RUNNING AND HANDLING PROCEDURE FOR U. S. STEEL USS-CDC, USS-CDC HTQ AND USS-CDC HTQ SR THREADED AND COUPLED CONNECTIONS	**Procedure: ENG 06** **Revision: 7** **Effective Date: 12/18/2018** **Page: 1 of 13**

1.0 Scope.

1.1 The purpose of this specification is to provide the procedure to aid in the successful running and pulling of U. S. Steel (USS) USS-CDC™, USS-CDC HTQ™ and USS-CDC HTQ SR™ threaded and coupled connections. This document provides a procedure to avoid common causes of pipe and connection damage due to improper rig running and handling practices. Failure to follow this procedure may result in improper connection makeup and/or performance.

2.0 Definitions.

2.1 **USS-CDC™ –** connection for casing is a Modified API Buttress threaded and coupled connection designed for, and field proven in, drilling-with-casing and horizontal drilling applications.

2.2 **USS-CDC HTQ™ –** connection for casing is a Modified API Buttress threaded and coupled connection with reduced hoop stress in coupling designed for drilling-with-casing and horizontal drilling applications.

2.3 **USS-CDC HTQ™ SR –** USS-CDC HTQ™ with the addition of proprietary USS Resilient Seal Ring.

2.4 **Makeup Signature –** A graph that is generated from the Torque vs. Turn or Torque vs. Time monitoring system. This is also called a makeup graph.

3.0 Reference Documents.

3.1 ENG-05: Approved Running and Storage Compounds and Thread Protectors

4.0 Equipment.

4.1 Accessory equipment

4.1.1 Inspection of all accessory equipment and backup equipment, such as crossovers, safety subs, float equipment and packer assemblies, shall be conducted prior to any other operation. Care shall be taken to ensure that the proper connection is threaded on all accessories.

4.1.2 Only accessories threaded by a USS facility or licensed

manufacturer or repair shop shall be used. Unauthorized USS connections can jeopardize the entire string resulting in catastrophic consequences.

4.2 Elevators

4.2.1 Casing Bottleneck type elevators are acceptable; however, slip type or spider type elevators are recommended. Slips shall not be set over the threaded area or any formed area of the connection.

4.3 Power Tongs, Gauges, and Torque Recorders

4.3.1 Tongs shall be in good condition with jaws that correctly fit the pipe.

4.3.2 Make-up torque shall be accurately measured and controlled. Torque measuring equipment (gauges and torque recorders) shall be in good working order and cover the appropriate range and be properly calibrated.

4.3.3 If a snub line is used, it should be set at a 90-degree angle to the arm of the tong.

4.4 Thread Protectors

4.4.1 Properly fitting, clean thread protectors shall be installed on each connection when stored on pipe racks or when it is being moved.

4.5 Thread Field Inspection

4.5.1 Threads shall be thoroughly cleaned and dried with seal ring removed prior to inspection to remove all dirt, thread or storage compound, or other residue. Proper cleaning solution shall be used. Do not use metal brushes or other abrasive methods that will cause scratching of the threads.

4.5.2 An authorized USS Representative shall perform a visual thread inspection to evaluate for damage and corrosion.

4.5.3 Minor anomalies on threads can be field repaired. After repairs, threads shall be cleaned and dried. Molybdenum Disulfide spray shall be applied to all repaired areas.

4.6 USS-CDC HTQ™ SR Seal Ring Installation

4.6.1 Where applicable, seal rings shall be installed after thread inspection. Both the seal ring and the seal ring groove shall be clean and dry prior to installation. Care should be taken to ensure that the ring fits properly and is firmly seated into the groove. It is

imperative that the seal ring is evaluated for proper fit after the hump has been displaced in the groove. This evaluation shall be conducted by using your finger and going around the entire circumference of the groove. Any abnormal areas of the seal ring must be corrected at this time. Movement of the seal ring axially will assure proper installation, resulting in a snapping sound once the seal ring is in the correct position. After it has been determined that the ring is properly installed, the seal ring must be seated the entire circumference by applying force to the ring with a blunt, non-metallic object, most commonly a wooden or fiberglass tool handle (i.e. broom, axe, or hammer handle). Seal rings shall not be installed sooner than necessary before make-up of the connection.

