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JESCO

Tubular Running Manual

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Chapter 1:
Introduction to Connections and Field Services

This chapter presents Jubail Energy Services Company premium connections, engineered for demanding drilling environments and supported by a global manufacturing and service network. It stresses the importance of certified threading and repair facilities for maintaining connection integrity and explains the manual's purpose: to provide clear procedures that enhance performance, reduce failures, and support safe, efficient operations.

1.1 PRODUCT OVERVIEW AND GLOBAL EXPERTISE

JESCO premium connections represent the result of years of engineering excellence and field experience. Designed for challenging environments, these connections are tailored to meet the demands of modern drilling and completion operations — from conventional oilfields to deepwater and unconventional plays.

Manufactured and supported by JESCO, a world-renowned provider of seamless steel pipe solutions and integrated tubular services, JESCO products are backed by a robust infrastructure. This includes manufacturing plants, research and development center, field service team, and a fully integrated supply chain; enabling quick response, consistent quality, and customer-specific solutions.

These connections are engineered for well integrity, offering advanced sealing mechanisms, torque capacity, and fatigue resistance. Their proven track record spans operations across several countries, covering both onshore and offshore projects (see Appendices 1 & 2).

1.2 CERTIFIED THREADING AND REPAIR FACILITIES

To maintain the technical integrity and long-term performance of JESCO connections, JESCO operates an extensive network of licensed threading and repair facilities. These centers are equipped and audited to meet strict quality standards, ensuring that all re-threading and inspection services comply with JESCO specifications.

Only these authorized facilities are permitted to rework or re-thread JESCO connections. Using unauthorized services may lead to connection failure, invalidation of warranties, and increased HSE risk.

1.3 PURPOSE AND SCOPE OF THIS MANUAL

This manual serves as a comprehensive field reference for the proper care, preparation, and installation of JESCO premium connections. It consolidates globally validated procedures and incorporates lessons learned from multiple field jobs across diverse geographies and operating environments.

Whether you’re working with carbon steel or chrome alloys, these guidelines are designed to:

- Enhance connection integrity and reduce failure rates.
- Ensure consistent application of best practices across the field.

- Support HSE standards and mitigate environmental and operational risks.
- Extend the service life of each joint and reduce NPT (non-productive time).

While this manual does outlines key procedures, we strongly recommend the presence of JESCO field service representatives during running operations. These representatives are extensively trained, undergo continuous qualification programs, and are experienced in adapting procedures to variable rig conditions.

1.4 RIG-SITE FIELD SUPPORT: RUNNING ASSISTANCE

JESCO offers direct technical support during live operations through on-site field service representatives. These professionals act as advisors and quality gatekeepers throughout the running process.

Rig-Site Running Support Includes:

- Coordination with the rig's operating company representatives and service providers.
- Application of procedures described in this manual and latest JESCO technical updates.
- Visual inspection of each joint and connection before running.
- Verification of tool and equipment readiness, including:
    - Drifts
    - Stabbing guides
    - Thread Compounds
    - Handling Plugs
    - Quick-fit protectors
    - Correctly sized elevators and tongs
- HSE compliance monitoring and awareness guidance.
- Ensuring correct compound selection and application per environment and connection type.
- Supervision of make-up parameters and torque-turn readings.
- Advising on pipe handling techniques, surplus preparation, and rejection identification.

- Performing minor connection repairs if conditions and approvals allow.
- Real-time adjustments and troubleshooting based on field observations.

1.5 OFF-SITE TECHNICAL SERVICES: YARD & FACILITY SUPPORT

In addition to rig-site involvement,JESCO offers support across various operational nodes — including pipe yards, bucking units, and preparation facilities. These services are crucial for ensuring readiness and compliance before material reaches the rig.

Technical Services Provided Include:

- Close collaboration with drilling engineers, completion teams, and logistics personnel.
- Validation of torque equipment calibration and readiness.
- Supervision of make-up for:
  - Couplings
  - Completion assemblies
  - Packers and hangers
  - Float shoes and casing accessories
- Inspection of components, seals, threads, and protectors prior to loadout.
- Stock and inventory traceability checks, including condition audits.
- Guidance on safe and efficient storage, transportation, and staging.
- Pre-job technical briefings and participation in drilling-on-paper sessions.
- Operator and crew training — both on-site and remote — on connection handling, torque monitoring, and damage prevention.
- Ongoing process optimization recommendations

1.6 REPORTING AND DOCUMENTATION

Upon completion of each job, the JESCO field service representative prepares a service ticket, to be signed by the company representative at the rig or yard. This summary includes:

- Work performed and results.
- Notable deviations or non-conformances.

- Connection behavior observations.
- Technical issues encountered and corrective actions

A comprehensive post-job report may also be provided, offering graphs, photos, and conclusions. This is particularly valuable for future jobs or procedural reviews.

1.7 COMMITMENT TO HEALTH, SAFETY, AND ENVIRONMENTAL STEWARDSHIP

JESCO upholds a firm commitment to sustainability, personal safety, and environmental protection. These values are deeply embedded in our operating philosophy and field service culture.

HSE Key Practices:

- All site-specific safety protocols must be fully implemented — including risk assessments, PPE use, and incident response plans.
- Only experienced and/or qualified personnel should handleJESCO connections.
- Daily safety briefings (toolbox talks) should address pipe handling hazards, chemical exposure, fall risks, and equipment safety.
- Hazards such as H_2S exposure, heavy lifting, and rotational machinery must be managed with vigilance.

Environmental Considerations:

- Ensure all waste (thread compound, cleaning rags, protectors, wash fluids) is disposed of as per local regulations.
- Protect sensitive components (threads, seals) from exposure to water, mud, or debris to prevent corrosion and contamination.
- Apply proper compound containment measures to avoid spills on rig floor or yard surfaces.

1.8 PIPE

Tubing and casing are types of pipe used in oil and gas wells, but they serve different purposes and are installed at different stages of the drilling process. Connections are used to bring two pieces of pipe together.

1.8.1 TUBING

Tubing is used to transport fluids from a reservoir to the surface. Tubing is a smaller-diameter pipe installed inside the casing once the well has been drilled. It is used to transport the oil or gas to the surface.

1.8.2 CASING

Casing is for well integrity and isolation of well zones (underground layers). Casing is a large diameter pipe that is installed in the drilled well to stabilize the hole, prevent the well from collapsing, and isolate different underground layers (like oil, gas, water, or rock formations). It ensures that the drilling fluids, hydrocarbons, and other substances stay contained and don't mix with surrounding layers.

Chapter 2:
Quick Start Running Guidelines

This chapter outlines the essential steps for preparing and running connections. It highlights proper use of compounds, alignment checks, controlled rotation speeds, and correct torque application. Special care for chrome and CRA materials is emphasized, along with a checklist to confirm readiness before running operations.

2.1 PRE-OPERATION SETUP: PREPARING CONNECTIONS

Before any running activity begins, it's critical to prepare connections correctly. Proper preparation ensures structural integrity, reduces downtime, and prevents costly rework.

Follow these pre-running procedures carefully:

- Apply thread and running compounds precisely as recommended (see Section 7 for full application diagrams).
- Protect seal areas and threads with clean, dry protectors until the pipe is positioned for running.

2.2 ENSURING ALIGNMENT AND EQUIPMENT READINESS

Correct alignment prevents mechanical stress, misalignment, and premature wear of the connection threads and seals.

Checklist: Alignment Verification

Task	Description
Traveling Block	Must be aligned vertically above the rotary table.
Suspended Pin	Ensure it centers perfectly over the box connection. Adjust with stabbing guides if necessary.
Rotary Hole	Confirm concentricity to prevent stabbing issues.

SUGGESTION:

For challenging setups (e.g. floating rigs, narrow rotary tables), use precision laser alignment tools to reduce error margins.

2.3 ROTATION SPEEDS FOR CONNECTION MAKE-UP

Improper rotation speeds are a common cause of galling, seal deformation, and make-up failure. Use the following guidelines for safe and effective make-up:

Operation Phase	Recommended RPM
Spin-In	≤15RPM
Final Make-Up	≤5RPM (low gear only)

2.4 TORQUE APPLICATION: BEST PRACTICES

Always refer to the latest online JESCO torque specifications. Using incorrect torque risks seal failure, inadequate interference, and long-term fatigue damage.

Sources for updated torque info:

- Data Sheets:
- Torque Tables:

IMPORTANT:

Always calibrate your torque wrench system on- site before beginning operations. A 5%torque deviation can make or break sealing performance.

2.5 SPECIAL MATERIALS: CHROME AND CRA GUIDELINES

Connections made of chrome and corrosion-resistant alloys (CRAs) require special handling due to their reduced ductility and high surface hardness.

When handling Chrome or CRA pipes:

- Walk the connection in by hand until fully hand-tight before using tongs.
- Use compounds designed specifically for high-chrome materials.
- Avoid impacting the threads — even minor dings can cause cracks under load.

Quick Start Essentials Summary Checklist

Tasks

Tasks	Completed
Have you applied thread compounds?	
Have you checked alignment?	
Have you confirmed torque references?	
Have you set rotation speeds?	
Have you performed all material-specific checks?	

NOTE:

Most connection issues in the field occur due to skipping or rushing pre-running checks. A 10-minute preparation saves hours of fishing operations.

Chapter 3:
Running and Handling Guidelines

This chapter details best practices for running and handling connections, from lifting and protector use to compound application, stabbing, and make-up. It stresses the importance of torque-turn monitoring, proper inspection, and rejection criteria. Procedures for breakout, repair, surplus pipe management, and harsh environment operations are also included to protect connection integrity and extend service life.

3.1 CONNECTION CARE DURING RUNNING

Running premium connections is a critical phase where most field damage can occur if proper handling protocols aren't followed. This section provides step-by-step best practices for safely and effectively running JESCO connections, ensuring optimal performance and integrity throughout the operation.

IMPORTANT:

Most connection failures trace back to simple oversights during handling —like dropped joints, dirty threads, or excessive stabbing force. The aim here is prevention through precision.

3.2 PIPE HANDLING: GENERAL GUIDELINES

- Use properly rated slings, spreader bars, and lifting devices.
- Always lift pipes using the body, never by the threads or connection ends.
- Inspect slings and lifting gear before each use.
- Ensure thread protectors are in place until just before running.
- Store pipe on clean, flat racks with sufficient padding to avoid point loading.

CAUTION: Avoid the following handling mistakes.

- Never drag pipe along hard surfaces.
- Do not roll pipe joints on gravel or dirty rig floors.
- Do not remove protectors prematurely, as they prevent dust, fluid, and mechanical impact damage.

3.3 THREAD PROTECTOR MANAGEMENT

Thread protectors are often overlooked but are the first line of defense against environmental and impact damage.

Best Practices:

- Inspect protectors before removal. Discard if cracked, deformed, or contaminated.
- Replace protectors immediately after pulling out of hole (POOH), especially in extended operations.
- Store used protectors away from direct sunlight and contamination.

IMPORTANT:

Reusing protectors is allowed only if they are JESCO-approved and fully intact.

3.4 CLEANING PIPE BEFORE STABBING

Every connection should be thoroughly cleaned before stabbing. Even microscopic debris or residue can cause galling, cross-threading, or torque interference.

Cleaning Procedure:

1. Wipe the pin and box ends with a clean, lint-free cloth.
2. Use a mild solvent (if needed) to remove residual dope or shipping compound.
3. Use thread chasers or combs to dislodge dried particles in grooves.

CAUTION: Never use wire brushes or abrasive pads. These can scratch or deform sealing surfaces.

3.5 APPLYING COMPOUND

Apply a thin, even coat of thread compound to the entire pin and seal area using a clean brush.

Figure 3-1: Apply a thin coat to pin

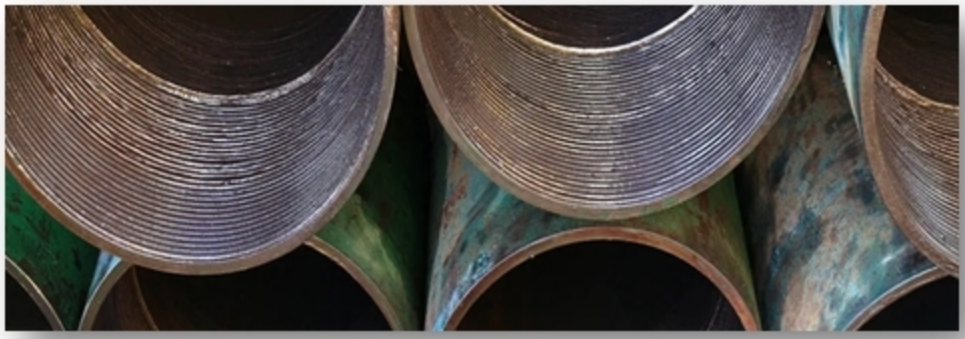


Figure 3-2: Apply a thin coat to seal area

Avoid over-applying — excess compound can increase torque and affect make-up.

NOTE:

Always refer to the compound compatibility matrix when running JESCO connections.

Manufacturer	Brand Name	JPC4 C1
	Thread Compound (FF=1.0)	
All	API Modified (API RP 5A3 Annex B compliant)	√
BestOLife	BoL 72733 (HPHT exceeds API RP 5A3)	√
BestOLife	BoL 2000 (Lead & Zinc Free)	√
Jet Lube	Jet-Lube API modified HP	√
Weatherford	Weatherford Lube Seal	√
	Storage Dope	
BestOLife	BESTOLIFE BSC STORAGE	√
ARGL	Kendex	√
ARGL	Kendex OCTG Orange	√
Jet Lube	Jet- Lube Korr-guard	√
Haughton	Rust Veto AS	√
Shell	Shell Showa Shell Storage	√
Total	Total Jet Marine 5271	√

Figure 3-3: Brands of Thread Compound

3.6 STABBING AND MAKE-UP: STEP-BY-STEP GUIDE

Proper stabbing and make-up are the foundation of a leak-proof connection.

Stabbing is the process of aligning and inserting the pin connection into the box connection. Make-up involves rotating the connections until the required torque is achieved to ensure proper seal and structural integrity.

3.6.1 STABBING

In most cases, connections are run with the pin end down, meaning stabbing occurs when the pin is lowered into the box. Proper alignment between the two pipe ends is critical to prevent cross-threading and ensure smooth make-up.

Always use a plastic or rubber stabbing guide over the box connection to protect the pin seal from damage during stabbing.

Stabbing Procedure

1. Use a non-metallic stabbing guide designed for the connection size.
2. Slowly lower the pin into the box until it contacts the shoulder.
3. Maintain vertical alignment — horizontal force causes shoulder galling.
4. Maintain a clear line of sight to monitor the stabbing process at all times

3.6.2 MAKE-UP

The required make-up torque for each connection is listed in this manual and on the connection data sheets. Torque values depend on several factors, including pipe diameter, weight, steel grade, and connection type.

