

The procedures described below have been developed to accommodate most rig operations and address the unique features and parameters of the DUO connection - when paired with best industry practices and experienced personnel, the DUO connection will provide its maximum levels of capability through even the toughest of drilling conditions.

## 1. PRE-RUNNING CHECKS

- 1.1. Visually inspect all drill pipe tubes, tool joints, and connections for damage.
  - 1.1.1. If any thread protectors are damaged, remove and visually inspect the connection(s).
  - 1.1.2. Identify all new or repaired tool joints for recommended break-in.
- 1.2. Inspect the pipe slips for any damaged or missing dies.
- 1.3. Check to ensure the counter balance on the top drive is working properly and is set up to provide a minimum amount of weight to stabbed connections.
  - 1.3.1. If the top drive counter balance is not working or adjusted incorrectly, too much weight may be applied to the connection during make-up, resulting in connection damage.
  - 1.3.2. Contact the top drive manufacturer for proper counter balance troubleshooting or adjustment procedures.
- 1.4. Adjust the bore through the top drive bell stabbing guide so it will be no more than ½” larger in diameter than the box tool joint OD.
- 1.5. Ensure the position of the backup torque wrench or iron roughneck jaw is set at a minimum 4” below the box shoulder to avoid crushing the counterbore of box connections.
- 1.6. Determine the operating makeup torque(s) for connections being utilized in the drillstring.
  - 1.6.1. Appropriate make-up torque should be determined based on a variety of factors including (but not limited to) drilling conditions, connection style and size, thread compound friction factor, rig capabilities, etc. *Modifying (increasing or decreasing) the intended make-up torque should only be performed at the discretion of qualified personnel.*
- 1.7. Verify the top drive torque and the iron roughneck torque using the rig tongs and a recently calibrated load cell.
- 1.8. Break in new threads on top drive saver subs, stabbing valves, and other accessories as per section 4.

## 2. PICKING UP

- 2.1. Leave all pin protectors on the pipe as it is pulled up the V-door and lowered into the mouse hole.
  - 2.1.1. Only remove pin protectors after the pipe is pulled out of the mouse hole and a connection is to be made.
- 2.2. If the pipe is to be picked up with pick-up nubbins, visually inspect the nubbin thread damage before making them up in the drill pipe box connections.
  - 2.2.1. Keep protectors on the lifting nubbins when they are lowered down the V-door or not in use.

REVISION	DATE	AUTHOR	APPROVAL	NOTES
1	DEC 04 2019	NG	--	MAKEUP SPEED LIMIT, STORAGE COMPOUND
0	APR 25 2018	SC	--	INITIAL ISSUE

### 3. THREAD COMPOUND

- 3.1. A high-quality copper based thread compound is sufficient for most applications.
  - 3.1.1. For specific circumstances, specialized thread compounds may be more appropriate – consult with the compound manufacturer in these cases.
  - 3.1.2. At the discretion of the end-user, friction factors may be applied to Complete Group supplied DUO makeup torques as per the thread compounds manufacturer’s recommendations. *Complete Group waives all responsibility and liability for connection damage or failure resulting from overtightening of connections where thread compound friction factors are applied.*
  - 3.1.3. The thread compound should be kept free of contaminants and stored in a climate-controlled environment when not in use.
  - 3.1.4. Storage compounds, greases or varnishes are not a suitable replacement for drill pipe thread compound.
- 3.2. Ensure the connection is clean, dry, and free of contaminants before applying thread compound.
  - 3.2.1. Storage compounds, wellbore fluids and drilling muds that can affect the adhesion of thread compound to the connection must be rinsed off.
  - 3.2.2. A soft wire brush and/or clean cloth may be utilized in conjunction with solvents such as Varsol for particularly difficult cleaning situations provided the solvent is cleaned off the connection before applying thread compound.
- 3.3. Apply thread compound to all metal contact surfaces of the DUO pin and box threads.
  - 3.3.1. Use a good quality brush which does not shed strands of hair.
  - 3.3.2. The DUO thread form, primary shoulder, and secondary shoulder should all be coated with a layer of thread compound.
  - 3.3.3. Thread compound must be spread across all thread surfaces prior to make-up – **CONNECTION SPIN-UP WILL NOT SPREAD IMPROPERLY APPLIED COMPOUND**

### 4. CONNECTION BREAK-IN

- 4.1. For connections with newly machined pin or box features, connection break-in is recommended to be performed.
  - 4.1.1. This includes new threads, shop repaired/recut threads, and refaced box or pin seal surfaces.
  - 4.1.2. Break in aims to work harden the raw machined surface(s) to prevent future damage from occurring.
- 4.2. Apply an appropriate thread compound to the entire connection as per section 3.
- 4.3. Properly align and stab the pin into the box.
  - 4.3.1. For smaller components and accessories, stabbing should be done by hand and/or using the winch line.
  - 4.3.2. Minimize the amount of weight being applied to the connection.
  - 4.3.3. Do not rotate with high weight applied to a partially stabbed connection in an effort to have the pin ‘fall’ into the box.
  - 4.3.4. Do not rotate the pin into the box during stabbing.
  - 4.3.5. Do not let the nose of the pin strike the seal face of the box.

