PROCEDURE

Joint Assembly & Manual Bolt Tightening

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1 PURPOSE

The purpose of this procedure is to detail the processes used by Reay Services Group to assemble and manually tightened flanged joints.

2 SCOPE

All flange joint assemblies completed by Reay Services Group except where a client requests a different step to be undertaken. It covers the assembly of the flanged joint and the manual tightening process used on a flanged joint.

3 DEFINITIONS

Company / the Company: Refers to Reay Services Group (RSG) and associated entities.

HDPE: High Density Polyethylene

System: Quality, Safety and Environmental Management Systems.

4 RESPONSIBILITIES

4.1 Managing Director

The Managing Director shall:

- Ensure the procedure is implemented as part of the quality management system; and
- Ensure adequate resources are available to apply the procedure.

4.2 Managers/ Supervisors

The Managers / Supervisors shall:

- Ensure the procedure is applied in the workplace including training people in the procedure;
- Regularly monitor the workplace and workplace practices to ensure compliance with the procedure; and
- Review the procedure with their people periodically.

4.3 Employees and Contractors

Employees and contractors shall:

- Comply with the requirements of the procedure; and
- Provide feedback on the procedure Supervisor as required.

5 PROCESS

5.1 Joint Assembly

- Ensure all sealing surfaces are clean and examined before assembly is started. Report any imperfections to the supervisor or engineer for clarification before assembly.
- Ensure flanges are aligned both axially and radially without the use of excessive force.
- Verify bolt nut and gasket specifications (material, diameter, length of bolts, thread pitch and nut thickness equal to bolt nominal diameter) See Appendix A – Project flange data.

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Ensure threads are free from damage and the nuts run freely on threads.
Good Mechanical fitting practice shall be applied at all times, particularly using a crisscross pattern and at least four passes.

5.2 Manual bolt tightening

1. Ensure that the flanges are parallel and axially aligned. Refer to Appendix B – Joint assembly tolerances.

2. Lubricate the nut and bolt threads, and the contact face of the nut on the flange.

3. Locate the gasket centrally and lightly nip the bolts. If using stud bolts, ensure that stud has equal thread lengths on either side after the nut.

4. Tighten evenly to approximately 25% of the final torque using a torque wench working on diametrically opposed bolts following the sequence shown in “Typical “Criss-Cross” Bolt Tightening Sequence. Refer to Appendix C – Typical “Criss-Cross” Bolt Tightening Sequence.

5. Repeat the tightening sequence in at least three more steps to the full torque.

6. Finally re-tighten adjacent bolts, start and finish at the same bolt, e.g. 1, 3, 2, 4 and 1. For HDPE flange joint assemblies return 4 hours after the initial bolt torque and re torque to the target torque.

7. Complete an information tag and attach to the joint.

8. Record all information on the Bolt Tensioning / Flange Integrity Record (RSG Form: QMS-FRM-036)

9. Ensure that the work area is left in a safe and tidy condition.

5.3 Record Keeping

Information tags are to be attached to all assembled flanged joints that have been tightened. This Information tag shall detail the following:

- The name of the person assembling and tightening the flange joint
- The date and time the flanged joint was tightened
- The final torque value applied to the assembled joint
- The date and time the flanged joint was re-torqued (for HDPE flanges)

All information regarding the assembly of the joint shall be recorded in the bolt tensioning/flange integrity record.

6 REFERENCED DOCUMENTS

AS/NZS 4129: 2000	Fittings for Polyethylene (PE) Pipes for Pressure Applications
AS/NZS 4130:2003	Polyethylene (PE) Pipes for Pressure Applications
AS 2033	Installation of Polyethylene Pipe Systems

TN-38/ July 2011	Bolt Torque for Polyethylene Flanged Joints
TWGEC/09/07	Tyco Water - Installation guidelines for ductile iron flanged joints
QMS-FRM-036	Bolt Tensioning / Flange Integrity Record

