HUNTING

RECOMMENDED PRACTICE TEC-LOCK WEDGE AND WEDGE-LOCK HT PRODUCT LINES

Approved	Initial	Date
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Revision	004	

SUBJECT: FIELD RUNNING AND HANDLING PROCEDURES

1.0 SCOPE

1.1 This document sets forth Hunting's recommended practice for the field running and handling procedures that should be used in conjunction with all Hunting **TEC-LOCK WEDGE (TLW), (including FLUSH, SC and SLIM WEDGE), and WEDGE-LOCK HT (WLHT),** tubing and casing product line connections.

NOTE 1: WLHT is a premium integral connection which has a metal-to-metal seal.

NOTE 2: TLW, TLWF, TLWSC and TLSW are a semi-premium integral connection.

2.0 REFERENCES

2.1 The following documents were used for reference in the preparation of this document:

2.1.1 API RP 5C1, latest edition

2.1.2 API BUL 5A3, latest edition

3.0 EQUIPMENT

3.1 The following list of equipment should be on location when the connections are run:

3.1.1 Ample supply of fresh, unopened thread compound. For thread compounds, please refer to Hunting's website to verify the current Recommended Thread Compounds approved by Hunting – Per Connection List.

3.1.2 Hunting's field service kit consisting of a pit gauge and caliper. (Four (4) month gage calibration frequency)

3.1.3 Appropriate connection data sheet.

3.1.4 **VISUAL THREAD INSPECTION**, Ancillary Specification.

3.1.5 **STEEL IMPERFECTIONS**, Ancillary Specification.

3.1.6 **OPTIONAL** - Torque turn monitoring equipment.

3.1.7 Appropriate size and weight handling plug.

3.1.8 Appropriate size and weight stabbing guide.

3.1.9 Thread lubricant applicators #58235 moustache brush.

3.1.10 Hunting does not recommend a bottlebrush for thread lubricant application as the amount of lubricant cannot be adequately controlled.

3.1.11 Appropriate size single joint elevators, swivel with appropriate load rating.

3.1.12 Power tongs with torque capacity 30% above make up torque or anticipated operating torque should be supplied, as break out torques could be substantially higher.

3.1.13 Running operations involving rotating or pulling the casing string can increase the amount of torque stored in the connection. Running operations should be considered when selecting the torque capacity for the make up / break out equipment.

3.1.14 Tong Jaws with the ability to evenly contact most of the pipe OD are recommended.

3.1.15 Use low stress / non-marking, non-ferrous inserts for CRA pipe.

3.1.16 For TLW, WLHT, TLWSC, and TLSW, single joint elevators shall be bored to box O.D. + 0.050" + 0.075".

3.1.17 For TLWF, single joint elevators shall be bored to box O.D. + 0.030” + 0.050".

4.0 FIELD RUNNING AND HANDLING PROCEDURES

4.1 Precaution

4.1.1 Tubulars should not be stacked higher than five tiers at the rig. (API RP 5C1).

4.1.2 Layers should be separated by wooden dunnage so that no weight rests on the connections. (API RP 5C1)

4.1.3 Thread protectors should always remain in place when moving or handling tubulars.

4.1.4 If a mixed string is to be run, ensure proper identification to accommodate sequence of running.

4.1.5 Do not use a welding torch to remove thread protectors.

4.1.6 Avoid rough handling. Do not unload pipe by dropping.

4.1.7 Do not handle more than three joints unless the pipe is packaged or bundled.

4.1.8 Never use hooks on the ends of pipe without liftable protectors. When liftable protectors are not available, handle with nylon slings or wire rope slings only.

NOTE 3: Special attention shall be placed on protecting WLHT seal surfaces.

NOTE 4: When running WLHT connections with SealLube™, it is recommended to apply an approved dry molybdenum disulfide (Banner Moli-G lube) to the seal areas of the pin and box connections.

4.2 Preparation

4.2.1 Ensure that all necessary running equipment is available and in good condition.

4.2.2 Following a thorough review of running/accessory equipment discuss running procedures with Drilling Supervisor.

4.2.3 Slip type elevators of proper size, in good repair and with the setting plate adjusted properly, should be used.

4.2.3.1 For TLW, TLWSC, TLSW, and WLHT, HYC slip type elevators shall have a 10" tall setting plate with a mouth +0.050” +0.075” over Box O.D.

