

**TECHNICAL SPECIFICATION  
FOR HOT TAP FITTING**

**DOCUMENT NO: GGL/TS/STEEL/MATERIAL/HOT TAP  
FITTING/SPEC**

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## 1. SCOPE

This Technical specification covers the minimum requirements for the design, manufacture and supply of Hot Tap Fittings for size up to 450 mm and smaller to be installed in natural gas pipelines and piping systems.

All requirements contained in the standards mentioned in this specification shall be fully valid unless cancelled, replaced or amended by more requirements as stated in this specification.

## 2. REFERENCE DOCUMENTS

- 2.1. Each specification, codes and standards referred herein shall be latest edition or supplement in effect at the time of manufacturing.

ASME B 31.8	Gas Transmission and Distribution Piping System
ASME B 31.3	Process Piping
API 5L	Specifications for Line Pipe
API 1104	Welding of Pipelines and Related Facilities
ASTM A 537	Standard Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel
ASTM A 516	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A 105	Specification for Carbon Steel Forgings for Piping Applications
ASTM A 193	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A 194	Specifications for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service
ASTM A 153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 370	Standard Methods and Definitions for Mechanical Testing of Steel Products
ASME B 16.25	Butt — Welding Ends
ASME B 16.9	Factory made wrought steel butt welding fittings
ASME B 16.5	Pipe Flanges and Flange Fittings
ASME B 16.11	Forged Fittings Socket Welding & Threaded
MSS SP 25	Standard marking system for valves, fittings, flanges and unions
MSS SP 75	Specification for High Test Wrought Welding Fittings
MSS SP 97	Forged carbon steel branch outlet fittings — socket welding, threaded and butt-welding ends
MSS SP 25	Standard Marking System for Valves, Fittings, Flanges, and Unions

- 2.2. In case of conflict between the requirement of above reference documents and this specification, the requirements of this specification shall govern. **MANUFACTURER**

shall refer the matter to the **GGL** for clarification and only after obtaining the same from **GGL** it should proceed for manufacturing of Hot Tap Fitting.

### **3. MANUFACTURE'S QUALIFICATION**

3.1. Prior to start of fabrication, the **MANUFACTURER** shall submit the following document for approval to **GGL** within 7 working days after receipt of order.

- Detailed fabrication drawing and calculations
- Fabrication and quality control procedures
- List of materials including brought out items
- Qualified Welding Procedures (if applicable)
- Welder's Performance Qualification (if applicable)
- Heat Treatment Procedures
- Non-destructive testing procedures
- Any other relevant/supporting drawing and documents specified by **GGL**.
- QAP or Inspection Test Plan showing the procedure being followed by **MANUFACTURER** starting from identification of raw material to final tests, Packing and Dispatch.

3.2. Once the approval has been given by the **GGL**, any changes in design, material and method of manufacturing shall be notified to **GGL**/TPI whose approval in writing shall be obtained before the manufacturing of Hot Tap Fitting.

3.3. Prior to shipment of finished goods, **MANUFACTURER** shall submit below mentioned records for review /dispatch clearance to **GGL** / TPIA Test Certificates relevant to Chemical composition and Mechanical properties as per relevant standards and this specification.

- Test reports of Non-Destructive examination.
- Test reports of heat treatment carried out as per this specification.
- Any other supporting Test certificates/reports required with reference to tests/criteria mentioned in approved QAP Plan or Inspection Test Plan.
- Reports and certification shall be considered valid only when approved / certified by **GGL** /TPI. Only those materials, which are certified as mentioned above, shall be dispatched from **MANUFACTURER**'s works.
- All documents shall be in English Language Only.

#### 4. MATERIAL

- 4.1. The basic material for fittings shall be as indicated in the COONTRACT Additionally; the material shall also meet the requirements specified hereinafter.