Make-Up Procedure:

1. Rotate the joint by hand as far as possible before applying torque.
2. Engage tongs and rotate at low speed (≤15 RPM spin-in; ≤5 RPM final).
3. Monitor torque-turn graph in real time (see Section 4).
4. Stop once final torque is reached and the turn profile is consistent with manufacturer expectations.

NOTE:

Use a digital torque-turn system with memory logging to fulfill quality assurance / quality control requirements.

Before beginning make-up, verify the correct torque values for the specific connection being run.

Once the threads are properly engaged, the power tong can be applied to the pipe. If the tong features a single set of rotating jaws, position them just above the pin threads.

Ensure the back-up line is level and that the jaws will not strike the coupling (or box) face during operation.

For power tongs with integrated back-up jaws, the tool should be positioned so that the back-up jaws are below the coupling and the rotating jaws are above. In the case of integral joints, it's critical that the back-up jaws are placed below the box connection to prevent crushing the connection.

Do not lower the elevators over the pipe until the connection is fully made up. If the elevator is already positioned on the pipe, it must be released prior to make-up.

Power tongs typically operate with both high and low gear ratios. Begin make-up in high gear at low speed—this reduces the risk of damage in the event of cross-threading, as the

tong will stall before causing harm. Once the threads are fully engaged, the speed can be increased until resistance builds due to thread interference. At this point, switch to low gear and low speed to complete the make-up process with precise torque control.
An early increase in torque may indicate an issue such as cross-threading or galling. If such a condition occurs, stop rotation immediately, break out the connection completely, and inspect it. Typically, thread interference does not begin until approximately two-thirds of the pin threads are within the box.

Although not mandatory for all connections, the use of torque-turn monitoring equipment is recommended, as outlined in the following section. After make-up, verify the torque-turn monitoring system. Once confirmed, disengage the power tong.

If the casing string is not open to the bottom during run-in-hole operations, it must be filled from the top at regular intervals. Failure to do so can result in external pressure collapse. Care should be taken to ensure the casing fill-up tool does not damage box connections or introduce debris, drilling, or completion fluids onto the threads.

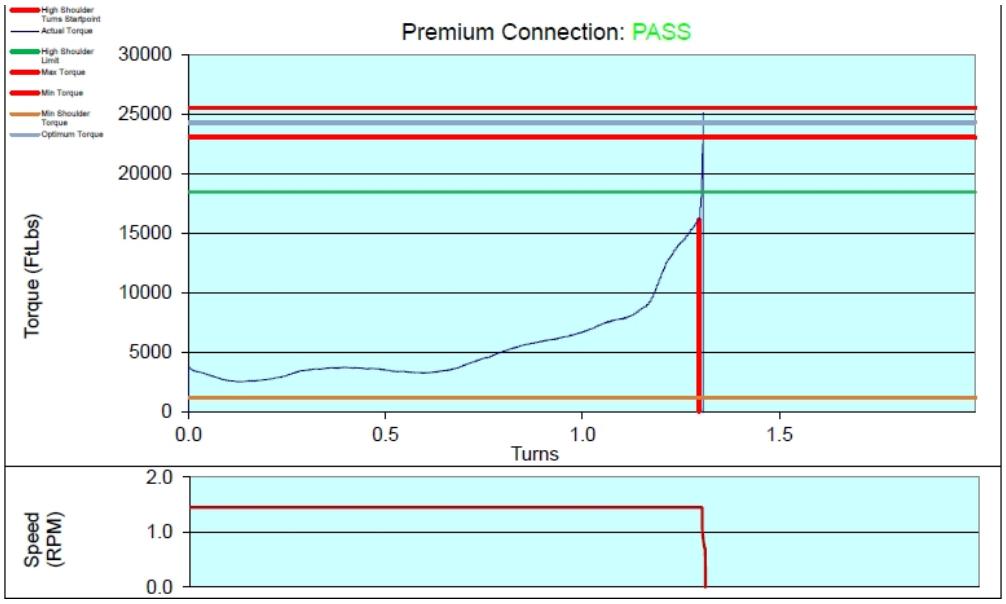


Figure 3-4: Acceptable Make-Up Torque

3.6.2.1 Unacceptable Make-up Verification

Since it is not possible to achieve exactly the same final torque for every connection make-up, an acceptable torque range—or acceptance window—is defined. This window is typically ±10% of the optimum torque. However, some connections may allow a wider or narrower window depending on the connection type.

Any final torque value within the minimum and maximum limits of this window is generally acceptable. However, some end users may require the final torque to fall specifically between the optimum and maximum values.

In addition, shoulder contact must occur when the torque is between 5% and 70% of the optimum torque. Given the ±10% tolerance on final torque, this ensures that at least 20% of optimum torque is applied after shoulder engagement.

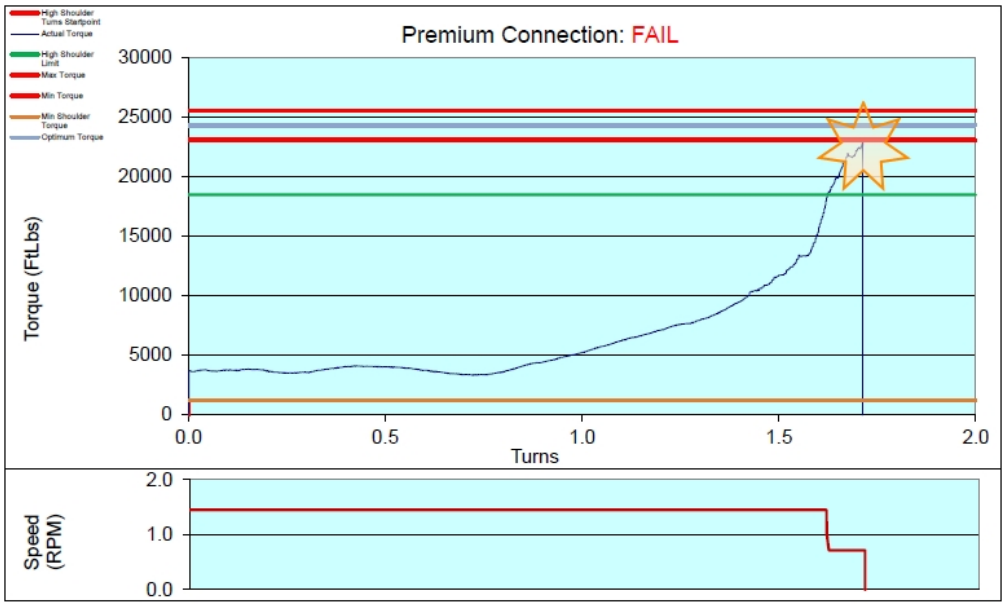


Figure 3-5: Unacceptable Make-Up Torque

3.6.2.2 Graph Interpretation And Resolution

Make-up graphs can appear very different depending on the scale and resolution used. A graph can look "stretched" or "compressed" depending on how the axes are configured. This makes it essential not only to assess the shape of the graph, but also to check the values on both the torque and turns axes.

Poor resolution may cause an unacceptable make-up to appear acceptable. To avoid misinterpretation:

- Display the graph as large as possible on the screen.
- Ensure the turns axis includes at least the final two turns.
- Use consistent scaling to maintain accurate profile recognition.

Each make-up graph must include the pipe tally number, date, and time. If a graph is rejected for any reason, it must still be stored with a clear explanation for rejection, for traceability and quality control.

3.6.2.3 Risk And Common Issues

By oilfield standards, running casing or tubing is considered a low-risk operation. Statistics indicate that 98% of connections are made up successfully on the first attempt. However, there is still a small chance of make-up errors, which can include:

- Final torque too low with no seal or shoulder contact
- Final torque too low with seal engagement but no shoulder contact
- Final torque too low after shoulder contact
- Short graph indicating no thread interference
- Plastic deformation or yielding
- Final torque too high
- Shoulder contact too low
- Excessive thread interference
- Humping (torque peak before shoulder contact)
- Humping (torque peak after shoulder contact)
- Irregular thread interference
- Too many turns after shoulder
- Step or torque drop during shouldering
- Graph step (abrupt change in torque)
- Torque spike
- Unusual or inconsistent torque profile

Proper monitoring, clear visual representation, and qualified interpretation of torque-turn graphs are essential to detect and prevent these issues before the connection is run downhole.

3.7 DAMAGE PREVENTION AND FIELD REPAIRS

Despite best practices, minor damage may occur. In most cases, JESCO-trained personnel can evaluate and perform on-site repair.

Field Repair Examples:

- Light galling or scratches: May be buffed and re-doped.
- Minor seal damage: Requires expert evaluation.
- Dents, deep scores, or bent pins: Reject the joint immediately.

CAUTION:

Never attempt makeshift repairs with files, sandpaper, or torch heating.

3.8 CONNECTION REJECTION CRITERIA

Reject a connection if:

- The thread form is visibly deformed or missing.
- Seal surfaces show signs of corrosion, pitting, or galling.
- Pipe body is bent or out of round.
- Make-up torque exceeds allowable limits without shoulder engagement.

Use JESCO visual inspection guidelines and cross-check against digital torque-turn profiles (See Page 43).

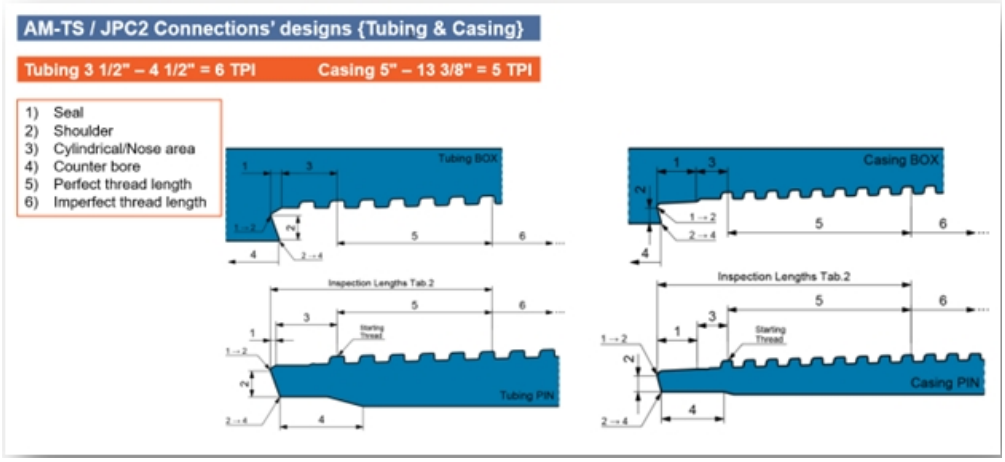
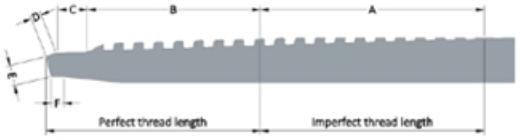


Figure 3-6: Visual Inspection Locations

Element	Corrosion		Mechanical Damage		
	Rust	Pitting[2]	Scratch[3]	Dent/Ding/Mashes/Tears	Galling
Seal (D)	Remove discoloration with Scotch Brite only	REJECT	REJECT	REJECT	REJECT
Shoulder (E)	Remove with Scotch Brite or emery paper	REJECT	Remove with Scotch Brite or emery paper	REJECT	REJECT
Nose area (C)	Remove with Scotch Brite or emery paper	REJECT	Remove with Scotch Brite or emery paper	Remove with Scotch Brite or emery paper	N/A
Counter Bore (F)	Remove with Scotch Brite or emery paper	Remove with Scotch Brite or emery paper	ACCEPTED	ACCEPTED	N/A
Perfect Thread[1] (B)	Remove with Scotch Brite or emery paper	REJECT	ACCEPTED	REJECT	REJECT
Imperfect Thread (A)	Remove with Scotch Brite or emery paper	Remove with Scotch Brite or emery paper	ACCEPTED	Remove with Scotch Brite, emery paper or file	Remove with Scotch Brite, emery paper or file

Notes:-
1. Up to 2 threads may be imperfect as long as no more than 25% of diameter (1/4 turn) is affected. However, all protruding metal outside of the thread form shall be removed to avoid galling.
2. Pitting is the localized accelerated dissolution of metal that occurs as a result of the breakdown of the passive protective film on the metal surface.
3. Scratch is rejectable if detectable by fingernail

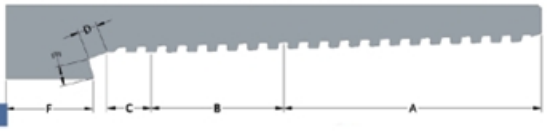


PIN VTI Guidelines

Figure 3-7: Pin Visual Inspection Guidelines

Element	Corrosion		Mechanical Damage		
	Rust	Pitting[3]	Scratch[4]	Dent/Ding/Mashes/Tears	Galling
Seal (D)	Remove discoloration with Scotch Brite only	REJECT	REJECT	REJECT	REJECT
Shoulder (E)	Remove with Scotch Brite or emery paper	REJECT	Remove with Scotch Brite or emery paper	REJECT	REJECT
Cylindrical Part (C)	Remove with Scotch Brite or emery paper	REJECT	ACCEPTED	Remove with Scotch Brite or emery paper	N/A
Internal Bore (F)	Remove with Scotch Brite or emery paper	Remove with Scotch Brite or emery paper	ACCEPTED	Remove with Scotch Brite or emery paper	N/A
Perfect Thread (B)	Remove with Scotch Brite or emery paper	REJECT	ACCEPTED	REJECT	REJECT
Imperfect Thread (A)	Remove with Scotch Brite or emery paper	Remove with Scotch Brite or emery paper	ACCEPTED	Remove with Scotch Brite, emery paper or file	Remove with Scotch Brite, emery paper or file
Coupling Face	ACCEPTED	REJECT	ACCEPTED	Remove with Scotch Brite, emery paper or file	N/A

Notes:-
1. Any couplings mashed on the outside diameter should be rejected
2. Imperfect threads for box/coupling are the threads corresponding to imperfect threads of pin ends
3. Pitting is the localized accelerated dissolution of metal that occurs as a result of the breakdown of the passive protective film on the metal surface.
4. Scratch is rejectable if detectable by fingernail



BOX VTI Guidelines

Figure 3-8: Box Visual Inspection Guidelines

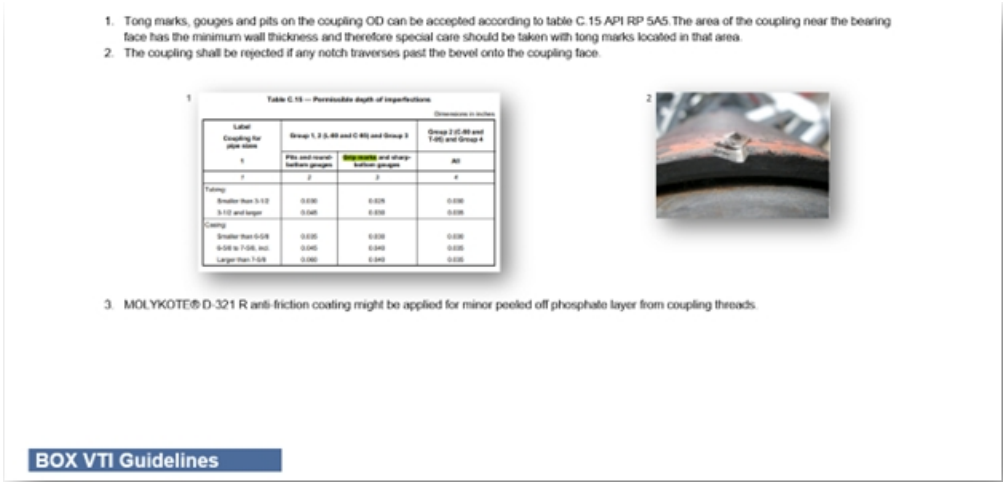


Figure 3-9: Box Visual Inspection Guidelines (Cont'd.)

