Annexure - V

Specifications, Typical Drawing & Data Sheet for Split TEE (Hot Tapping Material)
# CONTENTS

<table>
<thead>
<tr>
<th>SL NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>SCOPE</td>
</tr>
<tr>
<td>2.0</td>
<td>REFERENCE DOCUMENTS</td>
</tr>
<tr>
<td>3.0</td>
<td>MANUFACTURER'S QUALIFICATION</td>
</tr>
<tr>
<td>4.0</td>
<td>MATERIALS</td>
</tr>
<tr>
<td>5.0</td>
<td>DESIGN AND CONSTRUCTION REQUIREMENTS</td>
</tr>
<tr>
<td>6.0</td>
<td>INSPECTION AND TESTS</td>
</tr>
<tr>
<td>7.0</td>
<td>TEST CERTIFICATES</td>
</tr>
<tr>
<td>8.0</td>
<td>PAINTING, MARKING AND SHIPMENT</td>
</tr>
<tr>
<td>9.0</td>
<td>WARRANTY</td>
</tr>
<tr>
<td>10.0</td>
<td>DOCUMENTATION</td>
</tr>
</tbody>
</table>

## REFERENCE DRAWINGS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>SPLIT TEE WITH LOCK – O – RING FLANGE &amp; GUIDE BAR ASSEMBLY (TYPICAL)</td>
</tr>
</tbody>
</table>
1.0 **SCOPE**

This specification covers the basic requirements for the design, manufacture and supply of carbon steel Split Tees as Hot Tapping material to be installed in pipeline system for handling hydrocarbons in liquid or gaseous phase.

2.0 **REFERENCE DOCUMENTS**

2.1 Reference has also been made in this specification to the latest edition of the following codes, standards and specifications:

<table>
<thead>
<tr>
<th>(i)</th>
<th>ASME B 16.5</th>
<th>: Steel Pipe Flanges &amp; Flanged Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>ASME B16.9</td>
<td>: Factory made Wrought Steel Butt Welding Fittings</td>
</tr>
<tr>
<td>(iii)</td>
<td>ASME B 16.25</td>
<td>: But Welding Ends</td>
</tr>
<tr>
<td>(iv)</td>
<td>ASME B 31.4</td>
<td>: Liquid transportation systems for hydrocarbons and other liquids</td>
</tr>
<tr>
<td>(v)</td>
<td>ASME B 31.8</td>
<td>: Gas transmission and distribution piping systems</td>
</tr>
<tr>
<td>(vi)</td>
<td>ASME Sec. VIII</td>
<td>: Boiler &amp; Pressure Vessels Code-Rules for the construction of pressure vessels</td>
</tr>
<tr>
<td>(viii)</td>
<td>ASTM A 370</td>
<td>: Standard test methods and definitions for mechanical testing of steel products</td>
</tr>
<tr>
<td>(ix)</td>
<td>API 1104</td>
<td>: Welding of pipelines and related facilities</td>
</tr>
<tr>
<td>(x)</td>
<td>MSS-SP-44</td>
<td>: Steel Pipe Flanges</td>
</tr>
<tr>
<td>(xii)</td>
<td>MSS-SP-75</td>
<td>: Specification for High Test Wrought Butt Welding Fittings</td>
</tr>
<tr>
<td>(xiii)</td>
<td>SSPC-VIS-1</td>
<td>: Steel structures painting council-visual standard</td>
</tr>
</tbody>
</table>

In case of conflict between the requirement of this specification and the codes, standards and specifications referred above, the requirements of this specification shall govern.

3.0 **MANUFACTURER’S QUALIFICATION**

Manufacturer who intend bidding for fittings should possess the records of a successful proof test for split tees qualifying the ranges of sizes quoted, in accordance with the provisions of ASME B16.9/ MSS-SP-75. These records shall be submitted on demand by Purchaser / Consultant before or after placement of order.

4.0 **MATERIALS**

4.1 The basic materials required for manufacturing of Split Tees have been indicated in the data sheet. Other additional materials required for manufacturing split tees shall be as per
Specifications for Split Tees
(Hot Tapping Materials)

manufacturer's standard suitable for the service conditions indicated in data sheet and shall be subjected to approval by Purchaser.