Base material chemistry control	Component thickness (T)	
	T ≤ 50mm	T > 50mm
Carbon equivalent (CE)	0.43% max	0.48% max
Vanadium (V) + Niobium (Nb) + Titanium (Ti)	0.05% max.	0.05% max.

- 4.2. Steel used for manufacturing of Hot Tap Fittings shall be fully killed and shall have fine grain structure (Deoxidized).
- 4.3. Material of fitting shall be compatible with the material of the Run-Pipe/header to be hot tapped in terms of metallurgy and weldability.
- 4.4. For hot tap fittings and any applicable reinforcement having wall thickness below 25.4 mm, and of conventional carbon steel material, the following codes shall be applicable
- Flanges — ASTM A105 / ASTM A350 Gr. LF2
  - Sleeves—ASTM A537 CL1/ASTM A516 Gr. 70
  - Weldolet — ASTM A105 / ASTM A350 Gr. LF2
  - Thredolet — ASTM A105/ ASTM A350 Gr. LF2
- 4.5. Unless specified otherwise, Charpy V-notch test shall be conducted for each heat of steel, in accordance with the impact test provisions of ASTM A370 at temperature mentioned in standard to which MOC of Hot Tap Fitting comply. If not mentioned in MoC standard, test shall be carried out at 0° C temperature and absorbed energy value shall be 35 J (Avg.). Minimum impact energy value of any one specimen of the three-specimen analyzed as above shall not be less than 80% of the above-mentioned average value.
- 4.6. Hardness testing shall be carried out by **MANUFACTURER** in accordance with applicable ASTM code. If hardness value is not mentioned in MoC standard, then the same shall not exceed 248 HV10 based on minimum 3 measurements

#### 5. DESIGN AND MANUFACTURE

- 5.1. ID of Hot Tap Fittings shall match the OD of run pipe. **MANUFACTURER** to submit the drawings to GGL for approval prior to manufacturing of hot tap fittings
- 5.2. Stub-in or pipe-to-pipe connection shall not be used in the manufacture of Hot Tap Fittings. This shall be manufactured by forging or extrusion methods. No longitudinal weld seam shall be allowed. Fittings shall also not have any circumferential joints and shall be manufactured in split form. **MANUFACTURER** to submit the drawings to GGL for approval prior to manufacturing of hot tap fittings
- 5.3. All butt weld ends shall be beveled as per ASME B 16.25.
- 5.4. Repair by welding on parent metal of the fittings is not allowed. Reinforced hot tap fittings shall comply with one of the following types:
- Full-encirclement with welded-on reinforcement, split tees
  - Pad or saddle type reinforced

- Integrally reinforced, welding outlet fitting (i.e. 'O-let'®)
  - Full encirclement integrally reinforced, split tee
- 5.5. Full encirclement split tees shall be supplied with a recessed groove to allow the use of a backing strip and with run-off plates at either end.
- 5.6. Hot tap fittings shall be designed to prevent buckling of the surface being hot tapped due to the weight of the hot tap machine and application of test pressure to the inside of the branch connection.
- 5.7. Full encirclement reinforcement type fittings shall be fully fabricated, heat-treated (if necessary), pressure (strength) tested and dimensionally surveyed prior to cutting along its horizontal axis. Each section shall be uniquely identified to ensure traceability and correct alignment on installation, and shall contain a telltale hole for leak testing.
- 5.8. Flanges & Fittings not covered in ASME B 16.5, ASME B 16.9 and ASME B 16.11 like o-let fittings shall be manufactured in accordance with MSS SP 97.
- 5.9. Hot tap connections shall be restricted to the following dimensional limitations:
- Fittings such as 'O-let' or fabricated set-on branch connections shall be restricted to the following dimensional limitations:
    - d/D ratio of equal & less than 0.5 for design pressure equal & less than 7 barg
    - d/D ratio of equal & less than 0.5 for design pressure equal & less than 35 barg for 'O-lets'® equal & less than 3" NB
    - d/D ratio of equal & less than 0.5 for design pressure equal & less than 35 barg for 'O-lets'® Greater than 3" NB
    - d/D ratio of equal & less than 0.5 for design pressure Greater 35 bar
  - Maximum nominal diameter of 'O-let' or fabricated set-on branch connections shall be as follows:
    - 10" NB, for pipeline pressures equal & less than 7 barg
    - 8" NB, for pipeline pressures Greater than 7 barg
  - Minimum nominal diameter shall be 3/4" NB Set-on branch with reinforcement, where the branch design can include a full penetration weld, shall be used where the d/D ratio is > 0.4 and shall be used in preference to a full encirclement split tee.
  - Full encirclement split tees shall be used for "stopple" operations, or where the d/D ratio is > 0.4 and where the conditions for the use of set-on branches cannot be met.
  - Full encirclement split tees are not permitted where the process fluid is assessed as corrosive to the material
  - Size-on-size hot taps shall be avoided whenever possible. When a size-on-size fitting is unavoidable a full encirclement reinforced fitting shall be used orientated at 90° to the carrier pipe