3.9 BREAK OUT

A break-out becomes necessary when a connection doesn't meet acceptance criteria. Before beginning breakout, unlatch the elevators.

Position the connection to be broken out at a comfortable working height above the slips. Set the power tong and back-up tongs (or slips) as close together as possible to minimize bending and prevent damage during breakout.

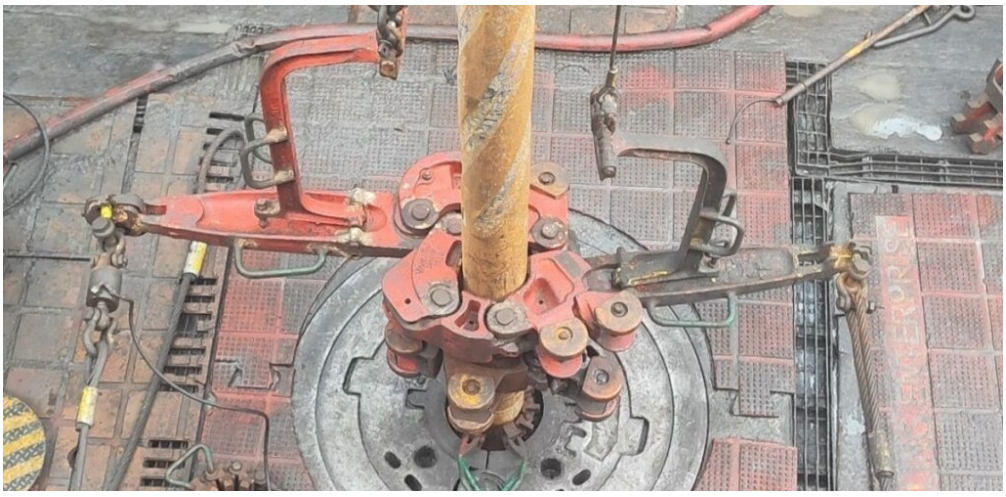


Figure 3-10: Tongs in Use

Maintain vertical alignment and full control of the pipe at all times. This should be done using either a person on the stabbing board or a stabbing arm.

Apply torque slowly and steadily to break the connection. Never strike the connection with a hammer or any hard object, as this can cause damage. Be aware that break-out torque may be significantly higher than make-up torque, particularly if the pipe has been in the well for an extended period—though in some cases, the opposite may occur.

Continue turning at a controlled, consistent speed until the pin disengages and drops inside the box. Use a weight compensator if available to reduce the risk of thread galling during breakout. To prevent the pin from bouncing as it’s removed from the box, use a stabbing guide.

Once the connection is fully broken out, and if the joints are being returned for inspection or storage:

- Apply storage compound to the threads.
- Fit the correct thread protectors.
- Ensure the protectors are properly secured. Using the wrong type can result in the protector coming loose during transportation.

For tubing sizes 4 1/2" and below, a maximum of three break-out attempts is allowed. For casing sizes 5" and above, the limit is two break-outs. If the connection fails to make up properly after these attempts, the box connection (or coupling) must be replaced.

If the pin connection of the laid-out joint is undamaged, it may be reused later in the string. This limitation is in place to minimize rig time and prevent unnecessary delays during operations.

Pipes that are retrieved from the well carefully can be safely reused. Each pipe must be thoroughly cleaned using a high-pressure washdown gun with fresh water to remove all traces of completion fluids.

All connections must then be cleaned, dried, greased, and protected following the same procedures outlined below for handling surplus pipe.

Surplus Pipe

Operators typically bring 5% to 10% contingency pipes to the rig site in case of unexpected issues. These pipes retain value after running the string in hole and must not be treated as waste. An effective management system ensures that contingency pipes from Well #1 are used at the bottom of Well #2.

If rig personnel remove the protectors and grease from contingency pipes at the rig site, they must thoroughly clean and dry the connections. After cleaning, they should apply a thick coat of suitable compound to the entire threaded and sealing area to prevent water ingress and protect against corrosion. Finally, they must fit clean, undamaged protectors, ensuring they use the correct type for the connection to avoid contamination or damage.

3.10 HARSH ENVIRONMENT PROTOCOLS

Operations in challenging weather conditions or abrasive environments demand specific measures:

Sandy/Dusty Environments:

- Protect open connections from airborne grit using temporary caps or film covers.
- Increase frequency of thread inspections and compound re-application.

IMPORTANT:

When running, use stabbing guides. Be sure to clean connections thoroughly, and also monitor torque-turn in real time. Apply the recommended thread compound (avoid generic grease) and inspect after each make-up.

Avoid freehand stabbing or misaligned stabbing. Do not run dirty or wet threads. Never rely on visual torque or by "feel," and do not skip inspections between joints.

Chapter 4:

Torque- Turn Monitoring and Interpretation

This chapter highlights the importance of torque- turn monitoring to ensure connections are made up correctly and safely. It explains the phases of the torque- turn graph, how deviations indicate issues, and the use of digital systems for real- time monitoring and logging. Torque acceptance windows guide proper make- up, and post- job analysis of logs supports quality control, troubleshooting, and tool calibration.

4.1 TORQUE-TURN MONITORING

Torque-turn monitoring is essential to ensure each connection is made up to the correct specifications. It provides a graphical representation of the torque applied versus the turns during make-up, helping verify mechanical integrity, sealing performance, and identifying anomalies in real time.

Why It Matters: Incorrect torque or turn profiles can lead to connection leaks, galling, or mechanical failure — even if the final torque appears acceptable. The graph tells the full story.

4.2 UNDERSTANDING THE TORQUE-TURN GRAPH

A typical torque-turn graph is divided into three phases:

Phase 1: Thread Engagement

- Initial low resistance as threads engage.
- Smooth, gradual rise in torque.
- No sharp spikes or flat zones.

Phase 2: Interference/Shoulder Contact

- Torque begins to rise more steeply.
- The connection shoulder makes contact.
- A consistent, controlled increase is expected.

Phase 3: Final Make-Up (Yield Point)

- The slope increases sharply.
- Target torque is reached.
- A distinctive shoulder point (or break point) may appear, followed by stabilization or a plateau.

