



Exploration & Production

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS PVV 144

Fittings

01	10/03	General review – Change of Group name and logo
00	02/01	First issue
Rev.	Date	Notes



Contents

1. Scope	3
2. Reference documents.....	3
3. Materials.....	4
3.1 Carbon steel fittings	4
3.2 Galvanised fittings.....	5
3.3 Austenitic stainless steel fittings.....	5
3.4 Copper Alloy fittings	5
4. Substitution of equivalent materials.....	5
5. Dimensions.....	5
5.1 Thicknesses.....	5
5.2 Other dimensions.....	6
6. Ends	6
6.1 Bevelled ends	6
6.2 Threaded ends.....	6
6.3 Socket-welding ends.....	7
7. Manufacture.....	7
7.1 Fittings up to 1 ^{1/2} " in diameter	7
7.2 Fittings 2" or more in diameter	7
7.3 Repairs of defects.....	8
8. Inspection	8
8.1 Quality control.....	8
8.2 Acceptance	8
9. Documentation	9
9.1 Certificates of conformity.....	9
9.2 Material certificates	9
10. Preparation for shipment.....	9
10.1 Markings	9
10.2 Protection.....	9
10.3 Packing	9

1. Scope

This specification completes the description given in the requisitions issued by the Engineering Company and stipulates the particular requirements for the fabrication, inspection and shipment of fittings made of carbon steel, alloy steel, stainless steel and copper alloys.

This specification does not apply to fitting materials made of glass-reinforced plastic (GRP).

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.

Standards

Reference	Title
MSS SP 25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP 43	Wrought Stainless Steel Butt-Welding Fittings
MSS SP 97	Forged carbon steel branch outlet fittings
ASTM A 105	Forgings, Carbon Steel, for Piping Components
ASTM A 182	Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A 370	Mechanical Testing of Steel Products
ASTM A 403	Wrought Austenitic Stainless Steel Piping Fittings
ASTM A 420	Piping Fitting of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
ASTM A 530	General Requirements for Specialized Carbon and Alloy Steel Pipe
ASTM B 466	Seamless Copper-Nickel Pipe and Tube
ASTM B 467	Welded Copper-Nickel

Professional Documents

Reference	Title
API 5L	Line Pipe

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASME B 1.20.1	Pipe Threads (Except Dryseal)
ASME B 16.9	Factory Made Wrought Steel Butt-Welding Fittings
ASME B 16.11	Forged Steel Fitting, Socket-Welding and Threaded
ASME B 31.3	Code for Pressure Piping - Chemical Plant and Petroleum Refinery Piping
ASME B 36.10M	Welded and Seamless Wrought Steel Pipe
ASME B 36.19M	Stainless Steel Pipe

Other documents

Reference	Title
BONNEY FORGE	Catalogue for weldolet, sockolet, threadolet and similar connections

Total General Specifications

Reference	Title
GS PVV 612	Piping and equipment subject to severe sour service. Metallurgical and welding requirements
GS PVV 622	Piping and equipment subject to intermediate sour service. Metallurgical and welding requirements

3. Materials

3.1 Carbon steel fittings

The carbon steel used for the fabrication of fittings shall be produced in an electric furnace or by the basic oxygen process.

All carbon steels, including normalised steels, used for the fabrication of fittings shall have a maximum carbon content of 0.23 %.

The carbon equivalent of these materials, calculated using the formula:

$$C_E = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \text{ shall be less than 0.42 (ladle analysis).}$$



If the content of alloying elements other than C or Mn is unknown, the formula to be used shall be: $C_E = C + \frac{Mn}{6}$ and, in this case, the carbon equivalent shall be less than 0.40 (ladle analysis).

All carbon steels materials of thicknesses greater than 12.7 mm (½ inch) must be impact tested at minus 29°C (- 20°F) in accordance with [ASME B 31.3](#) (paragraph 323.3) unless more stringent requirements (including lower impact test temperatures) are already required in the product specification.

All carbon steel materials for services at lower temperatures (i.e., below minus 29°C) shall undergo toughness testing in accordance with the requirements of their reference codes and standards.

