



## Running & Handling Procedures for Delta™ Connections

### Background

Delta is Grant Prideco's 4<sup>th</sup> generation double shoulder drill stem connection, following the 1<sup>st</sup> generation HI-TORQUE™, 2<sup>nd</sup> generation eXtreme™ Torque (XT™), and 3<sup>rd</sup> generation TurboTorque™ (TT™). This connection was developed on the basis of user feedback and incorporates features to ensure ease of use. This document provides a procedure for effectively and efficiently running & handling Delta connections. Delta connections differ from HI-TORQUE, XT, TT and some connection running & handling processes will differ from the procedures of these earlier generations of rotary-shouldered connections.

### Detail

- 1.0 **Scope:** This procedure describes the running & handling requirements for Grant Prideco Delta connections.
- 2.0 **Equipment:** The equipment listed below are considered industry best practice to perform the described activities:
  - 2.1. calibrated load cell
  - 2.2. saver sub
  - 2.3. thread compound (dope) and application brush
  - 2.4. thread protectors
  - 2.5. drill pipe wiper (preferred)

3.0 **Procedure:** This procedure assumes normal running conditions and a pin down, box up string configuration.

- 3.1. Use rig tongs and a calibrated load cell to ensure the correct make-up torque (MUT) value is applied to the Delta™ connection from the top drive, iron roughneck and/or other automated make-up equipment.
- 3.2. When using a top drive, adjust the top drive bell stabbing guide, fixed or adjustable in order to provide ½ inch maximum clearance with the drill pipe box tool joint outside diameter (OD). This will guide the pin connection into the box without damaging the box shoulder. Contact the top drive manufacturer to get the proper size of guide if necessary.
- 3.3. When using a top drive, verify that the weight of the top drive and hoisting equipment applied at the Top Drive Saver Sub (TDSS) lower connection during make-up operations is at a minimum, either through properly calibrated and aligned automated pipe handling equipment or as controlled by the driller hoisting equipment.

**Note:** Top drive counterbalance systems provide a means to minimize the weight of the top drive shaft (quill) and TDSS applied to the connection during make up. If the top drive counterbalance is not effective, excessive weight applied to the Delta™ connection may cause damage. Contact the top drive manufacturer for proper counterbalance adjustment and calibration procedures.

- 3.4. Lower the top drive bottom connection of the TDSS into the top box connection of the string near the rig floor to confirm that the pin nose is centered in the box counterbore. If misalignment is visible, make necessary adjustment.
- 3.5. The overall length of saver subs used for API rotary-shouldered connections is suitable for use with Delta™ connections. Most saver sub length requirements are tied to the top drive manufacturer and type. Consult the top drive manufacturer for proper saver sub shoulder to shoulder length requirements.

**Note:** Saver subs observe elevated loading and multiple make & breaks. Grant Prideco™ has specific requirements for material properties of these sub types when Grant Prideco proprietary connections are installed. Ensure the saver sub material is provided by either Grant Prideco or a licensed Grant Prideco machine shop.

- 3.6. Top drive grippers used to make up the Delta™ box to the saver sub pin connection

must be positioned as far away and at least ½” from the Delta box primary shoulder. In no instance should the top drive pin gripper be positioned simultaneously on both the saver sub pin and Delta box connection and vice versa.

3.7. Determine the proper MUT to be applied to the connections. Reference below notes.

**Note 1:** Grant Prideco™ MUT range is based on several parameters, including connection OD and ID. Ensure that you have the right information. Two make-up torque values are available from our set of performance data sheets for Delta connections:

- Minimum MUT – minimum MUT that must be applied to the connection
- Maximum MUT – Grant Prideco recommended MUT for typical drilling applications

These two values are defining the MUT range that should be applied to the connection. MUT values less than the minimum or greater than the maximum as advised by Grant Prideco for these connections are not acceptable.

**Note 2:** It is considered industry best practice and in accordance with IADC Drilling Manual that applied drilling torque should not exceed 80% of the applied connection MUT. Drilling torque that exceeds these values can expose any connection to downhole conditions that may cause damage to the connection.