4.2 Fully killed Carbon steel shall be used in the manufacture of split tees.

4.3 Each heat of steel used for the manufacture of pressure containing parts of the Split Tees shall have carbon equivalent (CE) not greater than 0.45 calculated from the check analysis in accordance with the following formula.

\[
CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}
\]

Carbon content on check analysis shall not exceed 0.22%.

4.4 When specified in Data sheet, Charpy V-notch test shall be conducted for each heat of steel used in manufacture of split tee. Test shall conform to the provisions of ASTM A-370 and at a temperature of -20°C. The Charpy impact test specimen shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of the plate or forging. The average impact energy values of full sized three specimens shall be as follows, unless indicated otherwise in the data sheets:

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Base Metal (Joules)</th>
<th>Weld Metal &amp; HAZ (Joules)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For all size</td>
<td>27</td>
<td>27</td>
</tr>
</tbody>
</table>

Minimum impact energy value of any one specimen of the three specimens analysed shall not be less than 80% of the above average values.

4.5 When specified in the data sheet, hardness test shall be carried out as per ASTM A 370 for each heat of steel used. A full thickness cross section shall be taken for this purpose and the maximum hardness of base metal, weld metal and HAZ of all pressure containing parts shall not exceed 248 HV10, unless otherwise specified.

5.0 DESIGN AND CONSTRUCTION REQUIREMENTS

5.1 Split tees shall be designed and manufactured in accordance with the provisions of codes and standards referred in Section 2.0 of this specification. Flanges upto size 16” shall conform to the requirements of ASME B16.5. Design factor and corrosion allowance indicated in data sheet shall be taken into account for design of split-tees.

5.2 Split tees shall generally conform to the figure shown in the data sheet and shall meet following requirements as minimum :

5.2.1 Sleeves shall be designed to meet pressure & reinforce requirements of ASME Codes.

5.2.2 Fittings shall be manufactured with controlled carbon equivalent for its welding in harsh outside environments.

5.2.3 Split tee shall be of full branch or reducing branch & meet the requirement for fittings with hot tap machine.

5.3 Butt weld ends shall be bevelled as per MSS-SP-75 / B16.25.

5.4 Split tees shall be manufactured by hot drawn, full branch / reduced branch opening, snug-fitting sleeve or fabricated full size nipple, branch outlet welded to snug-fittings sleeve.
5.5 All welds shall be made by welders and welding procedures qualified in accordance with ASME Section-IX. The welding procedure qualification test shall include Charpy impact test and hardness test and shall meet the requirements of clause 4.3 and 4.5 of this specification respectively.

5.6 Repair by welding on parent metal is not allowed. Repair of welds shall be carried out only after specific approval by Purchaser's Representative for each repair. The repair welding shall be carried out by the welders and welding procedures duly qualified as per ASME Section-IX and records for each repair shall be maintained.

6.0 **INSPECTION AND TESTS**

6.1 The manufacturer shall perform all inspections and tests as per the requirements of this specification and the relevant codes, prior to shipment, at his works. Such inspection and tests shall be, but not limited to the following:

6.1.1 All split Tees shall be visually inspected.

6.1.2 Dimensional checks shall be carried out as per the approved drawing.

6.1.3 Chemical composition and Mechanical properties shall be checked as per MSS-SP-75 and this specification for each heat of steel used.

6.1.4 Non destructive examination of individual split tees shall be performed as given below:

   (i) 100% inspection by radiography shall be carried out on all pressure containing welds on fittings. Acceptance limits shall be as per API 1104.

   (ii) Welds which in Purchaser's Representative's opinion cannot be inspected by radiographic methods shall be checked by ultrasonic or magnetic particle methods. Acceptance criteria shall be as per ASME Section VIII Appendix-12 and Appendix-6 respectively.

   (iii) All finished wrought weld ends shall be 100% ultrasonically tested for lamination type defects for a distance of 25mm from the end. Any lamination larger than 6.35mm shall not be acceptable.

   (iv) All forgings shall be wet magnetic particle examined on 100% of the forged surfaces. Method and acceptance shall comply with MSS-SP-53.

6.2 Purchaser's Representative shall also perform stage-wise inspection and witness tests as indicated in clause 6.1 at manufacturer's works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection, to the Purchaser's Representative.