4.2.3.2 For TLWF, HYC slip type elevators shall have a 10" tall setting plate with a mouth +0.030” +0.050” over Box O.D.

4.2.3.3 OPTIONAL: Air slip locking HYC elevators.

4.2.3.4 Hunting does not recommend the use of bottleneck or shoulder type elevators.

4.2.4 Use power tongs with capacity 30% above make up or anticipated operating torque.

4.2.5 Ensure that slips are of the correct size to accommodate the size, weight and length of the tube.

4.2.6 Ensure that the safety clamp is the correct size and in serviceable condition. The safety clamp should be used above the table slips up to a string weight per the clamp manufacturer’s rated load limit.

4.2.7 Check for traveling block alignment and rotary hole alignment.
4.2.8 Ensure that an ample supply of recommended thread compound is available. Only fresh, previously unopened cans of recommended thread compound shall be used.
4.2.9 A stabbing board or a yoke may be required to offer stability for ease of make up.
4.2.10 Ensure that the power tong snub line is at 90° and level with the tong and that the tongs are level at rotary hole.
4.2.11 Ensure that an accurate torque monitoring device is available.
4.2.11.1 Ensure that the inputs from the load cell, arm length and tong used are adequate for the required torque range.
4.2.11.2 The load cell must have been calibrated within the past six (6) months.

4.3 Cleaning and Thread Inspection
4.3.1 All tubular connections shall be thoroughly cleaned and dried prior to visual inspection.
4.3.2 Before running, remove protectors from both the pin and box ends. Clean each connector and protectors, preferably with soap and water. Thoroughly dry the connectors and protectors.
4.3.2.1 Care must be taken to ensure that the cleaning process does not cause environmental pollution.
4.3.2.2 Ensure debris and contamination is removed from each thread protector.
4.3.3 Check and clean the inside of the tubulars to eliminate any foreign material that may fall into the box while stabbing.
4.3.3.1 If compressed air is available, air blast from box to pin.
4.3.3.2 Ensure that there are no bristles left on the threads from cleaning.
4.3.4 Drift the pipe and accessory equipment with a clean, properly sized mandrel. Drift shall be performed box to pin, being careful not to damage the box connection when placing the mandrel in the joint.
4.3.5 Inspect the threaded connections using Hunting's **VISUAL THREAD INSPECTION** guidelines and **ANCILLARY SPECIFICATIONS**. Repair as required by **VISUAL THREAD INSPECTION** and/or **STEEL IMPERFECTION ANCILLARY SPECIFICATIONS.**
4.3.6 If any joint shows obvious ovality, it should not be run.
4.3.7 For WLHT, apply recommended thread compound or SealLube™ to entire pin thread and seal only.
4.3.8 For make ups of TLW/TLSW/TLWSC/TLWF with SealLube™, application of SealLube™ shall be to the entire pin thread only.
4.3.9 For make ups of TLW/TLSW/TLWSC/TLWF, with thread compound, application of the approved thread compound shall be to the entire box thread only.
4.3.10 Rig ready preparation for SealLube™, application of PRESERV-A-THREAD™ shall be applied to the pin and box.

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4.4 Running

4.4.1 Handling plugs and/or thread protectors must be in place whenever tubulars are moved.

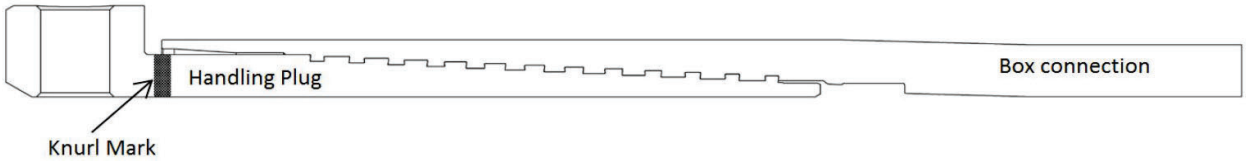
4.4.2 Joints should be moved to the V-door via a pick-up machine. If a pick-up machine is unavailable, joints should be moved to the V-door by slings, or a pick-up line attached to the box end.

4.4.3 For TLW, TLSW, TLWSC, and WLHT, elevators or pick-up line with or without single joint elevators may be used to lift the joint up in the derrick. The single joint elevators shall be bored to box O.D. + 0.050” + 0.075" for the appropriate size and weight to be run.