**Note 3:** If using a thread compound with a friction factor (FF) other than 1.0, follow recommendations of our latest technical bulletin PR-16. Thread compounds with FF below 1.0 are not acceptable.

3.8. For connections that have been newly repaired or recut AND have not been made & broke at the repair facility, it is considered industry best practice and Grant Prideco™ recommends to break in the connection by making it up and breaking it out to the maximum make-up torque three times. In particular, new saver subs should be made & broke to full make-up torque for the connection prior to use.

3.9. Verify the break-out torque (BOT) value to ensure it is less than or equal to the MUT value. If BOT exceeds MUT, ensure all procedures are being followed and verify all equipment is in calibration. High BOT is typically an indication of, but not limited to, improper doping or alignment during makeup/breakout, debris trapped between mated connections (such as debris from setback area present on pin nose), damaged connections or downhole makeup. If the anomaly persists, contact Grant Prideco.

3.10. Thread protectors are recommended to be installed during pipe movement and storage, where practical, to reduce the risk of damage to the connection shoulder, bevel and threaded regions. Pin thread protectors may be required in some horizontal racking system skids, while the box thread protectors may remain off. For pipe racking systems that are expressly configured to eliminate contact damage to the connections, thread protectors may be removed after placement of the pipe within the racking system. After removing the thread protectors, an even layer of thread compound should be applied to connections with adequate coverage on threads and external and internal shoulders. Storage thread compounds that are compatible with copper-based (and other) running thread compounds may help to slow corrosion rates resulting from extended periods of storage/exposure.

**Note 1:** Thread protectors should remain on pipe that is pulled through the V-door.

**Note 2:** Pin thread protectors should remain on pipe that is placed in the mouse hole. Only remove pin protectors after the pipe is pulled out of the mouse hole and prepped for installation in the string.

**Note 3:** It is not necessary, nor recommended, to install thread protectors on drill pipe racked in the derrick.

**Note 4:** The rack back area should be kept clean of debris (gravel, cuttings, etc.). Excessive debris in the rack back area may inadvertently damage the connection and/or inhibit proper make-up.

3.11. The connections of all handling plugs (lift subs, cast steel protectors, or else) shall be visually inspected prior to each use. Damaged handling plugs shall not be used on Delta™ connections. Secure thread protectors to handling plugs prior to placing them into the V-door and maintain thread protectors on the handling tools until they are ready for make up to the Delta box connection.

3.12. Visually inspect the pipe and tool joints for damage. If thread protectors are damaged, remove and visually inspect connections.

3.13. Visually inspect the threads, primary (external/sealing) shoulder and secondary (internal/torque) shoulder for damage or foreign material. Damaged threads or foreign material on the threads and shoulders can cause galling or prevent proper makeup. Refer to the latest revision of Field Inspection Procedure for Used Delta™ Connections.

3.14. Both pin and box connections are to have thread compound applied to the primary and secondary shoulders, and all of the threads prior to make-up.

**Note 1:** Confirm the type of thread compound on connections, i.e. – rotary

shoulder connection running compound – or – connection storage compound. User is responsible for ensuring existing compound is compatible with intended running compound at rig site. Otherwise, clean connections as necessary to remove storage compound and replace with rotary shoulder connection running compound. If dried or hardened compound is present on the connection (regardless of type), clean connections to remove dried or hardened compound and replace it with fresh compound. Do not use diesel fuel for connection cleaning as it can leave a film that will prevent compound adhesion to the connection.

**Note 2:** Recently cleaned connections may require the threads to be dry before thread compound is applied. Some thread compounds may not properly adhere to the threads and shoulders of wet connections.

**Note 3:** Ensure the use of contaminant-free thread compound and proper doping procedures. Delta connections are designed to be run with any thread compound recommended for use with API rotary shoulder connections. However, Grant Prideco™ prefers the use of a good quality copper-based thread compound for rotary shoulder connections due to its repeatable frictional characteristics and increased friction factor. An even coat of thread compound shall cover the entire connection surface; both the internal shoulders and external shoulders, and all threads of both.

**Note 4:** Some drilling/completion fluids and additives may alter frictional and other properties of the thread compound. Consult the thread compound manufacturer to verify compatibility of the thread compound with drilling/completion fluids and additives. If breakdown of the thread compound properties due to fluid contamination is suspected, rinse the drilling fluid off the connections before reapplying thread compound.