7 APPENDIX A – PROJECT FLANGE DATA

Pipe Size	Flange (Table D)	Number of bolts	Bolt size	Bolt / Stud Class	Gasket	Final Torque Value (Nm)
DN250	Steel – Steel	8	M20	4.6	3mm thick, Nitrile, full face	110 Nm
DN250	Steel or HDPE - B/Fly Valve	8	M20	4.6	Nitrile valve seat	110 Nm
DN450	Steel - B/Fly Valve	12	M24	4.6	Nitrile valve seat	150 Nm
DN450	Steel - Steel	12	M24	4.6	3mm thick, Nitrile, full face	150 Nm
DN630	HDPE – HDPE	16	M27	4.6	3mm thick, Nitrile, full face	390 Nm
DN630	HDPE – Steel	16	M27	4.6	3mm thick, Nitrile, full face	345 Nm
DN630	Steel – Steel	16	M27	4.6	3mm thick, Nitrile, full face	390 Nm
DN630	Steel or HDPE - B/Fly Valve	16	M27	4.6	Nitrile valve seat	290 Nm
DN900	HDPE – HDPE	24	M33	4.6	3mm thick, Nitrile, full face	625 Nm
DN900	HDPE – Steel	24	M33	4.6	3mm thick, Nitrile, full face	530 Nm
DN900	Steel or HDPE - B/Fly Valve	24	M33	4.6	Nitrile valve seat	530 Nm

Lightly greased galvanised fasteners – K factor = 0.16

8 APPENDIX B – JOINT ASSEMBLY TOLERANCES

Flange face/holes aligned & within tolerance as per ASME PCC-1 2010, Fig E-1 to E-4:

- High/Low within 1.5mm.
- Parallel within 0.8mm.
- Holes within 3.0mm.
- No cold spring or locked in tolerances
- No excessive gap or spacing.

Fig. E-1 Centerline High/Low

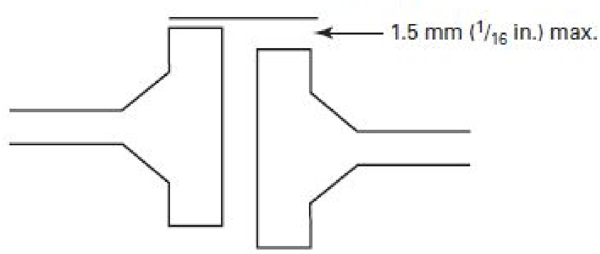


Fig. E-2 Parallelism

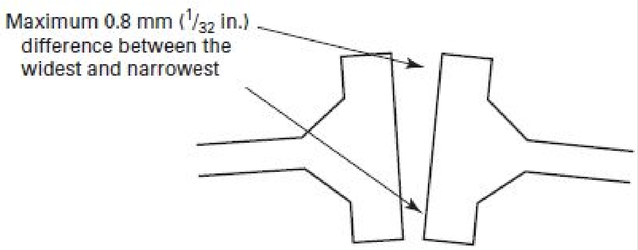


Fig. E-3 Rotational-Two Hole

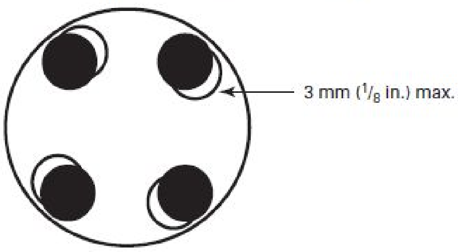
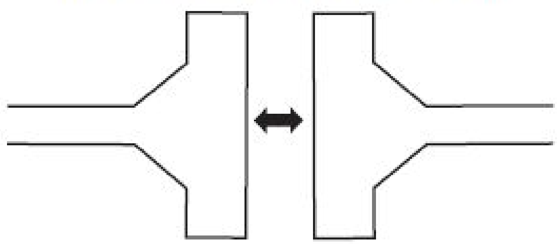


Fig. E-4 Excessive Spacing or Gap



9 APPENDIX C – TYPICAL 'CRIS-CROSS' BOLT TIGHTENING SEQUENCE