



Exploration & Production

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 233

**Carbon steel tees for pipelines
(Mild, Intermediate and Severe Sour service)**

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1. Scope

1. This specification defines the company's general technical requirements for the design, materials, manufacture, testing and inspection of hot extruded carbon steel tees (including barred tees and sphere tees) of the welding neck type, for use in onshore and offshore pipeline systems.
2. Tees specified in this specification are to be used in Mild, Intermediate or Severe Sour Service as defined in specification **GS EP COR 170**.
3. This specification applies to tees with minimum specified yield strengths ranging from 290 N/mm² (42,000 psi) to 448 N/mm² (65,000 psi).
4. Tees shall comply with the requirements of **MSS SP 75**, except where otherwise noted in this specification. Pressure-temperature ratings shall be defined in Appendix 1.
5. Requirements are also specially stated in this specification for tees where the properties of base material are to be ascertained after a Post Weld Heat Treatment.
6. Tees may be supplied welded onto piece(s) of pipe at least 500 mm long, when so required in the PPS. These welded pipe pieces are designated as "pup pieces" in this specification.
7. This specification shall be used in conjunction with a Project Particular Specification (PPS) detailing the additional tests requirements or the possible modifications to the present specification, based on the particular design conditions of the pipeline Project.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

The order of precedence of the applicable documents shall be:

- The Purchase Order/Requisition
- The Project Particular Specification (PPS)
- The General Specification
- The Codes and Standards in reference.

Applicable Codes and Standards, which are to be used in conjunction with this specification shall be as stated hereafter.

Unless otherwise specifically indicated in writing, the SUPPLIER shall work in accordance with the requirements specified herein and the applicable requirements of the latest editions at time of contract award of the referenced Codes and Standards, whenever requested in the present specification.

Where this specification states no overriding requirements, the referenced Codes and Standards shall apply in full.

Standards equivalent to those referred to herein shall not be substituted without the written approval of the COMPANY.

The SUPPLIER shall equip himself with copies of all the specifications referred to in this specification and shall make them readily available to all fabrication, testing and inspection personnel involved on the work.

Note: The specification **GS EP COR 170** is mentioned herein only as a background to the definition of the types of sour services (i.e. Mild Sour Service, Intermediate Sour Service or Severe Sour Service) and corresponding “areas” on graph of the said specification (i.e. areas: 1, 2 or 3).

Standards

Reference	Title
ASTM A 283	Low and Intermediate Tensile Strength Carbon Steel Plate
ASTM A 370	Mechanical Testing of Steel Products
ASTM A 578	Straight-beam ultrasonic examination of plain and clad steel plates of special application
ASTM E 23	Notched Bar Impact Testing of Metallic Materials
ASTM E 384	Test Method for Micro-hardness of Materials
ASTM E 709	Magnetic Particle Examination
ISO 148	Charpy impact test (V-notch)
ISO 1027	Radiographic Image Quality Indicators for non-destructive testing. Principles and identification
ISO 6507	Hardness test - Vickers test - Part 1: HV5 to HV10
ISO TS 29001	Quality systems: Model for quality assurance in production, installation and servicing
ISO 12096	Radiographic testing of longitudinal and spiral welds for the detection of imperfections
EN 10204	Types of inspection documents
EN 473	Qualification and certification of non-destructive testing personnel

Professional Documents

Reference	Title
MSS SP 75	Specification for high test wrought butt welding fittings
API 5 L	Specification for line pipe
ISO 15156	Petroleum and natural gas industries – Materials for use in H ₂ S – containing environments in oil and gas production

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASME, Section V	Boiler and Pressure Vessel code: Non-destructive Examination
ASME, Section VIII Division 1	Boiler and Pressure Vessel Code
ANSI B 16.9	Factory-Made Wrought Steel Butt welding Fittings

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP COR 170	Materials for sour service (upstream applications). Specification for design
GS EP PLR 212	Fabrication of longitudinally submerged arc welded pipes for pipelines (Mild, intermediate or severe sour service)
GS EP PLR 421	Site welding of carbon steel pipelines to API 1104 (Mild, intermediate and severe sour service)

3. General

3.1 Definitions

Throughout this specification, the following definitions shall apply:

- Purchaser** Means the COMPANY or the SUPPLIER (as applicable), which have placed the purchase order to the MANUFACTURER.
- Inspector** Means the COMPANY's inspector(s) or inspector(s) from an independent Inspection Agency duly appointed by the COMPANY or the SUPPLIER (as applicable) to act on its behalf for the purpose of the contract.
- Approval** Means the authorisation in writing given by the COMPANY to the SUPPLIER on a procedure or to proceed with the performance of a specific part of the work without releasing in any way the SUPPLIER from any of his obligations or liabilities under the contract or at law. The words Approve, Approved and Approval shall be construed accordingly.
- PPS** Designates the Project Particular Specification.

