

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS EP PVV 171

Steel piping fabrication

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1. Scope

This Specification applies to the fabrication and construction of any process or utility piping system, offshore or onshore, in aerial or underground situation.

The extent of the related piping systems is defined in [GS EP PVV 111](#) or [GS EP PVV 112](#).

Requirements herein shall govern shop and field fabrication in addition to rules expressed in the design code [ASME B31.3](#). Requirements related to coating and wrapping, are not covered in this document.

The general specification does not address requirements from local regulation.

The project particular specification shall:

- Comply with the present general specification
- Be limited to the contractual scope of work
- Comply with requirements from local regulation.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

Any divergence between this specification and any other Contractual Reference Document, shall be reported to the Company for decision. In such a case, and unless otherwise agreed or decided by the Company, it is understood that the more stringent requirement shall apply.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
ASME BPVC Section V	Non-Destructive Examination
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B31.3	Process Piping
ASME PCC-1	Guidelines for Pressure Boundary Bolted Flange Joint Assembly

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Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 354	External protection of onshore structures and equipment by painting
GS EP COR 356	Corrosion Protection of Fasteners for Subsea and Topsides Applications
GS EP EXP 107	Commissioning Execution
GS EP EXP 501	Equipment and piping numbering
GS EP PVV 107	Piping Stress Analysis
GS EP PVV 111	Piping design specification
GS EP PVV 112	Piping material classes
GS EP PVV 119	Design and fabrication of metallic piping supports - Standard for piping supports
GS EP PVV 173	Pneumatic testing of above ground piping systems
GS EP PVV 175	Cleaning of piping and vessels
GS EP PVV 611	Welding of pressure containing piping and equipment
GS EP PVV 612	Piping and equipment subject to severe sour service. Metallurgical and welding requirements
GS EP PVV 622	Piping and equipment subject to mild and intermediate sour service. Metallurgical and welding requirements
GS EP PVV 631	Phased Array Inspection (PAUT)

3. Definitions

3.1 Definitions

Company	The party (or its representative) who manages the contract with the Contractor.
Contractor	The party in charge of the fabrication or the construction of the plant, or any of its sub-contractor or suppliers involved in purchasing, manufacturing, testing and controlling any part of the fabrication or construction.
Inspection Agency	Generic term used for inspection body or authority, recognized and allowed by Company for approving welding procedures and qualification

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test records, welder qualification records, or performing inspection in fabrication.

Managing entity The entity identified on the front page of the document.

Prefabricated spool Finished piping spool manufactured, tested and painted, made indoors or outdoors, as delivered to the construction site for the assembly of the piping system.

3.2 Abbreviations

3XX	Austenitic Stainless Steel type 304L, 316L, 321	PMI	Positive Material Identification
5D	5 times Diameter	PT	Penetrant Testing
CAT	Category	PTFE	PolyTetraFluoroEthylene
CRA	Corrosion Resistant Alloy	PWHT	Post Weld Heat Treatment
CS	Carbon Steel	RT	Radiographic Testing
CVN	Charpy V-Notch	RTJ	Ring Type Joint
GTAW	Gas Tungsten Arc Welding	SMAW	Shielded Metal Arc Welding
LMC	Liquid Metal Cracking	SS	Stainless Steel
LNG	Liquefied Natural Gas	TOFD	Time Of Flight Diffraction
LTCS	Low Temperature Carbon Steel	VT	Visual Testing
MT	Magnetic Testing	WPQT	Welding Procedure Qualification Test
NDE	Non Destructive Examination	WPS	Welding Procedure Specification
NDT	Non Destructive Testing	WT	Wall Thickness
NPS	Nominal Pipe Size	PMI	Positive Material Identification
NPT	National Pipe Thread	PT	Penetrant Testing
ORJ	Orthogonal Ring Joint	PTFE	PolyTetraFluoroEthylene
PAUT	Phased Array Ultrasonic Technique	PWHT	Post Weld Heat Treatment

4. Information sources

4.1 Piping material classes

The piping material classes specification **GS EP PVV 112** shows the pipes, valves, flanges, fittings, branch connections, design details for vents, drains and instrument connections, and other specific material requirements for piping services. The specification includes the individual piping material classes and branch reinforcement requirements.