5.0 Thread Locking Procedure.

5.1 Thread locking compound may be used when required by customer.

5.1.1 USS-CDC™ and USS-CDC HTQ™

5.1.1.1 The pin and box connections shall be cleaned, dried, and free of contaminates.

5.1.1.2 Pin application: Apply a thin, uniform coat of locking compound to the entire pin end threads, covering the entire circumference. No thread locking compound shall be applied to the box.

5.1.1.3 A torque in excess of the connection maximum make up torque may be required to shoulder the connections.

5.1.1.4 The use of excessive thread locking compound may result in a no shoulder situation.

5.1.2 USS-CDC HTQ™ SR

5.1.2.1 The seal ring shall be removed from the field end prior to thread locking application. Follow recommended thread locking procedures as stated in 5.1.1.

6.0 Running Procedure.

6.1 Pipe handling

6.1.1 Extra care shall be used when handling pipe to protect connections.

Pipe shall not be moved unless the threads, both pins and boxes, are protected with thread protectors. Pipe shall be lifted with straps, not hooks. If a soft line is used it shall be double wrapped when picking up a joint of pipe.

6.2 Thread running compound

6.2.1 Thread running compound shall be free of foreign contaminants (sand, dirt, etc.). It is recommended that a new container of compound be used at the start of each job. Diesel or other foreign thinning agents shall not be added to thread running compound for any reason.

6.2.2 Thread compound shall be applied to clean, dry connections. All storage compounds shall be removed to avoid a mixture of storage and running compounds during makeup.

6.2.3 Preferred thread compounds are BOL 2000 and JET-LUBE RUN-N-SEAL. Other approved API modified thread compounds commonly used on API LTC and API BTC casing may also be used.

6.3 Thread running compound application

6.3.1 USS-CDC™ and USS-CDC HTQ™

6.3.1.1 Thread compound shall be applied to the entire thread area of the box and pin connections. The compound shall fill approximately1/4 to 1/3 of the thread height.

6.3.2 USS-CDC HTQ™ SR

6.3.2.1 Thread compound shall be applied to the entire thread area of the box and pin connections. The compound shall fill approximately 1/4 to 1/3 of the thread height. Under no circumstances shall thread compound be applied to pin only.

6.4 Stabbing and thread engagement

6.4.1 A stabbing guide shall be used on the pipe box thread to prevent damage to thread.

6.4.2 The pipe must be in true vertical alignment over the box. Movement or sway of the pipe shall be held to a minimum. Only after the pipe is positioned properly, the pipe shall be slowly lowered into the box

until the stab flanks of the pin are in contact with the stab flanks of the box.

6.4.3 A weight compensator is recommended, especially when running doubles or triples.

6.4.4 Remove stabbing guide after stabbing. Rotate the pipe by hand to insure proper thread engagement. Tongs can be used to slowly rotate the pipe for thread engagement verification if weight restricts doing this by hand. NOTE: Slack shall remain in the snub line and no appreciable torque buildup shall be seen during this process. The connection should be free running without torque required. If connection is not stabbed correctly, rotate the connection counter-clockwise1/4 to 1/2 turn to correct. Pipe shall not be rocked back and forth from stab board during thread engagement.

6.5 Power Makeup

6.5.1 Power tongs are required. The use of pipe wrenches, rig tongs or spinning chain shall not be used. Make up at a steady and controlled speed, usually between 5 and 35 RPM's. The power tongs shall be in low gear before connection shoulder. Make up to within the recommended makeup torque range. Backup tongs shall be located as close to the power tong as possible to prevent bending during makeup. Back up tongs are not to be set over the box connection except in the rare cases where the coupling turns during makeup of more than one quarter of a revolution. The elevator should not be latched until the make up process is complete.