   Inspection and tests performed / witnessed by Purchaser's Representative shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

7.0 **TEST CERTIFICATES**

7.1 Manufacturer shall submit following certificates to Purchaser's Representative:

   (i) Test certificates relevant to the chemical analysis and mechanical properties of the materials used for construction as per this specification and relevant standards.

   (ii) Test reports on radiographic and ultrasonic inspection and wet magnetic particle examination.
(iii) Certificates for each split tee stating that it is capable of withstanding without leakage for a test duration of 15 minutes and test pressure which results in a hoop stress equivalent to 95% of the Specified Minimum Yield Strength (SMYS) and for the pipe with which the split tee is to be attached without impairing its serviceability.

(iv) Test reports on heat treatment carried out.

8.0 PAINTING, MARKING AND SHIPMENT

8.1 Split tees entire surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint, after all the required tests have been performed and accepted by Purchaser's Representative. The surface preparation shall be carried out by shot blasting to SP 6 in accordance with "Steel Structures Painting Council - Visual Standard - SSPC-VIS-1".

8.2 Manufacturer shall indicate the type & recommended coats of corrosion resistant paint used, in the drawing submitted for approval.

8.3 Split tees shall be marked with indelible paint with the following data :
   (i) Manufacturer's Name
   (ii) Nominal diameter in inches D1 x D2
   (iii) End thickness in mm T1 x T2
   (iv) Material
   (v) Tag numbers

8.4 Split tees shall be suitably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for weld ends.

9.0 WARRANTY

Purchaser will be reimbursed by Manufacturer for any Split tee furnished to this specification which fails under field hydrostatic testing or does not perform satisfactory during the pigging operation and if such failure or non-performance is caused by a defect in the Split tees which is outside the acceptance limits of this specification. The reimbursement cost shall include cost of Split tee, labour and equipment rental for finding, excavating, cutting, and installation of replaced Split tee in position.

10.0 DOCUMENTATION

10.1 At the time of bidding, bidder shall submit the following documents :

   (i) General arrangement drawing of split tees with overall dimensions and cross sectional drawings.
   (ii) Reference list of previous supplies of split tees of similar specification with relevant details viz Project, Year of supply, Client, size, Rating and service for the last five years.
   (iii) Clause-wise list of deviation from this specification, if any.
   (iv) Brief description of the manufacturing, heat treatment and quality control facilities of the manufacturer's work.
   (v) Quality Assurance Plan (QAP), data sheets enclosed with the tender enquiry duly filled in / stamped and signed by the Bidder.
10.2 Within two weeks of placement of order, the manufacturer shall submit four copies, of but not limited to, the following drawings, documents and specifications for approval.

(i) Fabrication drawings and relevant calculations for pressure containing parts.
(ii) Calculation for fittings thickness.
(iii) Method of manufacture, welding procedure and heat treatment details.
(iv) Quality control Manual.

Once the approval has been given by Purchaser, any change in design, material method of manufacture shall be notified to Purchaser whose approval in writing of all changes shall be obtained before the Split tees are manufactured.

10.3 Within four weeks from the approval date Manufacturer shall submit one reproducible and six copies of the approved drawings, documents and specification as stated in clause 10.2 of this specification.

10.4 Prior to shipment, Manufacturer shall submit one reproducible and six copies of test certificates as listed in clause 7.0 of this specification.

10.5 All documents shall be in English Language.
EXISTING PIPE

FLOW THROUGH LOCK-O-RING
ASSEMBLY

GUIDE BAR

LOCK-O-RING FLANGE

WELDING AT SITE

PLAN

SPLIT TEE

FLOW THROUGH LOCK-O-RING
ASSEMBLY WITH GUIDE BAR

ELEVATION

PIPE PLUG

PCD

RETAINING RING

FLOW THROUGH
LOCK-O-RING
ASSEMBLY WITH
GUIDE BAR

LOCK-O-RING FLANGE

SLEEVE

FLOW THROUGH LOCK-O-RING
ASSEMBLY WITH GUIDE BAR

DESCRIPTIONS

SPLIT TEE WITH

GUIDE BAR ASSEMBLY (TYPICAL)

SCALE: N.T.S.