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4.2 Drawings

4.2.1 Design drawings

4.2.1.1 General arrangement drawings

Complete design of the piping systems including description, sizes, dimensions, relative location of the various parts or components is generally shown on Piping General Arrangement drawings.

4.2.1.2 Isometric drawings

Complete and detailed information such as description, sizes, exact locations, dimensions, joint details, are given in the isometric drawings. They shall clearly indicate the parts and/or components scheduled for assembly on the field. Welds and connections to be performed in the field shall be positioned in a manner requiring the least amount of field work and/or in order to facilitate field installation. A material take-off attached to the isometric drawing shall show details of all components of the isometric (list of materials, thickness, ratings, quantities, etc.).

For lines subject to level 3 piping stress analysis as defined in **GS EP PVV 107**, the contractor shall verify anytime that the isometrics used for the construction strictly coincide with the isometrics used for the flexibility analysis report in its last published edition.

4.2.2 Fabrication drawings

Shop drawings or sketches shall be prepared by the Contractor to facilitate the fabrication of parts or components of the Piping Systems. These drawings are intended to provide full information and instructions including typical shop details, weld preparation and procedures, etc., needed for that purpose. They must show the spool number, materials, dimensions, fabrication details, and the applicable code and procedures. Drawings must identify all equipment, lines or spools connecting to that spool. The General Arrangement or isometric drawing used as a reference shall be indicated. Spool pieces shall be identified by numbers indicating the isometric line number followed by suffix letters: A, B, C, etc.

Approval or review of shop drawings by the Company does not relieve the Contractor of his responsibility to complete the work in accordance with the Contract, the approved fabrication drawings and the Contractual Reference Documents.

4.3 Lines list

Mechanical data section of the lines list shows lines design pressures and temperatures as well as testing and insulation requirements. Additional information such as wall thickness is available in the relevant piping material classes.

4.4 Isometric index

This document is a list of all isometric drawings with their issue dates.

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5. Piping Materials

5.1 Supply

All piping materials (pipes, fittings, valves, accessories) shall conform to the relevant piping material class and to all the other related documents. Materials for non pressure parts which are directly welded to pressure parts shall be of the same type and quality as the pressure parts (Nominal Chemical composition).

5.1.1 Materials furnished by the Company "free issue"

Materials possibly furnished by the Company shall be as listed in the Contract documents. The Contractor shall be provided with a copy of Mill Certificates including chemical and physical properties for the materials furnished by the Company.

The Contractor shall inspect all the materials (pipes, fittings, etc.) internally and externally. The Contractor shall agree or disagree with their condition at the time of delivery on site.

In case of disagreement, the Contractor shall declare all unacceptable defects and damages which are found on materials furnished by the Company. Damaged material or materials found to have injurious defects shall not be used in the fabrication. The Company shall decide if such materials have to be repaired or to be replaced. Repairable defects or damages may be repaired by the Contractor on a cost plus basis to the Company. Before a repair is made, the way forward must be submitted to the Company for approval. Non-repairable materials shall be replaced by the Company.

The Contractor shall be considered responsible for defects or damages which will be detected after delivery on site. Repair or replacement of such defective materials shall be at the Contractor's expense.

The Contractor, on accepting the responsibility of the materials, shall keep a record on all related activities including date of inspection, designation and number of materials accepted or to be repaired or replaced, and any other pertinent information detailing material defects or damages. This record shall be signed by the Contractor and the Company.

5.1.2 Materials supplied by the Contractor

The Contractor shall furnish all other materials necessary to perform the work. Materials furnished by the Contractor shall be new and shall be subject to prior approval by the Company. The Contractor shall not substitute any material specified in the Contract documents without the prior written approval of the Company.

5.2 Identification

The Contractor shall ensure that the mill markings and identification on all materials shall be maintained throughout. The markings and identification, as proposed by the Contractor, shall be visibly clear and recognized as being correct by the Company. An identification system for class of material shall be used by the Contractor.

