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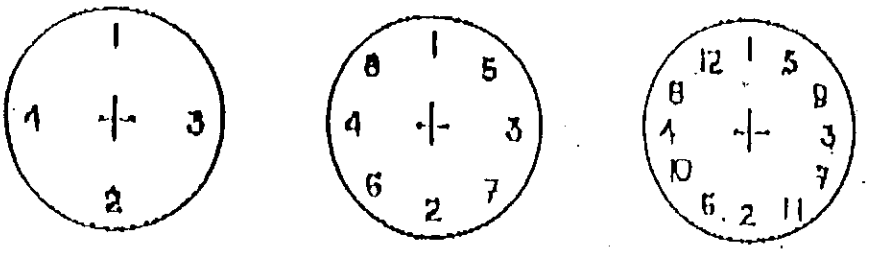
BOLT TIGHTENING PROCEDURE

Bolts for the Mondi™ and Ductile Iron piping systems should be installed and tightened when the system is at ambient temperature. There should be no "hot" bolting of these systems. Make sure that the gasket is properly located between the flanges.

Tightening of the bolts should be done so that the gasket is compressed uniformly. Tighten the bolts in sequence from side to side around the flange as shown below:



BOLT TORQUING SEQUENCE

The bolts should be tightened in three or more steps to develop the required bolt stress and uniform gasket compression for good sealing. The following bolt torque should be applied to Mondi™ and Ductile Iron flanged pipe and fitting assemblies. A torque wrench should be used to insure consistent tightening to the proper level. Later, when the system is ready for testing, all bolts should be tightened again to the proper torque and in the recommended sequence to compensate for gasket relaxation which may have occurred after initial tightening.

A-193 Gr. B7 Stud Bolt with A-194 Gr. 2H Hvy. Hex Nuts

Pipe Size	Typical Test Pressure	Initial Torque		Mid Torque		Final Torque	
Inches	Psi	Ft. Lb.	M Kg	Ft. Lb.	M Kg	Ft. Lb.	M Kg
3	100	30	4.1	60	8.3	120	16.6
4	100	30	4.1	60	8.3	120	16.6
6	100	50	6.9	100	13.8	200	27.7
8	100	50	6.9	100	13.8	200	27.7
10	100	65	9.0	130	18.0	262	36.2
12	100	80	11.1	150	20.7	312	43.1
14	100	120	16.6	240	33.2	490	67.8
16	100	120	16.6	240	33.2	490	67.8
18	100	170	23.5	330	45.6	673	93.1
20	100	150	20.7	300	41.5	596	82.4
24	100	190	26.3	380	52.6	784	108.4
30	100	170	23.5	340	47.0	696	96.3

A-307 Gr. B Heavy Hex Head Machine Bolt with A-307 Gr. B Hvy. Hex Nut

Pipe Size	Typical Test Pressure	Initial Torque		Mid Torque		Final Torque	
Inches	Psi	Ft. Lb.	M Kg	Ft. Lb.	M Kg	Ft. Lb.	M Kg
3	100	20	2.8	40	5.5	80	11.1
4	100	20	2.8	40	5.5	80	11.1
6	100	30	4.1	50	6.9	100	13.8
8	100	30	4.1	50	6.9	100	13.8
10	100	50	6.9	100	13.8	160	22.1
12	100	50	6.9	100	13.8	180	24.9
14	100	50	6.9	100	13.8	245	33.9
16	100	50	6.9	100	13.8	245	33.9
18	100	90	12.4	180	24.9	355	49.1
20	100	90	12.4	180	24.9	355	49.1
24	100	125	17.3	250	34.6	500	69.2
30	100	125	17.3	250	34.6	500	69.2

The Final Torque Value should not be exceeded by more than 20% or be less than the specified level. When in doubt, contact the bolt manufacturer for recommended torque values.

The above torque values should be used as a guideline and are based upon using the Garlock Fawn Gylon Style 3500 Step Ring Gasket, 1/8" thick, new bolts and nuts with clean threads, and thread lubricant on the bolts and nuts but not the gaskets.

Whenever possible, the system should be bolted up starting from a fixed origin flange at one end of the run. Each joint shall be bolted up loosely from this starting point down the line to its completion.

As each joint is made, particular care should be taken to keep the centerline straight, plumb, level and all flanges two-holed as the system is assembled.

Each joint should be faced up square before any bolts are tightened. The bolts should not be used to pull the pipe or fittings around square. When these flanges will not face up square, filler flanges can be added or removed to correct this problem. When the addition or removal of filler flanges is impractical, a piece of pipe shall be taken out and replaced with one that is the correct length to make up a squared-up joint. Each joint shall then be bolted tight, per bolt tightening procedure, and with the proper torque per the values in the table above.

If a flange joint is loosened for any reason, a new gasket should be installed.

Qualification Statement for the use of Garlock Bolt Torque Tables with Mondi Pip : Ga kets in 150# Class Flanges

- These bolt torque tables are only to be used as a general guide. They should not be considered to contain absolute values due to the large number of uncontrollable variabl s involved with bolted joints.

