------	---	--	---	--	---	----------------

FLANGES WITH RAISED FACES - ADD IN THE THICKNESS OF THE RAISED FACE

Nut Thickness	+	Washer Thickness	+	Flange Thickness	+	Gasket Thickness	+	Minimum Stud Engagement of One Stud Diameter	+	Seat Retainer Ring Raised Face (Only for Retainer Ring Side)	=	Length of Stud (Plus 2 Threads for Studs)
---------------	---	------------------	---	------------------	---	------------------	---	--	---	--	---	--



CAUTION: Tapped holes at neck locations **DO NOT** permit thru holes.

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

- Lengths rounded to the nearest 1/4" for maximum thread engagement.
- Nut thickness as per ASME B18.2.2 Heavy Hex.
- Washer thickness as per ASME B18.22.1 Type A.
- Flange thickness as per ASME B16.5 or ASME B16.47 Series A.
- Gasket thickness .175".
- Raised Face - .06".



**Series 40
Typical Wafer**



**Series 41
Typical Lug**

SERIES 40 CLASS 150 | WAFER

Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	5.50	140	4
2½	65	5/8-11UNC	6.00	152	4
3	80	5/8-11UNC	6.00	152	4
4	100	5/8-11UNC	6.25	159	8
5	125	¾-10UNC	6.75	171	8
6	150	¾-10UNC	7.00	178	8
8	200	¾-10UNC	7.50	191	8
10	250	7/8-9UNC	8.25	210	12
12	300	7/8-9UNC	8.50	216	12
14	350	1-8UNC	9.75	248	12
16	400	1-8UNC	10.25	260	16
18	450	1½-8UN	11.25	286	16
20	500	1½-8UN	12.00	305	16
24	600	1¼-8UN	13.25	337	20
26	650	1¼-8UN	15.75	400	20
28	700	1¼-8UN	15.75	400	24
30	750	1¼-8UN	17.00	432	24
32	800	1¼-8UN	18.25	464	24
36	900	1½-8UN	19.75	502	28
42	1050	1½-8UN	21.50	546	32
48	1200	1½-8UN	22.75	578	40
54	1350	1¾-8UN	25.00	635	40

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.50	140	4	4.50	114	4
N/A	N/A	N/A	N/A	N/A	N/A
6.75	171	4	6.00	152	4
6.75	171	4	6.00	152	4
7.50	191	4	6.00	152	4
7.75	197	4	7.00	178	4
8.25	210	4	7.25	184	4
8.00	203	4	7.50	191	4
8.25	210	4	7.75	197	4
10.00	254	4	8.75	222	4

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex

Washer thickness as per ASME B18.22.1 Type A

Flange thickness as per ASME B16.5 Class 150 or ASME B16.47 Class 150 Series A.

Gasket thickness .175"

Raised Face - .06"

SERIES 41 CLASS 150 | LUG - STUD LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Studs			Back Side Studs		
in	mm		in	mm	Qty	in	mm	Qty
2½	65	¾-11UNC	3.00	76	4	2.75	70	4
3	80	¾-11UNC	3.00	76	4	2.75	70	4
4	100	¾-11UNC	3.25	83	8	2.75	70	8
5	125	¾-10UNC	3.25	83	8	2.75	70	8
6	150	¾-10UNC	3.50	89	8	3.25	83	8
8	200	¾-10UNC	3.75	95	8	3.25	83	8
10	250	¾-9UNC	4.00	102	12	3.75	95	12
12	300	¾-9UNC	4.25	108	12	4.00	102	12
14	350	1-8UNC	5.00	127	12	4.25	108	12
16	400	1-8UNC	5.00	127	16	4.75	121	16
18	450	1½-8UN	5.50	140	16	5.25	133	16
20	500	1½-8UN	5.50	140	16	5.50	140	16
24	600	1¼-8UN	6.50	165	20	6.25	159	20
28	700	1¼-8UN	7.00	178	24	7.25	184	24
30	750	1¼-8UN	7.50	191	24	7.25	184	24
32	800	1½-8UN	8.00	203	24	8.00	203	24
36	900	1½-8UN	8.25	210	28	8.25	210	28
40	1000	1½-8UN	8.00	203	32	8.75	222	32
42	1050	1½-8UN	8.25	210	32	9.25	235	32
48	1200	1½-8UN	8.50	216	40	9.75	248	40
54	1350	1¾-8UN	9.50	241	40	10.75	273	40
60	1500	1¾-8UN	10.25	260	42	9.25	235	42

