



Exploration & Production

GENERAL SPECIFICATION

SUBSEA SYSTEMS

GS SPS 005

Subsea ball valves

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1. Scope

This Technical Specification defines the minimum requirements for the design and manufacture of carbon steel subsea ball valves, which will be used for isolation and/or emergency shutdown service.

This document applies in addition to the Total general specification **GS PVV 142**.

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.

Works specified shall be in accordance with this specification and the appropriate sections of the following codes and standards. Unless specified otherwise, the latest editions including amendments shall apply.

Any conflicting requirements between this specification and any other relevant document shall be reported to Total for decision.

In any case and notwithstanding the final decision of Total, the most stringent requirement is first meant to govern.

Standards

Reference	Title
ASTM A 193	Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A 194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 352	Specification for Steel Castings, Ferritic and Martensitic, for Pressure-containing Parts suitable for Low-Temperature Service
ASTM A 370	Test Methods and Definitions for Mechanical testing of Steel Products
ASTM A 388	Recommended Practices for Ultrasonic Examination of Heavy Steel Forgings
ASTM E 186	Standard Reference Radiographs for Heavy Walled (2-inch to 4½-inch) Steel Castings
ASTM E 280	Standard Reference Radiographs for Heavy Walled (4½- inch to 12-inch) Steel Castings
ASTM E 446	Standard Reference Radiographs for Steel Castings up to 2-inch Thickness
BS 427	Methods for Vickers Hardness Test
BS 1133 Part 6	Temporary Protection of Metal Surfaces Against Corrosion (During Transport and Storage)
BS 1503	Specification for Steel Forgings for Pressure Purposes

Reference	Title
BS 1504	Specification for Steel Castings for Pressure Purposes
BS 1706	Specification for Electroplated Coatings of Cadmium and Zinc on Iron and Steel
BS 3382	Cadmium plating of Threaded Fittings
BS 4515 + AMD 5810	Process of Welding of Steel Pipelines on Land and Offshore
BS 4870	Approval Testing of Welding Procedures
BS 4882	Bolting for Flanges and pressure containing purposes
BS 5750	Quality Systems
BS 6208	Methods for Ultrasonic Testing and for Specifying Quality Levels of Ferritic Steel Castings
DIN 500 49	Certificates on Material Testing
ISO R 85	Bend Testing
ISO R 148	Beam Impact Testing (V-notch)
ISO 82	Tensile Testing
ISO 2604	Specification for Carbon and Carbon Manganese Steels for Pressure Vessels

Professional Documents

Reference	Title
API 5L	Specification for Line pipe
API 6D	Specification for Pipeline Valves (Steel, Gate, Plug, Ball and Check Valves)
API 598	Valve Inspection and Test
ASNT-TC-1A	Personnel Qualifications and Certification in Non-Destructive Testing
NACE MR-01-75	Sulphide Stress Cracking Resistant Metallic Materials for Oil field Equipment

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ANSI B 16.34	Valve - Flanged, Threaded and Welding End
ANSI B 16.20	Ring Joint Gaskets and Grooves for Steel Pipe Flanges
ANSI/ASME B 31.3	Chemical Plant and Petroleum Refinery Piping
ANSI B 16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other special Alloys
ANSI B 18	Bolts and Hexagonal Nuts
ASME Section V	Boiler and Pressure Vessel Code - Non-Destructive Examination
ASME Section VIII Division 1	Boiler and Pressure Vessel Code - Pressure Vessels
ASME Section IX	Boiler and Pressure Vessel Code - Welding and Brazing Qualifications
ASME E 428	Fabrication and Control of Steel Reference Blocks used in Ultrasonic Inspection
BS 5500	Unfired Fusion Welded Pressure Vessels

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS PVV 142	Valves
GS SPS 024	Subsea Mechanical Quarter Turn Actuator (manually operated gearbox)
GS SPS 025	Subsea Hydraulic Spring Return Quarter Turn Actuator

3. Valve operational requirements

3.1 Functional requirements

The main purpose of the subsea ball valves will be for emergency shutdown (ESD) service in high pressure subsea pipelines. It is also anticipated that the valves will be used for subsea pipeline isolation service during precommissioning of a pipeline system, and subsequent for isolation of discrete sections of the pipeline system for pipeline repair work at any time during the design life of that system (see Environment Data Sheet - Appendix 1).

3.2 Service requirements

(Refer to Data Sheets in Appendix 1)

Valves shall be suitable for use in a subsea environment.

Valves shall be designed in accordance with the specified pressure and temperature ranges of the produced medium as contained in the Service Data Sheet in Appendix 1.

Valves shall be designed to withstand a sustained internal vacuum in both open and closed positions to cover the possibility of vacuum drying of pipelines.