- 5.10. All hot tap fittings shall be checked for size to ensure there is adequate clearance to accommodate the "set" in the hot tap machine cutter teeth.
- 5.11. The design temperature and Pressure range shall be as per applicable as per purchase order
- 5.12. Unless otherwise specified in purchase order, the location class 4 shall be considered as per ASME B31.8 for designing the hot tap fitting and other pressure containing parts.

## **6. DIMENSIONS, WORKMANSHIP AND DEFECTS**

- 6.1. Dimension check shall be carried out for finished product as per applicable standard mentioned in this specification. Items not covered in this specification shall be checked as per **MANUFACTURER's** standard which shall be approved by TPI before starting of production.
- 6.2. Dimension tolerance on fitting shall be as under
  - The tolerance of wall thickness shall be as specified in the relevant codes and standards as mentioned in this specification.
  - Minimum wall thickness must be greater than or equal to the largest value of the either calculated wall thickness in each zone of the fitting or of the nominal wall thickness of pipe to which the fitting is welded.
- 6.3. All parts of Hot Tap Fitting shall be free from injurious defects and shall have workman like finish. Injurious defects are defined as those having depth in excess of 5% of specified wall thickness.
- 6.4. Each part of Hot Tap Fitting in which injurious defects are found during plant or field fabrication, shall be rejected. **MANUFACTURER** shall be notified and shall replace the item at no extra cost to **GGL**.

## **7. INSPECTION AND TESTS**

- 7.1. **MANUFACTURER** shall perform all inspection and tests as per the requirements of this specification and as per the relevant codes, prior to shipment, at his works. Such inspection and tests shall be, but not limited to the following:
  - Visual inspection of the product.
  - Dimensional checks as per approved drawings.
  - Chemical composition, mechanical properties, notch toughness and hardness examination to be conducted.
  - All finished wrought weld ends shall be 100% ultrasonically tested for lamination type defects. Any lamination shall not be acceptable.
  - All other tests not specifically listed but are required as per applicable standard/ specification.
- 7.2. **GGL's** Inspector may also perform stage wise inspection and witness tests as indicated approved in ITP at **MANUFACTURER's** works prior to shipment. **MANUFACTURER** shall give reasonable notice of time and shall provide without charges reasonable access and facilities required for inspection to the **GGL's** Inspector

- 7.3. Inspection and tests performed/witnessed by **GGL's** Inspector shall in no way relieve the **MANUFACTURER's** obligation to perform the required inspection and test.