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.50	140	4	4.50	114	4
N/A	N/A	N/A	N/A	N/A	N/A
7.00	178	4	6.00	152	4
7.50	191	4	6.25	159	4
8.00	203	4	7.00	178	4
8.25	210	4	7.25	184	4
8.00	203	4	7.25	184	4
8.25	210	4	7.50	191	4
8.50	216	4	8.00	203	4
9.50	241	4	8.50	216	4
10.25	260	10	9.25	235	10

SERIES 41 CLASS 150 | LUG - BOLT LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Hex Head Bolts			Back Side Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty
2½	65	¾-11UNC	2.25	57	4	1.75	44	4
3	80	¾-11UNC	2.25	57	4	2.00	51	4
4	100	¾-11UNC	2.25	57	8	2.00	51	8
5	125	¾-10UNC	2.25	57	8	2.25	57	8
6	150	¾-10UNC	2.50	64	8	2.00	51	8
8	200	¾-10UNC	2.50	64	8	2.50	64	8
10	250	¾-9UNC	2.75	70	12	2.75	70	12
12	300	¾-9UNC	3.00	76	12	3.00	76	12
14	350	1-8UNC	3.75	95	12	3.25	83	12
16	400	1-8UNC	3.75	95	16	3.25	83	16
18	450	1½-8UN	4.25	108	16	4.00	102	16
20	500	1½-8UN	4.25	108	16	4.25	108	16
24	600	1¼-8UN	5.00	127	20	4.75	121	20
28	700	1¼-8UN	5.50	140	24	5.75	146	24
30	750	1¼-8UN	6.00	152	24	5.75	146	24
32	800	1½-8UN	6.25	159	24	6.50	165	24
36	900	1½-8UN	6.75	171	28	6.75	171	28
40	1000	1½-8UN	6.50	165	32	7.25	184	32
42	1050	1½-8UN	6.50	165	32	7.50	191	32
48	1200	1½-8UN	6.75	171	40	8.00	203	40
54	1350	1¾-8UN	7.75	197	40	8.75	222	40
60	1500	1¾-8UN	8.50	216	42	7.50	191	42

AND

Retainer Blind Hex Head Bolts			Back Blind Hex Head Bolts		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
4.25	108	4	3.50	89	4
N/A	N/A	N/A	N/A	N/A	N/A
5.25	133	4	4.50	114	4
5.75	146	4	4.50	114	4
6.00	152	4	4.75	121	4
6.25	159	4	5.25	133	4
6.00	152	4	5.25	133	4
6.25	159	4	5.75	146	4
6.50	165	4	6.25	159	4
7.25	184	4	6.50	165	4
8.25	210	10	7.00	178	10



**Series 42
Typical Wafer**



**Series 43
Typical Lug**

SERIES 42 CLASS 300 | WAFER

Valve Size		Diameter/Thread Bore	Studs		
in	mm		in	mm	Qty
2½	65	¾-10UNC	6.25	159	8
3	80	¾-10UNC	6.50	165	8
4	100	¾-10UNC	7.00	178	8
5	125	¾-10UNC	7.50	191	8
6	150	¾-10UNC	7.75	197	12
8	200	¾-9UNC	8.75	222	12
10	250	1-8UNC	10.00	254	16
12	300	1½-8UN	10.75	273	16
14	350	1½-8UN	12.25	311	16
16	400	1¼-8UN	13.50	343	16
18	450	1¼-8UN	14.25	362	20
20	500	1¼-8UN	15.00	381	20
24	600	1½-8UN	16.75	425	20
30	750	1¾-8UN	21.00	533	24
36	900	2-8UN	24.25	616	28

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.50	140	4	5.00	127	4
5.75	146	4	5.50	140	4
6.25	159	4	5.50	140	4
6.25	159	4	5.75	146	4
7.00	178	4	6.50	165	4
8.25	210	4	7.75	197	4
9.25	235	4	9.00	229	4

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations
 Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.
 Washer thickness as per ASME B18.22.1 Type A.

Flange thickness as per ASME B16.5 Class 300 or ASME B16.47 Class 300 Series A.
 Gasket thickness .175".
 Raised Face - .06".