4.4.4 For TLWF, elevators or pick-up line with or without single joint elevators may be used to lift the joint up in the derrick. The single joint elevators shall be bored to box O.D. + 0.030” + 0.050" for the appropriate size and weight to be run.

WARNING: Prior to lifting, TLW and TLSW handling plugs must be made-up to the knurl hand tight without the assistance of make up bar or snapping of handling plug and securely engaged in the box. (See Figure 1.) Failure to make up to the proper position may cause the handling plug to disengage, which may result in the pipe falling. This may cause connection damage, property damage, bodily injury, or loss of life.

Figure 1



WARNING: Prior to lifting a TLW, TLWF, TLWSC, WLHT and TLSW connection, handling plugs shall be tightened utilizing a make up bar. Handling plugs should shoulder on the box face (See Figure 2) however, up to a 0.100” gap is acceptable (see Figure 3). Failure to make the handling plugs up to the proper position may cause the handling plug to disengage, resulting in the pipe falling, connection damage, property damage, bodily injury, or even the possibility of loss of life.

Figure 2 Acceptable

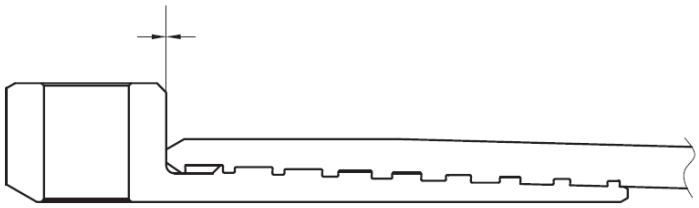
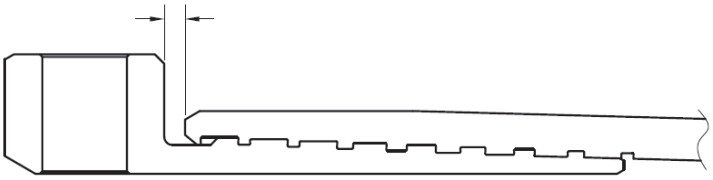


Figure 3 Maximum gap 0.100" Acceptable



4.4.4 Do not remove handling plug from box until mud line is removed after filling.
4.4.5 Remove protector and re-inspect each connector as it hangs in the derrick.
4.4.6 Visually inspect the pin and box connection.
4.4.7 Use an alignment yoke to assist make up.
4.4.8 Stab the pin connector into the box connector utilizing the appropriate size and weight stabbing guide.
4.4.9 If the connection is mis-stabbed, pick up the joint, clean the pin and the box and reinspect.

4.5 Dump Test

4.5.1 Dump test shall be conducted prior to casing run. Failure to verify dump test could result in premature dump of torque prior to acceptable optimal torque and or over torque of connection.

4.5.2 When conducting a dump test, the torque applied at test will depend on the wall thickness of the casing body. Consideration should be given to "THIN WALL" casing. This will have to be evaluated by the qualified Hunting representative on location at that time. It is recommended, in questionable thin wall casing dump tests that 65% of the connection optimal torque be utilized. If the dump test results are questionable, contact HUNTING FIELD SERVICE for guidance.

4.5.3 When conducting multiple dump tests on casing, it is crucial that the Hunting representative have the tong operator release the jaws and remove the tongs from casing. Tongs are to be applied at a different area on the casing for sequential dump tests. Failure to do so may result in excessive die penetration or point loading which can jeopardize the integrity of the casing.

4.6 Make up

4.6.1 Torque-Turn Equipment.

A torque-turn/time or torque/turn monitoring system should be utilized. Monitoring equipment should be capable of resolving torque to 1/100th of a turn increments as a minimum but equipment capable of resolving torque to 1/1000th of a turn should be utilized when available. An enhanced computer display should be part of the torque-turn monitoring equipment and should be utilized to monitor make up. The monitoring equipment should be capable of dumping during the make up by either the computer technician or when maximum parameters are

reached. The load cells used with the torque monitoring equipment should be calibrated every six (6) months, traceable to the appropriate national standard.

4.6.2 Back-up tongs should be placed below the box connection. (Refer to Reference 1 below) Use back-up tongs until enough weight is generated in the slips to prevent the entire string from rotating.