## **8. PAINTING, MARKING AND SHIPMENT**

- 8.1. Hot Tap Fitting shall be marked as per MSS SP 25.
- 8.2. All loose material and foreign material i.e. rust; grease, etc. shall be removed from the inside and outside of the fittings before painting and Marking.
- 8.3. Surface of the finished product shall be cleaned by shot blasting with surface finish to SA 2 1/2 as per SSPC SP 10. It shall be applied with corrosion protective paints for protection of surface against corrosion during material transit and storage.
- 8.4. Ends of all fittings shall be suitably protected to avoid any damage during transit. Each fitting shall be marked with indelible paint with the following data:
- **MANUFACTURER** Name / Trademark
  - Material Specification
  - Size & Schedule/Wall Thickness
  - Heat Number
- 8.5. Package shall be marked legibly with suitable marking ink to indicate the following:
- Order Number
  - Package Number
  - **MANUFACTURER** Name / Trademark
  - Size/Dimension of Hot Tap Fittings

## **9. HANDLING, TRANSPORTATION & STORAGE**

Care shall be taken to ensure that wire ropes, chains or other metallic parts do not come in to contact with the Hot Tap Fitting, No-metallic broad bend slings shall be used to load/unload and support Hot Tap Fitting during transit. Fitting shall be adequately supported to prevent damage during transit. Storage of the same shall be arranged to avoid accumulation of water inside fitting.

**10. WARRANTY**

**MANUFACTURER** shall give warranty stating that Hot Tap Fitting complies with the requirement listed in this specification and other relevant standard & codes.

**MANUFACTURER** is bound to replace or repair all Hot Tap Fitting, which are found defective due to inadequate engineering or to the quality of materials and machining or any other reasons at no extra cost to **GGL**. If defects can't be eliminated, **MANUFACTURE** shall replace the fitting without any delay.

**MANUFACTURER** will reimburse **GGL** for any fitting furnished on the order that fails under field hydrostatic test if such failure is caused by a defect in the fitting, which is outside the acceptance limits of this specification. The reimbursement cost shall include fitting, labor and equipment rental for finding, excavation, cutting out and installation of replaced fitting in position. The field hydrostatic pressure will not exceed the value which will cause a calculated Hoop stress equivalent to 100% of SMYS for the pipe with which the fitting is to be attached without impairing its serviceability.

**11. WARRANTY VALIDITY**

The above warranty shall be valid only for any defect occurring during the first year of operation, but not later than 24 months from the date of shipment from **MANUFACTURER**'s works. All expenses shall be borne by **MANUFACTURER**.

## 12. DATASHEET OF HOT TAP FITTINGS

Sr. No.	Technical Description	Specifications
<b>General</b>		
1	Type of Fitting	3 Way Tee / Split Tee (As per Purchase Order)
2	Pressure Rating	150 # / 300 # / 600 # (As per Purchase Order)
3	Design Code	ASME B 31.8
4	Design Pressure	19 bar-g / 49 bar-g / 99 bar-g
5	Design Temperature	(-10°C) to 65 °C
6	Corrosion allowance	1.5 mm
7	Design Class	0.4
8	Service	Natural Gas
9	Branch End	Flanged (RF) with "Lock-O-ring" Plug
10	Flange Facing and Finish	Raised Face and 125 AARh
11	Run End	Butt weld as per ASME B 16.25
12	Post Weld Heat Treatment	Bidder to indicate in accordance with Code
13	Sleeve OD (mm)	Bidder to indicate
14	Sleeve Thickness (mm)	Bidder to indicate
15	Sleeve Length (mm)	Bidder to indicate
16	Branch OD (mm)	Bidder to indicate
17	Branch Thickness (mm)	Bidder to indicate
18	Fitting height (centre line of run pipe to flange top) (mm)	Bidder to indicate
19	Flange OD (mm)	Bidder to indicate
20	Weight of Fitting (kg)	Bidder to indicate (Bidder to provide lifting lugs)
21	Guide Bar	As per Purchase Order Design shall be suitable to pass all kind of pigs and in-line pigging.
22	Backing strip	Required, Bidder to indicate material specification suitable for welding
<b>Material Specification</b>		
23	Full encirclement Sleeves (Top and Bottom)	ASTM A537 CL1/ASTM A516 Gr. 70
24	Branch	ASTM A537 CL1/ASTM A516 Gr. 70/API 5L Gr. X52
25	Lock-O-Ring Flange	ASTM A105 or Bidder to secure prior approval from GGL for other material – Pressure class as per Sr No 2