3.2 Approval of SUPPLIER's procedures

The SUPPLIER shall submit the following documentation for review and approval one month prior to commencement of fabrication.

- a) Design calculations and fabrication drawings of tees.
- b) Manufacturing Procedure Specification, describing all proposed forming and forging operations, heat treatment, inspection and non-destructive testing in their correct sequence. This document will also include the characteristics of equipment used to carry out above mentioned operations.
- c) Sketch showing location and orientation of test specimens in test tee.
- d) Heat treatment and recording procedures, including number and location of thermocouples.
- e) Dimensional inspection procedures.
- f) Non-destructive inspection procedures.
- g) Quality Control Plan.
- h) Welding Procedures Specifications (where applicable).
- i) Welder qualifications (when applicable).
- j) Handling, storage and packing procedures.
- k) Proposed measures for temporary corrosion prevention (non-coated tees).

Once approved these procedures shall not be altered without the Approval of the COMPANY.

The SUPPLIER shall submit, at bid stage, to COMPANY's prior approval any deviations to requirements specified in applicable technical documents.

3.3 Quality assurance/quality control

1. The SUPPLIER shall operate a Quality Assurance system in accordance with [ISO TS 29001](#), approved by a COMPANY recognised authority. The Quality Assurance Manual shall be submitted one month prior to commencement of work.
2. Four weeks prior to commencement of tee manufacture, the SUPPLIER shall prepare and submit a Quality Control Plan which describes the inspections to be performed during the supply of tees. The Quality Control Plan shall set forth "witness", "hold", "review" and "monitor" points.

3.4 Project Particular Specification (PPS)

The PPS shall clarify, where needed, the following:

- (1) The necessity or not to have pup piece(s) (refer to Section 1).
- (2) The requirement to have the ID of tee same as that of matching pipes (i.e. constant internal diameter pipeline) (refer to para. 4.2).
- (3) The minimum tee thickness above which the simulated PWHT is required, if this thickness is below or equal to 25 mm (refer to para. 5.3.5).
- (4) The sour service severity and type of pipeline effluent to clarify the H₂S test conditions and hardness requirements in welds (if any) (refer to para. 5.5 and 4.3 of Appendix 2).

- (5) The number of originals and copies required for the documentation (refer to para. 15.1).
- (6) The tees characteristics, including impact test temperatures (refer to para. 5.3.3, 6.1 and Appendices 1 and 2).

4. Design

4.1 Design data

Details of pipe diameter, wall thickness and material steel grades of the matching pipelines shall be given in Appendix 1 of this specification, together with the relevant design conditions.

4.2 Tee design

1. All tees shall be designed to **MSS SP 75**, unless otherwise stated in this specification. Moreover, the tees shall also conform to the applicable pipeline code or standard (**B31.4**; **B31.8**; **DNV OSF101**.... Calculation shall be provided to COMPANY for approval-
2. All tees shall be designed in material with tensile properties at least equal to those of the matching pipes (refer to para. 5.3 of this specification).
3. The nominal internal diameter (bore) of the main header shall be that of the matching pipeline, unless otherwise stated in the PPS and in Appendix 2, with a tolerance of ± 1.6 mm.
4. The minimum wall thickness at welding ends shall not be less than those of the matching pipelines. Excess material shall be machined back as stated in para 10.2 of this specification. There should be no excess material on the internal diameter of tees when pipeline is designed as a constant internal diameter pipeline.
5. Internal bars (if any) shall be welded into the outlet neck of tees running longitudinally with the run and conform to the ID of the run, when nominal diameter of outlet neck is NPS 12" and above, unless otherwise stated in the PPS. Welds shall be full penetration welds, unless otherwise stated in PPS or on COMPANY approved drawings.
6. The bars and bars fixing shall be designed in such way that welds are out of the crotch radius area. Welds for bar fixing shall be carried out before final Heat Treatment (Q+T)
7. The SUPPLIER shall consider and meet the requirements stated about Design Proof Test in **MSS SP 75**.
8. When records of successful Design Proof Test corresponding to the tee of the order is not available, then Finite Element Analysis is required for the said tee together with hydrostatic testing as stated in Section 11 of this specification.
9. The design for the connection in between Header and Branch shall be governed by the OD ratio (OD Header v/s OD Branch). The required connection type is summarized in the Table (Appendix 3)

5. Materials

5.1 Manufacturing process

1. Steel shall be made by the Electric Furnace or Basic Oxygen Converter, and shall be fully killed and made to fine grain practice.