6.6 Makeup Torque

6.6.1 USS Connection Performance Data Sheets provide torque values for USS–CDC™ and USS-CDC HTQ™ connections. The torque values listed are the minimum and maximum recommended make-up torques, as well as the connection yield torque. The minimum and maximum recommended make-up torques can be averaged to obtain an optimum torque however, a connection with an acceptable makeup signature that has a final torque reading within the minimum and maximum torque window shall be considered acceptable. The makeup triangle is a secondary visual verification of proper makeup of the connection. Torque values are recommended and can be affected by field conditions.

6.6.2 In isolated cases, the USS authorized Rig Site Services representative has the authority to accept connections, which are outside the minimum and maximum torque window at their discretion. The value shall not exceed 10% below or above the recommended torque value.

6.7 Breakout

6.7.1 When breakout of a connection is necessary, backup tongs shall be applied to the mill end of the coupling with the leading edge not to encroach on the field end connection (the end that is to be broken out).

6.7.2 Elevators shall be unlatched prior to breakout. Place power tongs and backup tongs as close to each other as possible to prevent bending during breakout. Slowly apply torque required to break out connection. Never strike the connection to assist in breakout. Doing so will result in damage to the connection and will jeopardize its performance.

6.7.3 A weight compensator should be used during the breakout process whenever possible to prevent damage to the connection.

6.7.4 Stop rotation immediately when the pin jumps inside the box. The use of a stabbing guide is required when lifting the pin out of the box. Lift the pin out slowly to avoid damage. Remove power tongs prior to separating the pin from the box connection.

6.7.5 Install clean, dry thread protectors to the connection prior to pipe movement.

6.8 Torque Monitoring Equipment

6.8.1 The use of a computerized torque monitoring system is recommended for makeup of USS-CDC™ and USS-CDC HTQ™ connections. The use of such equipment permanently records the makeup signature, shoulder torque, and final torque of each connection. It also gives the opportunity to evaluate the connection makeup prior to running the connection in the hole.

6.8.2 Torque vs. Turns plots are preferred over Torque vs. Time plots. These plots shall be evaluated for signature characteristics. Any major anomalies shall require breakout of the connection. Inspection and repair of the connection, if needed, shall be conducted prior to the connection being re-made.

6.8.3 Setup of torque monitoring equipment

6.8.4 Minimum and maximum recommended makeup torques are listed on the USS Connection Performance Data Sheet.

6.8.5 Minimum Shoulder Torque is 30% of minimum published makeup torque. Maximum Shoulder Torque is 80% of minimum published makeup torque.

6.8.6 Reference torque shall be set at 5% of the minimum recommended torque.

6.8.7 Graph size and scale shall be set to produce a clear signature curve of the makeup. A maximum of two curves per sheet of paper are permitted on printed output.

7.0 Disposition of Makeup Curves.

7.1 Makeup curves or signatures display the relationship of torque vs. turns or torque vs. time. These curves demonstrate the makeup characteristics of each connection. The signatures should look similar to other signatures of the entire string of pipe. Any major abnormalities shall result in breakout of the connection to examine for damage and to determine the cause of the unusual graph. USS Rig Site Services representatives are responsible for acceptance or rejection of the connection makeup curve.

7.1.1 An acceptable makeup signature is shown in figure 1. A distinct shoulder shall be present and shall fall in between the minimum and maximum shoulder torque values. The final torque shall fall between the minimum final torque and the maximum final torque values.

7.1.2 A rejected makeup signature is defined as an irregular appearing signature that is significantly different than the acceptable makeup signature (figure 1) and the signatures from the rest of the order. Some examples of reject signatures are:

7.1.2.1 Final torque falling outside the final torque maximum and minimum values (figure 2). A connection with this signature shall be broken out, and inspected as outlined in section 7.1.3.