Sr. No.	Technical Description	Specifications
26	Lock-O-Ring Assembly with Guide bar	Bidder to indicate – Pressure class as per Sr No 2
27	Lock-O-Ring /Retaining device	Bidder to indicate – Pressure class as per Sr No 2
28	Weld-o-let	ASTM A105/ASTM A 350 or Bidder to secure prior approval from GGL for other material
29	Thread-o-let	ASTM A105/ASTM A 350 or Bidder to secure prior approval from GGL for other material
30	Stud, bolts and Nuts	STUD BOLT - ASTM A 193 Gr. B7 NUT - ASTM A 194 Gr. 2H WASHER - 3 mm thick Washers shall be provided on both the sides. Stud bolts and nuts dimensions shall be as per ASME B16.5 and all stud bolts shall be supplies with extra lengths considering washer and 1 cm from nut face. All fasteners shall be galvanized and tested as per ASTM A153
<b>TESTING &amp; INSPECTION</b>		
31	Chemical Test	Required, As per specifications and ITP
32	Mechanical Test	Required, As per specifications and ITP
33	Charpy Impact Test	Required, As per specifications and ITP
34	NDE Test	Required, As per specifications and ITP (Refer Note 5)
35	Marking & Painting Spec.	SSPC-SP/MSS SP-25 and GGL Specification
36	Field Test	Required post welding at 1.1 times of operating pressure
<b>NOTE: -</b>		
1	<b>MANUFACTURER</b> to obtain approval for drawing and ITP from <b>GGL</b> prior to commencement of manufacturing	
2	Inspection shall be carried out by TPI appointed by GGL at Manufacture's work as per ITP approved by <b>GGL</b>	
3	Test Certificates shall be reviewed by client/ <b>GGL</b> appointed TPIA as per approved ITP, GA drawing, Inspection & Test certificates including NDE.	
4	All butt weld ends shall be subjected to 100% radiography test or UT test and all fillet welds shall be subject to 100 % UT or MPI test.	
5	<b>MANUFACTURER</b> to furnish all applicable valid certificates of tests, duly reviewed by NABCB accredited TPIA, along with final inspection release note.	
6	TPI to issue the certificates as per EN 10204 Type 3.2.	