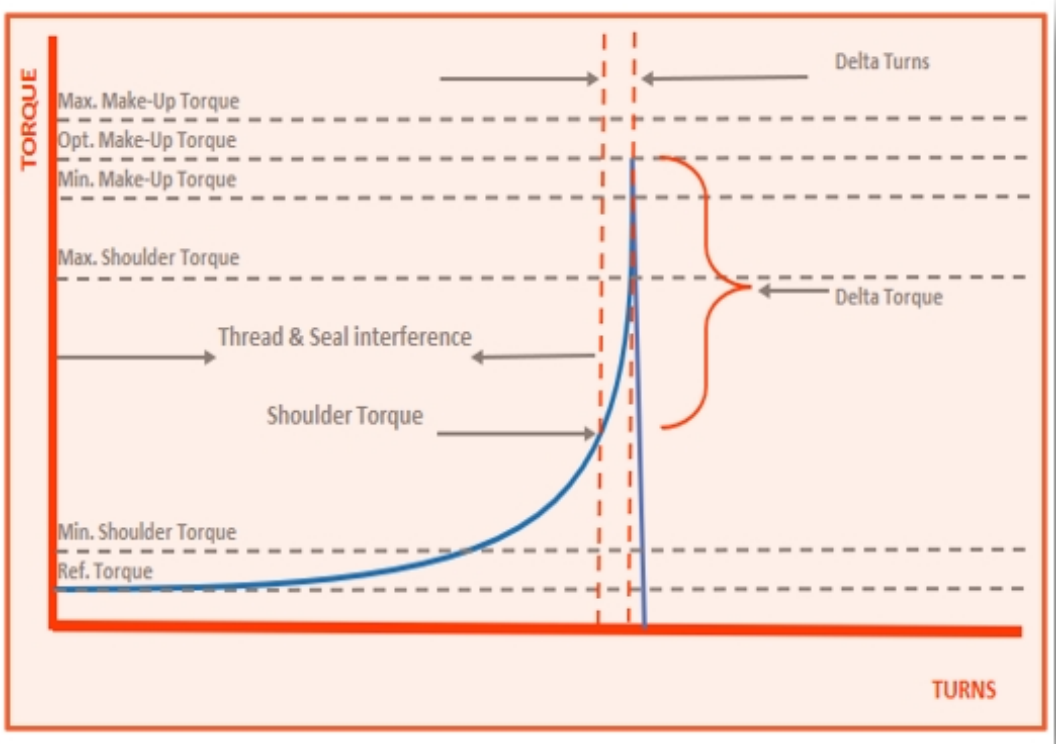


Figure 4-1: Typical Torque-Turn Graph

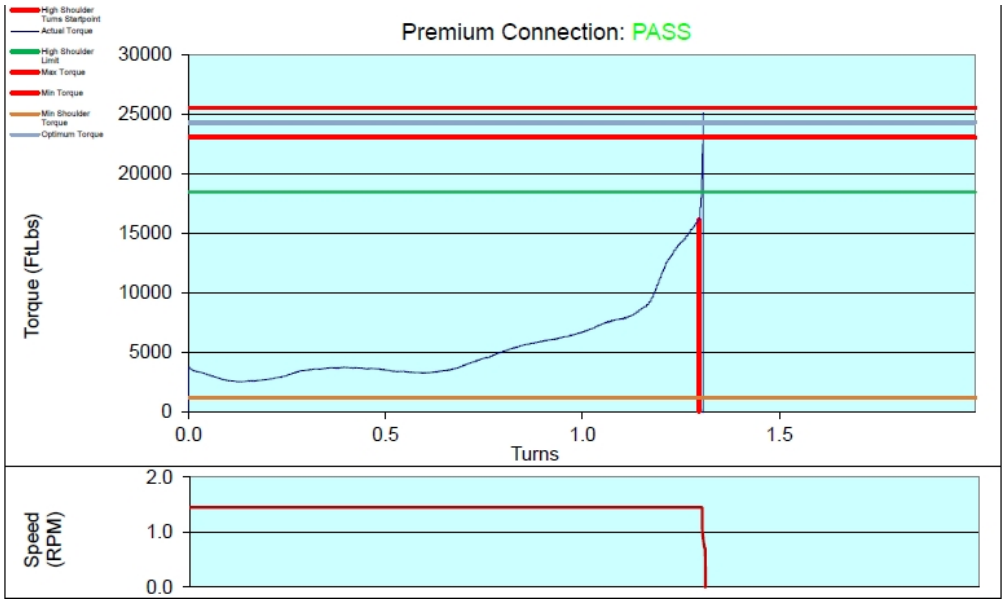


Figure 4-2: Acceptable Torque-Turn Graph

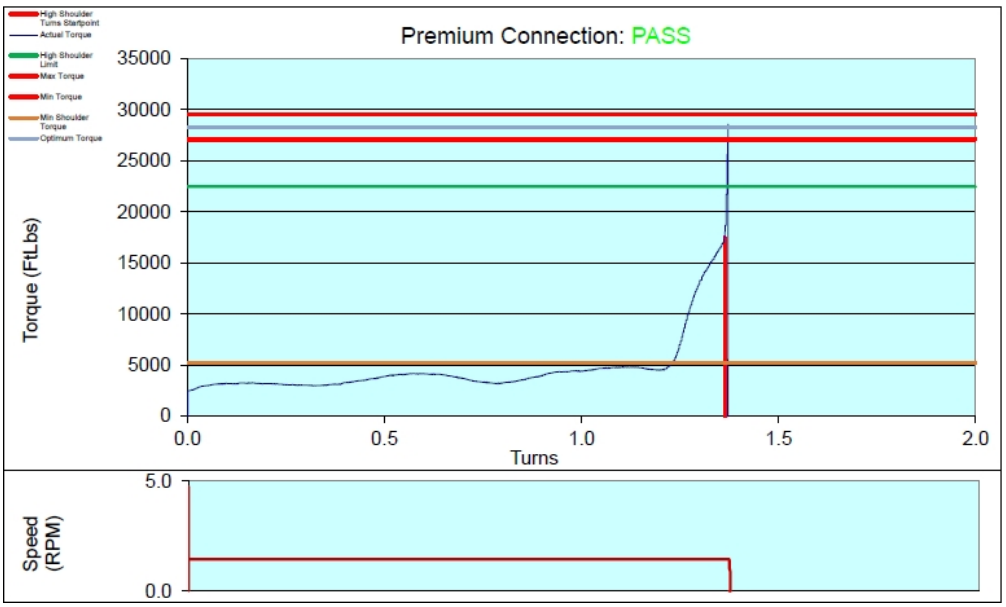


Figure 4-3: Acceptable Torque-Turn Graph

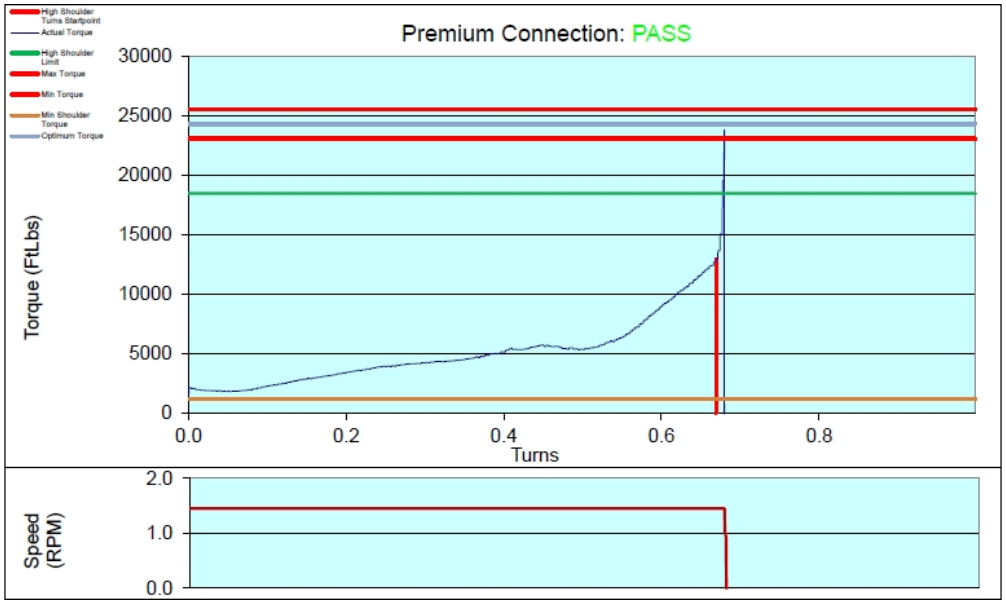


Figure 4-4: Acceptable Torque-Turn Graph

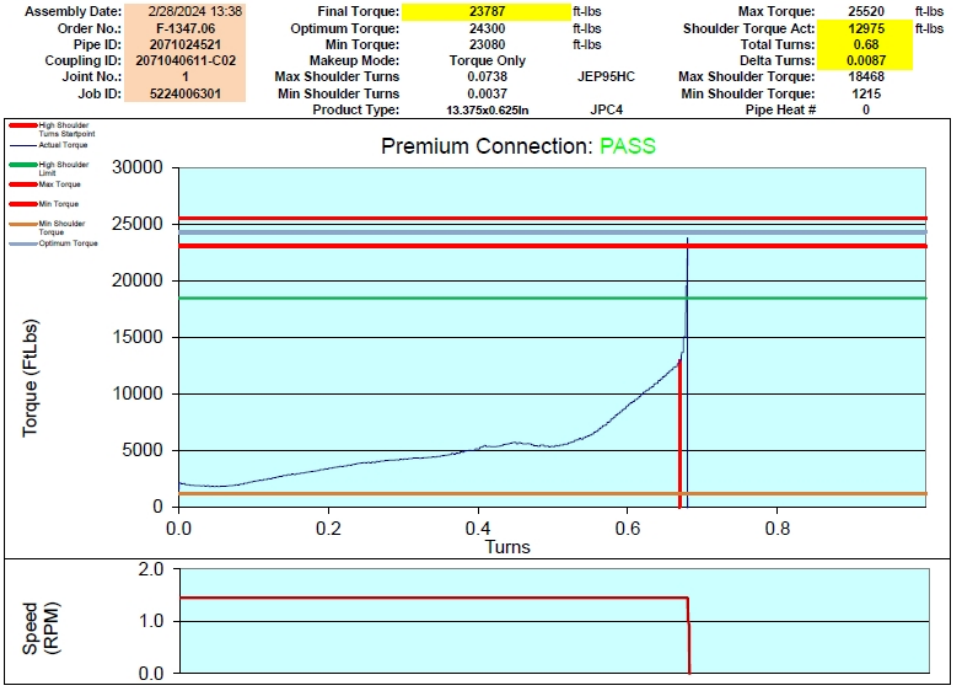


Figure 4-5: Make-Up Report

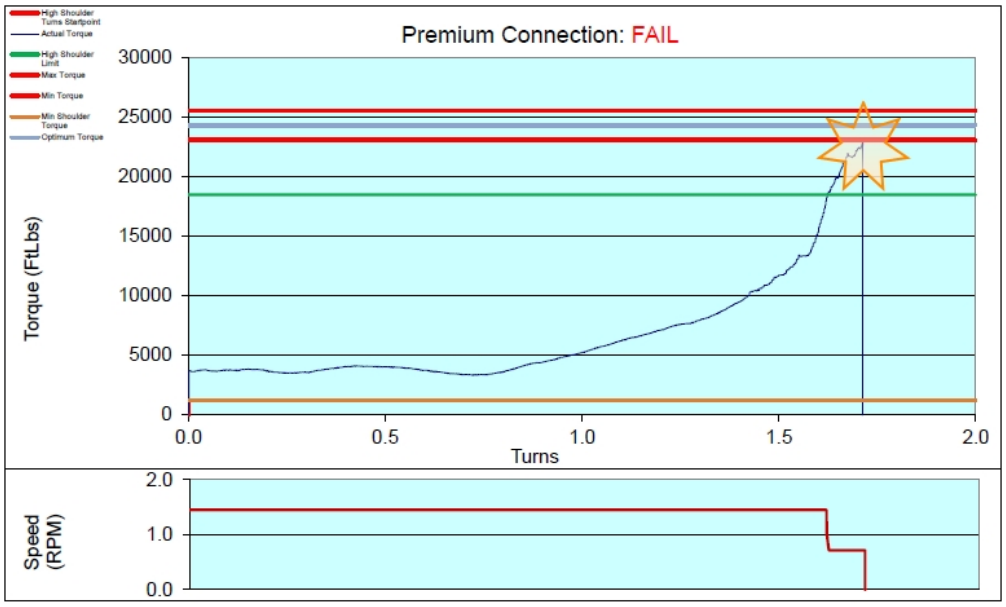


Figure 4-6: Unacceptable Torque-Turn Graph (Low Torque)

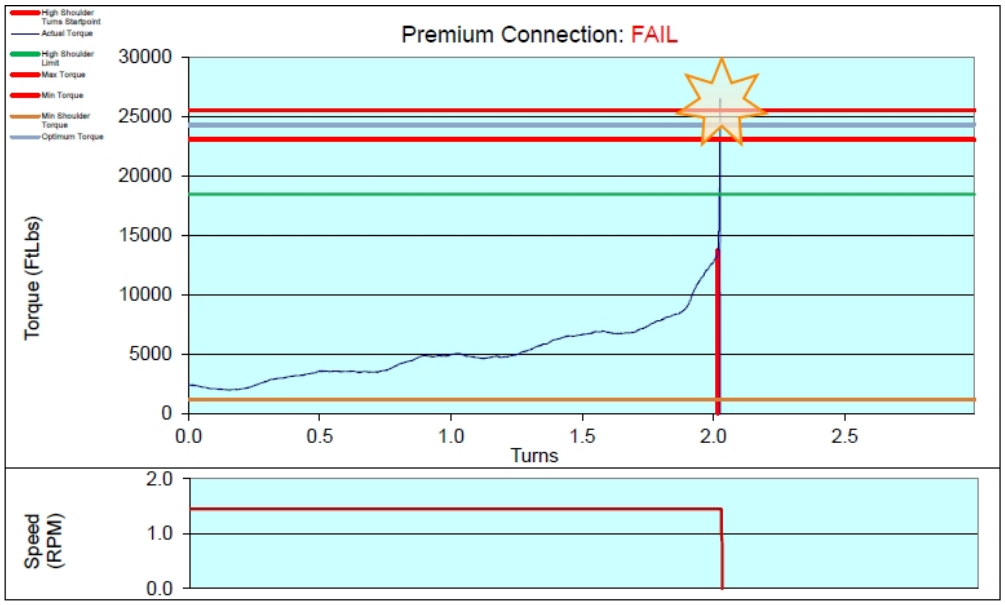


Figure 4-7: Unacceptable Torque-Turn Graph (Max Torque Exceeded)

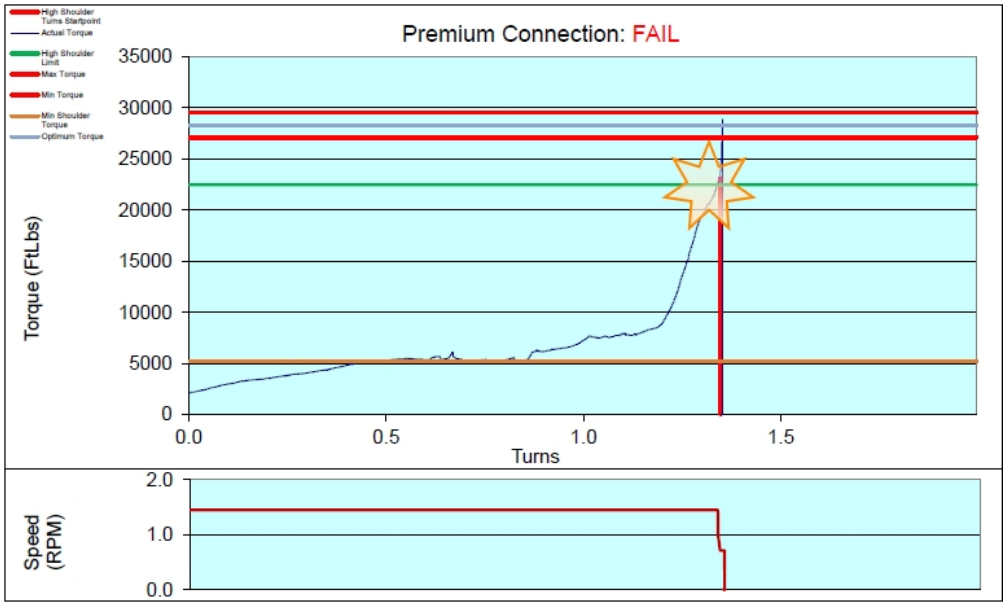


Figure 4-8: Unacceptable Torque-Turn Graph (High Shoulder Torque)

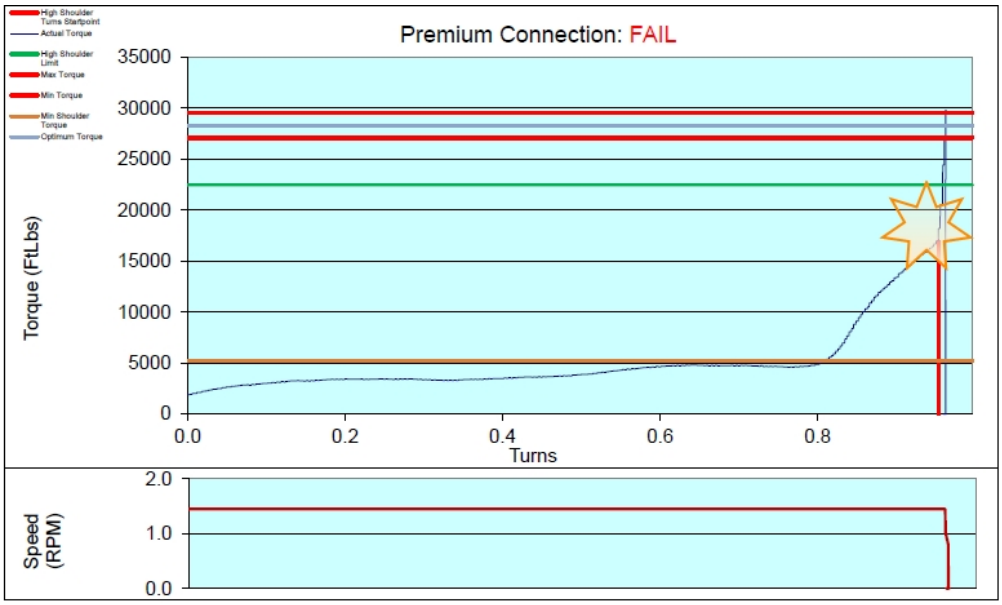


Figure 4-9: Unacceptable Torque-Turn Graph (High Shoulder Torque)

4.3 INTERPRETING NORMAL GRAPHS

Identifying deviations from standard torque-turn behavior helps diagnose potential issues:

Graph Behavior	Possible Cause	Recommended Action
Flat initial segment	Damaged or contaminated threads	Inspect and clean threads thoroughly
Early torque spike	Cross-threading or galling	Stop immediately and evaluate connection
No sharp rise at final phase	Shoulder not fully engaged	Re-evaluate torque specs and reattempt make-up
Multiple dips in torque	Tong slippage or equipment issues	Inspect tongs and calibration

4.4 REAL-TIME MONITORING & TOOLS

Modern rigs should use digital torque-turn monitoring systems capable of:

- Capturing full graph data per joint.
- Logging and tagging torque-turn profiles.
- Providing alerts for abnormal trends.
- Syncing with QA/QC systems or cloud reporting.

IMPORTANT:

Maintain a torque-turn log with visual graphs and notes for each connection. This supports traceability and helps troubleshoot future failures.

4.5 TORQUE ACCEPTANCE WINDOWS

Each JESCO connection type has a recommended torque range, including:

- Minimum Make-Up Torque (MMT)
- Maximum Make-Up Torque (XMT)
- Optimum Torque (OT) — where sealing is most reliable
- Minimum Shoulder Torque (MST)
- Maximum Shoulder Torque (XST)

Always refer to the latest connection datasheet for updated torque values.

NOTE:

Torque specifications may vary by pipe grade, coating, compound, and application.

4.6 POST-JOB ANALYSIS AND TROUBLESHOOTING

After operations, torque-turn logs should be:

- Reviewed by JESCO field service representatives.
- Stored for QA audits.
- Used to generate insights into crew consistency and tool calibration.

NOTE:

Integrate torque- turn logs into daily reports or digital job summaries.

Chapter 5:
APPLYING THREAD COMPOUNDS

This chapter highlights the critical role of thread compounds in sealing, lubricating, and protecting connections. It covers selecting the correct compound for standard, premium, and CRA materials, proper application techniques, and storage requirements. Troubleshooting guidance ensures issues like galling, excessive torque, or sealing inconsistencies are identified and corrected to maintain reliable connection performance.

5.1 OVERVIEW: ROLE OF THREAD COMPOUNDS

Oil rigs use thread compounds, also known as pipe dope, to seal and lubricate threaded connections, preventing issues like galling and leaks. These compounds ensure smooth assembly and also protect against corrosion, which is crucial for maintaining the equipment integrity under harsh conditions.

Thread compounds are essential in ensuring the mechanical integrity and sealing performance of premium connections.

Thread compounds serve many purposes, including:

- Lubrication during make-up
- Corrosion protection
- Sealing thread interference areas

IMPORTANT:

Selecting or applying the wrong compound can result in galling, over-torque, leakage, or long-term connection failure.