7.1.2.2 No distinct and visible shoulder (figure 3). A connection with this signature shall be broken out and inspected as outlined in section 7.1.3.

7.1.2.3 Shoulder torque value falling outside the shoulder torque maximum and minimum values (figure 4). A connection with this signature shall be broken out and inspected as outlined in section 7.1.3.

7.1.2.4 Yielding or deformation indications prior to final torque release (figure 5). A connection with this signature shall be broken out and the pin and box connection shall be rejected.

7.1.2.5 Interrupted rotation during makeup (figure 6). A connection with this signature shall be broken out and inspected.

7.1.2.6 Irregularities in the makeup chart prior to shouldering (figure 7). A connection with this signature shall be broken out and inspected as outlined in section 7.1.3.

7.1.3 In the case of a rejected signature curve, the connection in question shall follow a back-out evaluation.

7.1.3.1 If the connection makeup signature is rejected, the pin shall be broken out completely to expose the entire pin and box connection.

7.1.3.2 For USS-CDC HTQ™ SR, it is required to remove the seal ring after connection break-out.

7.1.3.3 The pin and box shall be thoroughly cleaned and visually inspected for damage to the threads.

7.1.3.4 Connections found with detrimental damage in the thread area (galling) the connection shall be rejected and marked appropriately.

7.1.3.5 Connections with no damage shall be reassembled.

7.1.3.6 For USS-CDC HTQ™ SR, it is required to install a new seal ring per section 3.6 prior to connection reassembly.

7.1.3.7 If the second makeup signature is acceptable or similar to the first makeup signature and the shoulder torque and final torque of the second makeup are within the acceptable limits, the connection shall be

considered acceptable.

7.1.3.8 Connections shall not be made up more than three times. After third attempt to get an acceptable makeup signature, the connection shall be rejected and shall not be used.

8.0 Common Causes of Connection Damage.

8.1 When connections are experiencing galling or torn metal during breakout of signature rejects, there are some common causes that can be evaluated to correct this issue. Some of these causes are as follows:

8.1.1 Foreign contaminants (sand, dirt, diesel, or other) on threads and/or in thread compound. Reference 6.2.

8.1.2 Insufficient or improperly applied thread compound. Proper thread compound application is critical to connection makeup. Reference section 6.3.