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1	DEC 04 2019	NG	--	MAKEUP SPEED LIMIT, STORAGE COMPOUND
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- 4.4. Spin the pin into the box using chain tongs.
  - 4.4.1. *Spinners (high or low speed) should not be used during break in operations.*
- 4.5. Torque the connection up to 100% of the predetermined make-up torque using the tongs or iron-roughneck.
- 4.6. Break-out the connection, monitoring break-out torque.
  - 4.6.1. **IF BREAK-OUT TORQUE IS EVER GREATER THAN MAKE-UP TORQUE, COMPLETELY SEPARATE THE CONNECTION, CLEAN THE BOX AND PIN THOROUGHLY, AND INSPECT BOTH FOR DAMAGE.**
  - 4.6.2. If break-out torque is less than the make-up torque, do not separate the connection; simply back the connection out approximately ½ turn to ensure shoulder separation.
- 4.7. Make up the connection again to 100% of the predetermined make-up torque.
- 4.8. Break-out the connection and separate completely.
  - 4.8.1. Note that visual wear or minor surface damage to the landing pad threads of the DUO connection is common and is typically of no concern. Protruding debris may be dressed with a triangular file, emery cloth, or soft grinding wheel.
  - 4.8.2. The DUO landing pad on newly machined connections may initially exhibit a small amount of debris when first spinning connections apart. Ensure that any debris is removed from the connection prior to re-applying thread compound to prevent contamination of the thread compound.
- 4.9. Reapply thread compound as per section 3 and stab/spin the connection again as per 4.3 and 4.4.
- 4.10. Make up the connection to 100% of predetermined make-up torque.
  - 4.10.1. The connection is ready for service at this point.

## 5. MAKING A CONNECTION

- 5.1. Use a stabbing guide when running DUO connections.
  - 5.1.1. Stabbing guides ensure proper pin to box alignment, reduce damage to the box seal face and pin nose, enhance safety by reducing opportunities for finger pinch points, and reduce time spent aligning connections during tripping operations.
- 5.2. If a connection has been identified for break in, break in the connection as per section 4.
- 5.3. Apply an appropriate thread compound to the connection as per section 3.
- 5.4. Properly align the connection and stab the pin into the box.
  - 5.4.1. Minimize the amount of weight being applied to the connection.
  - 5.4.2. Do not rotate with high weight applied to a partially stabbed connection in an effort to have the pin ‘fall’ into the box.
  - 5.4.3. Do not rotate the pin into the box during stabbing.
  - 5.4.4. Do not let the nose of the pin strike the seal face of the box.
- 5.5. Spin the pin into the box.
  - 5.5.1. Minimize the weight applied to the connection while spinning-in.

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- 5.5.2. If a slow speed spinner is not available, one to two revolutions of initial spin-up should be made with a chain tong prior to spin up.
- 5.5.3. High speed spinners may be used once the starting threads have been engaged. Makeup speed should not exceed 25 RPM.
- 5.5.4. Minor thread damage can occur over time to the DUO landing pad threads. These threads are intentionally designed to contain and control handling damage and will wear-in over time. Most damage to the landing pad threads will not be detrimental to the DUO connection. Protruding debris may be dressed with a triangular file, emery cloth, or soft grinding wheel.
- 5.6. Use the rig tongs or iron roughneck to make up the connection to 100% of the recommended operating make-up torque for the connection ensuring that the position of the backup torque wrench or iron roughneck jaw is set at a minimum 4" below the box shoulder to avoid crushing the counterbore of box connections.
- 5.7. Continue to run in hole.

**6. TRIPPING IN/OUT**

- 6.1. Setting pipe slips should only be done while the drill string is no longer in motion.
  - 6.1.1. Never use the pipe slips to stop the downward movement of the drill string.
- 6.2. Monitor break-out torque when tripping out.
  - 6.2.1. Break-out torque greater than make-up torque is an indicator of downhole make-up and/or thread damage and should be investigated.
- 6.3. Alternate breaks when tripping so that each joint will eventually be broken-out and made-up over multiple trips.
- 6.4. Inspect the pin and box connections for signs of damage prior to re-applying thread compound.
  - 6.4.1. Note that visual wear or minor surface damage to the landing pad threads of the DUO connection is common and is typically of no concern. Protruding debris may be dressed with a triangular file, emery cloth, or soft grinding wheel.
  - 6.4.2. The DUO landing pad on newly machined connections may initially exhibit a small amount of debris when first spinning connections apart. Ensure that any debris is removed from the connection prior to re-applying thread compound to prevent contamination of the thread compound.
  - 6.4.3. Thread compound may be applied at any time during tripping in and/or out to the box and/or pin connections as long as the process is consistent.
- 6.5. Ensure pin protectors are installed when DUO pipe is stood back in the derrick.
  - 6.5.1. If the rig is equipped with wood or rubber matting in the base of the birdbath it is permissible to stand DUO pipe in the derrick without protectors. Pipe adjacent to the edge of the birdbath must have thread protectors installed as the exposed steel floor may cause pin nose damage upon stabbing.
  - 6.5.2. Note that racking pipe in the derrick without thread protectors installed will wipe thread compound from the pin nose of DUO connections; be sure to re-apply thread compound to the secondary shoulder prior to make-up in this case.
  - 6.5.3. Pipe stood back in the derrick should never have steel thread protectors installed.
- 6.6. When pipe is laid down ensure thread protectors are installed.

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