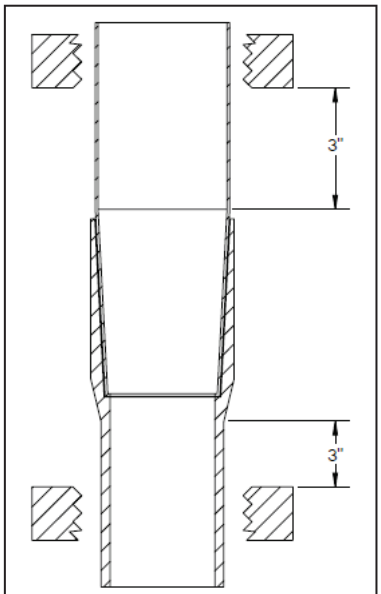
4.6.2.1 It is recommended not to grip over box connections. (Refer to Reference 1 below)

4.6.2.2 It is recommended to use a proper jaw / insert size with enough contact area with the pipe to minimize the insert marks.

4.6.3 Power and backup tong dies SHALL be clean and not worn. The maximum acceptable insert mark depth on Carbon steel pipe is 12.5% of the pipe wall thickness and 5% or 0.012" on sour service and CRA material per API 5CT latest revision.

4.6.4 Insert marks are NOT allowed over the TLW/WLHT/TLSW/TLWSC/TLWF Box connection. It is highly recommended to avoid gripping over the TLW/WLHT/TLSW/TLWSC/TLWF Box transition area as this will lead to uneven deep insert marks. Refer to acceptance criteria.

4.6.5 The below Reference 1 shows the location of Tong Jaws during make up of the TLW/WLHT/TLSW/TLWSC/TLWF connections.



Reference 1

4.6.6 In the event of horizontal makeups all standard procedures apply.

4.6.6.1 A Scribe Line across the connection shall be painted.

4.6.6.2 Any time the Scribe is no longer aligned, the connection shall be

retorqued in accordance with the appropriate connection data sheet and Field Running and Handling Procedures. The end user may request for the connection to be rechecked for torque at any time between the initial makeup and the run-in hole procedure.

4.6.6.3 The care and transportation of the doubles and the connections is the responsibility of the end user.

4.6.7 When using a CRT (Casing Running Tool) to make-up a connection, the equipment shall the following apply:

4.6.7.1 Equipment shall have the proven capability to compensate for the vertical movement associated with connection makeup:

4.6.7.1.1 The compensation per rotation shall be associated to the number of threads per inch of the connection. Contact HCT Engineering for the correct threads per inch for the connection.

4.6.7.1.2 The total amount of the vertical movement of a connection make-up could be up to half of the makeup loss published on the appropriate size, weight, and grade specific Connection Data Sheet.

4.6.7.2 Effective compensation for the vertical movement of the connection make-up shall not cause an increase of more than 1500 ft/lbs. of torque during the rotation of the connection from the stab position to the hand tight position.

WARNING: Failure to effectively compensate vertical movement of the connection make-up will result in an inadequate make-up with false torque records.

4.6.7.3 When using a CRT for connection make-up, no DUMP VALVE SHALL be used, instead, a 5 to 8 second torque hold SHALL be applied.

4.6.7.4 The connections should be checked by hand after make-up for excessive heat generated during make-up. The excessive heat can be caused by too much or the lack of compensation by the CRT tool. If excessive heat is detected (should see interference in make-up torque turn graph as well). CRT make-up operations should be stopped and HUNTING FIELD SERVICE as well as the END USER'S COMPANY REPRESENTATIVE shall be immediately notified of the issue.

4.6.7.5 Prior to using a CRT tool for connection make-up operations, it is recommended to contact Hunting Field Service for CRT equipment review and experience. Failure to complete the review could result in an inadequate make-up of the connection, lost time, rig downtime, or the operator running connections at their own liability and risk.

4.6.8 For high torque application, Hunting recommends the use of integral tongs with low stress tong dies.

4.6.9 Do not allow the stabber to rock the tube during make up.

4.6.10 Make up in high gear is allowed from stabbing to hand-tight.

4.6.10.1 It is recommended to not exceed 20 RPM in high gear.

4.6.10.2 Make up speed should not vary excessively and should be continuous with no gear changing after the snub line becomes tight.

4.6.10.3 In no case should the make up speed exceed 5 RPM after the hand tight / snub line becomes tight.

4.6.11 If torque/turn monitoring equipment is used, a make up torque/turn graph should be generated for every connection.

