

Field Inspection Procedure for Used
TSC Double Shoulder Tool Joint Connection
Rev 0 (March 21, 2024)

1. Scope:
 - 1.1. This document provides procedures and acceptance criteria for field inspection of used TSC tool joint connection. This procedure supplements industry inspection practices and standards applicable to field inspection of rotary shouldered tool joint connections.
 - 1.2. The TSC connection is a modified rotary shouldered connection that has a Primary (external) and Secondary (internal) shoulder, refer to Figure 1 and Figure 2. The primary shoulder serves as the only sealing surface on the connection. The secondary shoulder serves as a mechanical stop and is not a sealing surface. The TSC connection is not compatible with any API connection.
2. References:
 - 2.1. The following references shall be included in application of this procedure.
 - 2.1.1. Refer to Figures 1 through 4 in this document for connection labels and benchmark feature.
 - 2.1.2. Connection Field Inspection Drawing
 - 2.1.3. Product Data Sheet
3. Equipment: The party performing the inspection shall ensure the measuring equipment is calibrated and in proper working condition.
 - 3.1. 12" Steel Rule graduated in 1/64" increments
 - 3.2. Metal Straightedge
 - 3.3. Outside and Inside Diameter Spring Calipers
 - 3.4. Long Stroke Depth Micrometer and Setting Standards/Blocks
 - 3.5. Dial Caliper
 - 3.6. Profile Gauge, Hardened and Ground (V-042R, 0.750 TPI, 3.5 TPF)
 - 3.7. Lead Gauge with 0.165" Dia. Contact Points, and Lead Gauge Setting Standard
 - 3.8. Pit Depth Gauge
 - 3.9. Inspection Mirror
4. Preparation: The connection shall be thoroughly cleaned to removal all contaminants to permit complete visual and dimensional inspection of all surfaces.
5. Primary Shoulder: (Seal Shoulder)
 - 5.1. The box and pin primary shoulder shall be inspected for any abnormalities on the shoulder that result in any metal protrusions above the surface. The surface shall be flat and free of corrosion deposits or other contaminants. Connections with protrusions (raised metal) shall be rejected. Filing of the primary shoulder is not permitted. Connections rejected for protrusions (raised metal) may be repaired by refacing or rethreading, as applicable.
 - 5.2. The primary shoulder shall be free of galls, nicks, washes, fins, fluid erosion or other conditions that exceed 0.031" in depth or occupy more than 30% of the radial width of the seal surface. Connections that do not meet these criteria shall be rejected. The connection shall be rejected if shoulder damage is present that would compromise connection sealing capability or performance. Connections rejected for primary shoulder damage may be repaired by refacing or rethreading, as applicable.
 - 5.3. The connection shall be rejected if the benchmark length indicates the primary shoulder has been refaced beyond the acceptable limit of 0.063" (1/16") minimum length box benchmark and 0.187" (3/16") maximum length pin benchmark, refer to Figure 3 and Figure 4. Connections rejected for benchmark length may be repaired by rethreading.
 - 5.4. An OD bevel at least 0.031" wide by approximately 45° shall be present for the full circumference of the box and pin primary shoulder.