- The tables were developed to be used with GYLON Style 3500 – 1/8" thick Mon li Pipe Gaskets. Due to the proprietary nature of the dimensions, only the area is g ven n the tables.

- All bolt torque values are based upon the use of new nuts (A194 Grade 2H) nd r ew bolts (A193 Grade B7 or A307 Grade B) of proper design, acceptable quality and approved materials of construction as well as metallurgy. It is also required that two hardened : teel flat washers be used under each nut and that a lubricant be used on the nuts, bolts and wash rs, b ut **not on the gasket.**

- The flanges are assumed to be in good condition and in compliance with AN SI B16.5 specification. Special attention with respect to the seating surface finish and flatness should be given.

- The relationship between the bolt torque values and their transmitted loads i taken from the bolt tables listed in the Engineered Gasketing Products catalog.

- Only torque wrenches that have been calibrated shall be used. The proper b lt tightening pattern must be followed (see Installation Instructions section of the Engineered Ga keting Products catalog for proper bolting pattern) with the desired ultimate torque value ar ved at in a minimum of three even increments. All bolts in the flanges should then be checked in consecutive order in a counter-clockwise direction.

- The ring contact dimensions may vary from standard ANSI ring gasket dim nsio is.

- No provisions have been made in these tables to account for vibration effect : on he bolts. These tables are not compensated for elevated or fluctuating temperatures, b t ar : based on ambient conditions. If conditions different from these exist, we suggest that further analysis be performed to determine the proper solution.

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Bolt Torque Values for .125" thick Style 3500 Mondi Pipe Gaskets - ANSI B16.5 Class 150# Flanges with A307 bolts & Heavy Hex Nuts

Nominal Pipe Size (in)	Gasket Contact Area (sq.in.)	Number Of Bolts	Size of Bolts (in)	Bolt Torque at 30ksi Stress (ft.lbs.)	Comp Force Per Bolt @ 30ksi (psi)	Max. Gasket Stress Avail. (psi)	Internal Pressure (psig)	Min. Rec'd Gasket Stress (psi)	Min. Rec'd Torque/Bolt (ft.lbs.)*	Max. Rec'd/Avail. Gasket Stress (psi)	Preferred Torque/Bolt (ft.lbs.)
3	5.50	4	0.63	60	6060	4411	<300	4800	85	4411	80
4	7.07	8	0.63	60	6060	6862	<300	4800	42	6862	80
6	10.21	8	0.75	100	9060	7102	<300	4800	68	7102	100
8	13.35	8	0.75	100	9060	5431	<300	4800	88	5431	100
10	16.49	12	0.88	160	12570	9150	<300	4800	84	9150	160
12	19.63	12	0.88	160	12570	7686	<300	4800	100	7686	160
14	34.74	12	1.00	245	16530	5711	<300	4800	206	5711	245
16	39.45	16	1.00	245	16530	6705	<300	4800	175	6705	245
18	44.16	16	1.13	355	21840	7914	<300	4800	215	7914	355
20	48.87	20	1.13	355	21840	8939	<300	4800	191	8939	355
24	58.29	20	1.25	500	27870	9563	<300	4800	251	9563	500
30	72.42	28	1.25	500	27870	10776	<300	4800	223	10776	500

NOTE: The above-mentioned torque values are based on the use of A307 bolts with a proof load of 33,000 psi.

* Garlock's minimum recommended sealing stress is not achievable in the 3" pipe size.

Bolt Torque Values for .125" thick Style 3500 Mondi Pipe Gaskets - ANSI B16.5 Class 150# Flanges with A193 B7 studs & Heavy Hex Nuts

Nominal Pipe Size (in)	Gasket Contact Area (sq.in.)	Number Of Bolts	Size of Bolts (in)	Bolt Torque at 60ksi Stress (ft.lbs.)	Comp Force Per Bolt @ 60ksi (psi)	Max. Gasket Stress Avail. (psi)	Internal Pressure (psig)	Min. Rec'd Gasket Stress (psi)	Min. Rec'd Torque/Bolt (ft.lbs.)	Max. Rec'd/Avail. Gasket Stress (psi)	Preferred Torque/Bolt (ft.lbs.)
3	5.50	4	0.63	120	12120	8823	<300	4800	85	8823	120
4	7.07	8	0.63	120	12120	13724	<300	4800	42	13724	120
6	10.21	8	0.75	200	18120	14205	<300	4800	68	14205	200
8	13.35	8	0.75	200	18120	10862	<300	4800	88	10862	200
10	16.49	12	0.88	320	25140	18300	<300	4800	84	16000	262
12	19.63	12	0.88	320	25140	15372	<300	4800	100	15000	312
14	34.74	12	1.00	490	33060	11421	<300	4800	206	11421	490
16	39.45	16	1.00	490	33060	13410	<300	4800	175	13410	490
18	44.16	16	1.13	710	43680	15828	<300	4800	215	15000	673
20	48.87	20	1.13	710	43680	17877	<300	4800	191	15000	596
24	58.29	20	1.25	1000	55740	19126	<300	4800	251	15000	784
30	72.42	28	1.25	1000	55740	21552	<300	4800	223	15000	696