



Exploration & Production

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 221

Fabrication of hot bends for pipelines (sweet service)

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Contents

1. Scope	4
2. Reference documents.....	4
3. General.....	6
3.1 Definitions	6
3.2 Project Particular Specification (PPS).....	7
3.3 Approval of SUPPLIER's Procedures	7
3.4 Quality Assurance/Quality Control	8
4. Materials	9
5. Checking of mother pipes prior to bending.....	9
5.1 Dimensional check.....	9
5.2 Ultrasonic check.....	9
6. Bend manufacture	10
6.1 General	10
6.2 Bending heat input and cooling conditions.....	10
6.3 Post bending heat treatment.....	11
6.4 Qualification of bend manufacturing procedure	11
7. Dimensional inspection.....	12
7.1 Wall thickness	13
7.2 Diameter at bend ends.....	13
7.3 Out-of-roundness	13
7.4 Radius of curvature	13
7.5 Bend angle	13
7.6 Off-plane	13
7.7 Centre-to-end dimension.....	14
7.8 Bend end preparation.....	14
7.9 Squareness	14
7.10 Pig gauge trial	14
7.11 Bulges, Dents and Flat Areas	14

8. Production tests.....	14
8.1 General	14
8.2 Tensile tests	14
8.3 Bends tests transverse to weld (if any weld)	15
8.4 Impact tests.....	15
8.5 Hardness tests	15
8.6 Micrography on base material (for qualification of bend manufacturing procedure only)	15
8.7 Failed tests.....	16
8.8 Storage of test specimen	16
9. Inspection and testing.....	16
9.1 General	16
9.2 Visual and non-destructive inspection.....	17
10. Repair of defects.....	18
11. Hydrostatic testing.....	19
12. Test rings.....	19
13. Marking of bends	19
14. Handling, transport and storage.....	20
15. Documentation.....	20
15.1 Mill certificates.....	20
15.2 Production report.....	20
15.3 Schedule	21
15.4 Documentation to submit by the SUPPLIER at bid stage	21
16. Technical Queries/Non-Conformance Reports	21

1. Scope

This specification defines the COMPANY's general requirements for the manufacture and inspection of butt welding bends that are shop fabricated by induction bending or induction forging for use in "Sweet Service" (i.e. corresponding respectively to area 0 in design specification **GS EP COR 170**), using seamless pipes or longitudinally submerged arc welded pipes.

It applies to bends in Grade X42 up to Grade X70 of **API Spec 5L** for use in onshore or underwater pipelines.

This specification shall be used in conjunction with a so-called 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 (see § 3.2 in this specification).

Requirements are also specifically stated in this specification for bends where the properties of base material and weld (if any) are to be ascertained after a Post Weld Heat Treatment is made.

The present specification shall also apply to mother pipes whatever they are free issued by the COMPANY to the SUPPLIER, or they are directly procured by the SUPPLIER.

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 PO/Requisition
- The Project Particular Specification (PPS)
- 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 in tables hereafter.

Unless otherwise specifically indicated in writing by the COMPANY, 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 written Approval from 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. Sweet Service) and corresponding “areas” on graph of the said specification (i.e. area 0).

Standards

Reference	Title
ANSI B 16.9	Factory-Made Wrought Steel Butt welding Fittings
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
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
API Spec 5L	Specification for Line pipe
API RP 5L1	Railroad Transportation of Line pipe
API RP 5LW	Transportation of Line pipe on Barges and Marine Vessels
MSS SP 75	Specification for high test wrought butt welding fittings

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASME B31.4	Pipeline Transportation System for Liquid Hydrocarbons and others Liquids
ASME B31.8	Gas Transmission and Distribution Piping System
ASME, Section V	Boiler and Pressure Vessel Code. Non-destructive Examination
ASME Section VIII, Division 1	Boiler and Pressure Vessel Code

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 201	Fabrication of seamless pipes for pipelines (sweet service)
GS EP PLR 202	Fabrication of longitudinally submerged arc welded pipes for pipelines (sweet service)
GS EP PLR 420	Site welding of carbon steel pipelines to API 1104 (sweet service)

3. General

3.1 Definitions

- Inspector**

The COMPANY's inspector(s) or the inspector(s) from an independent Inspection Agency duly appointed by the COMPANY to act on its behalf for the purpose of the Contract shall be referred to herein as the "Inspector".
- 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".
- Contract Documents**

The material requisitions, material specifications, etc. issued by the COMPANY and attached to the Contract or the Purchase Order shall be referred to herein as the "Contract Documents".

