

PROCEDURES

FLANGED JOINTS IN STEEL PIPE

9.0 PURPOSE

This section presents the procedure for fabricating gas-tight flanged joints.

Each new facility installation in which a flanged joint is to be incorporated shall comply with engineering specifications detailing the proper design and fabrication of the flanged connections being assembled.

When assembling flanged connections to which no engineering specifications are available, the following procedure shall be utilized.

9.1 GENERAL

- A. Flanges shall be used to facilitate installation and removal of pipe, fittings or equipment in facilities in **above ground** installations & **shall not** be buried.
- B. Raised face weld neck and blind flanges will be used for natural gas piping. Threaded flanges may be used on meter sets only.
- C. The ends of stud bolts shall extend completely through the nuts with at least one thread on the bolt showing from each nut, unless the body design does not allow the bolt to protrude enough for one thread to show. Grade B7 studs and nuts only.
- D. Standard wall thicknesses of the flange hub at the weld bevel are provided in Table 5. Flanges shall not be taper bored. It is recommended to use pipe of the same wall thickness or within 3/32" for fabricated assemblies. Back welding and transition segments are acceptable.
- E. Recommended stud bolt sizes for standard and insulating flanged connections are shown in Tables 1, 2, 3, and 4. The bolt lengths shown may be greater than those found in other sources to allow for thicker gaskets and to allow at least one thread showing on each end of stud bolts. Stud bolts may be used for all flanges.
- F. When flanged connections are made to fittings or valves, consideration shall be given to non-standard bolting requirements, such as cap screws or changes in bolt lengths due to flange thickness or clearance behind the flange. Non-standard items may be used where necessary. **A minimum of one thread must extend beyond the nut.**
- G. Ring gaskets are for use with raised-face flanges only.

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- H. Only steel flanges and steel stud bolts will be used in following applications:
 - 1. Bridge crossing and spans.
 - 2. Areas of known unstable ground or significant vibration.
- I. Documentation. The as-built information will show the flange specification.
- J. All studs and nuts to be utilized shall be new.

9.2 PROCEDURE

- A. All components and materials to be installed while assembling the flanged joint should be suitable for the intended application.
- B. The sealing surface area of the flange should be inspected and cleaned of dirt, old gasket material, worn or plugged serrations, gouges or nicks, paint, and any other defect that could affect the integrity of the joint.
- C. The stud bolts should be clean, lubricated with an approved thread lubricant, and free of burrs or any other defects that could affect the integrity of the joint.
- D. The gasket should be inspected for dirt, gouges, or any other defect that could affect the integrity of the joint.
- E. Assembly
 - 1. Install the gasket on the gasket seating surface and bring the cover flange in contact with the gasket.
 - 2. Install all studs, making sure they are clean and well lubricated with an approved lubricant.
 - 3. Run-up all nuts finger tight.
 - 4. Develop the required bolt stress in a minimum of four steps, following a tightening sequence (see Figure 1). It is important that no more than 30% of the required bolt stress is achieved on the initial set. Should this occur,

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serious damage can be inflicted to the gasket and subsequent tightening cannot offset the damage. After following this sequence, a final tightening should be performed in a bolt-to-bolt pattern to ensure that all bolts are evenly stressed.

In the absence of assembly torque specifications the bolts may be torqued to a stress level of 45,000 psi or 50% of their yield strength.

- F. The final installation shall be tested in accordance with **Section H-3**.

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TABLE 9-1

**RECOMMENDED STUD SIZE AND TORQUE SETTINGS FOR
CLASS 125 CAST-IRON OR 150 ANSI STEEL FLANGES**

Pipe Size Inches	No. Bolts Req'd	Bolt Diameter Inches	Bolt Type	Bolt Length Inches		Torque Specifications
				Standard	Insulating	Stud 45,000
				Raised Face		(ft lbs)
1	4	1/2	Stud	2 3/4	3	45
1 1/2	4	1/2	Stud	3	3 1/4	45
2	4	5/8	Stud	3 1/4	3 1/2	90
3	4	5/8	Stud	3 3/4	4	90
4	8	5/8	Stud	3 3/4	4	90
6	8	3/4	Stud	4	4 1/2	150
8	8	3/4	Stud	4 1/4	4 3/4	150
10	12	7/8	Stud	4 3/4	5	240
12	12	7/8	Stud	4 3/4	5 1/4	240
16	16	1	Stud	5 1/2	5 3/4	370
18	16	1 1/8	Stud	6	6 1/2	530
20	20	1 1/8	Stud	6 1/4	6 3/4	530
22	20	1 1/4	Stud	6 3/4	7 1/4	750
24	20	1 1/4	Stud	7	7 1/4	750
26	24	1 1/4	Stud	7 1/4	7 1/2	750