SERIES 43 CLASS 300 | LUG - STUD LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Studs			Back Side Studs		
in	mm		in	mm	Qty	in	mm	Qty
2½	65	¾-10UNC	3.25	83	8	3.00	76	8
3	80	¾-10UNC	3.25	83	8	3.00	76	8
4	100	¾-10UNC	3.25	83	8	3.25	83	8
5	125	¾-10UNC	3.75	95	8	3.25	83	8
6	150	¾-10UNC	3.75	95	12	3.50	89	12
8	200	7/8-9UNC	4.25	108	12	4.00	102	12
10	250	1-8UNC	5.00	127	16	4.25	108	16
12	300	1½-8UN	5.50	140	16	4.75	121	16
14	350	1½-8UN	5.25	133	16	5.75	146	16
16	400	1½-8UN	5.75	146	16	6.50	165	16
18	450	1½-8UN	6.00	152	20	6.00	152	20
20	500	1½-8UN	6.00	152	20	6.25	159	20
24	600	1½-8UN	6.50	165	20	7.00	178	20
30	750	1¾-8UN	8.00	203	24	9.25	235	24
36	900	2-8UN	8.75	222	28	10.50	267	28
40	1000	1¾-8UN	9.00	229	28	9.75	248	28
42	1050	1¾-8UN	9.75	248	28	8.50	216	28
44	1100	1¾-8UN	9.00	229	28	8.75	222	28
48	1200	1¾-8UN	11.50	292	28	10.00	254	28
54	1350	2¼-8UN	12.50	318	24	11.50	292	24

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.25	133	4	5.00	127	4
5.75	146	4	5.25	133	4
6.00	152	4	5.50	140	4
6.00	152	4	5.50	140	4
6.50	165	4	6.25	159	4
8.00	203	4	7.75	197	4
8.75	222	4	8.75	222	4
9.00	229	4	7.75	197	4
9.75	248	4	8.00	203	4
9.00	229	4	8.75	222	4
11.50	292	4	9.50	241	4
12.50	318	4	11.00	279	4

SERIES 43 CLASS 300 | LUG - BOLT LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Hex Head Bolts			Back Side Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty
2½	65	¾-10UNC	2.25	57	8	2.00	51	8
3	80	¾-10UNC	2.25	57	8	2.25	57	8
4	100	¾-10UNC	2.50	64	8	2.25	57	8
5	125	¾-10UNC	2.75	70	8	2.50	64	8
6	150	¾-10UNC	3.00	76	12	2.75	70	12
8	200	7/8-9UNC	3.25	83	12	3.00	76	12
10	250	1-8UNC	4.00	102	16	3.25	83	16
12	300	1½-8UN	4.25	108	16	3.50	89	16
14	350	1½-8UN	4.25	108	16	4.75	121	16
16	400	1½-8UN	4.50	114	16	5.25	133	16
18	450	1½-8UN	4.75	121	20	5.00	127	20
20	500	1½-8UN	4.75	121	20	5.00	127	20
24	600	1½-8UN	5.25	133	20	5.50	140	20
30	750	1¾-8UN	6.25	159	24	7.50	191	24
36	900	2-8UN	7.00	178	28	8.50	216	28
40	1000	1¾-8UN	8.00	203	28	8.75	222	28
42	1050	1¾-8UN	8.75	222	28	7.50	191	28
44	1100	1¾-8UN	7.25	184	28	7.00	178	28
48	1200	1¾-8UN	9.50	241	28	8.00	203	28
54	1350	2¼-8UN	10.25	260	24	9.25	235	24

AND

Retainer Blind Hex Head Bolts			Back Blind Hex Head Bolts		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
4.00	102	4	3.50	89	4
4.00	102	4	3.75	95	4
4.50	114	4	3.75	95	4
4.50	114	4	4.00	102	4
4.75	121	4	4.50	114	4
5.75	146	4	5.50	140	4
6.75	171	4	6.50	165	4
8.00	203	4	6.75	171	4
8.50	216	4	6.75	171	4
7.00	178	4	7.00	178	4
9.25	235	4	7.25	184	4
9.75	248	4	8.50	216	4

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION
Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.
 Washer thickness as per ASME B18.22.1 Type A.

