



Exploration & Production

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 232

**Carbon steel flanges and branch outlet fittings and
forged components for pipelines
(mild, intermediate and severe sour service)**

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Note: Appendix 1 shows a table which is to be filled-in by the Engineer and incorporated in the Project Particular Specification (PPS).



1. Scope

- This specification defines the Company's general technical requirements for the design, materials, manufacture, testing and inspection of hot forged carbon steel flanges and the like (e.g. anchor flange/deadweight support, swivel flange/swivel ring, etc.), of the welding neck type, to be used in onshore and offshore pipeline systems.
- Within this specification the term "flanges" is used indifferently to designate anchor flanges, blind flanges, swivel rings, hang-off collar, buckle arrestors, master fittings and forged components (except tees and bends), when applicable.
- It also applies to branch outlet fitting.
- This specification applies to flanges with minimum specified yield strength ranging from 290 N/mm² (42,000 Psi) up to 448 N/mm² (65,000 Psi).
- This specification shall be used in conjunction with a Project Particular Specification (PPS) detailing the additional tests and requirements or the possible modifications to the present specification, based on the particular design conditions of the pipeline Project
- Within this specification the term "flanges" is indifferently used to designate all items stated in bullet 2 here-above
- This specification also covers ring joint gaskets, as well as stud bolts and nuts for the flanges

Note that split ring of swivel flanges (to hold the swivel flange in position) needs not to meet any special requirements as regards to H₂S service

- Flanges specified in this specification are to be used in Mild sour service, Intermediate Sour Service or Severe Sour Service as defined in specification [GS EP COR 170](#)
- Flanges shall comply with the requirements of [MSS SP 44](#) for flanges and [MSS SP 97](#) for branch outlet fittings, except where otherwise noted in this specification. Pressure-temperature ratings shall be defined in table of Appendix 1
- Flanges shall be forgings meeting the material requirements of this specification and the requirements of [ASTM A 694](#) and [NACE MR 01-75](#), unless otherwise indicated in this specification
- For NPS 38 and larger sizes of the 300 and higher classes of welding neck flanges shall have 42 ksi minimum yield strength in the ring section (plateau); unless otherwise specified into the PPS.
- Special requirements are also stated in this specification for flanges to be used in platform topsides, risers, expansion loops, etc., where the properties of Base Steel are to be ascertained after a Post Weld Heat Treatment
- Flanges may be supplied welded onto a piece of pipe at least 500 mm in length, when so required in the PPS. This welded pipe piece is designated as "pup piece" in this specification.



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 (PO)/Requisition
- The Project Particular Specification
- The present General Specification
- The Codes and Standards in reference.

Applicable Codes and Standards which are to be used in conjunction with this specification, are 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 of the referenced Codes and Standards at time of Contract award, 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 written approval of the Company.

The Supplier shall equip himself with copies of all the reference 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. area 1, 2 or 3).

Standards

Reference	Title
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.20	Ring-Joint Gaskets and Grooves for Steel Pipe Flanges
ASME B16.47	Large Diameter Steel Flanges NPS 26 Through NPS 60 Metric/Inch Standard
ASME B31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and other Liquids
ASME B31.8	Gas Transmission and Distribution Piping Systems
ASME B18 and B1.1	Bolting Dimensions
ASTM A 193/A 193 M	Alloy-Steel and Stainless Steel Bolting Materials for high temperature service

Reference	Title
ASTM A 194/A 194 M	Carbon and Alloy Steel Nuts for High Pressure and High Temperature Service
ASTM A 370	Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A 388/A 388 M (or BS 4124, Part 1)	Ultrasonic Examination of Heavy Steel Forgings
ASTM A 694/A 694 M	Specification for Forgings, Carbon and Alloy Steel for Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Services
ASTM E 23	Method for Notched Bar Impact Testing of Metallic Materials
ASTM E 384 (or BS 427, Part 1)	Test Method for Micro-Hardness of Materials
ASTM E 709 (or BS 4124, Part 2)	Magnetic Particle Examination
EN 473	Qualification and certification of non-destructive testing personnel
EN 10204	Types of inspection documents
ISO 148	Charpy impact test (V-notch)
ISO 6507	Hardness test - Vickers test - Part 1: HV54 to HV10
ISO 15156	Petroleum and natural gas industries - Materials for use in H ₂ S - containing environments in oil and gas production
ISO TS 29001	Quality systems: Model for quality assurance in production, installation and servicing
MSS SP 55	Quality Standard for Steel Castings for Valves, Flanges, Fittings and Other Piping Components - Visual Method for Evaluation of Surface Irregularities

