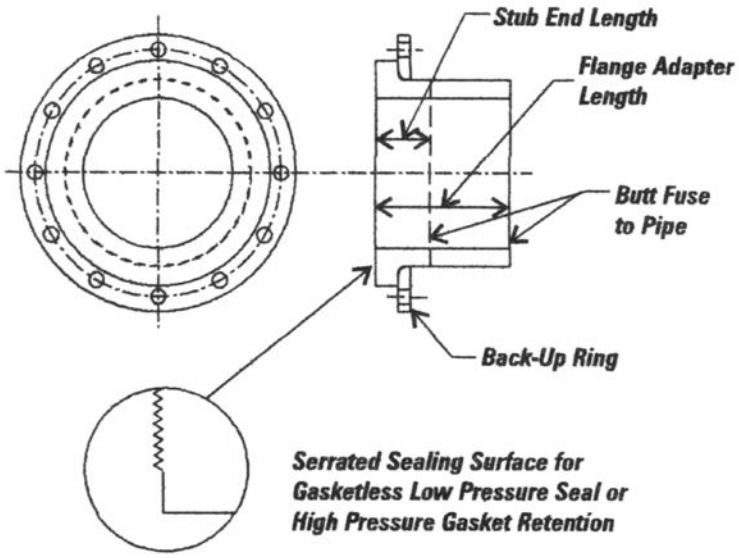
Bulletin PP-901

Flange Adapters

Standard back-up rings are Standard back-up rings are convoluted ductile iron with AWWA C207 150 lb drilling. One edge of the back-up ring bore must be radiused or chamfered. This edge fits against the back of the sealing surface flange.

Figure 11 Flange Adapter and Back-Up Ring



FLANGE GASKETS

A flange gasket may not be necessary between polyethylene flanges. At lower pressures (typically 100 psi or less) the serrated flange-sealing surface may be adequate. Gaskets may be needed for higher pressures or for connections between polyethylene and non-polyethylene flanges. If used, gasket materials should be chemically and thermally compatible with the internal fluid and the external environment, and should be of appropriate hardness, thickness, and style. Elevated temperature applications may require higher temperature capability. Gasket materials are not limited to those shown in Table 22. Other materials may also be suitable. Gasket thickness should be about 1/8"-3/16" (3-5 mm), and about 55-75 durometer Type A hardness per ASTM D2240.

Too soft or too thick gaskets may blow out under pressure. Overly hard gaskets may not seal.

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Figure 12 Flange Adapter and Back-Up Ring