REV
### Split Tee / Hot Tapping Material

**UNITS:** Gas Flow - MMSCMD, Liquid Flow - m³/hr, Steam Flow - Kg/hr, Pressure - Kg/cm²g, Temperature - Deg C, Level / Length - mm

1. **Type of Fitting**: As per SOR
2. **ANSI Rating**: 600#
3. **Quantity**: As per SOR
4. **Design Code**: ASME B31.8
5. **Design Pressure**: 92 kg/cm²
6. **Design Temperature (°C)**: (-) 29 to 65
7. **Corrosion Allowance (mm)**: 0.5
8. **Design Factor (F)**: 0.5
9. **Flange Facing**: RF
10. **Flange Finish**: 125 AARH
11. **Branch End**: RF
12. **PWHT**: Yes (in accordance with code)
13. **Field Test Pressure**: 129 kg/cm²
14. **Existing Pipeline Details (on which hot tapping is to be conducted)**:
   - (i) Outside Diameter: AS per SOR
   - (ii) Thickness: 6.4 - 11.1mm
15. **Type of Valve to be used on the branch**: Full Bore Ball Valve
16. **Product Handled**: Natural Gas
17. **Sleeve, OD - dia. A(mm)**: @
18. **Sleeve, Thickness - T1(mm)**: @
19. **Sleeve, Length - L(mm)**: @
20. **Branch, OD - dia. B(mm)**: @
21. **Branch, Thickness T2(mm)**: @
22. **Fitting Height (center line of run pipe to flange top) - H(mm)**: @
23. **Flange, OD - dia. C (mm)**: @
24. **Split Tee, Weight (kg)**: @
25. **MATERIAL REQUIRENT**:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Part Description</th>
<th>Specified Material</th>
<th>Material Offered by Bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Full Encirclement Sleeve - Top Portion</td>
<td>MSS-SP-75, Gr.X-52 / A-537Cl.1 / ASTM A 707 L3 Cl3 or equivalent</td>
<td>@</td>
</tr>
<tr>
<td>2</td>
<td>Full Encirclement Sleeve - Bottom Portion</td>
<td>MSS-SP-75, Gr.X-52 / A-537Cl.1 / ASTM A 707 L3 Cl3 or equivalent</td>
<td>@</td>
</tr>
<tr>
<td>3</td>
<td>Branch</td>
<td>MSS-SP-75, Gr. WPHY-42 / A-537Cl.1 / ASTM A 707 L3 Cl3 or equivalent</td>
<td>@</td>
</tr>
<tr>
<td>4</td>
<td>Lock-O-Ring Flange</td>
<td>Manufacturer Standard</td>
<td>@</td>
</tr>
<tr>
<td>5</td>
<td>Lock-O-Ring Assembly with Guide Bars</td>
<td>Carbon Steel</td>
<td>@</td>
</tr>
<tr>
<td>6</td>
<td>Lock-O-Ring/ Retaining Device</td>
<td>Manufacturer Standard</td>
<td>@</td>
</tr>
</tbody>
</table>

**Notes:**

1. To be confirmed later
2. Bidder to indicate

1. Split Tee shall be manufactured, tested and supplied in accordance with Spec. No. GAIL-3015-09-CNS-TS-025
2. For Typical arrangement of Reduced Branch Split Tee with Lock-O-Ring Flange & Guide Bar Assembly Refer Drawing No. GAIL-3015-09-CNS-TS-025-01
3. Fittings thickness shall be calculated based on pressure corresponding to ANSI 600# and considering design code, design factor and corrosion allowance indicated above. Calculation in this respect shall be submitted by vendor for review/approval of Purchaser/ Consultant.
4. The fitting shall be capable of withstanding field hydrostatic test pressure indicated above or 90% of SMYS of fitting material which ever is more.
5. Requirement of impact test & hardness as per Specification No. GAIL-3015-09-CNS-TS-015 shall be applicable for the Fittings & Flange material.
6. Flow through Lock-O-ring assembly with guide bars shall allow full flow into branch line and shall allow pigs to cross the opening smooth & unobstructed in the main pipeline.
7. Lock-O-ring flange assembly with guide bars shall be of TDW make or equivalent. Vendor shall indicate the name of manufacturer for the same.
8. Vendor shall submit Inspection & Test Plan for approval within two weeks from date of order.