Valves shall be suitable for exposure to the short term and long term pipeline fluids expected during precommissioning, decommissioning and recommissioning as well as chemical injection during the operational phases of the pipeline life.

The valve may be operated a minimum of 5 times per year for each year of operation. Alternatively the valve may remain in open position for a period of five years or more.

3.3 Valve design

Valves shall comply with **GS PVV 142** and shall be of class E.

Valves shall be of a tested and field proven subsea ball valve design and configuration.

Valves shall be full-bore, constant ID and suitable for the passage of all types of pipeline pigs in both directions without causing damage to either the valve components or the pig.

The valve shall be capable of being pigged and scraped regularly, without debris being pushed between the valve seats and the ball. The bore of the open valve shall present as smooth a profile as possible to a passing pig or scraper. The valve shall be designed to be pigged in both directions.

The design shall be such that a build-in of rust, sand and other debris when the valve is in the open position will not prevent the free movement or proper functioning of valve components.

As a minimum the valve shall withstand stresses imposed on it by external and internal pressures. The valve MANUFACTURER shall demonstrate by means of calculations or bend testing that a bending moment in all planes from pipeline stressing of up to the bending moment necessary to achieve the specified minimum yield stress in the pipeline, shall not be detrimental to valve operation.

Valves shall be capable of sealing against the pipeline Maximum Allowable Operating Pressure in either direction.

The lower trunnion of the valve shall be of the non-exposed type, i.e. the lower stem shall not be exposed to the environment and shall not rely on stem seals.

The valve design shall minimise the possibility of ingress of debris into the trunnion area as far as practicable.

The valve shall have the capability to facilitate the following subsea/diver operations:

- Flushing of valve cavities (1-inch to 2-inch connection)
- Sealant injection into stem and seat seals.

The number of tapings and body vents shall be minimised.

Body cavity relief shall be provided by the seat rings. Relief shall occur at a differential pressure of between 6 bars and 50 % of the M.O.P. of the valve. A hole in the ball, or a relief valve in the

body, for pressure relief is not allowed. VENDOR shall demonstrate by calculation that cavity relief pressure and seat spring force are not so low as to allow pigging to pull the downstream seat rings off the valve ball. The pig force shall be assumed to be 1 bar multiplied by the cross sectional area of the pipeline. The cavity relief pressure calculated to equate to the spring load equal to this pig force shall be indicated by VENDOR.

All joints shall be sealed against the ingress of seawater at the external design pressure. Any seal grooves in horizontal flanges shall be on the underside of the top flange for protection during maintenance and shall be positively located.

The valve shall be provided with position stops for the fully open and fully closed positions. Visual indication of the ball in any position shall be possible, and easily visible to diver and/or ROV, with and without the actuator in position.

When subjected to the pipeline maximum allowable bending moment and axial forces (see Data Sheet), the valve shall still be capable of full sealing and operation.

Stem cap to incorporate stops to prevent rotation of the valve stem from both the fully open and fully closed positions when the actuator is removed.

Valve closure times will be within 15 to 30 seconds for sizes up to 24 inches, and 40 seconds for sizes 32 inches and above, unless otherwise specified in the data sheet.

Effects of low temperature caused by depressurisation during valve closure or possible leakage within the system shall be considered.

The valve body shall include lifting eyes.

4. Actuator interface

4.1 Actuator type

Actuators will be of both the hydraulic and mechanical type. Mechanical actuated ball valves shall preferably have right angle worm gear operators. Hydraulically actuated ball valves shall be remotely operated with an hydraulic actuator which shall be fail safe.

The minimum requirements for the design and manufacture of valve actuators are presented in separate specifications (References Section 2). The integration testing of valve with actuator shall be carried out in accordance with these specifications.

4.2 Interface requirements

The valve to actuator interface shall consist of the following minimum requirements:

- The valve to actuator interface shall be designed such that the actuator can be removed and replaced easily and safely without affecting the pressure retaining integrity of the valve.
- All mounting bolts, adaptor plates, keys and keyways, splined shafts, etc. shall be as a minimum designed to transmit the maximum rated actuator torque.
- The valve stem to actuator interface shall be designed such that the actuator can only be located in the correct orientation.
- Mechanical and hydraulic actuators shall be interchangeable.
- Actuators to be removable and installable subsea, with pipeline under pressure.



VENDOR shall be responsible for the correct function of the valve to actuator interface and shall control all interface documentation.

The valve shall be capable of being capped with a protective housing (stem cap) in the event that the actuator is removed for an extended period. The housing shall include provision for flushing with a non-corrosive fluid to replace seawater which may be trapped in cavities between the housing and valve stem after installation onto the valve. The protective housing shall be designed in such a way that the ball is maintained in the correct position fully open or fully closed without rotation possibility.