5.2 TYPES OF THREAD COMPOUND

Compound Type	Application Context	Notes
API Modified	Standard steel connections (non-premium)	Basic performance, not suitable for high-end seals
Premium Compound	JESCO and other premium connection	High-pressure sealing, controlled friction
CRA-Compatible Compound	Chrome, duplex, or CRA materials	Non-metallic; avoids galvanic reactions

Always refer to the JESCO Running Manual for the correct compound per material and application.

5.3 APPLICATION PROCEDURES

JESCO Connections:

- Use a clean, dry brush (natural or synthetic bristles).
- Apply a thin, uniform coating over the entire pin — threads, seal surfaces, and stabbing flank.
- Avoid applying to the box unless specifically instructed.
- Do not leave gaps or over-apply (which can increase torque).

CAUTION: Excess dope may mask misalignment or cause early shoulder contact —always apply evenly.

Manufacturer	Brand Name	JPC4 C1
	Thread Compound (FF=1.0)	
All	API Modified (API RP 5A3 Annex B compliant)	√
BestOLife	BoL 72733 (HPHT exceeds API RP 5A3)	√
BestOLife	BoL 2000 (Lead & Zinc Free)	√
Jet Lube	Jet-Lube API modified HP	√
Weatherford	Weatherford Lube Seal	√
	Storage Dope	
BestOLife	BESTOLIFE BSC STORAGE	√
ARGL	Kendex	√
ARGL	Kendex OCTG Orange	√
Jet Lube	Jet- Lube Korr-guard	√
Haughton	Rust Veto AS	√
Shell	Shell Showa Shell Storage	√
Total	Total Jet Marine 5271	√

Figure 5-1: Thread Compounds

Figure 5-2: Compound Application Brushes

See figures, "Apply a thin coat to pin" on page 14 and "Apply a thin coat to seal area" on page 14 for correct application.

5.3.1 APPLYING THREAD COMPOUND

Perform the following steps when applying thread compound:

1. Use the connection datasheet to select the correct compound.
2. Ensure that brushes are clean and the compound is not contaminated.
3. Apply a thin, even layer along the full pin length.
4. Ensure that box threads are clean and dry.

5.4 CRA AND HIGH-ALLOY CONNECTIONS

CRA materials (e.g., 13Cr, 25Cr, duplex) require special handling due to higher sensitivity to galling.

Key Guidelines:

- Use only JESCO-approved CRA compound.
- Never mix different compound types.
- Clean pin and box with solvent and lint-free cloth before dope application.
- Apply immediately prior to make-up to avoid evaporation or contamination.

IMPORTANT: Avoid moly- based compounds unless specifically certified for CRA use.

5.5 MANAGING AND STORING COMPOUNDS

Store thread compounds in a dry, shaded location that maintains a temperature between 5-40°C (41-104°F).

Keep the compound container sealed, and avoid exposure to dust, dirt, or liquids.

Follow manufacturer's shelf life expiration dates.

Replace applicator brushes on a regular maintenance scheduled basis.

IMPORTANT: Dirty compound is one of the most commonly- over-looked risks in thread failure analysis.

5.6 THREAD COMPOUND TROUBLESHOOTING

Issue	Probable Cause	Recommended Action
Excessive torque on make-up	Over-application or wrong compound	Remove and reapply correct amount
Thread galling or resistance	Contaminated or incom-patible compound	Clean and use approved material
Sealing inconsistency	Uneven coating or expired compound	Re-clean, reapply using fresh dope
Torque-turn curve distortion	Compound buildup in shoulder area	Clean and apply thin coat

Figure 5-3: Thread Compound Troubleshooting Table

Chapter 6:
Handling and Inspecting Connections

This chapter stresses that connection performance depends on proper handling long before running operations begin. It provides guidelines for safe storage, transport, and rig-site handling, along with inspection intervals to detect damage early. Environmental risks such as humidity, salt, dust, and freezing are addressed, with preventive measures to protect pipe integrity.

6.1 OVERVIEW: WHY HANDLING MATTERS

Connection performance begins before it ever reaches the rig floor. Mishandling in yards, during transport, or on-site can lead to damage that is not immediately visible — but becomes catastrophic during make-up or downhole use.

CAUTION:

A single dent, crushed thread, or missed contaminant can compromise seal integrity and lead to leaks, downtime, or total joint failure.

6.2 PIPE TRANSPORT AND STORAGE

Store pipe on padded, level racks away from direct contact with the ground. Use pipe chocks to prevent rolling. Stack pipe with proper dunnage spacing to prevent ovality and point loading. Avoid stacking too high without lateral support, as this increases the risk of collapse and deformation. Do not leave pipes exposed to harsh elements without adequate cover.

Be sure crew members are trained on proper lifting procedures. Use lifting slings or spreader bars to move pipes. Never use hooks or chains on pipe bodies. Do not lift pipe from the connection ends. Do not drag pipe along hard surfaces or gravel.

IMPORTANT:

Keep thread protectors installed at all times during storage and transit. Condensation inside protectors can freeze overnight in harsh weather conditions. Always warm pipe ends before inspecting or running.

Proper pipe storage is critical to maintain the integrity, cleanliness, and readiness of tubular goods prior to running operations. Store all pipe in accordance with industry best practices to prevent physical damage, corrosion, contamination, or distortion of the pipe body and threaded ends.

Storage Guidelines:

1. Surface Preparation:
   - Store pipes on a clean, level, and stable surface free of debris, sharp objects, or corrosive materials.
   - Avoid ground contact by using wooden sleepers, pipe racks, or steel stands with rubber or plastic padding.
2. Stacking:
   - Stack pipes in layers with uniform orientation and alignment.
   - Separate each layer by wooden dunnage or rubber spacers, placed at equal intervals to prevent bending or bowing.
   - Stack height must not exceed safe working limits, typically no more than 3 to 4 layers high, depending on pipe diameter and weight.
3. End Protection:
   - Fit all pipes with protectors (plastic, composite, or steel) on both ends to prevent thread or bevel damage.
   - End caps shall remain in place until the pipe is moved to the rig floor or prepared for cleaning and inspection.
4. Marking and Traceability:
   - Mark heat numbers, pipe grades, and sizes clearly and visibly on at least one end.
   - Maintain bundle tags and material identification throughout storage.
5. Environmental Protection:
   - Store pipes under cover or with a tarpaulin where possible, especially in corrosive environments (e.g., marine or humid conditions).
   - Ensure adequate ventilation to prevent condensation buildup under covers.
6. Handling Precautions:
   - Perform all lifting and handling using padded slings, cradles, or pipe hooks to avoid damaging the pipe surface or coating.
   - Never drop or drag a pipe.
7. Inspection and Housekeeping:
   - Inspect stored pipe periodically (per maintenance schedule) for signs of corrosion, damage, or displacement.
   - Keep storage areas clean and free of obstacles or spill hazards.

6.3 YARD HANDLING PROCEDURES

Perform the following tasks before shipping pipe to the rig site:

- Inspect threads and seals for dents, rust, or debris
- Check thread protectors for cracks or improper fit
- Verify heat numbers and tally list accuracy
- Apply drift tests for all pipes, especially after long storage
- Replace any damaged protectors immediately

6.4 RIG SITE HANDLING

6.4.1 PRE-STAGING

- Lay pipe on non-abrasive supports, with racks free of gravel or metal contact.
- Keep pipe ends elevated where possible to prevent water pooling inside protectors.

6.4.2 DURING RUNNING

- Only remove protectors just before stabbing.
- Use soft-handling tools (rubber-coated or lined) to prevent mechanical impact.
- Ensure stabbing guides are clean and matched to connection type.

6.5 INSPECTION INTERVALS AND DAMAGE MARKERS

When to Inspect pipes and connections:

- On arrival to pipe yard
- Before transport to rig
- Upon arrival at rig site
- Before every run

6.6 CLEANING AND RE-INSPECTION

If connections are found dirty or damaged:

- Use clean, lint-free rags and approved solvents (non-abrasive).
- Reinspect threads using profile gauges and magnifiers, if applicable.
- Never use steel brushes, files, or power tools on premium threads.

Refer to inspection criteria tables for pin and box, below:

Pin Element	Pin Area	Rust	Pitting	Scratches	Friction Marks	Galling	Dents
1	Bore	Accept	Accept	Accept	Not Applicable	Not Applicable	Accept
2	Shoulder	Remove with emery paper	Recut the Thread [1]	Remove with emery paper	Remove with emery paper	Recut the Thread	Recut the Thread
3	Seal Radius	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Recut the Thread	Repair by qualified per-sonnel
4	Seal Area	Recut the Thread [1]	Recut the Thread	Recut the Thread	Recut the Thread	Recut the Thread	Recut the Thread
5	Cylindrical Section	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Accept	Not Applicable	Not Applicable	Repair by qualified per-sonnel
6	Complete Thread	Repair by qualified per-sonnel	Recut the Thread [1]	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Recut the Thread [2]	Recut the Thread
7	Thread Portion	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Accept	Accept	Recut the Thread [2]	Repair by qualified per-sonnel
8	Groove	Repair by qualified per-sonnel	Repair by qualified per-sonnel	Accept	Not Applicable	Not Applicable	Accept

Table 1: Inspection Criteria, Pin

Box Element	Pin Area	Rust	Pitting	Scratches	Friction Marks	Galling	Dents
1	Complete Threads	Repair by qualified personnel	Recut the Thread [1]	Repair by qualified personnel	Repair by qualified personnel	Recut the Thread [2]	Recut the Thread
2	Incomplete Threads	Repair by qualified personnel	Repair by qualified personnel	Accept	Accept	Recut the Thread [2]	Repair by qualified personnel
3	Sealing Area	Recut the Thread [1]	Recut the Thread	Recut the Thread	Recut the Thread	Recut the Thread	Recut the Thread
4	Shoulder	Remove with emery paper	Recut the Thread [1]	Accept	Remove with emery paper	Recut the Thread	Recut the Thread
5	Bearing Face	Remove with emery paper	Repair by qualified personnel	Accept	Not Applicable	Not Applicable	Repair by qualified personnel
6	Seal Radius	Repair by qualified personnel	Recut the Thread	Recut the Thread	Repair by qualified personnel	Recut the Thread	Recut the Thread
7	Cylindrical Section	Repair by qualified personnel	Repair by qualified personnel	Accept	Not Applicable	Not Applicable	Repair by qualified personnel
8	Groove	Remove with emery paper	Repair by qualified personnel	Accept	Not Applicable	Not Applicable	Accept

Table 2: Inspection Criteria, Box

6.7 ENVIRONMENTAL EXPOSURE RISKS

The following table outlines the exposure risks pipe can experience in different environments.

Environment	Risks	Precautions
High Humidity	Rust/corrosion in protectors	Use desiccants and/or air-dry plugs
Coastal Sites	Salt damage to seals	Apply corrosion inhibitors, inspect daily
Dust / Dirt / Sand	Grit embedded in threads	Cover connections with breathable fabric
Freezing Temperatures	Cracking, dope hardening	Warm dope and inspect daily

6.8 PIPE HANDLING PRECAUTIONS

See "Pipe Handling: General Guidelines" on page 12 for infrormation about proper pipe handling.

Chapter 7:
Field Repairs and Rejection Guidelines

This chapter explains how to assess and manage connection damage in the field, distinguishing between repairable issues like light galling or minor scratches and rejectable conditions such as deformed threads, gouged seals, or bent pipe. It outlines approved repair steps, required tools, and documentation procedures to ensure traceability. Clear criteria are provided for when repairs can be done in the field, when shop intervention is needed, and when full rejection is required.

7.1 MANAGING CONNECTION DAMAGE IN THE FIELD

Field damage, whether from handling, transport, or running operations, can compromise connection integrity. This section outlines how to distinguish between reparable and rejectable damage, and how to handle each case using approved procedures.

NOTE:

Only JESCO- trained personnel or licensed service providers should perform any repair on JESCO connections.

7.2 COMMON DAMAGE TYPES AND ROOT CAUSES

Type of Damage	Typical Cause
Light galling	Excessive stabbing force, mis-alignment
Cross-threading	Improper stabbing, lack of guide use
Seal face nicks	Impact from foreign objects or tools
Thread corrosion	Poor storage, water or chemical exposure
Dents in pin / box	Dropping pipe, poor rig handling

7.3 FIELD REPAIR CRITERIA

The following defects can be repaired:

- Light galling that doesn't distort thread profile
- Minor seal scratches that don't breach plating or geometry
- Small amounts of thread corrosion that can be brushed and cleaned

The following defects must be rejected:

- Threads missing, flattened, or deformed
- Seal faces with gouges, deep pitting, or cracks
- Ovality or bent pipe body
- Recurrent make-up failure on torque-turn
- Any connection with unauthorized prior repairs

IMPORTANT:

Never attempt to “grind” or file JESCO connections. This voids warranty and compromises structural integrity.

7.4 FIELD REPAIR PROCESS

Perform the following steps to fix repairable pipe.

1. Clean the area thoroughly using lint-free rags and mild solvent.
2. Visually inspect using adequate lighting and magnification.
3. Buff minor damage with non-metallic pad (if approved by JESCO field service representative).
4. Reapply thread compound evenly across pin.
5. Re-inspect using profile gauges or approved templates.
6. Tag as “Field Repair Approved” if accepted. Log all actions.

7.5 TOOLS AND MATERIALS NEEDED FOR REPAIRS

Required Tool	Tool Purpose
Clean rags and solvent	Surface preparation
Flashlight and mirror	Deep visual inspection
Profile gauge	Thread geometry validation
Non-metallic buffing pad	Minor galling/scratch removal
Approved thread compound	Post-repair protection
Inspection tags / forms	Documentation and traceability

7.6 REJECTION DOCUMENTATION

When a connection is deemed irreparable:

- Tag the joint clearly with a red “Rejected” tag
- Record the serial/heat number and pipe tally location
- Photograph the damage for traceability
- Note the condition and cause (if known) in the field report
- Segregate the pipe away from running inventory

7.7 FIELD REPAIR VS. SHOP REPAIR VS. REWORK

Action	Who Can Perform	Scope
Field Repair	JESCO-certified field representative	Light galling, seal cleaning
Shop Repair	Licensed repair facility	Thread chasing, recutting, full inspection
Factory Rework	JESCO facility only	Major refurbishing, heat treatment, recertification

7.8 REPAIR OR REJECT CRITERIA

Damage	Action
Improper compound application	Clean and redo
Seal face nick < 0.5 mm depth	Field Repair
Corrosion visible on shoulder	Reject
Thread flattened or chipped	Reject
Bent pipe	Reject

Chapter 8:
After Running

This chapter explains post-running activities ensure that lessons are captured and performance is documented. The process includes inspecting backup connections, reviewing torque-turn data, debriefing the crew, and issuing a post-job report with findings and recommendations. Unused pipe must be cleaned, capped, and stored properly, while feedback from the job feeds into continuous improvement of procedures and training.