Flange thickness as per ASME B16.5 Class 300 or ASME B16.47 Class 300 Series A.
 Gasket thickness .175".
 Raised Face - .06".



**Series 44
Typical Wafer**

SERIES 44 CLASS 600 | WAFER

Valve Size		Diameter/Thread	Studs			Retainer Blind Studs			Back Blind Studs		
in	mm		in	mm	Qty	in	mm	Qty	in	mm	Qty
3	80	¾-10UNC	7.25	184	8	N/A	N/A	N/A	N/A	N/A	N/A
4	100	¾-9UNC	8.50	216	8	N/A	N/A	N/A	N/A	N/A	N/A
6	150	1-8UNC	10.25	260	12	N/A	N/A	N/A	N/A	N/A	N/A
8	200	1½-8UN	12.00	305	12	N/A	N/A	N/A	N/A	N/A	N/A
10	250	1¼-8UN	13.50	343	12	6.25	159	4	5.75	146	4
12	300	1¼-8UN	14.50	368	16	6.25	159	4	5.75	146	4
14	350	1½-8UN	15.50	394	16	6.50	165	4	6.00	152	4
16	400	1½-8UN	17.25	438	16	6.75	171	4	6.50	165	4
18	450	1½-8UN	18.75	476	16	7.50	191	4	7.00	178	4
20	500	1¾-8UN	20.00	508	20	8.00	203	4	7.25	184	4
24	600	1¾-8UN	22.25	565	20	8.75	222	4	8.50	216	4

AND

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.
 Washer thickness as per ASME B18.22.1 Type A.

Flange thickness as per ASME B16.5 Class 600 or ASME B16.47 Class 600 Series A.
 Gasket thickness .175".
 Raised Face - .06" Raised Face - Assumption of .06".



**Series 45
Typical Lug**

SERIES 45 CLASS 600 | LUG - STUD LENGTH

Valve Size		Diameter/Thread	Retainer Studs			Studs Back		
in	mm		in	mm	Qty	in	mm	Qty
3	80	¾-10UNC	4.00	102	8	3.50	89	8
4	100	7⁄8-9UNC	4.50	114	8	4.00	102	8
6	150	1-8UNC	5.00	127	12	4.50	114	12
8	200	1¼-8UN	5.75	146	12	5.25	133	12
10	250	1½-8UN	6.25	159	12	5.75	146	12
12	300	1¾-8UN	6.25	159	16	5.75	146	16
14	350	1⅝-8UN	6.50	165	16	6.25	159	16
16	400	1½-8UN	7.00	178	16	6.75	171	16
18	450	1⅝-8UN	7.75	197	16	7.25	184	16
20	500	1⅝-8UN	8.25	210	20	7.50	191	20
24	600	1⅝-8UN	8.75	222	20	8.50	216	20

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
6.25	159	4	5.50	140	4
6.25	159	4	5.75	146	4
6.50	165	4	6.25	159	4
6.75	171	4	6.50	165	4
7.75	197	4	7.25	184	4
8.25	210	4	7.50	191	4
8.50	216	4	8.25	210	4

AND

SERIES 45 CLASS 600 | LUG - BOLT LENGTH

Valve Size		Diameter/Thread	Retainer Hex Head Bolts			Back Side Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty
3	80	¾-10UNC	2.75	70	8	2.50	64	8
4	100	7⁄8-9UNC	3.25	83	8	2.75	70	8
6	150	1-8UNC	3.75	95	12	3.25	83	12
8	200	1¼-8UN	4.25	108	12	3.75	95	12
10	250	1½-8UN	4.75	121	12	4.00	102	12
12	300	1¾-8UN	4.75	121	16	4.25	108	16
14	350	1⅝-8UN	5.00	127	16	4.50	114	16
16	400	1½-8UN	5.00	127	16	5.00	127	16
18	450	1⅝-8UN	5.75	146	16	5.25	133	16
20	500	1⅝-8UN	6.25	159	20	5.50	140	20
24	600	1⅝-8UN	6.50	165	20	6.50	165	20

Retainer Blind Hex Head Bolts			Back Blind Hex Head Bolts		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
4.50	114	4	4.00	102	4
4.50	114	4	4.00	102	4
4.75	121	4	4.50	114	4
5.00	127	4	4.75	121	4
5.50	140	4	5.00	127	4
6.25	159	4	5.25	133	4
6.50	165	4	6.00	152	4