3.15. When using manual tongs, the height of the box tool joint above the rig floor should meet industry guidelines provided by organizational and standardization bodies such as International Association of Drilling Contractors (IADC), American Petroleum Institute (API) and International Standards Organization (ISO).

3.16. Similar to industry practice for running API connection, Grant Prideco DOES NOT REQUIRE the use of a stabbing guide at the rotary when stabbing Delta™ connections; however, using a stabbing guide will not have any adverse effect as it:

- Increases safety by reducing opportunities for finger pinch points when handling the connection, and
- Helps to guide the bottom pin connection into the top box connection at

the floor and reduces stabbing damage to the box seal face,

- May actually decrease trip times by reducing time spent by the rig crew when aligning pin to box connections during tripping operations

**Note:** With automatic pipe handling system, the pipe handling system shall be properly calibrated, aligned, and pre-adjusted to ensure proper alignment and smooth stabbing.

3.17. As with any connection, proper connection alignment is important prior to spin-up. Ensure the threads are engaged, and if the threads do not appear engaged; rotate the pin counterclockwise until it drops into the box. Then rotate clockwise to spin up the connection to shoulder engagement.

**Note:** If the connection is made up misaligned, thread damage may occur. Should this happen, any raised metal should be removed with a soft grinding wheel or a file. Refer to the latest revision of Field Inspection Procedure for Used Delta™ Connections.

3.18. Consistent with Industry Best Practices for all connections, Grant Prideco™ recommends that the box tong dies be positioned as far away and at least ½ an inch from the Delta box primary shoulder. In no instance should the pin tong be positioned simultaneously on both the pin and box connection and vice versa. The driller should be able to visually see that the external shoulder of the connection is between the pin and box tong dies. Tong dies should not be placed on drill pipe/HWDP tube sections and should only be placed on tool joint sections. Slips should NOT be used as back-up tongs.

**Note 1:** For iron roughnecks and other automated make-up equipment, care should be given to avoid gripping tong dies over tool joint hardbanding. TONGING on the hardbanding may lead to premature cracking, flaking or spalling of the hardbanding. Some automated systems MAY not support use of connections with both pin and box hardbanding due to limited visibility of gripping location, even when monitored by remote camera. Additionally, tong die systems may be setup to position box connections at predetermined height/location within the iron roughneck during makeup, which may affect tong gripping location on pin and box tool joints of varying lengths. Consult the iron roughneck manufacturer for details on adjusting tong die positioning when necessary.

**Note 2:** For iron roughnecks and other automated make-up equipment, tong die

pressure/load applied to the connection should be the minimal amount of pressure/load to avoid slipping of the dies on the connection and permit the proper torque input (MUT) to the connection. Poor die seating and/or incorrect gripping pressure may damage tool joints and increase make-up time. To make adjustments to the iron roughneck tong die pressure/load output, contact the iron roughneck manufacturer for proper adjustment procedures.

**Note 3:** Grant Prideco prefers, but does NOT require, the use of make-up equipment with multiple tong die sets spaced less than 180 degrees circumferentially apart to minimize the deformation of the box (squeezing or egging) when applying MUT to the connection. Ensure guidelines of 3.18 Note 2 are followed when make-up equipment that has two tong die sets spaced 180 degrees apart is used.

- 3.19. When tripping out of the hole, alternate connection breaks. During tripping, it is good practice to rinse the drill pipe OD with fresh water and use drill pipe wipers before racking back in the derrick. Ensure drill pipe wipers are not worn.
- 3.20. Break out the connection using tonging practices described in this procedure. Once the pin connection has disengaged from the box and prior to full separation of pin and box, avoid continued reverse fast spinning of the pin. This may lead to damage of the starting threads prior to full separation of the pin and box.
- 3.21. Apply thread compound per guidelines 3.14 to box and pin connections prior to racking back in the derrick. Standing the pipe in the derrick will wipe thread compound off the pin nose. Reapply compound to the secondary shoulder of the pin before connections are made up again.
- 3.22. When pipe is laid down, ensure pin and box connections are properly doped per guidelines 3.14, and thread protectors are installed.