**13.**

## SAMPLE INSPECTION & TESTING PLAN

Client:									
Project Name:									
Contract/Order Ref. No.									
Manufacturer Ref. No.									
Document Ref. o.									
Revision No.									
Date:									
Sr. No.	Process/Activity Description	Type of Check	Quantum of Check	Reference Standard/Document	Acceptance Criteria/Value	Format of Records	Inspection Control		
							Mfg.	TPIA	GGL
<b>1 Project Drawings &amp; Documents</b>									
1.1	Design & fabrication Drawing	Review & approval of drawing	-	GGL Specification & data sheet	GGL Specification & data sheet	Design & fabrication Drawing	H	R	A
1.2	Design calculations	Review of Design calculations	-	Design code as per GGL Specification & data sheet	Design code as per GGL Specification & data sheet	Design calculations	H	R	R
1.3	Welding procedure & welder qualification records, welder performance records	Review of welding procedure, specifications, procedure qualifications records, welder performance records	-	ASME Sec. IX / API 1104	ASME Sec. IX / API 1104	WPS, PQR and Welder Certificates	H	R	R
1.4	Non destructive examination procedure	Review of Non destructive examination procedures	-	-	-	NDE Procedures	H	R	R
<b>2 Raw Material Identification</b>									
2.1	Plates, Pipes, Flanges, Fittings, Plug, Backing Strip, Gasket, Bolting, Seal etc.	Certificates for Material Test Verifications for Chemical Composition & Mechanical Properties	100%	Applicable code-standard and GGL specification & Data Sheet	Applicable code-standard and GGL specification & Data Sheet	Material Test Certificate (MTC) (EN 10204 Type 3.1 Certificate) & material Heat Chart	H	R	R
2.2		Visual inspection, dimensions, material traceability & marking	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Inspection Report (EN 10204 Type 3.1 Certificate)	H	R	R
<b>3 In Process Inspection</b>									
3.1	Non-destructive Examination of plates	Magnetic Particle examination after rolling	100%	ASME Sec. V & ASME Sec. VIII Div. 1	ASME Sec. V & ASME Sec. VIII Div. 1	Inspection Report	H	W	R
3.2	Non-destructive Examination of fitting	Ultrasonic Lamination check along entire length for width of 50 mm	100%	ASTM A 578	ASTM A 578	Inspection Report	H	W	R
3.3	Fit Up	Check for dimensions, edge preparation, alignment, surface condition, root gap, bevel angle, Bolt hole orientation of Flange	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Inspection Report	H	W	R
3.4	Welding	Verification of WPS, PQR and WPO, Welding visual inspection, monitoring of welding parameters	100%	Approved WPS & PQR, Approved drawing, GGL Specification & Data Sheet	Approved WPS & PQR, Approved drawing, GGL Specification & Data Sheet	Inspection Report	H	W	R
<b>4 Non destructive examination</b>									
4.1	Butt Welds	Radiographic examination, RT film review	100%	ASMR Sec V & ASME Sec. VII Div. 1	ASMR Sec V & ASME Sec. VII Div. 1	RT Report	H	R	R
4.2	Fillet Welds	Ultrasonic examination	100%	ASMR Sec V & ASME Sec. VII Div. 1	ASMR Sec V & ASME Sec. VII Div. 1	UT Report	H	W	R
4.3	Field Weld End	Magnetic Particle examination	100%	ASME Sec. V & ASME Sec. VIII Div. 1	ASME Sec. V & ASME Sec. VIII Div. 1	MPI Report	H	W	R
<b>5 Painting &amp; Marking</b>									
5.1	Surface Preparation	Surface finish and Visual inspection with Surface roughness chart	100%	SSPC SP 10 - SA 1/2	SSPC SP 10 - SA 1/2	Inspection Report	H	W	R
5.2	Painting Finish	Visual inspection, Dry Film Thickness measurement of Primer-Paint	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Inspection Report	H	W	R
5.3	Marking	Marking of details	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Inspection Report	H	W	R
<b>6 Other items to be supplied</b>									
6.1	TOR, Flanges, Bolting, Gaskets, Seals, Backing strips	Visual inspection, review of MTC, heat number and quantity verification	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Inspection Report	H	R	R
<b>7 Final Inspection &amp; documentation</b>									
7.1	Dimensional inspection	Visual and dimensional inspection of assembly	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Inspection Report	H	W	R
7.2	Packing	Check packing, end protection & quantity	100%	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Approved Drawing, applicable code-standard, GGL Specification & Data Sheet	Packing List	H	R	R
7.3	Inspection Release Note and Final Doc	Review of Test Certificates & Supporting Documents	100%	Approved Drawing-QAP	Approved Drawing-QAP	Compliance Certificate / IRN (IN 10204 Type 3.2 Certificate)	H	P	R
Legends:- A - Approval, P - Perform, R - Review, W - Witness, RW - Random Witness, H - Hold, TP/A - Third Party Inspection Agency									
Notes:									
1 TP/A shall issue 3.2 certificate as per EN 10204.									
2 Above QAP covers requirement with reference to GGL specification, hence same shall be referred in conjunction with GGL valve specification/Data Sheet.									
3 All measuring instruments/equipments shall be duly calibrated and shall have valid calibration certificates. Same shall be reviewed by TP/A.									