

Two Tool/Bolt Torque Procedure

January 2023

1.0 Purpose

- 1.1 To safely apply the proper torquing methods to flanged connections, simultaneously using two tools with hand torque, pneumatic or hydraulic torquing equipment.
- 1.2 This procedure is designed to use two tools in a standard star pattern.

2.0 Pre-Job Review

- 2.1 The requirements contained within this procedure are applicable to Petrochem Field Services Industrial Services and affiliates. Tools Equipment
- 2.2 Appropriate size torquing equipment tools large enough to accommodate Target torque value.
- 2.3 Approved Back-Up wrench with safety lanyard
 - 2.3.1 See Pre-Job Review 4.5 for “Approved” Back-Up wrenches.
- 2.4 Miscellaneous hand tools and containment drip tray.

3.0 Customer to Furnish

- 3.1 Scaffolding, platform and/or ladder(s), as needed.
- 3.2 Plant air supply for small tools, as needed.
- 3.3 Plant air supply (Minimum of 100 psig, 100 cfm) for torquing equipment.
- 3.4 Manpower, crane or rigging for installation and removal of equipment to and from platform if needed.
- 3.5 The support of the piping component from moving once the joint has been broken.
- 3.6 Necessary work permits and authorizations.
- 3.7 Isolation of necessary equipment following appropriate Lockout Tag-out procedures.
- 3.8 Decontamination of equipment.
- 3.9 Radiation Protection and Health-Physics service, as required for nuclear applications.

4.0 Pre-Job Review

- 4.1 Review job requirements and perform a job walk down with the customer
- 4.2 Verify with the Customer Contact, conditions are as stated on the Pre-Job Assessment.
- 4.3 Air requirements
 - 4.3.1 100 cfm and 100 psi air connection
 - 4.3.2 How much air hose will be needed to reach the job site
 - 4.3.3 If the air supply is not within a reasonable distance from the job site, an air compressor may be required so that an adequate amount of air is available to power pneumatic equipment.
- 4.4 Back-up Wrenches
 - 4.4.1 Only following style wrenches are approved for use as a Back-Up wrench for hydraulic and/or pneumatic torquing or de-torquing activity:
 - 4.4.1.1 The use of any Back-Up tool other than those shown below must be approved prior to use.



4.5 Unapproved Back-Up tools



- 4.6 Before any use inspect the entire tool system, including hoses. Gauge, sockets and backup wrenches.
- 4.6.1 Do not use kinked hoses, oversized or heavily worn sockets, backup wrenches, damaged tools, pumps, connectors or gauges.
 - 4.6.2 Connect system to operate from a safe distance.
 - 4.6.3 Checkout tool function with drive or hex ratchet turning in one direction only.
 - 4.6.4 Checkout gauge from a safe distance that needle is on zero at no pressure and at 10,000 psi at high pressure.
 - 4.6.5 With system on at 10,000 psi check system visually for leaks.
 - 4.7 Decontamination of equipment, if applicable.
 - 4.7.1 Does the customer have a means of decontaminating equipment and tools that may come in contact with chemicals?
 - 4.7.2 If hazardous waste is generated, does the plant have areas for disposal?
 - 4.7.3 Review Communications Procedure with all persons on work crew.

5.0 Communications Procedure

- 5.1 If a team of two or more persons are working together to loosen or tighten a bolted assembly, a communication plan must be discussed and used.
- 5.1.1 The communication plan may be verbal, visual, hand signals or radio. All persons involved must understand the communication method and it must be documented on the JSEA.
 - 5.1.2 Whenever possible, the wrench operator should be the only person operating the pump.
- 5.2 **Communication OPTIONS:**
- 5.2.1 **OPTION #1** With normal eye contact/noise level:
 - 5.2.1.1 "Hand Motion Signals"

- 5.2.1.1.1 Clinched Fist Represents = “All-Stop”
- 5.2.1.1.2 Protruding Index Finger Represents = “Activate”
- 5.2.1.1.3 Fully extended hand with repeated opening & closing of fist represents = “Assistance Needed”