AND



SERIES 4A CLASS 150 | DOUBLE FLANGE

Valve Size		Diameter/Thread	Retainer Hex Head Bolts			Back Side Hex Head Bolts			Retainer Blind Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty	in	mm	Qty
3	80	5/8-11UNC	3.50	89	4	3.25	83	4	N/A	N/A	N/A
4	100	5/8-11UNC	3.75	95	6	3.25	83	8	2.25	57	2
5	125	3/4-10UNC	3.75	95	6	3.25	83	8	2.50	64	2
6	150	3/4-10UNC	4.00	102	6	3.50	89	8	2.50	64	2
8	200	3/4-10UNC	4.25	108	6	3.75	95	8	2.50	64	2
10	250	7/8-9UNC	4.50	114	10	4.00	102	12	2.75	70	2
12	300	7/8-9UNC	5.00	127	8	4.25	108	12	2.75	70	4
14	350	1-8UNC	5.25	133	8	4.50	114	12	3.25	83	4
16	400	1-8UNC	5.50	140	12	4.75	121	16	3.25	83	4
18	450	1 1/8-8UN	5.75	146	12	5.00	127	16	3.50	89	4
20	500	1 1/8-8UN	6.00	152	16	5.25	133	20	3.50	89	4
24	600	1 1/4-8UN	6.75	172	16	5.75	146	20	4.00	102	4
30	750	1 1/4-8UN	9.50	241	24	8.00	203	28	5.25	133	4

AND



SERIES 4B CLASS 300 | DOUBLE FLANGE

Valve Size		Diameter/Thread	Retainer Hex Head Bolts			Back Side Hex Head Bolts			Blind Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty	in	mm	Qty
3	80	3/4-10UNC	2.25	57	8	3.75	95	8	N/A	N/A	N/A
4	100	3/4-10UNC	2.50	64	8	4.00	102	8	N/A	N/A	N/A
5	125	3/4-10UNC	2.50	64	8	4.25	108	8	N/A	N/A	N/A
6	150	3/4-10UNC	2.75	70	12	4.25	108	12	N/A	N/A	N/A
8	200	7/8-9UNC	3.00	76	12	4.75	121	12	N/A	N/A	N/A
10	250	1-8UNC	3.50	89	12	5.50	140	12	3.50	89	8
12	300	1 1/8-8UN	3.75	95	12	6.00	152	12	3.75	95	8
14	350	1 1/8-8UN	3.75	95	16	6.00	152	16	3.75	95	8
16	400	1 1/4-8UN	4.00	102	16	6.50	165	16	4.00	102	8
18	450	1 1/4-8UN	4.25	108	20	6.75	171	20	4.25	108	8
20	500	1 1/4-8UN	4.25	108	20	7.00	178	20	4.25	108	8
24	600	1 1/2-8UN	4.75	121	20	7.75	197	20	4.75	121	8
30	750	1 3/4-8UN	6.00	152	24	9.75	248	24	6.00	152	8
36	900	2-8UN	6.75	171	28	11.00	279	28	6.75	171	8

AND

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.
 Nut thickness as per ASME B18.2.2 Heavy Hex.
 Washer thickness as per ASME B18.22.1 Type A.

Flange thickness as per ASME B16.5 or ASME B16.47 Series A.
 Gasket thickness .175".
 Raised Face - .06".

SINCE 1986, BRAY HAS PROVIDED FLOW CONTROL SOLUTIONS FOR A VARIETY OF INDUSTRIES AROUND THE WORLD.

VISIT **BRAY.COM** TO LEARN MORE ABOUT BRAY PRODUCTS AND LOCATIONS NEAR YOU.

HEADQUARTERS

Bray International, Inc.

13333 Westland East Blvd.

Houston, Texas 77041

Tel: +1.281.894.5454

All statements, technical information, and recommendations in this bulletin are for general use only. Consult Bray representatives or factory for the specific requirements and material selection for your intended application. The right to change or modify product design or product without prior notice is reserved. Patents issued and applied for worldwide. Bray® is a registered trademark of Bray International, Inc.

© 2023 BRAY INTERNATIONAL, INC. ALL RIGHTS RESERVED. BRAY.COM

Bolting wWashers Rev 8_06-20-2023a



THE HIGH PERFORMANCE COMPANY

BRAY.COM