- **Approval** 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.
- **Mother Pipe** The original pipe or base pipe used for fabricating the bend or any portion of it shall be referred to herein as the "mother pipe".
- **PPS** Used to designate the Project Particular Specification.

3.2 Project Particular Specification (PPS)

The following information will be supplied in the Project Particular Specification (PPS):

1. Steel Grade
2. Specified minimum wall thickness
3. Nominal Inside Diameter and minimum bore (or gauge) of pipeline and bend
4. Radius of curvature and angle of bends
5. Minimum length of tangential ends or welded pup pieces. Minimum length to be not less than 1,000 mm (refer to § 6.1)
6. The service environment and type of pipeline effluent to clarify the H₂S test conditions and hardness requirements in weld (if any) (refer to § 6.4 and 8.5.1)
7. Profile and dimensions of bevelled ends (refer to § 7.8)
8. Post Weld Heat Treatment (if any) before supplementary testing (at least for WT above 25.4 mm) (refer to § 6.4).
9. Routine test temperature for impact tests (refer to § 8.4).
10. The party (i.e. COMPANY or SUPPLIER) in charge for supplying the mother pipes (refer to section 4).
11. Number of originals and copies of Mill certificates and final production report (refer to § 15.2).

The PPS shall include the bend Data Sheet, if it is not included elsewhere in any other PPS.

3.3 Approval of SUPPLIER's Procedures

The SUPPLIER shall submit the following documentation for review and Approval by the COMPANY one month, at least, before production commences:

- a) A detailed Manufacturing Procedure Specification (MPS), describing all proposed fabrication and inspection operations in their correct sequence.
- b) The Bending Procedure shall include the essentials parameters and the associated methods of controlling, monitoring and recording such as :
 - Nominal OD of mother pipes
 - Nominal WT of mother pipes

- Minimum WT of mother pipes
- Steel grade
- Intrados and extrados temperatures during bending sequence
- Distance in between HF inductor and pipe body (Extrados/Intrados)
- Bending Heat Inputs (Volts, Amps, Frequency)
- Travelling speed for bending
- Induction heating to tangent lengths (if any)

The Manufacturing Procedure shall also mention the characteristics of equipment used to carry out above-mentioned operations

- c) Detailed Post Bending Heat Treatment (PBHT) procedures.
- d) Non-destructive testing procedures (including inspection procedures to be used on bend body, weld seam and bend ends)
- e) Proposals for mechanical testing, namely on trial bends and/or on production bends
- f) Dimensional procedures.

Once the Bending Procedure Specification (BPS) is approved by COMPANY, that procedure shall be qualified, Finally, VENDOR shall issue the relevant Bending Procedure Qualification (BPQ) for COMPANY approval prior to start with fabrication.

Once a procedure is qualified, VENDOR will not be allowed to modify those qualified procedure without the written Approval of the COMPANY.

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

3.4 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 to COMPANY before production commences and made available to the Inspector at all times.
2. Four weeks prior to commencement of the pipe manufacture, the SUPPLIER shall prepare and submit to the COMPANY a written Quality Control Plan which describes the inspections to be performed during the fabrication of bends. The Quality Control Plan shall set forth "witness", "hold", "review", and "monitor" points.
3. At bending mills: offices, workshops, laboratory, storage yards, etc., information on paper and/or in computers (procedures, working instructions, data, records, tracking system, etc.) concerning the order manufacturing and inspection, shall be made fully available and comprehensible to Inspector reading. Where the mill country language is not English, all these information shall be written in double language, i.e. mill country language and English language.
4. Just before production starting, mill QA Representative accompanied by Inspector shall check at every production and inspection station, that the relevant working instructions and procedures are available, complete, conform to the procedures agreed by