8.1.3 Misalignment from vertical during stabbing, makeup or breakout. Reference section 6.4.

8.1.4 Rocking of pipe to correct cross threading. Reference section 6.4.

8.1.5 Setting backup tongs over box threads. Reference section 6.5.

8.1.6 Continued rotation of pipe after threads have disengaged during pulling of pipe. Reference section 6.7.

8.1.7 Improper handling of pipe during storage and movement of pipe. See section 6.1.

8.1.8 Use of accessories with non-authorized USS connections. See section 4.1.

8.1.9 Over torque of the connection. See section 6.6.

9.0 Revision Notes: Added wording to 6.5.1 .

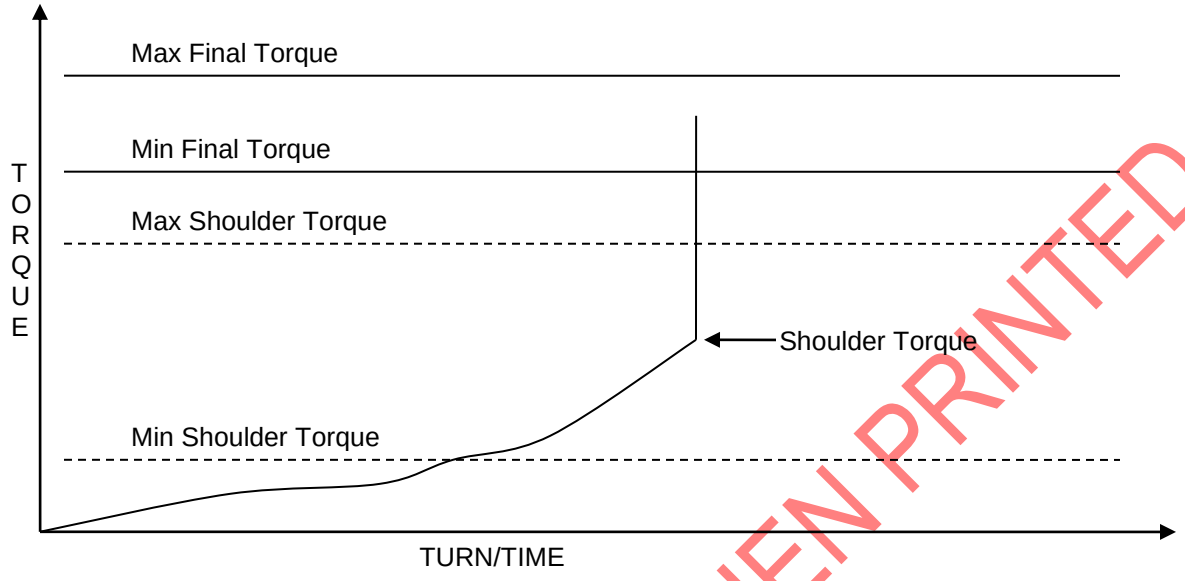

Figure 1 Typical Acceptable Makeup Signature

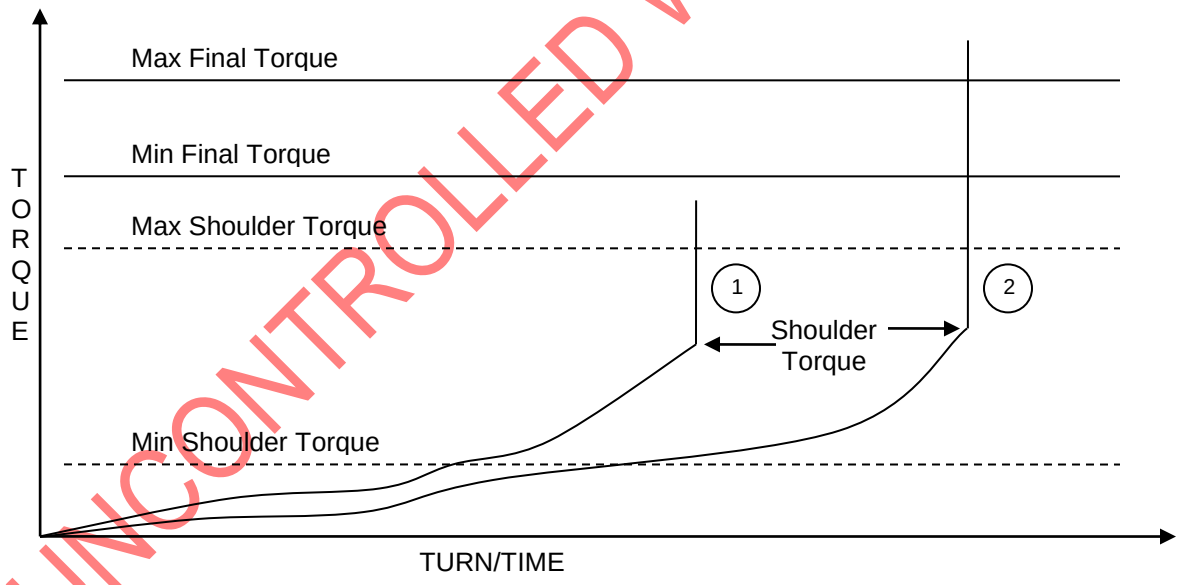

Figure 2 1. Below Min Final Torque (Breakout and evaluate) 2. Exceeded Max Final Torque (Breakout and evaluate)