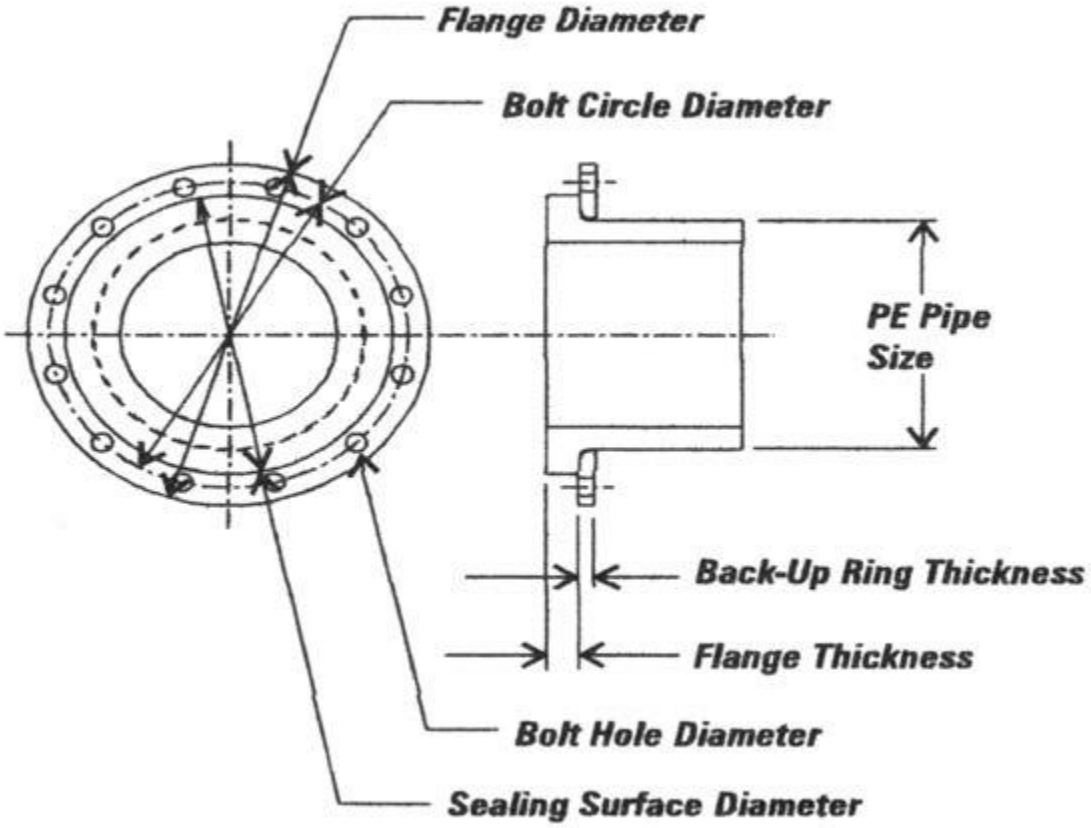

Table 22 Materials Used for Gaskets

Gasket Material[A]	*Suitable Chemicals*
Brown Rubber (cloth reinforced)	Water (hot or cold)
Neoprene	Water, weak acids
Nitrile	Water, oils
SBR Red Rubber (cloth or wire reinforced)	Air, gas water, ammonia (weak solutions)
PTFE gaskets with micro-cellular layers outside & hard center	Strong caustics, strong acids, and hydrocarbons
Hard, compressed Nitrile bound Aramid fiber	Water, oils, aliphatic hydrocarbons
[A] Consult gasket supplier for specific recommendations. Other materials may also be suitable for various applications.	

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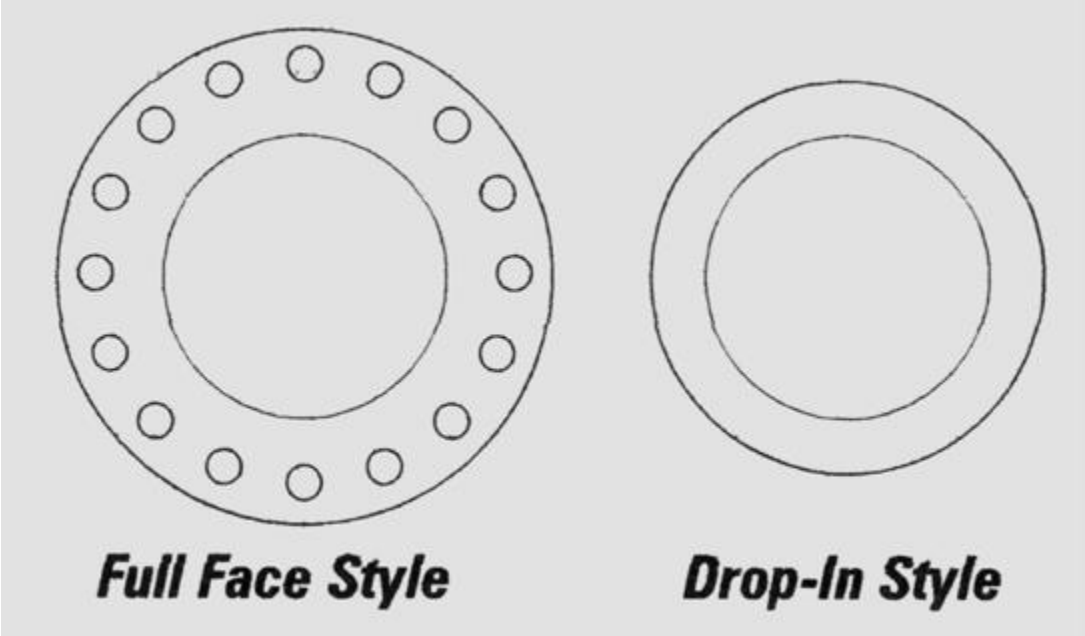
Common gasket styles are full-face or drop-in. Full-face style gaskets are usually applied to larger sizes (12” (300 mm) and larger) because flange bolts will hold a flexible gasket in place while fitting the components together. Drop- in style gaskets are usually applied to smaller pipe sizes.

