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CONNECTION OPTION FOR VACUUM INSULATED TUBING AND MAGNESIUM PHOSPHATE COATING

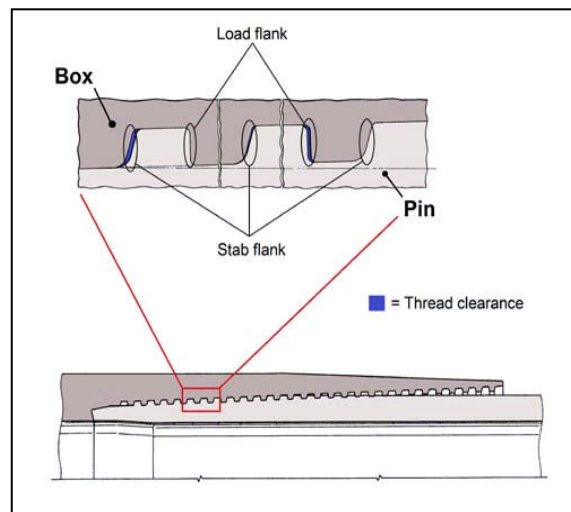
When completing high temperature and high pressure wells the both the tubing string and casing, insulated or not, must be able to withstand extreme conditions. The threaded connections are the most critical component of the entire chain. The Oil Tech Services insulated tubing offers two connection configurations:

1. API Buttress with AB Modification Sealing Ring threaded & coupled connection on the outer tube, and
2. Heavy Duty 2-Step connection, integral flush joint, on the inner tube (interchangeable with Hydril CS).

Buttress Connection

Historically, the API Buttress or its equal the USS Improved Buttress used on 3-1/2" sizes and below has been the standard thread configuration for Insulated Tubing. This threaded & coupled connection has a favorable history because of the ability to demount and reuse the tubing string multiple times. In recent years some operators have asked for semi-premium and premium threaded connections to fulfill certain wellbore requirements and in these cases the Heavy Duty 2-Step connection has been the thread of choice.

The API Buttress connection, patented by Samuel Webb (US2772102 - Sealed Threaded Pipe Joint, Nov. 27, 1956) provides excellent joint strength and the mismatch leads closing the thread clearance on the stab flanks when combined with the AB Modification Seal Ring provide the required leak resistance.

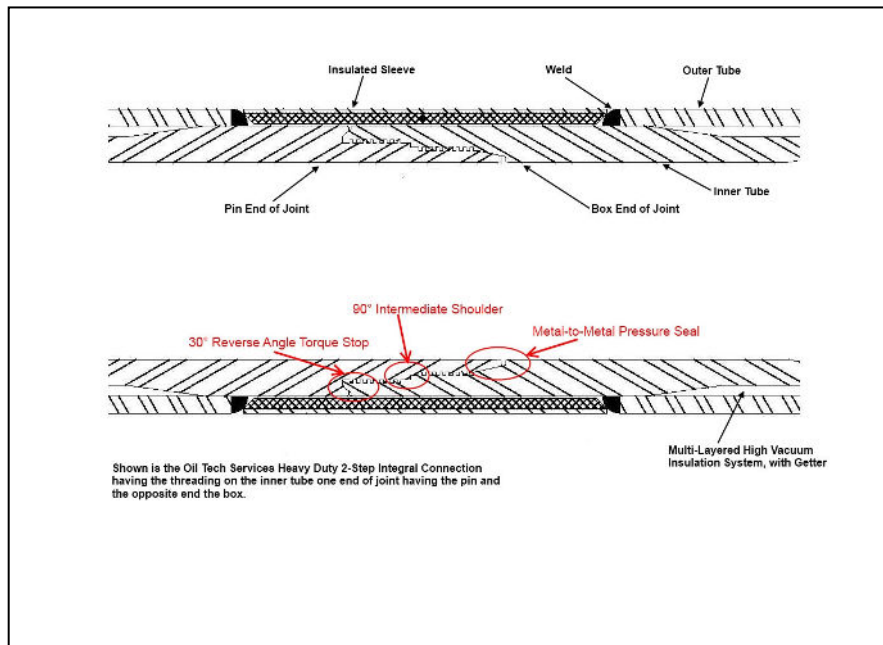




The Buttress T&C connection is less sensitive to stress concentrations and in most cases will have higher tension ratings than integral connections. These Buttress tapered threads inherently establish a certain make-up torque and have high resistance to cross threading.

Heavy-Duty 2-Step Connection

The second type of thread is the integral flush joint connection OTSI has named Heavy Duty 2-Step (interchangeable with Hydril CS) which offers metal-to-metal pressure seal. The primary metal-to-metal seal is located near the torque shoulder and a center step torque shoulder.



The connection offers a 30° degree reverse angle torque stop, an 90° intermediate shoulder, and a metal-to-metal pin nose seal providing a gas tight seal under high pressure and temperature.

Manganese Phosphate Coating

Manganese phosphate coatings is applied to all threads to increase wear resistance and anti-galling properties. The manganese phosphate improves the ability of threads to retain pipe dope further improving the anti-friction properties and corrosion resistance of the connection.

Manganese phosphate is applied by immersion method that includes:

- Pickling (acid cleaning). Oxide films and rust stains are dissolved in acid.
- Water rinsing.
- Phosphating is a timed process by immersion into fluid at high temperature.
- Water rinsing.
- Drying.