- 5.2.1.2 “Head Motion Signals”
 - 5.2.1.2.1 Vertical Up & Down Motion Represents = “Activate”
 - 5.2.1.2.2 Horizontal Side to Side Motion Represents = “All-Stop”
 - 5.2.1.2.3 Vertical Head Down Position with Horizontal Side to Side Motion Represents = “Assistance Needed”
- 5.2.2 **OPTION #2** With limited eye contact/above normal noise level:
 - 5.2.2.1 Add Additional Personnel to Ensure Eye-to-Eye Contact.
 - 5.2.2.2 Utilize Headset Radio Communications for Equipment Operators.
- 5.2.3 **OPTION #3** With no eye contact/high noise level:
 - 5.2.3.1 Utilize Headset Radio Communications for Equipment Operators.
 - 5.2.3.2 Safe Work Procedures for use with hydraulic torque equipment and Impact Wrenches.
 - 5.2.3.3 If a backup wrench is used, the backup wrench must be held in a manner that keeps the persons hands clear of pinch points at all times.
 - 5.2.3.3.1 It is mandatory to use a lanyard with your back-up wrench when working from an elevated position.
 - 5.2.3.3.2 All power being supplied to the power tools on the bolted assembly must stop before any repositioning of the back-up wrench is done.
 - 5.2.3.3.3 The person repositioning the back-up wrench must communicate to the person operating the power supply that the back-up wrench needs repositioning and the power being applied must cease.
 - 5.2.3.3.4 The person operating the power supply controls must confirm.
 - 5.2.3.3.5 The person operating the power supply controls will put the power supply controls down and remove the tool.
 - 5.2.3.3.6 Once the back-up wrench has been repositioned, the person on the back-up wrench will confirm that their hands and fingers are clear of the wrench and pinch points and will give the power supply controller clearance to continue applying power.
 - 5.2.3.3.7 The person operating the power controls will not operate the tool until they have received clear communication that it is safe to resume from the person operating the back-up wrench.
 - 5.2.3.3.8 The person using the opposite wrench will not apply any force until they have received clear communication that it is safe to resume from the person operating the back-up wrench.

6.0 Procedure

- 6.1 Complete and review Job Safety and Environmental Analysis (JSEA) with participating employees.
 - 6.1.1 A plant JSEA is acceptable in lieu of the IPS★ITCS JSEA as long as all Safety points are covered.
- 6.2 Complete Pre-Job Assessment
- 6.3 Determine required torque by one of the following methods: Use customer provided torque, if applicable. Use Torque Value Charts. Use a Torque Calculation Worksheet.
- 6.4 Complete an Elongation Calculation Worksheet (if ultrasonic measurements will be taken) and Follow Ultrasonic Bolt Measurement procedure before proceeding with torquing operations.
- 6.5 Visually check that the flange has been correctly assembled and the correct gasket is in place.
- 6.6 Visually check that the studs have been lubricated correctly.
- 6.7 Using an approved marking tool (paint marker, crayon, etc.) number studs in a standard star pattern
- 6.8 Begin first pass with two wrenches working simultaneously on studs numbered (1 & 2) studs and tighten at 30% of target torque, followed by simultaneously tightening studs numbered (3 & 4) studs also at 30% of target torque.
- 6.9 Begin second pass with two wrenches working simultaneously on studs numbered (5 & 6) studs and tighten at 60% of target torque, followed by simultaneously tightening studs numbered (7 & 8) studs also at 60% of target torque.
- 6.10 Begin third pass with two wrenches working simultaneously on studs numbered (1 & 2) studs and tighten at 100% of target torque, followed by simultaneously tightening studs numbered (3 & 4) studs also at 100% of target torque.
- 6.11 Continue Simultaneous torque following the star pattern number sequence at 100% of torque until pattern is complete.
- 6.12 Begin ringer pass from the end of the previous pass at 100% of target torque and move clockwise rotationally, one set of studs at a time until the nuts no longer turn.
- 6.13 Perform relaxation passes a minimum of 4 hours after ringer pass has been completed if allowed by customer.
- 6.14 Record all information on Flange Make-Up Data Sheet
- 6.15 Ensure work area is left in a clean and safe condition and all permits and LO/TO has been signed off.

