



To: Distribution

From: Applications Engineering

Re: API 650 Torque Values

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Bolt Torque Values for API 650 Roof Manholes and Shell Manholes

Roof Manholes

Roof manholes should not present any sealing problems since they see no pressure or media. The 20" and 24" standard roof manholes use 16 and 20, 5/8" bolts respectively. API 650 specifies full-face gaskets. We would recommend the following torques for full-face gaskets.

20" Roof Manhole – 78 ft.lbs. to 120 ft.lbs. (23,400 psi to 60,000 psi bolt stress)

(Resulting Gasket Stress = 600 psi to 923 psi)

24" Roof Manhole – 73 ft.lbs. to 120 ft.lbs. (21,900 psi to 60,000 psi bolt stress)

(Resulting Gasket Stress = 600 psi to 986 psi)

The available gasket stresses shown above are well suited for rubber gaskets. To safely attain these torque values ASTM A193 B7 bolts are required.

Shell Manholes

Shell manholes see head pressure from the liquid media inside the vessel. API 650 specifies that "long fiber sheet" gaskets be used. For all the manhole sizes, Garlock's minimum compressive stresses can not be achieved. However, compressed non-asbestos materials have worked successfully. This can be attributed to the fact that we are sealing against liquid and the pressures are very low. The torques given in the following tables are based on developing a bolt stress of 60,000 psi to 75,000 psi in 3/4" bolts, specified for all the shell manhole sizes. Therefore, ASTM A193 B7 or bolting with equal or greater yield strength must be used.

Gasket Compressive Stresses for Ring Gaskets (psi)					
Nominal Shell Manhole Size	Number of 3/4" Bolts	Gasket Stress at 60ksi Bolt Stress	Bolt Torque at 60ksi Bolt Stress	Gasket Stress at 75ksi Bolt Stress	Bolt Torque at 75ksi Bolt Stress
20"	28	2648 psi	200 ft.lbs.	3310 psi	250 ft.lbs.
24"	28	2252 psi	200 ft.lbs.	2815 psi	250 ft.lbs.
30"	42	2757 psi	200 ft.lbs.	3446 psi	250 ft.lbs.
36"	42	2330 psi	200 ft.lbs.	2913 psi	250 ft.lbs.

NOTE: Flat washers and lubricant are recommended for all bolts. Torquing should be done in a criss-cross pattern in three equal steps. All torques should be checked after the final torquing step.

Roof Manhole Gasket Dimensions (Full Face)					
Nominal Roof Manhole Size	Gasket I.D.	Gasket O.D.	Bolt Hole Diameter	Bolt Hole Quantity	Bolt Circle Diameter
20"	20"	26"	$\frac{3}{4}$ "	16	23-1/2"
24"	24"	30"	$\frac{3}{4}$ "	20	27-1/2"

Shell Manhole Gasket Dimensions (Ring)		
Nominal Shell Manhole Size	Gasket I.D.	Gasket O.D.
20"	20"	25-3/8"
24"	24"	29-3/8"
30"	30"	35-3/8"
36"	36"	41-3/8"