3.2 Galvanised fittings

Where galvanised fittings are specified, electrodeposited coating of zinc is not acceptable.

3.3 Austenitic stainless steel fittings

The types 321 and 347 stainless steels shall have a carbon content greater than or equal to 0.02 %.

Austenitic stainless steel fittings shall undergo an annealing heat treatment in accordance with the corresponding ASTM standards.

3.4 Copper Alloy fittings

Seamless and welded copper alloys fittings shall be annealed.

4. Substitution of equivalent materials

Any substitution of materials shall require the prior approval of the COMPANY.

A specified schedule may, with the approval of the Engineering Company, be replaced by a higher schedule provided that appropriate taper is machined by the Vendor in accordance with the reference codes and standards and that there is no extra charge. This taper must allow for connection by welding to the remainder of the pipework.

5. Dimensions

5.1 Thicknesses

5.1.1 Carbon steels and low alloy steels

The thicknesses of fittings must be in accordance with the standards [API 5L](#) or [ASME B 36.10M](#), except for the undermentioned tolerances for butt weld elbows above 14" Nominal Bore, which are additional to those, stated in the [ASME B 16.9](#). Note that the negative wall thickness tolerance for elbows larger than 24" is more stringent than [ASME B 16.9](#).

Wall thickness tolerances at any point of elbow ends		
Size	Plus tolerance	Minus tolerance
16" to 24" Wall thickness 12.7 mm and greater	15 %	12 ^{1/2} %
16" to 24" Wall thickness less than 12.7 mm	20 %	12 ^{1/2} %
Larger than 24"	20 %	10 %

5.1.2 Stainless steels

The thicknesses of fittings must comply with the standard [ASME B 36.19M](#), except that tolerance only for fittings in schedule 10S shall be in accordance with [MSS SP 43](#).

5.2 Other dimensions

The dimensions of forged, threaded or socket-welding fittings of the 3000 # and 6000 # series shall comply with the standard [ASME B 16.11](#).

The dimensions of butt-welding fittings shall be in accordance with the standard [ASME B 16.9](#), except that tolerances for stainless steel fittings in schedule 10S shall be in accordance with [MSS SP 43](#).

The dimensions of weldolet, sockolet, threadolet and similar fittings shall comply with the "BONNEY FORGE" catalogue.

For branch connection fittings, i.e. sockolets, weldolets, sweepolets, etc., the Vendor must confirm in his quotation that such fittings comply with the requirements of the [ASME B 31.3](#), and advise/confirm the branch standout in his quotation.

For fittings in diameters greater than the limits set by the standards [ASME B 16.9](#) and [MSS SP 43](#), the Vendor must submit a dimensioned document and calculations notes to the Engineering Company for approval.

6. Ends

6.1 Bevelled ends

All butt-welding fittings, including the stainless steel fittings in schedule 40S and 80S, shall have ends bevelled in accordance with the standard [ASME B 16.9](#).

The ends of stainless steel fittings in schedule 10S shall be in accordance with [MSS SP 43](#).

6.2 Threaded ends

The ends of threaded fittings, including threadolets, shall be in accordance with the standard [ASME B 16.11](#), and shall be threaded per [ASME B 1.20.1](#) (NPT).

Threads of galvanised fittings shall be free of galvanising.



6.3 Socket-welding ends

The ends of socket-welding fittings, including sockolets, shall comply with the standard [ASME B 16.11](#).

7. Manufacture

7.1 Fittings up to 1^{1/2}" in diameter

All fittings up to 1^{1/2}" in diameter, of the 3000 # and 6000 # series, shall be forged.

Fittings machined from bars are not acceptable.

7.2 Fittings 2" or more in diameter

7.2.1 Seamless fittings

Seamless fittings shall be forged or extruded.

Following these operations, which may be performed on seamless tubular elements, the thickness of the fittings must be within the tolerances required by the reference standards.

7.2.2 Welded fittings

Welded fittings shall be made from forgings.

Following these operations, which may be carried out on welded tubular elements, the thickness of the fittings must be within the tolerances required by the reference standards.