8.1 POST-RUNNING ACTIVITIES

Post-running activities are often overlooked, but they are just as critical as proper make-up. This stage ensures:

- Documentation of what occurred during running
- Issues or deviations from the plan are identified
- Lessons learned for future operations are preserved
- Field-level input into on-going JESCO procedures improvement

Remember, the job isn't done when the last joint is made up, but rather when the learning is captured and passed forward.

8.2 AFTER RUNNING INSPECTION AND TREND REVIEW

Once the string is landed and running tools are laid down:

- Conduct random spot-checks on backup joints (those not visible during make-up).
- Review all torque-turn graphs to identify:
    - Sudden variations in shoulder torque
    - Outliers in turn count
    - Inconsistent frictional profiles
- Look for repeatable patterns that could indicate equipment bias, crew variability, or material inconsistencies.

NOTE:

Reviewing a 10% sample of torque logs is often enough to identify systemic issues.

8.3 CREW DEBRIEF AND KNOWLEDGE CAPTURE

Conduct a structured debrief with:

- Rig supervisor or company representative
- JESCO field service representative
- Tong operator / torque technician
- Toolpusher or shift lead

Key Questions to Ask:

- What went well?
- Were there any rejected or repaired connections?
- Were any safety risks or near-misses encountered?
- Did the crew understand and follow the make-up parameters?
- Were there any equipment malfunctions or delays?

Document the responses objectively. Include specific recommendations for training or procedural updates. One honest conversation at the end of the job can save days of rework on the next one.

8.4 POST-JOB REPORT (BUILDING THE KNOWLEDGE CHAIN)

JESCO field service representatives (or customer QC leads) shall issue a detailed report, typically within 24–48 hours following job completion.

Minimum report elements shall contain:

- Well and string identifiers
- A running summary (including any deviations from procedure)
- Make-up analysis with Torque-Turn graph highlights
- A list of rejected or field-repaired connections
- Connection performance notes
- Tool performance and feedback

- A crew evaluation (if applicable)
- Safety/HSE observations
- Photographic documentation (e.g., damaged threads, back-outs, Torque-Turn curves)
- Recommendations for the next run

These reports contribute to the JESCO feedback loop and support technical performance analytics across all fields.

8.5 HANDLING UNUSED OR RETURNED PIPE

Any joints that were doped but not run into the well must be cleaned, capped, and stored correctly to maintain future usability.

1. Thoroughly clean the threads and seal surfaces with solvent and dry cloths.
2. Re-apply storage compound if pipe is to be stored for more than 30 days.
3. Use new protectors (preferably with vent holes to avoid condensation).
4. Clearly label each joint: unused, previously doped, or rejected.
5. Store horizontally, off the ground, and under cover — ideally in a climate-protected pipe rack.

.

IMPORTANT:

Threads that were doped but exposed to the environment must be re-cleaned and re-lubricated before re-use.

8.6 FEEDBACK FOR CONTINUOUS IMPROVEMENT

The final (and most valuable) step is feedback. This closes the knowledge loop. JESCO actively collects:

- Field learnings
- Product behavior observations
- Connection handling challenges
- Suggestions for procedural updates

Feedback helps refine running manuals and quick guides, connection enhancements, and field training programs.

OBSERVATION:

Every rig run is a test. The more data we share, the better our connections become.

Post-Running and Reporting Summary

1. Backup connections spot-checked
2. Torque-turn graphs reviewed
3. Crew debrief completed
4. Post-job report submitted
5. Rejected joints documented with photos
6. Unused pipe cleaned, tagged, and stored
7. Feedback shared with JESCO

Chapter 9:
Horizontal Assembly Technical Recommendations

This chapter explains horizontal assembly of JESCO connections, used when vertical makeup isn't practical, such as during workshop pre-assemblies or limited-clearance rig setups. It emphasizes proper cleaning, alignment, controlled stabbing, and torque-turn monitoring to ensure correct engagement and prevent thread or seal damage. Post-make-up checks, correct handling, and secure storage protect connection integrity and maintain readiness for rig operations.

9.1 OVERVIEW: WHEN AND WHY TO USE HORIZONTAL MAKE-UP

Horizontal assembly is employed when vertical make-up is not practical — such as during yard preparation, pipe yard sub-assemblies, limited-clearance rig ups, completion assemblies preparation or inline float equipment integration.

It is standard practice to pre-make-up accessories at a workshop before shipping them to the rig site. This is because drilling rigs are optimized for handling long, uniformly sized, and weighted components, not short or irregularly shaped items.

To facilitate rig handling, pup joints—short sections of pipe—are typically installed above and below assemblies. These help maintain consistent dimensions and weight distribution, making the equipment easier to run.

Workshop make-up is typically performed horizontally, using equipment that differs from what's used at the rig site. These systems feature adjustable jaws capable of gripping a wide range of pipe sizes and accommodating components with offset connections.

IMPORTANT:

While vertical make- up is ideal, properly executed horizontal assembly ensures the same connection integrity when aligned, torqued, and inspected correctly.

9.2 RISKS IN HORIZONTAL ASSEMBLY

Risk	Consequences	Mitigation Strategy
Misalignment	Cross-threading, galling	Use full-length support and proper alignment tools
Impact stabbing	Seal damage, shoulder distortion	Manually stab and spin with controlled force
Incomplete cleaning	Seal leakage, torque irregularity	Make a thorough inspection before applying dope
Improper torque monitoring	Over / under torque, make-up failure	Use calibrated Torque-Turn systems and log graphs

9.3 PRE-ASSEMBLY PREPARATION

When performing cleaning and visual inspection:

- Remove protectors and wipe pin/box ends with lint-free cloths.
- Use approved solvent for JESCO connections.
- Visually inspect threads, seal face, stabbing lead, and ensure no corrosion, dents, or deformation.

Be sure to have the following equipment and information on hand:

- Calibrated bucking unit or powered makeup tool with torque-turn monitoring
- Alignment supports, stabbing guides, and OD-specific dies
- Verified torque spec from connection datasheet

9.4 PIPE ALIGNMENT AND SUPPORT

- Use padded V-blocks or adjustable roller stands.
- Ensure pipe ends are centered and level along the entire length.
- Avoid sagging. Even minor bending can lead to misaligned stabbing.
- Confirm axial alignment visually and by using gauges.

IMPORTANT:

Never proceed with stabbing if the pipe is offset or angled —this can destroy premium threads instantly.

9.5 CONTROLLED STABBING PROCEDURE

1. Align the pin end precisely with the box.
2. Lower or advance the pin slowly, by hand or low-speed hydraulic assist.
3. Spin in by hand until threads are fully engaged (≥2 full turns).
4. Watch for smooth engagement. Ensure there is no jerking, wobble, or resistance.
5. If binding occurs, stop immediately, retract, clean, and realign.

9.6 APPLYING COMPOUND

For Conventional Connections:

- Use approved premium compound per material type.
- Apply thin, uniform coat on pin threads, seal face, and lead-in.
- Avoid globbing or shoulder buildup — this distorts torque readings.

For CRA / Chrome:

- Only use CRA-compatible compound (non-metallic).
- Apply immediately prior to make-up to prevent oxidation or dirt adherence.

9.7 MAKE-UP AND TORQUE MONITORING

- Use a calibrated bucking unit with digital torque-turn output.
- Monitor the graph in real time to confirm thread engagement, shoulder contact, and final torque.

Parameter	Target
Spin-in Speed	≤15RPM
Final Make-Up	≤5RPM

Torque window per connection datasheet.

Save each torque-turn graph for traceability and quality audits.

9.8 POST-MAKE-UP QUALITY CHECKS

- Verify full shoulder contact visually.
- Look for signs of slippage or tong scarring.
- Reinstall clean protectors immediately after inspection.

Recommendation:

Paint stripe joints that pass inspection and log all make- up data.

9.9 HANDLING AND STORAGE AFTER ASSEMBLY

Use tarps or breathable pipe covers to prevent sun/dirt/dust exposure.

For long term storage, reclean and relubricate pipe, then inspect monthly.

- Use padded slings or pipe-handling tools only — never chain or fork the body.
- Stack horizontally with chocks or soft dunnage.
- Clearly label: “PRE-MADE CONNECTION – DO NOT OPEN.”

Horizontal Assembly Summary

1. Ensure all pipe is cleaned and protectors removed
2. Apply proper compound
3. Align and support pipe correctly
4. Apply torque within spec with graph saved
5. Complete the post-make-up inspection
6. Reinstall clean protectors
7. Ensure the joints are marked, tagged, and stored per guidelines

Chapter 10:

Connection Interchangeability Guidelines

This chapter explains that certain JESCO connections of different weights and grades, such as 4½" L80.1and JEP95HS, are fully interchangeable when the recommended torque values and approved procedures are followed. Minor steps may appear at the torque shoulders due to size differences, but proper make- up ensures connection integrity. Users should always refer to JESCO specifications for torque values and other interchangeable connections.

10.1 MATERIAL

- 4 ½”, 12.6#, L80.1, JPC4-C1
- 4 ½”, 13.5#, JEP95HS, JPC4-C1

10.2 DESIGN FEATURES

Connection design for the aforementioned weights and grades is the same.

10.3 INTERCHANGEABILITY

Both connections are 100% interchangeable subject to application of the recommended make up torque values and approved buck-on process.

10.4 ASSEMBLY GEOMETRY

While assembling two different weights of an interchangeable connection, a resulting step may appear at the contact between both pin and box torque shoulders.

The step depth is approximately 50% of the difference between both connections’ IDs

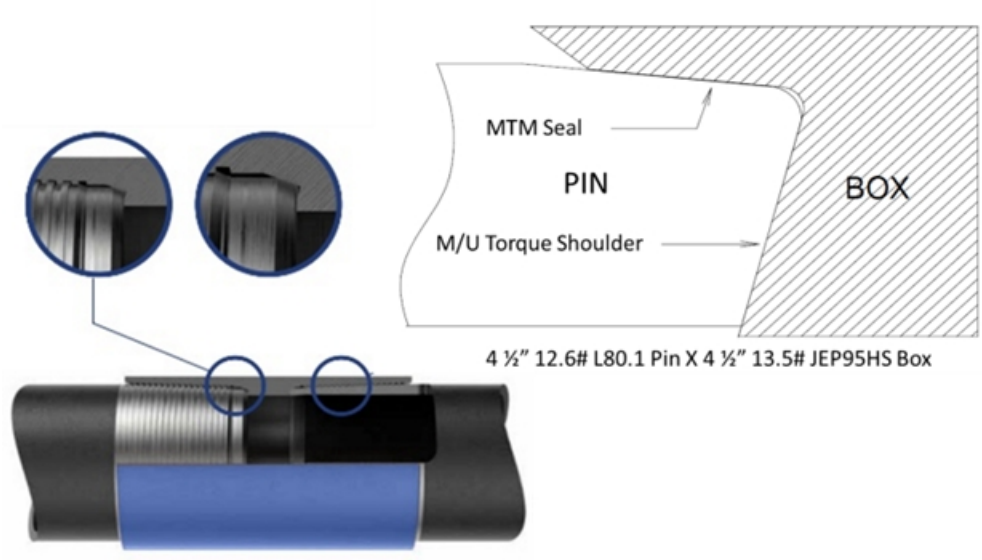


Figure 10-1: Assembly Geometry

10.5 RECOMMENDED MAKE-UP TORQUE VALUES

- 4 ½", 12.6#, L80.1, JPC4-C1 X 4 ½", 13.5#, JEP95HS, JPC4-C1

Minimum Make-up Torque	Optimum Make-up Torque	Maximum Make-up Torque	Minimum Shoulder Torque	Maximum Shoulder Torque
ft-lbs	ft-lbs	ft-lbs	ft-lbs	ft-lbs
4690	4920	5170	246	3444

Please consult JESCO for interchangeability of other sizes, weights, grades.

Chapter 11:
Manufacturing

This chapter explains the two main methods of pipeline manufacturing: seamless and ERW (Electric Resistance Welded) pipes. Seamless pipes are produced from heated steel billets pierced and rolled into hollow shells, then elongated, sized, straightened, cut, and finished with heat treatment, testing, and coating, providing high strength and reliability for critical applications. ERW pipes are made by cold-forming steel coils into cylindrical shapes and welding the seam using high-frequency electric current, followed by deburring, sizing, straightening, cutting, inspection, and finishing; both processes require specialized equipment to ensure precise dimensions, quality, and performance.

There are two methods of pipeline manufacture: Seamless and Electric Resistance Welded.

11.1 SEAMLESS PIPE

The seamless pipe manufacturing process is used to produce pipes without any welded joints, offering superior strength, pressure resistance, and reliability—especially for high-pressure, high-temperature, or critical applications.

A heated ingot is pierced with a mandrel and rolled into the proper pipe size.

1. Billet Heating:
   - Round steel billets (solid cylindrical bars) are heated to ~1200°C in a rotary hearth or induction furnace.
2. Piercing (Mannesmann Process):
   - The hot billet is pierced using a piercing mill with two skewed rollers and a piercing mandrel.
   - This creates a central hole, forming a rough shell (hollow).
3. Elongation:
   - The pierced shell is elongated using:
   - Mandrel Mill
   - Plug Mill
   - or Assel Mill
   - This reduces wall thickness and increases length.
4. Reheating (if necessary):
   - For temperature uniformity before sizing.
5. Sizing and Stretch Reducing:
   - Pipe is passed through a sizing mill or stretch reducing mill to achieve final diameter and wall thickness.
6. Cooling:
   - Pipes are cooled on a cooling bed.
7. Straightening:
   - Pipes are straightened using a straightening machine.
8. Cutting:

- Pipes are cut to desired lengths using flying saws or cutoff machines.
- Finishing:
- Includes:
    - End facing / beveling
    - Heat treatment (normalizing, quenching)
    - Non-destructive testing (ultrasonic, eddy current)
    - Hydrotesting
    - Coating or painting

Equipment Required

- Rotary hearth furnace
- Piercing mill
- Mandrel or plug mill
- Reheating furnace (optional)
- Stretch reducing/sizing mill
- Flying saw
- Straightener
- Heat treatment furnace
- NDT line
- Hydrotesting unit
- End-facing machine

11.2 ERW PIPE

ERW stands for the Electric Resistance Welded process. This process involves producing pipes by cold-forming generally low-carbon steel coil into a cylindrical shape and then welding the seam using electric resistance. The steel coil is cut into long strips. The strips are bent around sizing mandrels and welded into a tube.

