

1.0 OBJECTIVE

The objective is to put in place a procedure to be followed prior to proceeding with the hot-tapping / tie-ins and on-line welding on pipelines and the corresponding inspection and quality checks involved.

2.0 SCOPE

This Advisory is to be followed for hot-tapping or tie-ins which involve on-line welding on pipelines. It also includes the inspection and quality checks to be followed. This procedure also contains the general guidelines to be followed like metal thickness, minimum fluid flow to be maintained while welding and limitations of hot-tapping.

3.0 PROCEDURE

3.1 General

- 3.1.1. The hot tap executing agency, Maintenance or Projects, shall intimate to Inspection division regarding the hot tapping job being planned at least one week in advance. An isometric of the line with location being hot tapped marked on it shall be attached with the memo. The isometric with Bill of Material and welding details and other notes as applicable shall be approved by Mech. Engg. Services Div. or consultant engaged by HPCL.
- 3.1.2. The location to be hot tapped shall be marked at site. If the line is insulated, insulation shall be removed over a length of min. 6" over and above the RF pad size for the stub or the dia. of the stub in case RF pad is not required.
- 3.1.3. Ultrasonic thickness measurements shall be done over an area covering RF pad dia. plus 6" in case of RF pad being welded and stub dia. plus 6" in case of non-requirement of RF pad. The thickness shall be at least the minimum thickness required for the design pressure and temperature but in no case less than 4.8 mm.
- 3.1.4. The location shall be shifted if minimum 4.8 mm thickness is not obtained or presence of lamination, ovality, external corrosion or some material imperfection is detected. The same checks shall be done at the new location also.

3.2 Welding

- 3.2.1 The welding zone shall be cleaned by wire brushing, chipping or power brushing.
- 3.2.2 The welding shall be done by a qualified welder. He shall control the welding current and the arc so as to reduce the heat input while welding and the possibility of burn through.
- 3.2.3 The first run shall be made with electrodes of 2.5 mm dia. or less and subsequent runs may be made with 3.15 mm dia. electrodes.
- 3.2.4 Every time between beads, the welder shall stop welding for few minutes to allow the weld to cool to prevent overheating.
- 3.2.5 During the entire period of welding, there should be a continuous flow in the pipe line.

3.3. Inspection and Testing of welds

- 3.3.1 The welding of the stub to flange joint shall be checked visually and by
 - a) Dye Penetrant test or Magnetic Particle testing for <2" dia. and
 - b) Radiography for 2" dia. and more.
- 3.3.2 The welding of the stub on to the main pipe shall be inspected visually after its completion. It shall be subjected to DP test to check for any defect if the pipeline service temperature is less than 50 deg.C.. The RF pad weld shall be subjected to pneumatic test with soap solution at a pressure of max. 15 psig.
- 3.3.3 The new welds shall be hydrotested at a pressure mentioned in the approved drawing/isometric. The pressure should be at least equal to the operating pressure of the line and not greater by more than 10% of present operating pressure of the line.

3.4 Operating Parameters

- 3.4.1 Flow in lines – When welding, it is desirable to have some minimum level of flow to dissipate the welding heat input. High flow rates should also be avoided to reduce the weld cooling rate and associated risk of shrinkage / cracking, etc. The suggested flow velocities are:
 - a) Liquid - 0.4 m/s minimum and 1.2 m/s maximum.
 - b) Gas - 0.4 m/s minimum with no limit on maximum value.
- 3.4.2 Welding on a line shall not be attempted where there may be insufficient flow or intermittent flow (like that in Flare line) unless it has been confirmed that the line does

not contain any pockets of flammable mixture. In this case, it shall be confirmed that there is no oxygen ingress in to the line. If necessary, the line shall be continuously purged with inert gas or nitrogen.