#### 4.0 **Special Considerations:**

- 4.1. **New Delta™ String** - These recommended running and handling practices should always be used, but they are especially critical to adhere to during the first running of a Delta string. Most Delta connections are made and broke during manufacturing. The make & break operation is performed horizontally while the tool joints are loose and not attached to the drill pipe. As a result, it differs from rig makeup because axial compression is not placed on the connection during makeup. The manufacturing make & break successfully work hardens the shoulders and thread load flanks, but the

thread stab flanks are not work hardened as much. At the rig site, some portion of stand or top drive weight is often placed on the connection during makeup, providing an axial compressive load on the stab flanks. With continued rig makeup, the thread stab flanks will gradually work harden and improve resistance to thread damage.

- 4.2. **Simultaneous Multiple Connection Makeup** – The practice of making up multiple connections in a stand to final MUT using the top drive only is NOT recommended by Grant Prideco™ . This is acceptable practice when picking up singles, spinning up stands and racking back in the derrick. However, each connection must be made up individually to final desired and acceptable MUT prior to going in the hole.

## Conclusion

This document provides a procedure for safely, effectively and efficiently running & handling Grant Prideco Delta™ connections. Variances to any process in this procedure should be discussed with Grant Prideco to ensure compatibility with the Delta™ connection.

For questions regarding this Product Bulletin, please contact your local Grant Prideco representative.

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## Bullet Sheet Running & Handling Procedures for Delta™ Connections

**THIS IS A COMPLIMENTARY SECTION TO BULLETIN PC-22.2-2016Dec01-EXT AND IN NO WAY REPLACES IT**

- 3.0 This procedure is for a pin down, box up configuration.
- 3.1 Use rig tongs and a calibrated load cell to ensure correct make up torque values.
- 3.2 Adjust the top drive bell stabbing guide (fixed or adjustable) for 1/2" maximum clearance.
- 3.3 The top drive weight and hoisting equipment applied to TDSS connection during make-up must be minimal.
- 3.4 Lower bottom connection of the TDSS into the top box connection to confirm pin nose is centered. Adjust if misalignment is outside the manufacturer's specified limits.
- 3.5 Verify saver sub length and material are appropriate.
- 3.6 Position the box top drive grippers at least ½ an inch down from the Delta box primary shoulder.
- 3.7 Confirm the correct make up torque. If using a thread compound with a friction factor (FF) other than 1.0, follow recommendations of our latest technical bulletin PR-16.
- 3.8 Make and break new, or newly repaired, and new recut connections at maximum make up torque values three times before using downhole.
- 3.9 Verify break out torque value is less than or equal to make up torque value.
- 3.10 Use thread protectors and applicable compound during pipe movement and storage.
- 3.11 Do NOT use damaged handling tools. Check for damage prior to each run and periodically during run.
- 3.12 Visually inspect connection if thread protector is damaged. See Grant Prideco™ Field Inspection Procedure.
- 3.13 Visually inspect pipe, tool joints, and connections for damage. See Grant Prideco Field Inspection Procedure.
- 3.14 Before make up, apply an even layer of thread compound to all threads AND BOTH torque shoulders of the pin AND the box.
- 3.15 Follow industry guidelines for box height setup when using manual tongs.
- 3.17 Proper connection alignment is important prior to spin-up. Ensure the threads are engaged, then spin-up connection to shoulder engagement.
- 3.18 Tong dies can be positioned as close as ½" from the box primary shoulder. For automated make up equipment:
  - avoid gripping tong dies over the hardbanding
  - use the lowest tong pressure necessary to ensure make up torque but avoid tong slippage.
- 3.19 During tripping out of the hole, alternate connection breaks.
- 3.20 Follow 3.18 for connection breaking out. Stop rotation when connection threads are disengaged.
- 3.21 Apply thread compound to connection prior to racking back. Reapply dope on pin secondary shoulder when RIH.
- 3.22 Have pin and box connections properly doped and protectors installed when pipe is laid down.
- 4.2 Ensure make up torque values independently for EACH connection before going in the hole. The practice of making up multiple connections in a stand to final torque values with the top drive is NOT a recommended practice.