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5.3 Positive Material Identification (PMI)

PMI shall be done on 100% of in-coming materials, for low alloy carbon steel and corrosion resistant material (SS 3xx series, duplex, Inconel 625, etc.) components. Random checks shall be performed in the course of the piping spool fabrication.

5.4 Storage

All materials for the work, being the sole responsibility of the Contractor while in his custody, shall be stored in accordance with good practice, on pallets or timber blocking, off the ground and above the level of standing water. Materials shall be covered whenever possible. Materials shall not be stored near sites of operations such as blast cleaning or painting. The Contractor shall store all materials for the work in areas separate from surplus or scrap materials. Particular care shall be taken for valves. Valves shall be stored in a clean, covered area. Their obturators shall be maintained in the open position at all time, unless otherwise specified, with their original flanges ends-protection left in place till their installation.

CRA products shall be segregated in such a manner as to prevent the possibility of free iron contamination.

6. Fabrication of Piping Component

6.1 Bends

Cold bending shall only be used if permitted in the relevant piping class.

Galvanized pipes shall not be cold bent unless galvanizing is made after bending.

Cold bending shall comply with the requirements defined in [ASME B31.3](#) code and the following:

- Unless noted otherwise, the centerline radius of bends shall be five (5) nominal pipe diameter. Welds in bends are not permitted.
- Bends shall be produced only in seamless pipe. Bends shall be limited to diameters of NPS 1 ½ and smaller, unless otherwise approved by the Company. Elongation of outer layer shall not exceed 15%.
- Bending shall be made using suitable tools and procedures in order to obtain uniform arc surfaces free of cracks and buckles, without excessive out of roundness or thinning of the pipe material.
- The pipe wall thickness at the thinnest point after bending, less corrosion allowance, shall not be less than the calculated thickness required for pressure. Flattening of bends shall comply with the tolerances specified under clause 8.3 of this Specification. Weld repairs of defects in pipe bends are not acceptable.
- Bent pipes shall be subject to heat treatment in accordance with the requirements applying to each material and the recommendations defined by the code [ASME B31.3](#).
- A bend procedure qualification test is required for all impact tested materials, CRA materials and the ones subject to post bending heat treatment. Bends shall demonstrate the same properties as the adjoining pipes. A qualification test report shall be issued to

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Company approval with all the required mechanical testing, non destructive examinations and dimensional verification results.

- For sour service, bends shall comply with [GS EP PVV 612](#) or [GS EP PVV 622](#).
- Mitered and hot bends are not permitted by this general specification. Such components shall be subject to managing entity's approval and with the issuance of a particular specification dedicated to the scope of application.

6.2 Elbows

Elbows shall be long radius (1.5 diameter radius, as specified in the relevant piping material class) unless otherwise noted on drawings.

Mitered elbows are not allowed, except on lines open to the atmosphere such as safety valves open discharge or turbines exhaust lines.

7. Piping shop and field fabrication / Extent

7.1 Piping spools

Piping spools of sizes NPS 2 and larger shall be shop fabricated except for straight runs in pipe racks which are normally field run.

NPS 1 ½ sizes and smaller are normally field run, except if:

- Heat treatment is required.
- Lines are of high pressure class as defined by [ASME B31.3](#). In that case the number of site welds shall be minimized, and shall be limited to pipe to pipe connections.

7.2 Branch connection

Branch connections shall be in accordance with [GS EP PVV 112](#) branch connections chart.

Branch connections shop fabricated piping shall include appropriate couplings, fittings, or group of fittings (i.e. flanges thermowell connections), or stubs for small field-fabricated branch connections. NPS 1 ½ and smaller stubs shall not extend more than 300 mm from the outside of the header. NPS 2 and larger stubs and branches shall extend to the first flange or field weld point as indicated on the drawings or as required by transportation constraints.

7.3 Attachments

Attachments, such as supports, braces, lugs, and T-bars are normally installed in the field.

The use of reinforcing pads shall be used in the following cases:

- When the pipe support calculation fails because the forces on welded attachment are too high for the weld area
- When pipe wall thickness is below 5 mm
- When operating temperature levels or fluctuations create high stresses in the support weld.