1. Uncoiling:
   - Steel coil (hot rolled or cold rolled) is loaded onto an uncoiler.
   - The coil is fed into the forming line.
2. End Shearing and Welding:
   - The coil ends are trimmed and welded to allow continuous production.
3. Looping (Accumulator):
   - Stores strip temporarily so the mill can run continuously while new coils are being joined.
4. Forming:
   - The strip passes through a series of forming rollers that gradually shape it into a round tube.
5. Welding (ERW):
   - The edges of the tube are heated using high-frequency current (typically 100-800 kHz).
   - The heated edges are then squeezed together to form a weld.
6. Deburring:
   - Inside and outside weld beads are trimmed to ensure a smooth surface.
7. Sizing & Straightening:
   - The tube is passed through sizing rolls to get the precise diameter and straightness.
8. Cutting:
   - Pipes are cut to length using flying cutoff saws or other methods.
9. Inspection & Testing:
   - Pipes undergo non-destructive testing (NDT), such as ultrasonic or hydro testing, to ensure quality.

10. Finishing:
    - Includes end-facing, threading (if required), galvanizing, painting, or coating.

Key Equipment

- Uncoiler
- Shearing & end welding machine
- Strip accumulator
- Forming and welding mill
- High-frequency welder (solid-state or vacuum tube type)
- Bead trimmer
- Sizing mill
- Straightener
- Flying cutoff machine
- NDT equipment (UT, eddy current, etc.)
- Pipe bundling and stacking system

Chapter 12:
Products

This chapter explains the main JESCO product lines and their features. The JPC2 and JPC4 connections are designed for oil and gas exploitation, with the JPC4 offering a conical metal-to-metal seal, anti-galling properties, and enhanced torque shoulder for precise makeup.

12.1 JPC-2

- Size range: 5-1/2" to 13-3/8"
- Tolerances: API 5CT
- Extensive field proven premium connection technology
- Metal-to-Metal Seal
    - 30° Metal-to-Metal galling resistant pressure seal
    - Improved sealability compared to API connections
    - Used for higher temperature applications
- Torque Shoulder
    - 15°-20° reverse angle torque shoulder, enhancing connection sealability
    - Supports compression efficiency, and ensures precise make-up position control
- Thread Profile
    - Modified buttress thread profile reduces galling risk
    - OD 5-1/2" - 13-3/8" : 5 TPI
    - Thread taper 1:16
    - 3" load flank and 10" stab flank
    - Additional thread clearance for excess thread compound allocation.

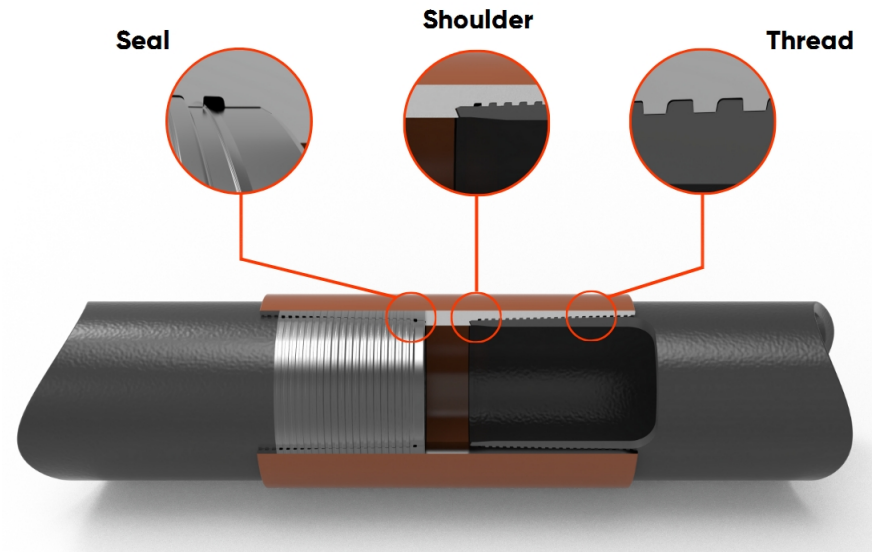


Figure 12-1: JPC-2, Cutaway View

12.2 JPC-4

- Size range: 3 ½” to 13 3/8”
- Successfully tested under ISO 13679:2002 CAL-IV and Major operator qualification test protocols
- Metal-to-Metal Seal
    - Conical seal design provides high performing gas tight sealability
    - Seal geometry provides excellent anti-galling properties
- Torque Shoulder
    - Negative angle torque shoulder to enhance sealability & compression resistance
    - Ensures precise make up position control
- Thread profile
    - Run out thread provides maximum pipe body area for tension and compression loads
    - Hooked thread profile for 100% tensile efficiency & preventing jump out
    - Steep stab flank angle and torque shoulder provide extra compression and bending resistance
    - Thread clearance for excellent anti-galling properties

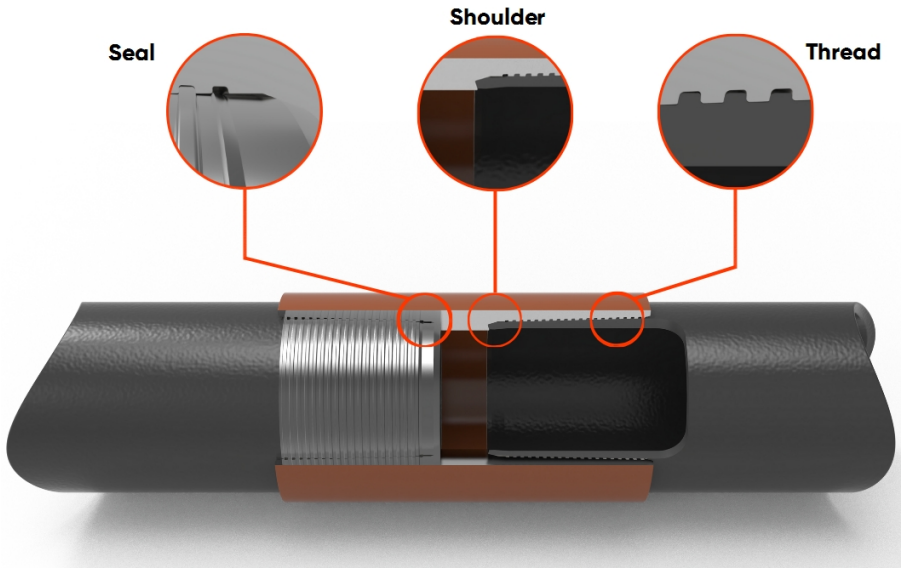


Figure 12-2: JPC-4 Connector, Cutaway View

12.3 FALCONTORQ

- Size range: 4-1/2" to 13-5/8"
- Built for the most challenging applications where well operations and economics are equally crucial.
- Successfully tested under API RP 5C5 2021 CAL-IV and Major Operators' qualification test protocols.

Concept Design:

- Thread and Coupled Wedge thread profile guarantees 100% Tensile and Compression efficiencies under combined loads.
- Assures outstanding operational torque rating.
- Guarantees advanced bending performance.
- Offers 100% PBYS rating for internal and external pressures (Burst and Collapse)
- Provides 100% internal and external gas tight sealability
- Thread clearance enhances anti-galling properties.
- Deep stabbing for quick make up.

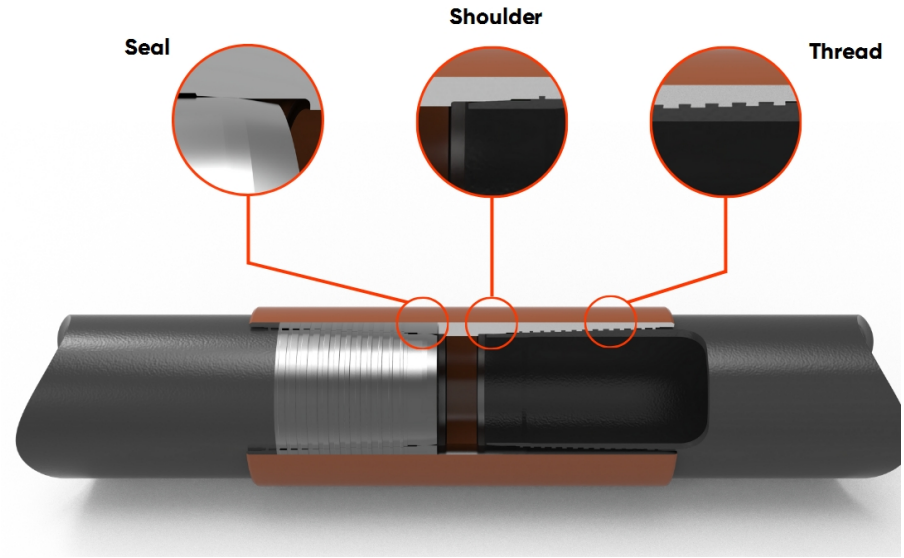


Figure 12-3: FalconTorq Connector, Cutaway View

APPENDIX A - JPC-2 DATA SHEETS

JPC-2 is a premium, proprietary, and interchangeable connection developed by Jubail Energy Services Company (JESCO) for Oil Country Tubular Goods (OCTG) applications in oil and natural gas extraction.

Designed for reliability and performance, JPC-2 is available in sizes ranging from 5.500" to 13.375", and is fully compliant with the API 5CT standard. It has improved sealability compared to API connections and is used for higher temperature applications. The modified thread profile reduces galling risk.

Successfully tested according to ISO 13679:2002 CAL-II with bending testing.

A.1 JPC-2 PERFORMANCE DATA

PIPE								PIN	COUPLING				
Nominal Outside Diameter	Nominal Weight	Nominal Wall Thickness		Nominal Inside Diameter	Drift Diameter		Nominal Section Area	Make up Loss Length	Coupling Outside Diameter	Coupling Inside Diameter	Finished Length	Critical Section Area	Tensile Efficiency
Inch (mm)	lbs/ft	inch	mm	Inch	Inch	mm	In²	Inch	Inch	Inch	Inch	In²	%
5-1/2 (139.7)	15.5	0.275	6.99	4.950	4.825	122.56	4.511	4.843	6.083	4.949	11.654	6.141	100%
	17.0	0.304	7.72	4.892	4.767	121.08	4.962	4.843	6.083	4.949	11.654	6.141	100%
	20.0	0.362	9.19	4.778	4.653	118.18	5.828	4.843	6.083	4.917	11.654	6.141	100%
	23.0	0.415	10.54	4.670	4.545	115.44	6.629	4.843	6.083	4.831	11.654	6.141	100%
	26.0	0.476	12.09	4.548	4.423	112.34	7.511	4.843	6.083	4.831	11.654	6.141	100%
7 (177.80)	23.0	.0317	8.05	6.366	6.241	158.52	6.653	5.197	7.697	6.437	12.402	9.405	100%
	26.0	0.362	9.19	6.276	6.151	156.24	7.549	5.197	7.697	6.388	12.402	9.405	100%
	29.0	0.408	10.36	6.184	6.059	153.90	8.449	5.197	7.697	6.339	12.402	9.405	100%
	32.0	0.454	11.53	6.094	5.969	151.61	9.317	5.197	7.697	6.339	12.402	9.405	100%
	35.0	0.499	12.67	6.004	5.879	149.33	10.173	5.197	7.697	6.339	12.402	9.405	100%
	38.0	0.541	13.74	5.920	4.795	147.19	10.960	5.197	7.697	6.339	12.402	9.405	100%
	41.0	0.590	14.99	5.820	5.695	144.65	11.875	5.197	7.697	6.339	12.402	9.405	100%
7-5/8 (193.68)	26.4	0.328	8.33	6.970	6.844	173.84	7.518	5.374	8.543	7.051	12.756	13.273	100%
	29.7	0.375	9.53	6.876	6.750	171.46	8.537	5.374	8.543	7.012	12.756	13.273	100%
	33.7	0.430	10.92	6.766	6.640	168.66	9.720	5.374	8.543	6.941	12.756	13.273	100%
	35.8	0.465	11.81	6.696	6.570	166.68	10.459	5.374	8.543	6.941	12.756	13.273	100%
	39.0	0.500	12.70	6.626	6.500	165.10	11.193	5.374	8.543	6.941	12.756	13.273	100%
	42.8	0.562	14.27	6.502	6.376	161.96	12.466	5.374	8.543	6.941	12.756	13.273	100%
	47.1	0.626	15.90	6.376	6.250	158.74	13.748	5.374	8.543	6.941	12.756	13.273	100%
9-5/8 (244.48)	36.0	0.352	8.94	8.922	8.765	222.63	10.253	5.433	10.630	9.047	12.874	18.096	100%
	40.0	0.395	10.03	8.836	8.679	220.45	11.455	5.433	10.630	8.992	12.874	18.096	100%
	43.5	0.436	11.07	8.756	8.599	218.41	12.560	5.433	10.630	8.949	12.874	18.096	100%
	47.0	0.473	12.01	8.682	8.525	216.54	13.572	5.433	10.630	8.949	12.874	18.096	100%
	53.5	0.545	13.84	8.536	8.379	212.83	15.547	5.433	10.630	8.949	12.874	18.096	100%
	58.4	0.595	15.11	8.436	8.279	210.29	16.880	5.433	10.630	8.949	12.874	18.096	100%
13-3/8 (339.72)	61.0	0.430	10.92	12.514	12.359	313.92	17.487	5.630	14.370	12.691	13.189	24.630	100%
	68.0	0.480	12.19	12.414	12.259	311.38	19.445	5.630	14.370	12.594	13.189	24.630	100%
	72.0	0.515	13.08	12.346	12.191	309.65	20.768	5.630	14.370	12.594	13.189	24.630	100%
	86.0	0.625	15.88	12.124	11.969	304.01	25.028	5.630	14.370	12.594	13.189	24.630	98%

A.2 JPC2 TORQUE DATA

			TORQUES											
			Makeup Loss	55 KSI		80 KSI		95 KSI		110 KSI		130 KSI	
OD	Weight	Wall		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
5.500"	17.0	0.304	4.843	4560	5560	4950	6050	5220	6360	5480	6680	6190	7550
	20.0	0.362	4.843	5340	6520	5860	7160	6120	7480	6450	7870	7170	8750
	23.0	0.415	4.843	6390	7790	7170	8750	7470	9130	7830	9570	9150	11150
7.000"	26.0	0.362	5.197	6510	7950	7470	9130	7830	9570	8460	10340	9150	11150
	29.0	0.408	5.197	7470	9130	8460	10340	9150	11150	9850	11850	10450	12600
	32.0	0.454	5.197	8150	9950	9150	11150	9850	11850	10450	12650	11100	13500
	35.0	0.499	5.197	8640	10300	9500	11500	10100	12300	10850	13050	11450	13850
7.625"	33.7	0.430	5.374	9150	11150	10450	12650	11100	13500	12100	14700	12700	15500
	35.8	0.465	5.374	9500	11500	10850	13050	11700	14300	12450	15050	13050	15850
	39.0	0.500	5.374	9850	11850	11100	13500	12100	14700	12700	15500	13700	16700
9.625"	40.0	0.395	5.433	9500	11500	11100	13500	12100	14700	13050	15850	14400	17400
	43.5	0.436	5.433	10850	13050	12700	15500	13700	16700	14400	17400	14400	17400
	47.0	0.473	5.433	11100	13500	13050	15850	14400	17400	14400	17400	14400	17400
	53.5	0.545	5.433	12100	14700	14400	17400	14400	17400	14400	17400	14400	17400
	58.4	0.595	5.433	12700	15500	14400	17400	14400	17400	14400	17400	14400	17400
13.375"	61.0	0.430	5.630	13700	16700	14400	17400	14400	17400	14400	17400	14400	17400
	68.0	0.480	5.630	14400	17400	14400	17400	14400	17400	14400	17400	14400	17400
	72.0	0.515	5.630	14400	17400	14400	17400	14400	17400	14400	17400	14400	17400

APPENDIX B - JPC-4 DATA SHEETS

JPC-4 is JESCO's latest premium connection, engineered for high-performance and reliability in the most demanding operating conditions.