Figure 13 Flange Gasket Styles



Flange Assembly

***Caution – Alignment – Before tightening*, mating flanges must be centered to each other and sealing surfaces must be vertically and horizontally parallel. Tightening misaligned flanges can cause leakage or flange failure.**

Before fit-up, lubricate flange bolt threads, washers, and nuts with a non-liquid lubricant grease. Gasket and flange sealing surfaces must be clean and free of significant cuts or gouges. Fit the flange components together loosely. Tighten all bolts by hand and recheck alignment. Adjust alignment if necessary.

Flange bolts are tightened uniformly in a 4-bolt index pattern to the appropriate torque value by turning the nut. A torque wrench is recommended for tightening.

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4-Bolt Index Pattern Tightening Sequence–Use a 4-bolt index pattern as follows: 1) Select and tighten a top bolt; 2) tighten the bolt 180° opposite the first bolt; 3) tighten the bolt 90° clockwise from the second bolt; 4) tighten the bolt 180° opposite the third bolt. 5) Index the pattern one bolt clockwise and repeat the 4-bolt pattern. 6) Continue tightening in a 4-bolt index pattern until all bolts are tightened to the specified torque level. 7) Increase the tightening torque to the next level and repeat the entire 4-bolt index pattern for all flange bolts.

Tightening Torque Values– Bolts should be tightened to the gasket manufacturer's recommended torque for the selected gasket and the particular application conditions. If the gasket manufacturer's recommended torque exceeds the maximum recommended value in Table 24 a different gasket may be required. The effectiveness of the seal is strongly dependent on the field assembly technique.

Establish an initial sealing surface pressure by tightening to an initial torque value of 5 ft-lbs.; then increase tightening torque in increments not more than 1/4 of the final torque value. Maximum recommended bolt tightening torque values for inch-size, coarse thread bolts are presented in Table 24.

The final tightening torque value can be less than the maximum, especially with large diameter piping systems, with systems operating at low pressures and where experience shows that a sufficiently tight joint can be obtained with a lower torque value. Higher final torque values may be required for higher pressures, but recommended bolt torque values in Table 24 should not be exceeded.

Table 24 Typical Flange Bolt Torque (Lubricated Bolts)

Dia – tpi	***Typical Torque* Rubber Gasket Lubricated Bolts Ft-lbs***	***Typical Torque No Gasket (PE to PE only) Max Press. 100 psi Lubricated Bolts Ft-lbs***	***Maximum Torque** Non-rubber Gaskets* Lubricated Bolts Ft-lbs***
½-13	20	30	60
5/8 – 11	40	60	100
3/4 – 10	65	100	125
7/8 – 9	120	150	150
1 – 8	150	150	200
1-1/8 – 8	160	160	250
1-1/4 – 8	220	220	300

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Caution *– Retightening. Polyethylene and the gasket (if used) will undergo* some compression set that may loosen the bolts. About an hour or so after the first tightening to the final torque value, retighten each flange bolt nut to the final torque value. As before, retighten in pattern sequence and in increments of 15 ft-lbs or less. For 12" and smaller flange adapters a second retightening after 4 hours is recommended. For flange adapters greater than 12", environmentally sensitive, or critical pipelines, the second retightening is recommended after an additional 12 to 24 hours.

Notes: Verify with the gasket supplier that the torque meets the minimum clamping force for the gasket.

**Maximum torque based on Convoluted Ductile Iron Back-up Rings supplied by Performance Pipe. Other style back-up rings may have different torque limits.

FLANGING TO BRITTLE MATERIALS

When flanging to brittle materials such as cast iron, accurate alignment and careful tightening are necessary. Tightening torque increments should not exceed 10 ft-lbs. Polyethylene flange adapters and stub ends are not full-face, so tightening places a bending stress across the flange face. Over-tightening, misalignment, or uneven tightening can break brittle material flanges.

Gajeske, Inc.

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