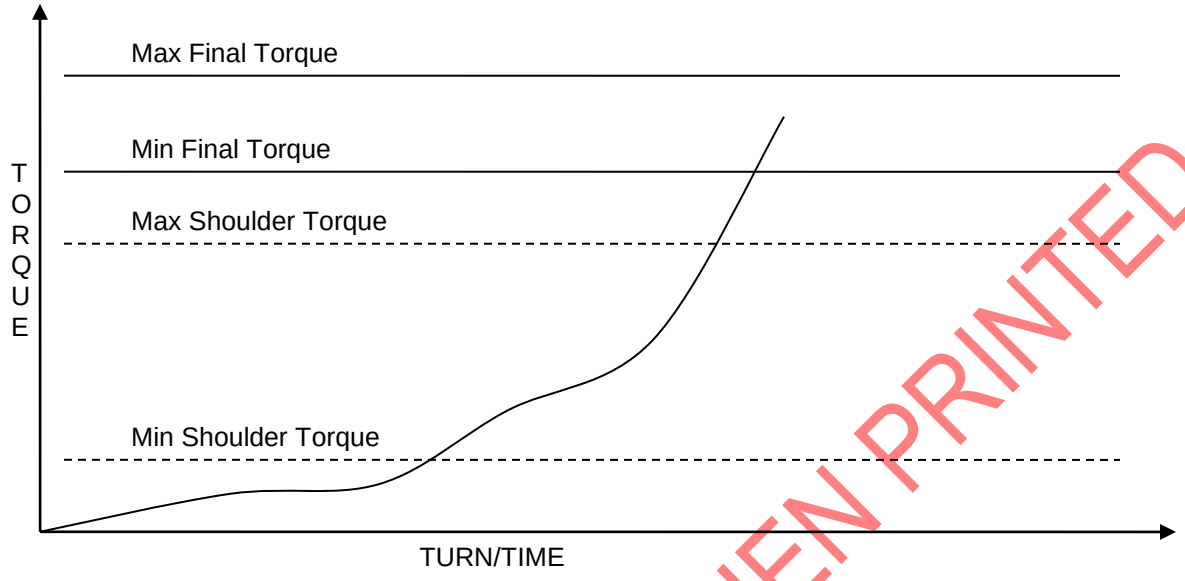

Figure 3 No visible shoulder (Breakout and evaluate)