The stem cap shall include a pressure release device to equalise hydrostatic head pressure and allow safe removal of the cap.

Markings shall be provided on the stem cap and valve body so that the status of the valve (i.e. open or closed) can be determined.

5. Materials

5.1 Selection of materials

Subsea ball valve materials shall be suitable for the service conditions defined in the Data Sheet (Appendix 1).

Materials for valves shall be specified by VENDOR on the relevant Data Sheet, which shall then become part of this Specification.

5.2 Valve body

Valve body materials shall be suitable for the service conditions defined in the Data Sheets.

The valve body shall be manufactured from fully killed, fine grained carbon manganese steel. Either forgings or castings may be used, subject to Total approval. The material shall be to a recognised standard for steel for pressure purposes dependant on the manufacturing procedure. The requirements of this Specification shall be additional to those contained in the relevant material standard.

The valve body shall be readily weldable to free-issued pup-pieces from linepipe manufactured in accordance with the linepipe specification (see Data Sheet in Appendix 1).

Pup-pieces will be free issued to VENDOR for welding on either side of the valve.

VENDOR shall be fully responsible for the welding of the pup-pieces to the valve body.

5.3 Valve internal components

Materials for valve components shall be suitable for the service requirements of Section 3.2 and Appendix 1. The valve design shall ensure that there is no possibility of bimetallic corrosion between the carbon steel body and these components. Details of selected materials shall be submitted to Total for approval prior to manufacture along with evidence of their suitability. All alloying elements shall be reported.

All seal materials shall be suitable for exposure to all intended pipeline contents. The effects of low temperature caused by depressurisation during valve closure or possible leakage shall be considered for seal material selection.

5.4 Mechanical properties - General

The Specified Minimum Yield Strength (SMYS) of the valve body end connection shall be not less than 66 per cent of that of the matching linepipe. The weld preparation thickness shall compensate fully for loss of strength if the SMYS of the valve material is less than that of the matching pipe.

For forgings, full size Charpy specimens shall be taken in the direction of principal grain flow and notched perpendicular to the original surface. For castings, full size Charpy specimens shall be taken transverse to the components major axis and perpendicular to the original surface. Tests shall be carried out at -20°C. The minimum average value shall be 65 Joules, and no individual value shall be lower than 50 Joules. A minimum of three tests shall be carried out.

Stud bolts and nuts shall conform to a suitable grade from [ASTM A 193](#) and [ASTM A 194](#) or [BS 4882](#) and shall be cadmium plated to [BS 3382](#) and have a PTFE coating applied to the Cadmium. Cadmium plating method shall prevent hydrogen embrittlement.

5.5 Mechanical testing

The requirements for mechanical testing (i.e. sampling) shall be agreed between VENDOR and Total and will depend on the method of manufacture. The minimum mechanical test requirement for C-Mn steel forgings and castings are given in Table 1 below.

Table 1 - Mechanical test requirements for C-Mn steel forgings and castings

Test	Number of tests required
Transverse Tensile	2
Longitudinal Tensile	2
Charpy V-Notch	4
Macro-Hardness (VHN)	2
Bend Test	2

Mechanical testing methods and results shall be in accordance with the following standards:

- [ISO 2604/I and IV](#) Specification for Carbon and Carbon Manganese Steels for Pressure Vessels
- [BS 1503](#) Specification for Steel Forgings for Pressure Purposes
- [BS 1504](#) Specification for Steel Castings for Pressure Purposes
- [ISO 82](#) Tensile Testing
- [ISO R 148](#) Charpy V-Notch Testing
- [ISO R 85](#) Bend Testing

All mechanical testing shall be witnessed by Total, who shall also witness the recording of test data. VENDOR shall forward copies of all test certification to Total.

Testing shall produce results in accordance with the material specification. Any results failing to meet requirements shall be investigated jointly by VENDOR and Total. All components and materials shall remain rejected until Total approves and accepts the material.

5.6 Manufacturing procedures

The manufacturing, quality control and inspection procedures shall be agreed between Total and VENDOR prior to order placement and shall include all proposed operations, depending on the method of manufacture, in the correct sequence. The procedures shall include details of:

- Steelmaking process
- Forging/casting procedures
- Heat treatment procedures
- Methods of temperature control
- Methods of chemical analysis and mechanical testing
- Welding procedures and qualification (including for welding of pup-pieces to valve body).

Note: All welding procedures and qualification tests shall be conducted in accordance with [ASME Section IX](#) and this Specification, other than for welding of pup-pieces which shall be in accordance with [BS 4515](#). All welding procedures and qualification test results shall be approved by Total prior to production welding. All welders and welding operators shall be qualified in accordance with Total approved welding procedure and [ASME Section IX](#) or [BS 4515](#) as appropriate prior to production welding.