4.6.12 Lower the elevators over the pipe after make up is complete, not during make up.

4.6.13 In the event torque/turn or torque turn/time equipment is used at the rig site, the following procedure should be used to set acceptance criteria:

4.6.13.1 Prior to the job, the operating company representative should review the Hunting connection data sheet for the connections. Torque acceptance limits should be in the range shown on Hunting's connection data sheet.

4.6.13.2 Those connections falling outside the acceptable make up window should be broken out and checked for damage. If no damage is found, the connection may be made up again.

4.6.13.3 A torque curve showing a small wave shall be acceptable. However, the connection with an excessive wave in the torque curve shall be broken out and visually inspected. If no damage is found, the connection may be made up again. (Refer to GRAPH 3)

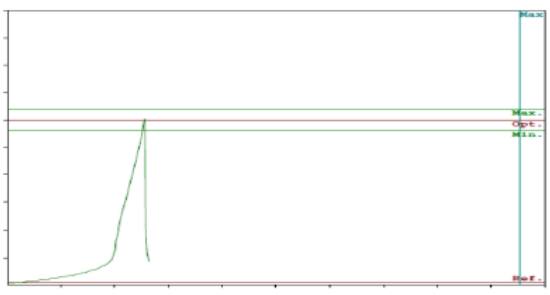
4.6.13.4 If a graph shows an anomaly as seen in GRAPH 4, and if the flat area is **less than** 0.1 turn, the connection is deemed acceptable. If the flat area is **greater than** 0.1 turns, the connection's make up is unacceptable and should be broken out for evaluation.

4.6.13.5 Final torque more than the maximum acceptable final torque or less than the minimum acceptable final torque, the connection should be broken out and visually inspected. If no damage is found, the connection may be made up again.

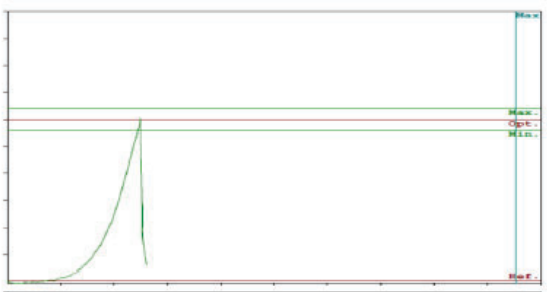
4.6.14 See following examples of acceptable and unacceptable make up graphs:

ACCEPTABLE GRAPHS:

1.



2.



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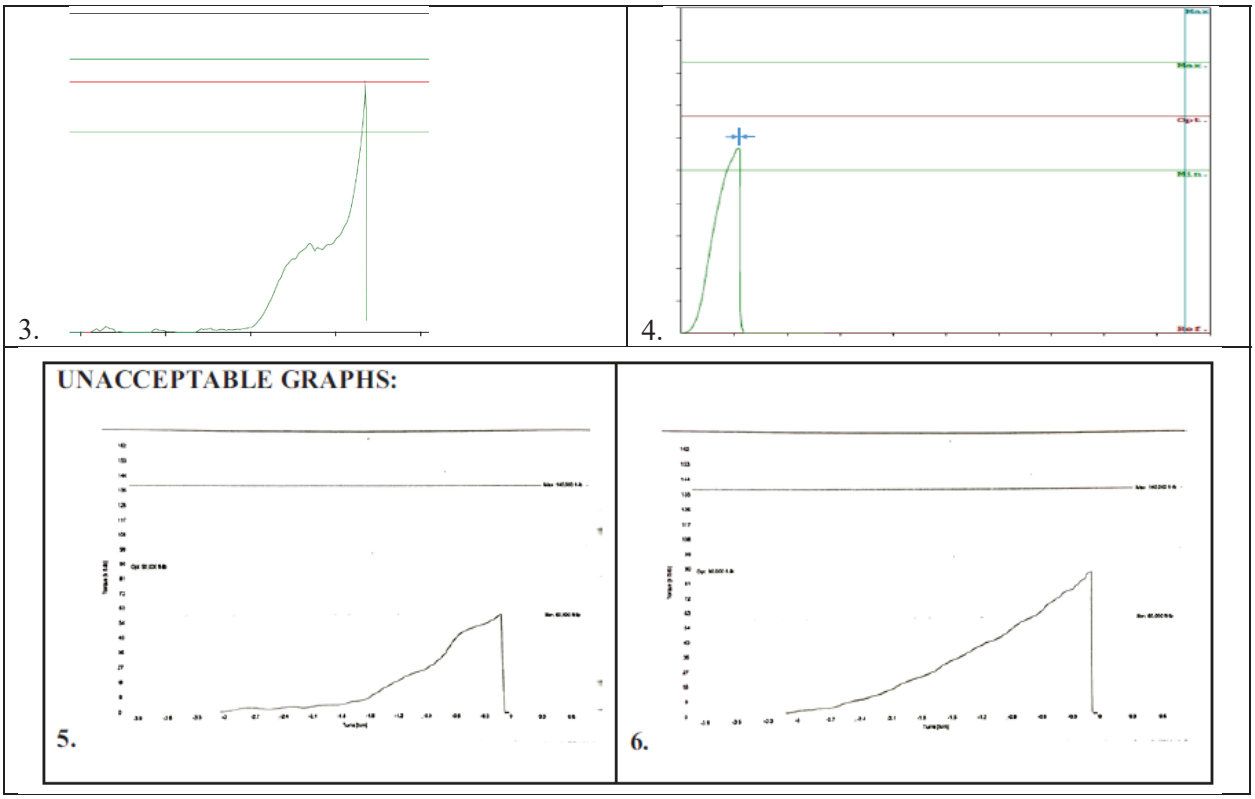