It is available in sizes 4-½", 5-½", 7", 9-5/8", and 13-3/8", each offered in a wide range of wall thicknesses and steel grades to suit diverse application requirements.

Extensive testing involving repeated makeup and breakout cycles—across varying torque levels and dope volumes—has demonstrated JPC-4's low galling tendency, ensuring gas-tight sealing even under the most critical conditions.

JPC-4 delivers 100% tensile and up to 100% compressive efficiency for sizes up to 7", and a minimum of 80% for 9-5/8" and 13-3/8" sizes.

Its superior performance under combined loads—including internal/external pressure, thermal cycling, bending, tension, and compression—has been fully validated through ISO 13679:2011 CAL IV testing. JPC-4 is among the few connections tested in accordance with the latest and most rigorous revision of this standard.

B.1 JPC4 PERFORMANCE DATA

PERFORMANCE DATA													
										Design Efficiency			
OD	Weight	Wall	Interchangeable Weights	Pin Bored ID	Std Cplg OD	Cplg Bored ID	Coupling Length	Makeup Loss	Critical Section Area	Ten	Com	IP	EP
4.500"	10.50	0.224	10.50-15.10	4.052	4.862	3.992	7.480	3.222	3.882	100%	100%	100%	100%
	11.60	0.250	10.50-15.10	4.000	4.906	3.945	7.480	3.222	4.214	100%	100%	100%	100%
	12.60	0.271	10.50-15.10	3.958	4.937	3.906	7.480	3.222	4.458	100%	100%	100%	100%
	13.50	0.290	10.50-15.10	3.920	4.969	3.870	7.480	3.222	4.703	100%	100%	100%	100%
	15.10	0.337	10.50-15.10	3.826	5.043	3.791	7.480	3.222	5.291	100%	100%	100%	100%
5.500"	15.50	0.276	15.50-29.70	4.950	5.929	4.872	10.748	4.382	4.951	100%	100%	100%	100%
	17.00	0.304	15.50-29.70	4.892	5.978	4.815	10.748	4.382	5.411	100%	100%	100%	100%
	20.00	0.362	15.50-29.70	4.778	6.071	4.719	10.748	4.382	6.286	100%	100%	100%	100%
	23.00	0.415	15.50-29.70	4.670	6.156	4.611	10.748	4.382	7.099	100%	100%	100%	100%
	26.00	0.476	15.50-29.70	4.548	6.248	4.489	10.748	4.382	8.000	100%	100%	100%	100%
	26.80	0.500	15.50-29.70	4.500	6.283	4.442	10.748	4.382	8.349	100%	100%	100%	100%
	28.40	0.530	15.50-29.70	4.440	6.327	4.390	10.748	4.382	8.777	100%	100%	100%	100%
	29.70	0.562	15.50-29.70	4.376	6.372	4.339	10.748	4.382	9.229	100%	100%	100%	100%
7.000"	26.00	0.362	26.00-42.70	6.276	7.565	6.280	11.539	4.776	8.129	100%	100%	100%	100%
	29.00	0.408	26.00-42.70	6.184	7.644	6.280	11.539	4.776	9.072	100%	100%	100%	100%
	32.00	0.453	26.00-42.70	6.094	7.717	6.198	11.539	4.776	9.947	100%	100%	100%	100%
	35.00	0.498	26.00-42.70	6.004	7.788	6.118	11.539	4.776	10.817	100%	100%	100%	100%
	38.00	0.540	26.00-42.70	5.920	7.853	6.044	11.539	4.776	11.616	100%	100%	100%	100%
	41.00	0.590	26.00-42.70	5.820	7.930	5.954	11.539	4.776	12.570	100%	100%	100%	100%
	42.70	0.626	26.00-42.70	5.750	7.980	5.891	11.539	4.776	13.199	100%	100%	100%	100%
9.625"	36.00	0.352	36.00-58.40	8.922	10.188	8.927	13.228	5.589	11.235	100%	100%	100%	100%
	40.00	0.395	36.00-58.40	8.836	10.264	8.927	13.228	5.589	12.456	100%	100%	100%	100%
	43.50	0.435	36.00-58.40	8.756	10.333	8.855	13.228	5.589	13.572	100%	100%	100%	100%
	47.00	0.472	36.00-58.40	8.682	10.396	8.788	13.228	5.589	14.597	100%	100%	100%	100%
	53.50	0.545	36.00-58.40	8.536	10.520	8.657	13.228	5.589	16.634	100%	100%	100%	100%
	58.40	0.595	36.00-58.40	8.436	10.601	8.569	13.228	5.589	17.977	100%	100%	100%	100%
13.375"	61.00	0.430	61.00-92.00	12.514	14.088	12.617	13.425	5.698	18.970	100%	100%	100%	100%
	68.00	0.480	61.00-92.00	12.414	14.176	12.528	13.425	5.698	20.928	100%	100%	100%	100%
	72.00	0.514	61.00-92.00	12.346	14.236	12.467	13.425	5.698	22.263	100%	100%	100%	100%
	77.00	0.550	61.00-92.00	12.274	14.299	12.402	13.425	5.698	23.674	100%	100%	100%	100%
	80.70	0.580	61.00-92.00	12.214	14.350	12.348	13.425	5.698	24.826	100%	100%	100%	100%
	85.00	0.608	61.00-92.00	12.158	14.400	12.299	13.425	5.698	25.937	100%	100%	100%	100%
	86.00	0.625	61.00-92.00	12.124	14.429	12.268	13.425	5.698	26.605	100%	100%	100%	100%
	92.00	0.672	61.00-92.00	12.030	14.510	12.184	13.425	5.698	28.439	100%	100%	100%	100%

B.2 JPC4 TORQUE DATA

			MAKE-UP TORQUES							
			Makeup Loss	80000 KSI		95000 KSI		110000 KSI	
OD	Weight	Wall		Optimum (lb-ft)	Maximum (lb-ft)	Optimum (lb-ft)	Maximum (lb-ft)	Optimum (lb-ft)	Maximum (lb-ft)
4.500"	10.50	0.224	3.222	2840	3060	3130	3370	3490	3760
	11.60	0.250	3.222	3640	3920	4070	4380	4500	4840
	12.60	0.271	3.222	4120	4530	4580	4930	5080	5470
	13.50	0.290	3.222	4650	5000	5230	5630	5810	6250
	15.10	0.337	3.222	5810	6250	6530	7020	7180	7720
5.500"	15.50	0.276	4.382	5440	5850	6170	6640	6890	7410
	17.00	0.304	4.382	6600	7100	7250	7800	8320	8950
	20.00	0.361	4.382	8720	9380	9770	10510	10870	11690
	23.00	0.415	4.382	10870	11690	12320	13250	13770	14810
	26.00	0.476	4.382	13420	14430	15220	16370	16670	17930
	26.80	0.500	4.382	14470	15560	16270	17500	18120	19480
	28.40	0.530	4.382	15570	16740	17720	19050	19570	21040
	29.70	0.562	4.382	16670	17930	18820	20240	21020	22600
7.000	26.00	0.362	4.776	12000	12900	13800	14840	15250	16400
	29.00	0.408	4.776	14900	16020	17050	18330	17750	19090
	32.00	0.453	4.776	15600	16770	17700	19030	19600	21070
	35.00	0.498	4.776	18150	19520	20650	22200	22850	24570
	38.00	0.540	4.776	20650	22200	23200	24940	23200	24940
	41.00	0.590	4.776	23200	24940	23200	24940	23200	24940
	42.70	0.626	4.776	23200	24940	23200	24940	23200	24940
9.625"	36.00	0.352	5.589	9500	9980	11040	11600	11650	12240
	40.00	0.395	5.589	9500	9980	11040	11600	11650	12240
	43.50	0.435	5.589	13100	13760	15720	16510	16000	16800
	47.00	0.472	5.589	16000	16800	18870	19820	20350	21370
	53.50	0.545	5.589	23250	24420	25190	26450	23150	25450
	58.40	0.595	5.589	23250	24420	25180	26440	23250	24420
13.375"	61.00	0.430	5.698	16750	17590	19740	20730	21100	22160
	68.00	0.480	5.698	23250	24420	24300	25520	23250	24420
	72.00	0.514	5.698	23250	24420	24300	25520	23250	24420
	77.00	0.550	5.698	23250	24420	24300	25520	23250	24420
	80.70	0.580	5.698	23250	24420	24300	25520	23250	24420
	85.00	0.608	5.698	23250	24420	24300	25520	23250	24420
	86.00	0.625	5.698	23250	24420	24300	25520	23250	24420
	92.00	0.672	5.698	50100	52610	52500	55130	50100	52610

APPENDIX C - OTHER DATA SHEETS

C.1 FALCONTORQ PERFORMANCE DATA

PERFORMANCE DATA														
											Design Efficiency			
OD	Weight	Wall	Interchangeable Weights	Pin Bored ID	Std Cplg OD	Matched Str OD	Cplg Bored ID	Coupling Length	Makeup Loss	Minimum Bore	Ten	Com	IP	EP
4.500	12.60	.271	12.6	3.877	5.200	4.866	3.950							
4.500	13.50	.290	13.50-15.10	3.839	5.200	4.897	3.912							
4.500	15.10	.337	13.50-15.10	3.745	5.200	4.971	3.818							
4.500	17.00	.380	13.50-15.10	3.659	5.200	5.037	3.732							
5.000	17.00	.304	15.50-20.00	.563	5.800	5.458	4.271							
5.000	20.00	.361	15.50-20.00	.563	5.800	5.574	4.121							
5.000	23.00	.415	23.00 26.00	.563	5.800	5.634	4.039							
5.000	26.00	.476	23.00 26.00	.563	5.800	5.666	3.995							
5.500	17.00	.304	15.50-20.00	4.818	6.300	5.887	4.891							
5.500	20.00	.361	15.50-20.00	4.704	6.300	5.981	4.777							
5.500	23.00	.415	23.00 26.00	4.596	6.300	6.054	4.669							
5.500	26.00	.476	23.00 26.00	4.474	6.300	6.147	4.547	14.818	5.980	1.395	100%	100%	100%	100%
6.625	24.00	.352	24.00-32.00	5.853	7.250	7.108	5.926							
6.625	28.00	.417	24.00-32.00	5.723	7.250	7.215	5.723							
6.625	32.00	.475	24.00-32.00	5.607	7.375	7.308	5.607							
7.000	23.00	.317	23.00-26.00	6.309	7.875	7.473	6.309							
7.000	26.00	.362	23.00-26.00	6.210	7.875	7.507	6.210							
7.000	29.00	.408	29.00-41.00	6.118	7.875	7.584	6.118							
7.000	32.00	.453	29.00-41.00	6.059	7.875	7.657	6.059							
7.000	35.00	.498	29.00-41.00	5.938	7.875	7.728	5.938							
7.000	41.00	.590	29.00-41.00	5.754	7.875	7.869	5.754							
9.625	36.00	.352	36.00-43.50	8.841	10.625	10.152	8.841							
9.625	40.00	.395	36.00-43.50	8.826	10.625	10.228	8.826							
9.625	43.50	.435	36.00-43.50	8.675	10.625	10.297	8.675							
9.625	47.00	.472	47.00-58.40	8.601	10.625	10.360	8.601							
9.625	53.50	.545	47.00-58.40	N/A	10.625	10.406	N/A							
9.625	58.40	.595	47.00-58.40	N/A	10.625	10.488	N/A							
13.375	54.50	.380	54.50-72.00	N/A	14.375	13.997	N/A							
13.375	61.00	.430	54.50-72.00	N/A	14.375	14.088	N/A							
13.375	68.00	.480	54.50-72.00	N/A	14.375	14.177	N/A							
13.375	72.00	.514	54.50-72.00	N/A	14.375	14.237	N/A							
13.375	77.00	.550	77.00-86.00	N/A	14.375	14.132	N/A							
13.375	86.00	.625	77.00-86.00	N/A	14.375	14.262	N/A							
13.625	88.25	.625	77.00-86.00	N/A	14.625	14.527	N/A							

C.2 FALCONTORQ TORQUE DATA

			Torques													
			Makeup		55000		75000		80000		95000		110000		125000	
OD	Weight	Wall	Min	Max	Operanl	Yield	Operanl	Yield	Operanl	Yield	Operanl	Yield	Operanl	Yield	Operanl	Yield
4.500	12.60	.271														
4.500	13.50	.290														
4.500	15.10	.337														
4.500	17.00	.380														
5.000	17.00	.304														
5.000	20.00	.361														
5.000	23.00	.415														
5.000	26.00	.476														
5.500	17.00	.304														
5.500	20.00	.361														
5.500	23.00	.415														
5.500	26.00	.476	17000	20400	26400	33000	29600	37000	31200	39000	34400	43000	41600	52000	44800	56000
6.625	24.00	.352														
6.625	28.00	.417														
6.625	32.00	.475														
7.000	23.00	.317														
7.000	26.00	.362														
7.000	29.00	.408														
7.000	32.00	.453														
7.000	35.00	.498														
7.000	41.00	.590														
9.625	36.00	.352														
9.625	40.00	.395														
9.625	43.50	.435														
9.625	47.00	.472														
9.625	53.50	.545														
9.625	58.40	.595														
13.375	54.50	.380														
13.375	61.00	.430														
13.375	68.00	.480														
13.375	72.00	.514														
13.375	77.00	.550														
13.375	86.00	.625														
13.625	88.25	.625														