Professional Documents

Reference	Title
ANSI B 16.20	Metallic Gaskets for Pipe Flanges Ring-Joint, Spiral-Wound, and Jacketed
API 5L	Specification for Line Pipe
MSS SP 44	Steel Pipeline Flanges
MSS SP 97	Integrally reinforced forged branch outlet fittings
NACE MR 01-75	Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment



Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASME section V	Boiler and Pressure Vessel Code - Section V: Non-Destructive Examination
ASME section VIII	Boiler and Pressure Vessel code - Section VIII: Pressure Vessels
ASME section IX	Boiler and Pressure Vessel code - Section IX: Welding and Brazing Qualifications

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 COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP PLR 211	Fabrication of seamless pipes for pipelines (mild, intermediate and severe sour service)
GS EP PLR 421	Site welding of carbon steel pipelines to API 1104 (mild, intermediate and severe sour service)
GS EP PVV 611	Welding of pressure containing piping and equipment

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 the 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.
Mill	The plants, Mills, workshops, laboratories or other locations where the fabrication, inspection and testing of materials and products are to be performed complete or in part, shall be referred to herein as the "Mill".
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.

- Design calculations and fabrication drawings of flanges
- Design calculation of ring joint and bolting
- Aimed chemical composition of flange material
- Manufacturing Procedure Specification, describing all proposed forging operations, heat treatment, inspection and non-destructive testing in their correct sequence. This document will also mention the characteristics of equipment used to carry out above mentioned operations
- Sketch showing the rough forging piece before machining and, when applicable, the prolongation or the test blank with exact location and orientation of test specimens (refer to para. 5.4.1)
- Material heat treatment(s) and recording procedures, including number and location of thermocouples
- Welding end preparations
- Dimensional inspection procedures
- Non-destructive inspection procedures
- H₂S corrosion test procedures
- Quality Control Plan
- Welding Procedures Specifications (where applicable)
- Welder qualifications (when applicable)
- Handling, storage and packing procedures
- Proposed measures for temporary corrosion prevention (non-coated flanges).

Once approved, these procedures shall not be altered without the approval of the Company.

3.3 Quality Assurance/Quality Control

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 prior to the start of work.

Four weeks prior to the commencement of the flange manufacture, the Supplier shall prepare and submit a Quality Control Plan, which describes the inspections to be performed during the supply of flanges. 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:

- The necessity or not to have pup piece(s) (refer to Section 1)
- The minimum flange thickness above which the simulated PWHT is required, if this thickness is below or equal to 25 mm (refer to § 5.4.5)
- The sour service severity and type of pipeline effluent to clarify the H₂S test conditions and hardness requirements in welds (if any) (refer to § 5.6 and 14.4.3)
- The minimum yield strength in the ring section (plateau) for NPS 38 and larger sizes of the 300 and higher classes of welding neck flanges (not less than 42 ksi)
- The supply or not of 1"1/2 valve and plug for blind flanges (refer to Section 9)
- The number of originals and copies required for the documentation (refer to § 19.2)
- The flanges characteristics, including impact test temperature (refer to § 5.4.3 and Appendix 1).

4. Design

4.1 Design data

Details of pipe diameter, wall thickness and material grades of the matching pipelines shall be stated in flange Data Sheet to be presented as per the form shown in Appendix 1 of the present specification, together with the relevant design conditions.

4.2 Flange design

- The Supplier shall provide design calculations and fabrication drawings in accordance with [MSS SP 44](#) (flanges) or [MSS SP 97](#) (branch outlet fittings) and [ASME section VIII](#), Division 1 Appendix 2, for approval. Specially, the flanges shall be checked/designed for the operating and extreme conditions. Equivalent pressure due to bending moment in the flange shall be considered, as well as decrease of allowable stresses due to flange service temperature.

However, the design factor for hoop stress, longitudinal stress and combined stress shall comply with [ASME B31.4](#) or [ASME B31.8](#), as applicable, and shall be, as a minimum, that of the matching pipeline (specially at flange hub).

The dimensions of flanges shall be, as a minimum, those specified in [ASME B16.5](#) for NPS ½" through 24", and [ASME B16.47](#) for NPS 26" through 60".