3.5 RESTRICTIONS FOR HOT TAPPING / ON-LINE WELDING

On-line welding and Hot tapping shall be avoided in the following cases:

- a) Pipeline thickness less than 4.8 mm at the location of hot tapping.
- b) Pipeline having lamination, ovality, external corrosion or any material imperfection.
- c) Pipeline requiring Post Weld Heat Treatment depending on:
 - i) Metallurgy, like Low alloy steel (1 ¼ Cr-1/2 Mo, 2 ½ Cr-1/2 Mo, etc.)
 - ii) Thickness more than 19 mm for C-steel, etc.
 - iii) Service like Amine, Caustic, etc.
- d) The diameter of the nozzle/branch connection to be welded should not be of same diameter as the run pipe but at least should be one standard diameter smaller.
- e) The nozzle shall not be set at an angle other than right angle to the run pipe.
- f) Upstream of rotating equipment without filters or traps to retain cut piece.
- g) Pipeline with internal cladding, strip lining, cement lining, refractory lining, etc.
- h) Pipeline made of brittle materials like Cast Iron, etc.
- i) Pipeline passing through casing / sleeves.
- j) When any flange or threaded connection is coming within 18 inches of Hot tapping.
- k) When the nearest weld including longitudinal seam of welded piping is within 3 inches of Hot Tapping.
- l) Pipeline in hydrogen service requiring adequate study and analysis for hot tapping.
- m) Pipeline in Vapour / air or vapour / oxygen mixtures near or within their flammable explosive range.
- n) Chemicals such as acids and chemicals which have potential to decompose and become hazardous due to heat of welding.
- o) Unsaturated hydrocarbons which may experience exothermic decomposition reaction from welding heat.

- p) Compressed air.
- q) Pipeline operating under vacuum.

4.0 RESPONSIBILITY

4.1 EXECUTING DEPARTMENT

- 4.1.1 The Executing dept. engineer shall fill up the Part-A (1) of the attached format (Annexure-I) and sign at the designated place.
- 4.1.2 He shall submit it to Inspection engineer after getting it signed by Operations officer at the designated place.
- 4.1.3 He shall mark the location of hot tapping on the pipe line.
- 4.1.4 He shall ensure that only skilled personnel carry out mounting and assembling of the hot tapping machine.
- 4.1.5 He shall ensure that the pipe line at the location of hot tapping is adequately supported to take the load of the isolation valve and hot tapping machine.
- 4.1.6 He shall provide all assistance required by inspection engineer to carry out inspection activities.
- 4.1.7 He shall ensure that the Hot tapping commences only after all NDTs, tests and clearance from Inspection engineer.
- 4.1.8 He shall ensure that the hot tapping being carried out does not fall under any of the restrictions mentioned in 3.5 above other than a) and b) which will be ensured by Inspection engineer.
- 4.1.9 He shall retrieve the cut piece of the line after hot tapping and handover to Inspection engineer.

4.2 OPERATIONS DEPARTMENT

- 4.2.1 The Operations officer shall ensure that the location marked for Hot tapping is correct.
- 4.2.2 He shall ensure that none of the restrictions mentioned in 3.5 above other than a) and b) is applicable for the Hot tapping job being undertaken.
- 4.2.3 He shall ensure that the flowrate mentioned in 3.4.1 is maintained during Hot tapping.

- 4.2.4 He shall sign at the designated place on Part-A (2) of the attached format (Annexure-I) confirming the clearance for the hot tapping and hand it over back to Executing engineer.

4.3 INSPECTION DIVISION

- 4.3.1 The Engineer in charge of the area in which hot tapping is planned shall start the inspection activities only after receiving the Part-A of the attached format (Annexure-I) duly signed by Executing dept. and Operations at designated places.
- 4.3.2 He shall check the isometrics for the location of the hot tapping and check at site for the marking.
- 4.3.3 All the observations, measurements and inspection findings shall be recorded by the Inspection Engineer in Part-B of the attached format (Annexure-I), sign it at the designated place and ensure proper filing in designated file.

This Advisory will be valid till the Head – Inspection Div. issues the next revision as and when required.