6. Secondary Shoulder: (Internal Shoulder)
 - 6.1. The secondary shoulders (box internal shoulder and pin nose face) are not a sealing surface. The shoulders shall be free of raised metal or other damage that would interfere with make-up, driftability, or cause galling. A file or nonmetallic buffing wheel may be used to remove material protrusions. Copper sulfate shall be applied to repaired areas. The connection shall be rejected if damage is too severe to repair with a file or nonmetallic buffing wheel. Connections rejected for secondary shoulder damage may be repaired by refacing or rethreading, as applicable.
 - 6.2. A 0.031" wide by 45° bevel shall be present on the full circumference of the internal edge of the box secondary (internal) shoulder and the internal and external edge of the pin secondary shoulder (pin nose face). A non-metallic buffing wheel may be used to bevel sharp edges if needed. Copper sulfate shall be applied to repaired areas.
7. Connection Shoulder to Shoulder Length (L_{PC} and L_{BC}):
 - 7.1. The distance between the primary and secondary shoulders (L_{PC} and L_{BC}) shall be measured in two locations at 180° apart using a long stroke depth micrometer. The measurement shall not be taken in damaged or file repaired areas.
 - 7.2. Shoulder to shoulder length (L_{PC} and L_{BC}) shall meet the requirements shown on the Field Inspection drawing. Connections that do not meet the shoulder to shoulder length requirement shall be rejected. Connections rejected for shoulder to shoulder length may be repaired by refacing or rethreading, as applicable.
8. Pin Nose OD:
 - 8.1. Pin nose OD shall be measured in two locations at 90° apart. The connection shall be rejected if either measurement exceeds the limits shown on the field inspection drawing. Rejected connections may be repair by rethreading.
9. Tool Joint OD and Box Shoulder Width:
 - 9.1. Box and pin tool joint OD shall be measured at a distance of 0.625" $\pm$ 0.250" from the primary shoulder. Measurements shall be taken around the circumference of the tool joint to locate the minimum diameter. The minimum diameter shall not be less than the minimum tool joint OD specified on the Product Performance Sheet, field inspection drawing, or user specified minimum OD, whichever is larger.
 - 9.2. Minimum shoulder width shall be inspected on box tool joints if eccentric wear is evident. Minimum shoulder width shall meet the requirement shown on the Field Inspection drawing. Box shoulder width shall be measured by placing a straightedge along the tool joint OD, with one end of the straightedge extended past the primary shoulder, and measuring the distance from the straightedge to the box counterbore (excluding any ID bevel).
10. Box Swell:
 - 10.1. The box counterbore diameter shall be measured at two locations approximately 90° apart. The connection shall be rejected if either measurement exceeds the dimension shown on the Field Inspection drawing. Connections rejected for box swell may be repaired by remachining the connection beyond the damaged area.
 - 10.2. The box internal shoulder and tool joint ID adjacent to the internal shoulder shall be visually inspected for swell that can result from excessive torque. The inspection is not used to determine acceptance or rejection, but shall be noted on the connection inspection report when present. ID swell adjacent to the internal shoulder is an indicator to verify connection shoulder to shoulder length and thread lead.
11. Thread Surfaces: Box and Pin
 - 11.1. The entire threaded portion of the connection and all machined surfaces shall be visually inspected for nicks, galls, rolled metal, meshes, washes, pitting and other damage that would inhibit make-up of the connection or compromise connection performance or serviceability. Material that protrudes beyond the thread surface is not acceptable and shall be removed with a round corner triangle file or soft nonmetallic buffing wheel. Copper sulfate shall be applied to repaired areas.

- 11.2. Pits, cuts and gouges that result in slight depressions in the thread flank or thread crest are acceptable if the damage does not exceed 1.5" in length.
 - 11.3. Thread roots shall be free of damage that extends below the radius.
 - 11.4. The stab flank and crest radius of the starting 4 to 5 threads of the box and pin connections may round off during connection break-in and normal service operations. The condition is typical and does not affect connection serviceability. Starting threads shall be free of raised metal and any other damage that would cause galling during connection make-up or break-out. Raised metal and rough surfaces shall be removed with a soft nonmetallic buffing wheel. Copper sulfate shall be applied to repaired areas.
 - 11.5. Connections rejected for thread damage may be repaired by rethreading.
 - 11.6. The connection shall be rejected if any crack is detected during inspection. The area containing the crack must be cut off prior to rethreading. Magnetic-Particle inspection shall be performed after rethreading to verify crack removal.
12. Thread Profile: Box and Pin
- 12.1. Thread profile shall be verified along the entire length of full depth threads in two locations, approximately 90° apart, with a profile gauge. The profile gauge shall seat evenly in the threads and show normal contact. The connection shall be rejected if the visible gap between the profile gauge and the thread crest is greater than 0.031" over four consecutive threads or greater than 0.063" over two consecutive threads. Visible gaps between the profile gauge and thread flanks estimated to exceed 0.016" shall be cause for rejections. Connections rejected for thread wear may be repaired by rethreading.
 - 12.2. If the profile gauge indicates thread stretch has occurred, the connection shall be inspected with a lead gauge. Lead shall be measured over a 2" interval beginning at the first full depth thread nearest the primary shoulder (seal shoulder). Two lead measurements shall be made at approximately 90° apart. Precaution shall be taken to ensure lead measurements are not taken in areas where thread flank surface damage prevents accurate measurement. The connection shall be rejected if the lead exceeds 0.006" over a 2" interval. Connections rejected for lead may be repaired by rethreading. Connections rejected for lead shall be Magnetic-Particle inspected for cracks prior to rethreading.
13. Refacing:
- 13.1. If refacing is required, only remove the minimum amount of material necessary to remove the damage. Refacing repair is limited to 0.031" maximum removal of material at any one refacing operation. Connections with shoulder damage that exceeds 0.031" depth are not acceptable for reface and shall be rejected. Rejected connections may be repaired by rethreading.
 - 13.2. The same amount of material shall be removed from the primary and secondary shoulder during a refacing operation. The refaced shoulder shall be flat and have a surface finish of 125 µin Ra or better.
 - 13.3. Refaced shoulders shall be treated with an anti-gall coating, such as a hot phosphate coating (preferred) or copper sulfate. Hot phosphate coating is required for connections that are machine refaced in a lathe.
 - 13.4. Machine refacing in a lathe is the method preferred by TSC Drill Pipe. Portable field refacing is an alternative method that may be suitable if properly performed and perpendicularity is maintained between the shoulders and thread axis. After refacing, connection shoulder to shoulder length (L_{BC} and L_{PC}) shall be measured in four locations at 90° apart. All measurements shall be within the limits shown on the Field Inspection drawing. Deviation between the maximum and minimum measurement shall not exceed 0.002". Connections that do not meet these requirements and the benchmark length requirement in Section 5.3 shall be rejected. Rejected connections may be repaired by rethreading.