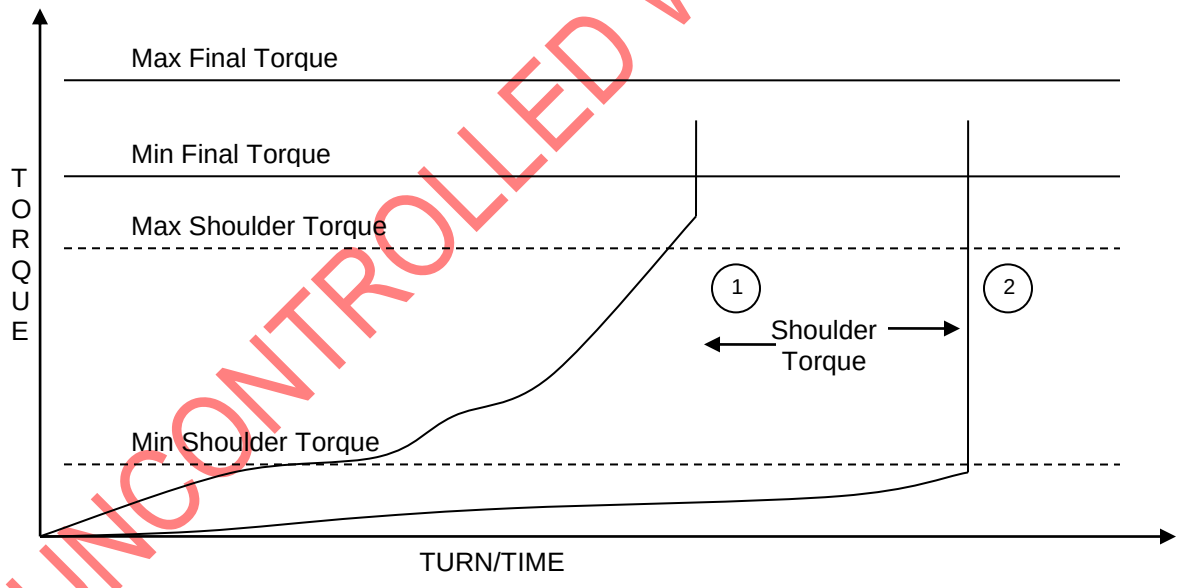

Figure 4 1. High shoulder (Breakout and evaluate) 2. Low shoulder (Breakout and evaluate)

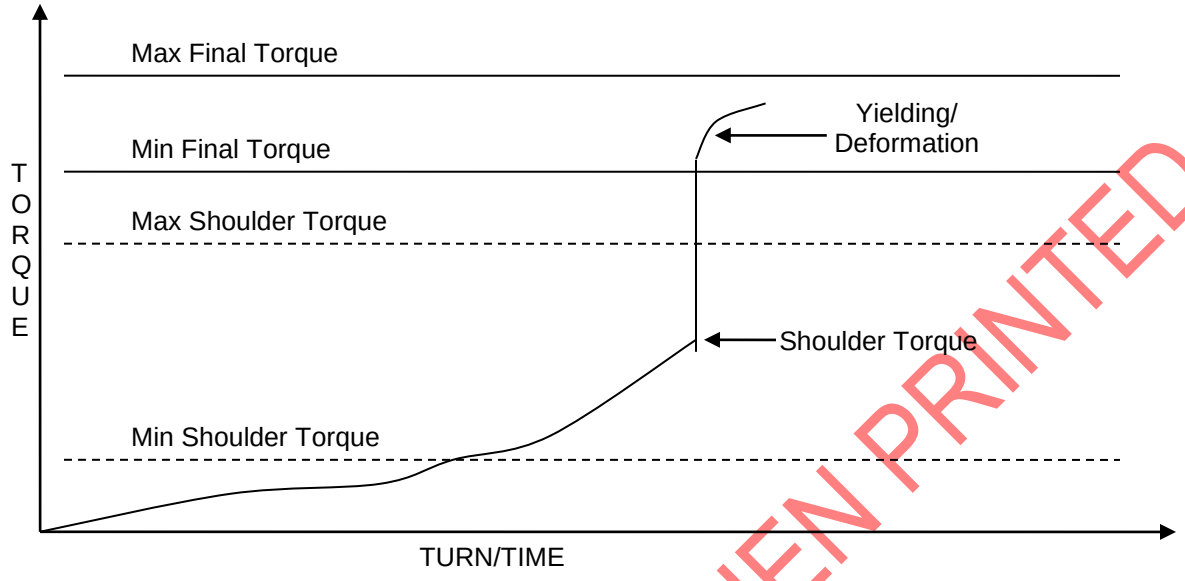

Figure 5 Yielding/deformation prior to final torque (Connection shall be rejected)