4.7 Casing String Rotational Parameters

4.7.1 When rotation of casing string to achieve total depth is warranted, careful considerations and monitoring by the operator are required to avoid unintended damage to the casing or connection. Unintended damage could include fatigue, casing or connection wear, over-torque, torsional yield or even triaxial failure.

4.7.2 Hunting recommends that maximum rotational RPM's do not exceed 30 RPM. If an end user requests a higher rotational RPM than recommended, contact HUNTING FIELD SERVICE for guidance.

4.7.3 Hunting recommends that maximum rotational torque applied to casing string not exceed posted maximum torque or operational torque on Hunting's connection data sheet.

4.7.4 It is pertinent to capture all circumstances (change in torques, RPM's, well conditions, pulling weight of string, etc.) once rotating of casing string has started.

4.7.5 During rotation of the casing string, it is important to pay close attention to the performance of all equipment.

4.7.5.1 Verify that handling plugs are properly engaged.

4.7.5.2 Verify that pins are not backing out of boxes.

4.7.5.3 Verify that loosening or excessive damage from not retracting grapples on CRT tool prior to lifting once disengagement by the driller has not occurred.

4.7.5.4 Any damage to tools shall be to be assessed by the Hunting representative.

4.7.5.5 After inspection, if the assessed damage is concerning to the operational ratings of the handling plug, the equipment shall be taken out of service immediately and documentation of the damage is required.

4.7.6 When pulling or working of casing string, Hunting recommends not exceeding 65% of longitudinal yield strength, which is posted on connection size, weight, and grade specific technical data sheet. If 65% of longitudinal yield strength is requested to be exceeded, contact HUNTING FIELD SERVICE for guidance. It is crucial to capture all readings when pulling and rotating the casing string.

4.8 Pulling

4.8.1 Preparation

4.8.1.1 Slip type elevators are required.

4.8.1.2 Use an alignment yoke and weight compensator when pulling casing.

4.8.1.3 Use power tongs with acceptable torque read-out and back-up tongs.

4.8.1.4 A wooden platform must be used for standing back casing. (Refer to API 5C1)

4.7.1.5 Clean thread protectors should be available prior to laying down or standing back. As each connection is broken out, protectors shall be installed on each pin.

4.8.1.6 The connection may require significantly more break out torque when compared to make up torque. Operations beyond normal make up conditions and the amount of time the string has been sitting in the well are factors that could cause higher break out torques. These conditions are inclusive of, but not limited to rotating, reciprocating, jarring, well temperature, thread compound and applying weight to the casing string.

4.8.2 Handling plugs must be used during pulling.

4.8.3 Breaking Out

4.8.3.1 During pulling operations, the back-up tong should be placed on the pipe below the connection including the box transition. (Refer to the Reference 1) Pipe wrenches or chain tongs shall not be used as back-ups.

4.8.3.2 Break out the connection at a speed less than 5 RPM.

4.8.3.3 After breaking the connection continue to rotate at 5 RPM or less. Remove the power tongs after 4 ½ turns and slowly pick up the joint. The connection will be disengaged and ready for separation in 4 ½ turns from the power tight position.

