

# Quality Assurance Program

## Procurement

### 1) **Bar stock material –**

Raw metal (bar stock) to be used for Rod Out Tools will be ordered with corresponding MTR's (Metallurgical Test Reports). Bar stock shall be ordered by metal type, diameter, heat treatment, and finish.

IE standard tool, raw bar stock order

a) Round bar, Smooth turned, Cold finish

b) 303 stainless steel AMS 5640 Type 1, Annealed

In all cases bar stock materials will have  $\geq 20,000$ PSI minimum yield strength

**Receiving –** Materials will be segregated from other materials and inspected for compliance with the A&W purchase order prior to being moved into production.

**Traceability –**Raw bar stock material will be color coded, etched, paint marked and or stamped with the Lot # and Heat # on each bar. The lot and heat number shall be transferred to any parted sections for further reference.

ROT bodies shall be etched with a serial number traceable to the original MTRs. Packing nuts and activation shafts shall not require etching.

### 2) **Machined part storage** - Machined bodies will be stored in cases by lot number traceable to the original MTRs.

**Inspection Test Plan (ITP)– machined ROT part** will be subject to visual inspection. 5% of mass produced parts shall be subject to dimensional inspection. Any part found by inspection to be noncompliant shall be disposed in a manor to assure it/they cannot be distributed. If a non compliant part is found in a batch run, all parts in the batch run shall be subject to dimensional check and destroyed if found to be non conforming.

ROT bodies will be etched with a serial number traceable to the original MTR and production year.

### 3) **Valves, tubing, tubing fittings, pressure gauges, and tubing (pressure containment components)**

Pressure measuring and containment components shall be ordered by metal type, pressure ratings or thicknesses, and compliance to ASTM and or ASME standards.

**Receiving Components** - will be segregated from other materials and inspected for compliance with the A&W purchase order prior to being issued for production of a ROT. Components shall be stored in their original packaging, were packaging exists. Where packaging does not exist, the components shall be stored in a manor to assure protection from damage and or contamination.

### 4) **Cable, solder, drill bits, (Non pressure containment components)**

Non pressure containment components shall be ordered as required and to applicable standards where standards exist.

Components shall be stored in their original packaging, where packaging exists. Where packaging does not exist, the components shall be stored in a manner to assure protection from damage and or contamination.

**5) Welding non pressure containment components**

Thermal arc welding is not permitted on any ROT body. Joining of drills to activator shafts and cables by the silver solder brazing method shall be in accordance with recognized manufacturers guidelines and trade standards. Brazing Material will be compliant to ANSI/AWS A5.8, ASME SFA 5.8, QQB 654A Class BAg-5

**Assembly**

All components to be assembled into a tool shall be inspected visually prior to assembly.

**Threaded Pipe Connection** – Thread compound will be applied to all pipe connection and tightened to a leak free position and orientation. Excess thread compound will be wiped clean.

**Tube Fittings** – Tube fittings will be tightened to manufacturer’s specifications

**Packing** – The packing cavity will be filled with packing rings (either Graphite or Teflon as requested by customer) and the packing nut hand tightened.

**6) ITP Final product**

**Random Lot Hydro Test** – A non-destructive hydro test will be performed on 2% of the ROT bodies from each body material lot order.

a) Test pressure will be 3000 PSI peak.

b) A before and after dimensional check will be performed to insure zero distortion of the pressure containment envelope.

Any abnormality or distortion will be investigated, “material lot/s pertinent to the investigation shall be segregated and confined pending the results of the investigation.

**7) Customer Requested Hydro Test** – If requested by customer, two additional Hydro Test will be performed.

a) The first Hydro Test at 2000 PSI measured against a certified high pressure gauge.

b) The second Hydro Test, will be performed with the tool pressure gauge installed. The tool assembly will be pressure tested to 80% of the maximum pressure of the tool gauge.

8) Tool capability tags will be stamped and attached to the tool in a manner that the operator of the tool can clearly see and read the tag.

9) Supporting safe operating documentation will be included in the shipping package of the tool/s.