The welds shall be made by an approved process. The seams shall be back-welded if the welding process does not assure full penetration with, on the back, a weld reinforcement of uniform thickness, free of appreciable distortion.

"Fabricated" fittings (mitered elbows, reductions, etc.) shall consist of a single rolled and welded plate. However, fabricated fittings may, if necessary, be made with two longitudinal welds. For all "fabricated" fittings, the Vendor shall submit, with his quotation, drawings showing all dimensions and tolerances of the fittings offered, giving details of method of manufacture, heat treatment (including PWHT), showing location of all welds, with joint details, for review by the Engineering Company.

All welds shall undergo radiographic examination in accordance with the reference codes and standards. Hardness testing is also required in case of H₂S service (where Specification [GS PVV 612](#) or [GS PVV 622](#) is applicable).

7.2.3 Machining

7.2.4 Bevels

Any bevelling of the ends of the fittings may be performed by machining or by flame cutting. The process used shall produce clean, square, burr-free cuts. Whenever flame-cutting is employed, all oxides and traces of previously melted metal shall be removed by grinding or machining. For stainless steels, only mechanical means shall be employed; flame cutting is not permitted.



7.2.5 Weld reinforcement

The inside reinforcement of the weld must be ground-off at each end of the fittings; this machining shall be performed in such a way as to leave a gradual transition.

7.3 Repairs of defects

Repair of defects shall only be permitted if performed fully in accordance with the reference codes and standards.

8. Inspection

8.1 Quality control

The inspection and tests necessary to confirm that the products meet the requirements of the standards, specifications and requisition shall be carried out in the Vendor's plant by personnel of the plant. This specially-qualified personnel shall be independent of the production department of the plant.

Products shall be guaranteed by an inspection certificate (conformity, material, test, etc.).

If the Vendor does not have the necessary means of examination, these tests may be carried out by an agency and at a place approved by the Engineering Company.

The Inspection Agency shall conduct inspections in the Vendor's plant so as to make sure of the proper execution of the order and of the quality controls. It shall also witness final shop acceptance.

8.2 Acceptance

The Inspection Agency shall not grant any acceptance unless the certificates concerning the products submitted have been made available to it in advance.

In addition to checking the certificates, the Inspection Agency shall check the quantities presented and shall have checked, by sampling, the following characteristics:

- Any radiographic and ultra-sonic examinations reports
- Shapes and nominal dimension
- Dimensional tolerances
- Surface treatment and finish conditions
- Marking and finishing conditions.

This sampling shall cover at least 5 % of each of the items submitted for acceptance.

The non-conformity of any or all of the products submitted for acceptance may give rise:

- Either to a second submission after the products have been corrected, if this is possible
- Or to final rejection.

9. Documentation

9.1 Certificates of conformity

The Vendor shall submit certificates of conformity with the ASTM standards specified in the requisitions for fittings made of carbon steel, alloy steel, stainless steel or copper alloys.

9.2 Material certificates

The Vendor shall submit 3.1.B material certificates giving the results of the chemical analysis and of the mechanical tests carried out in accordance with the requirements of the reference codes and standards.

10. Preparation for shipment

10.1 Markings

10.1.1 Identification of materials

In addition to the markings required by the [MSS SP 25](#) standard, the following information shall be marked by cold stamping on each fitting:

- Specification and grade of material
- Heat number
- Batch number.

However, fittings less than 3 mm thick shall not be marked by stamping but by etching.

10.1.2 Markings specific to the order

All fittings shall be identified by marking with colour marks and code numbers as and if specified in the order.

10.2 Protection

10.2.1 Carbon steel fittings

Threaded fitting ends shall be greased.

Bevelled fitting ends shall be protected by a peel-off varnish.

10.2.2 Austenitic stainless steel fittings

All stainless steel fittings shall be protected against the risks of saline corrosion during cleaning, transport, fabrication, testing and/or storage. If paint is used to protect these fittings, it must not contain chlorides or other substances that might damage the stainless steel.

10.3 Packing

Sea-packing shall be used for all fittings; in the case of austenitic stainless steel, the packing must also be water-proof. It must meet the conditions of all stages of transport (rail, road, air and sea).