4.8.3.4 Ensure all the threads are disengaged before lifting the tubing/casing out of the box. Do not jump out of the box. If this occurs, inspect the pin face and threads seal for damage.

4.8.3.5 If excessive torque is noted, rotation should be stopped until cause is determined.

4.8.3.6 Prior to lifting pin out of the box, it is recommended to use a stabbing guide.

4.8.4 Standing Back (Tubing or Casing)

4.8.4.1 Tubulars should be set on a firm wooden platform when stood back in the derrick.

4.8.4.2 Protect threads from dirt or damage when the tubulars are out of the hole. Thread protectors shall be installed on the pin members when standing back and may be required in the box when conditions warrant.

4.8.5 Re-Running

4.8.5.1 Clean connection members fully and inspect for damage.

4.8.5.2 Re-run as per 4.4, 4.5 and 4.6.

4.8.6 Laying Down (Casing)

4.8.6.1 Clean protectors shall be placed on the tubulars before they are laid down.

4.8.6.2 If tubulars are stored or re-used, remove the protectors after laying down, clean and inspect connections. Apply a uniform coat of recommended thread compound. Install clean thread protectors.

5.0 ROTATIONAL PARAMETERS DISCLAIMER

5.1 In situations where the rotational parameters set forth in the Hunting running and handling procedures are requested to be exceeded by the end user running Hunting Connections.

5.2 There are several variables that need to be taken into consideration when increasing Rotational Torques (Above posted operational torque on the CDS), Pulling Weight of the Casing String (Above 65% of the longitudinal yield strength on the CDS), and Rotational RPM's (30 RPMs posted in running and handling procedures for the Hunting Connections).

5.3 Some of the variables to consider are hole conditions, rate of penetration, duration of time in one spot (Joint or footage), pulling weight of string, curves or "dog legs" in well.

5.4 The Hunting wedge connections in these increased rotational parameter situations will continue to wedge "torque up". The connections are not really a concern in these situations from a performance perspective, the concern will be the higher break-out torques if the string must be pulled for any reason. Connections will need to go through a full visual inspection if pulled by a HES QA Service Representative.

5.5 If there are any die marks on the upset of the box connections (area where box transitions to plain end pipe body), this is part of the connections and will be rejected per Hunting's procedures.

5.6 The pipe body of the casing/tubing will be a concern in increasing rotational parameters above the recommended in running and handling procedures. If casing string must be pulled for any reason after increasing the rotational parameters, the breakout torques will be higher and may result in damage from the casing equipment utilized to break out the connections.

5.7 The dispositioning of the pipe body as acceptable or rejectable will be at the discretion of the end user. API governs the acceptance of pipe wall by 12.5%.

5.8 The accessories utilized in the well need to be taken into consideration as well in these increased rotational torque situations. Any damage to accessories needs to be addressed with the manufacturer of the accessory as well as the final dispositioning of the accessory will be by the end user. Hunting Energy Services LLC are only responsible for the performance of the Hunting connections threaded on the accessories.

5.9 Hunting Energy Services LLC. will only make the dispositions on the pin and box connections and provide that information to the end user upon completion of inspection.

6.0 RUNNING PROCEDURE FOR ACCESSORIES MADE UP USING THREAD LOCK COMPOUND / SealLube™

6.1 Using steam, soap and hot water, or safety solvent, remove all thread storage or running compound from both pin and box connectors.

6.2 Ensure that the thread is clean, dry, and free of oil, grease, or residues.

6.3 Just prior to make up, the thread lock / SealLube™ shall be applied on the entire pin connectors only (not on the box).

6.4 For WLHT it is recommended to apply Banner Moly-G Lube spray to seal areas of the pin and box connectors prior to the application of the thread locking compound/ SealLube™.

6.5 When making up float equipment, hangers, thick wall accessories, and others, torques might be higher than normal due to the wall thickness.

6.6 The make up torque of the accessories with thread lock should be targeted towards optimum torque listed on the connection data sheet, plus 20%.

6.7 Hunting does not recommend gripping over a box connection; however, if it is necessary to place back-up tongs over an accessory box connection, Hunting recommends the use of low stress tong dies. Maximum die penetrations shall not exceed 0.010". If the die penetration maximum is exceeded, Hunting Field Service shall be contacted at (281) 442-7382 or at Fieldserviceoperations@Hunting-intl.com.