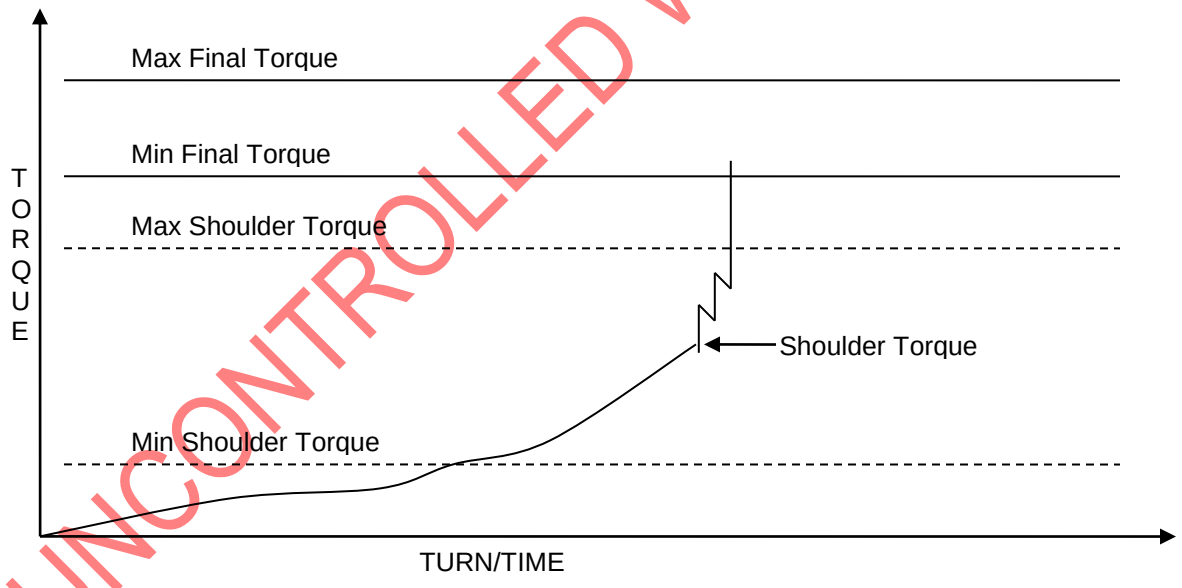

Figure 6 Interrupted rotation during makeup (Breakout and evaluate)

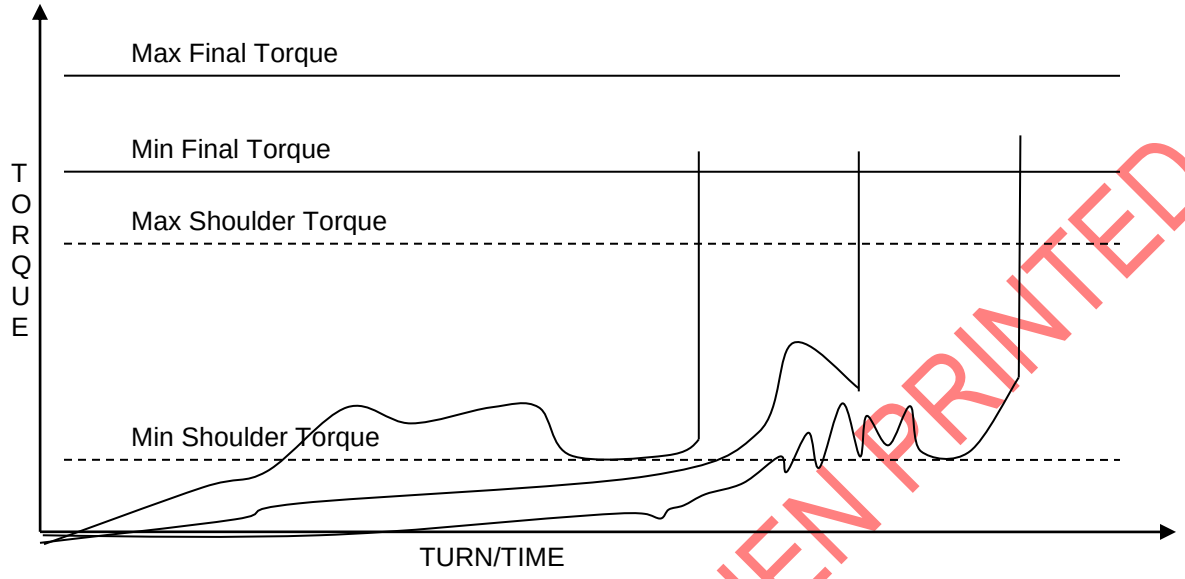

Figure 7 Irregularities prior to shoulder (Breakout and evaluate)