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TABLE 9-2

**RECOMMENDED STUD SIZE AND TORQUE SETTINGS FOR
CLASS 250 CAST-IRON OR 300 ANSI STEEL FLANGES**

Pipe Size Inches	No. Bolts Req'd	Bolt Diameter Inches	Bolt Type	Bolt Length Inches		Torque Specifications 45,000 Stud
				Standard	Insulating	
				Raised Faces		
2	8	5/8	Stud	3 1/2	3 3/4	90
3	8	3/4	Stud	4 1/4	4 3/4	150
4	8	3/4	Stud	4 1/2	5	150
6	12	3/4	Stud	5	5 1/4	150
8	12	7/8	Stud	5 1/2	6	240
10	16	1	Stud	6 1/4	6 3/4	370
12	16	1 1/8	Stud	6 3/4	7 1/4	530
16	20	1 1/4	Stud	7 1/2	8	750
18	24	1 1/4	Stud	7 3/4	8 1/4	750
20	24	1 1/4	Stud	8 1/4	8 1/2	750
22	24	1 1/2	Stud	9	9 1/4	1380
24	24	1 1/2	Stud	9 1/4	9 1/2	1380
26	28	1 5/8	Stud	10 1/4	10 1/2	1675
30	28	1 3/4	Stud	11 1/2	11 3/4	2190
34	28	1 7/8	Stud	12 1/2	13	2190
36	32	2	Stud	13	13 1/2	3300

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TABLE 9-3

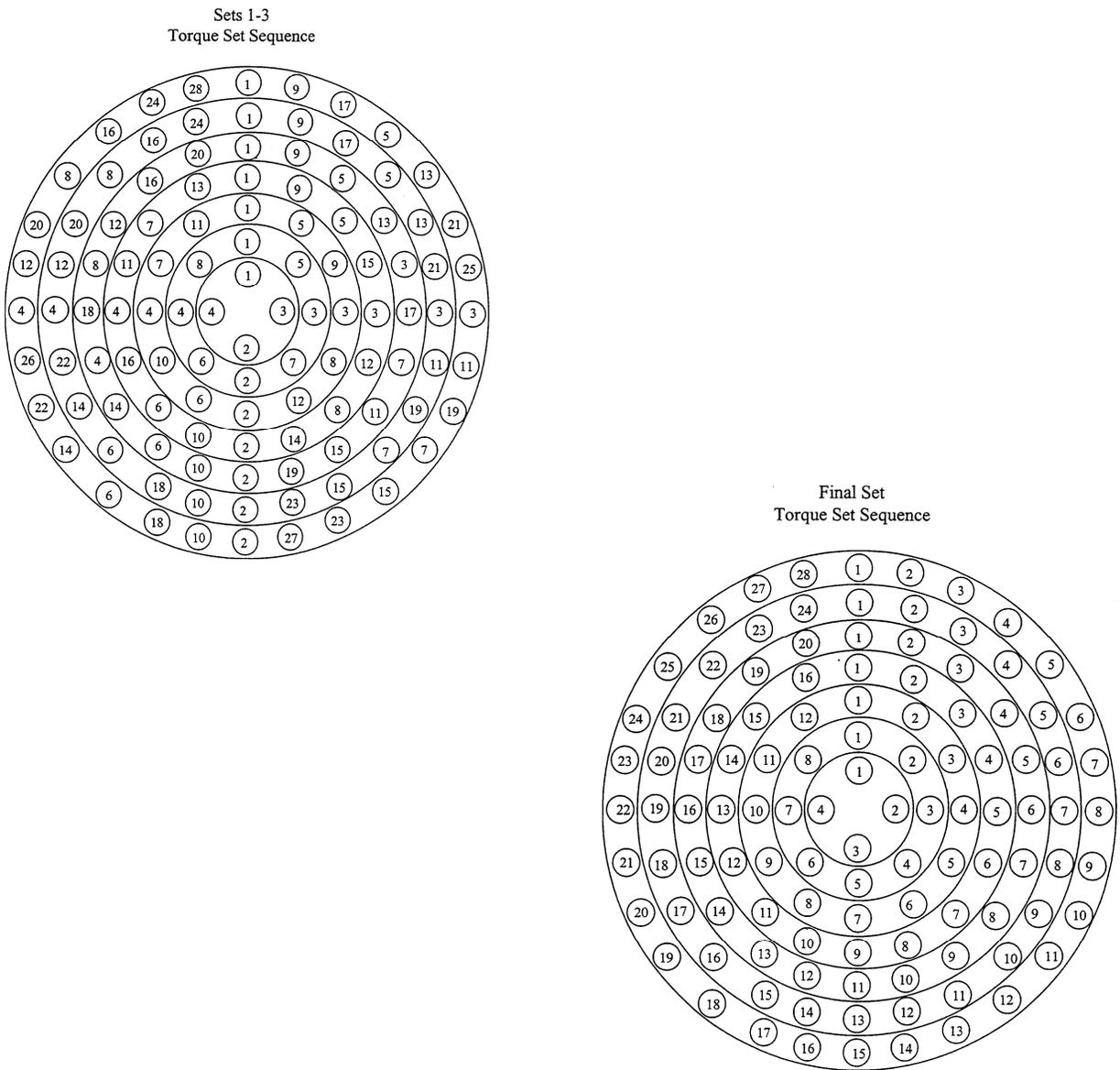
WELD NECK FLANGES

Nominal Size (Inches)	Wall Thickness Flange Hub at Bevel	
	ANSI 150 & 300	ANSI 400 & 600
2	.154	.218
3	.216	.300
4	.237	.337
6	.280	.432
8	.322	.500
10	.365	.500
12	.375	.500
16	.375	.500
20	.375	.500
24	.375	.500

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FIGURE 9-1



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TABLE 9-4

FLANGE PRESSURES

Material	Class	Max. Test Pressure psig
Cast Iron	125	275
Cast Iron	250	600
Steel	ANSI 150 lbs	425
Steel	ANSI 300 lbs	1100
Steel	ANSI 400 lbs	1450
Steel	ANSI 600 lbs	2175
Steel	ANSI 900 lbs	3250