14. Tong Length:

- 13.1 A 6" minimum tong space length is recommended for pin tool joints. The tong length shall exclude the hardband area if present.
- 13.2 Box tool joint minimum tong space length shall not be less than the box connection overall length plus 2" or 7" minimum, whichever is greater. Box tong space length shall exclude the hardband area if present. Box tong space length must be sufficient to ensure tong dies are not positioned over the connection counterbore area.
- 13.3 User shall increase the above minimum tong space lengths as needed to ensure safe and effective tonging operations and to accommodate rig tonging equipment.
- 13.4 Tong placement shall not be positioned over hardband or box connection counterbore area.

15. Magnetic-Particle Inspection:

- 15.1. Magnetic-Particle inspection of the connection and tool joint may be required by the user as part of the field inspection process. When Magnetic-Particle inspection is specified, the inspection shall be performed in accordance with the inspection standard specified by the user.

16. Hardband:

- 16.1. Inspection of tool joint hardband may be required by the user as part of the field inspection process. When hardband inspection is required, the inspection shall be performed in accordance with the inspection standard specified by the user.

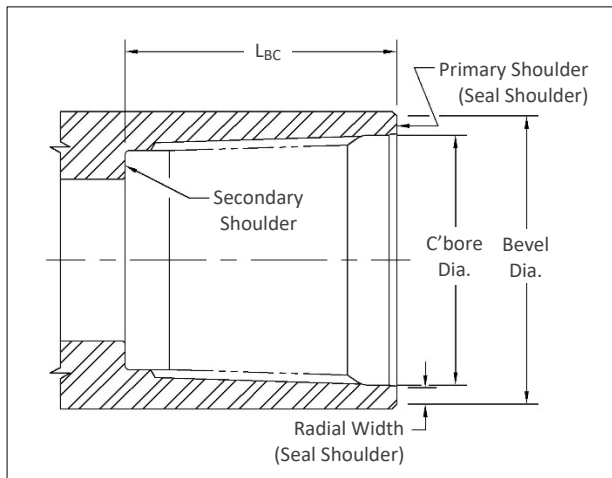


Figure 1: Connection Labels TSC Box

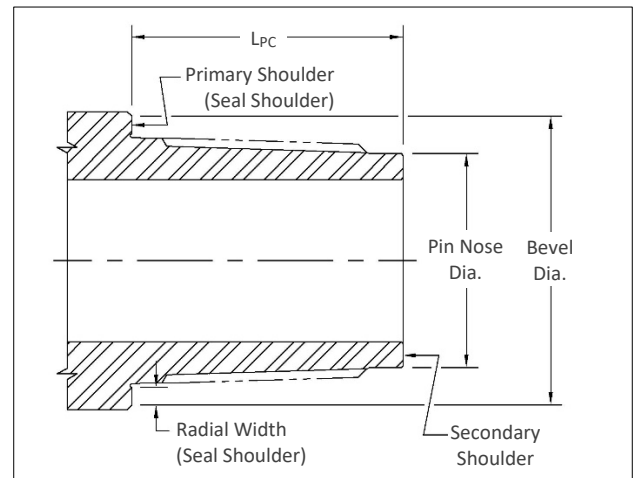


Figure 2: Connection Labels TSC Pin

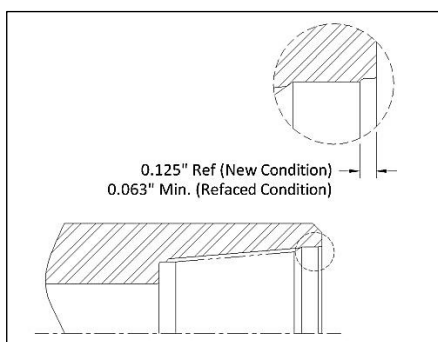


Figure 3: Box Benchmark

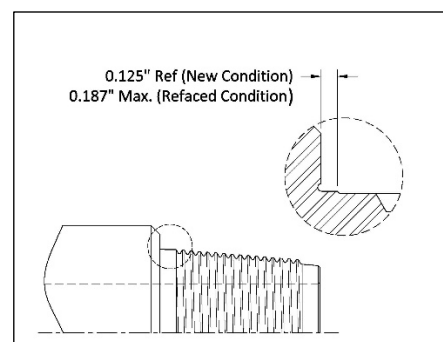


Figure 4: Pin Benchmark