Revision History

Rev	Rev Date	Rev By	Approved By	Description
1.0	1/3/2022	Erik DeLaRosa	Shayne Torrans	Initial Procedure
1.1	11/23/2022	Erik DeLaRosa	Shayne Torrans	Format Revision

Approvals:

Procedure Owner

Print Name

Date

Signature

Competency Assessment

No.	Questionnaire	C/NYC
Q1		
A1		
Q2		
A2		
Q3		
A3		
Q4		
A4		
Q5		
A5		

Enclosed Attachments	
Risk Assessment	<input checked="" type="checkbox"/>
Environmental Aspect and Impact	<input checked="" type="checkbox"/>
Training and Competency	<input checked="" type="checkbox"/>
Measure and Evaluation Tools	<input checked="" type="checkbox"/>

Competency Checklist

To be filled out by Trainer and signed by Employee, Assessor and Supervisor before being returned to the HSEQT Manager for recording purposes.

Procedure	Competency	Date	Competent YES / NO	Employee Signature

(Please tick appropriate box)

This employee is competent in performing the job.

This employee has not attained the competency level.

*

* *If the employee has not attained all competency levels, the General Manager must assess the action to be taken, provide an extension of training or alternative action as listed below.*

Alternate action to be taken: _____

Signed By Employee: _____ Date: _____

Trainer: _____ Date: _____

Assessor: _____ Date: _____

Regional Manager: _____ Date: _____

Environmental Aspects and Impacts

Identified Environmental Aspects and Impacts

The following table is a summary of the likely environmental aspects and impacts that may be identified during site inspections. The significance of each impact needs to be assessed using the Risk Assessment Model.

Activity	Aspect	Impact
Purchasing & Administrative Work	Consumption of goods	Conservation of natural resources
	Consumption of energy (eg. Electrical equipment and facilities)	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of waste (eg. Paper)	Consumption of space for waste disposal; Habitat loss
Climate Control	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of noise	Disturbance to community; Habitat loss
Cleaning of – offices / vehicles	Storage, use and release of chemicals	Contamination of air, water or soil; Risk to human health
Transport (Fleet vehicles / staff travel)	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Loss of habitat at all stages of generation; Light pollution
	Consumption of goods (eg. Oil)	Consumption of natural resources; Generation of waste; Habitat loss; Biodiversity impacts
	Generation of waste (eg. Oil)	Consumption of space for waste disposal; Potential contamination of water or soil; Habitat loss
	Exhaust emission	Release of greenhouse gases and atmospheric pollution
	Use of dangerous goods (eg. Batteries)	Potential contamination of air, water or soil; Risk to human health
	Generation of noise	Disturbance to community; Habitat degradation
Operations		

Activity	Aspect	Impact

Risk Assessment

Risk Assessment // insert name here

Step No: Logical sequence	Sequence of Basic Job Steps documented in the Procedure, Work Instruction and project plans. Break down Job into steps. Each step should be logical and accomplish a major task.	Potential Safety & Environmental Hazards/Impacts at the site of the Job Identify the actual and potential health and safety hazards and the environmental impacts associated with each step of the job.	Risk Rating Refer to the risk matrix or HSEQT.PRO. Risk Mgt	Recommended Corrective Action or Procedure <i>Determine the corrective actions necessary to reduce the risk to as low as reasonably practical (ALARP) refer to HSEQ.PRO.Risk Mgt. The risk must be reduced or controlled to ALARP before work commences.</i> Document who is responsible for implementing the controls to manage each hazard identified.	Risk Rating refer to the risk matrix or HSEQT.PRO.Risk Mgt
1.					
2.					
3.					
4.					
5.					

Audit

Process: insert// Procedure: Insert //			Date:	Audited by:
			Location of Audit:	Area Mgr/Supervisor:
Item	Question	Evidence Sited	Comments	Conformance Score 0,3,5
1.				
2.				
3.				
4.				
5.				
6.				
7.				
AUDITOR'S SIGNATURE: SAFETY REP'S SIGNATURE:		CONFORMANCE SCORE: / 25 CONFORMANCE %:		0 – Non-Conformance 3 – Continuous Improvement Opportunity 5 – Total Conformance