- Non-destructive examination procedures
- Defect removal
- Weld repair.

Note: Weld repairs to pup-pieces and to castings shall only be carried out to a detailed procedure approved by Total. Repairs shall be carried out before any heat treatment of the casting. Weld repairs to forgings are not permitted.

- Machining process.

6. Inspection and NDT

6.1 General

The responsibility for quality control and inspection rests with VENDOR.

Total however, reserves the right to:

- Inspect work in progress to ensure that materials and workmanship are in accordance with this Specification
- Determine which items shall constitute hold points for witness by Total.

The manufacturing procedures shall include but not be limited to the following NDT (non-destructive testing) techniques:

- Ultrasonics
- Radiography
- Magnetic particle inspection

- Dye penetrant inspection
- Visual examination.

All NDT personnel shall be trained and certified to [ASNT-TC-1A](#) Level II or equivalent.

A full chemical analysis shall be supplied with the material certificates, including all residual contents as well as H₂, O₂ and N₂ contents in steel.

6.2 NDT acceptance criteria

All radiographs for castings shall conform to appropriate ASTM standards for radiographic inspection (see Appendix 2, Table 1).

Ultrasonic inspection of castings shall conform to [BS 6208](#) and Appendix 2, Table 3.

Ultrasonic inspection of forgings shall conform to the appropriate ASTM standards, see Appendix 2 Table 2.

All castings and forgings shall be subjected to 100 % visual, wet fluorescent magnetic particle examination, or Dye Penetrant examination.

Magnetic particle examination shall be conducted from two directions at right angles, covering the whole surface.

The acceptance levels for surface flaws shall be as follows:

- Typical linear and other typical surface flaws shall be explored for depth; when the depth of such flaws exceed 3 mm below a finally machined or pressure containing surface, such flaws shall be considered unacceptable. A linear flaw is defined as a flaw having a length to width ratio greater than 3 (see also Table 6.1 below).
- Surface flaws not rated as unacceptable in a) above shall be removed by machining or grinding, provided the depth of metal removed does not exceed 3 mm below the adjacent material and that the minimum design wall thickness plus any corrosion allowance is maintained.
- Mechanical marks or abrasions and pits shall be acceptable without machining or grinding provided the depth does not exceed the limitations of b) above and they are removed in accordance with b) above.
- All surface marks, abrasions or pits shall be dressed by grinding to avoid sharp notches or grooves.
- The extent of porosity on cast surfaces shall not exceed the requirements of [ASTM E 125](#) Type III degree 2 and Type V degree 1 within 50 mm of any butt weld edge.

Table 7.1 - Acceptance limits of magnetic particle indications

Wall thickness		Maximum allowable linear flaw size	
Inches	mm	Inches	mm
≤ 5/8	≤ 15.9	1/4	6.4
> 5/8	> 15.9	3/8	9.5

The synergistic effect of two or more flaws of acceptable length (L) in close proximity (space S) is required to be assessed by the reclassification criteria in Table 6.2 below.

Table 7.2 - Reclassification of multiple linear indications

Indication orientation	Reclassify when	Reclassified length
In-line Coplanar	$S1 < \frac{L1+L2}{2}$	$L1 + L2 + S1$
Parallel Coplanar	$S2 < \frac{L2+L4}{2}$	Length of longest L2 or L4
Offset Coplanar	$S3 < \frac{L3+L4}{2}$	$L3 + L4 + S3$
Non-Coplanar	$S4 < \frac{L3+L5}{2}$	$L3 + L5 + S4$

For identification of indications above refer to Figure 7.1.

NDT acceptance criteria for welds shall be as follows:

- Any cracks penetrating the root run or second pass on welds where the back of the weld is inaccessible shall result in the complete weld being rejected
- Any cracks, areas of incomplete penetration or lack of fusion shall be unacceptable, and only one repair attempt shall be permitted
- Any area of porosity projecting radially through the weld exceeding 6.0 mm² in any 600 mm of the project weld area is unacceptable
- Any single slag inclusion or a total cumulative length of inclusion exceeding 6 mm in any 150 mm of weld length, or any slag exceeding 1.5 mm width shall be unacceptable
- Undercutting shall not be permitted.

Due to the possible orientation of certain defects making interpretation of some defects difficult by radiographic inspection, ultrasonic examination findings shall be used for defect sizing.

Depth of defects: since radiography provides a qualitative assessment in two dimensions only, it is possible that a weld, having one or more defects within the limits of acceptability set above, shall nevertheless not be acceptable if it is considered that the third dimension of any defect is sufficient to prejudice the performance of that weld.

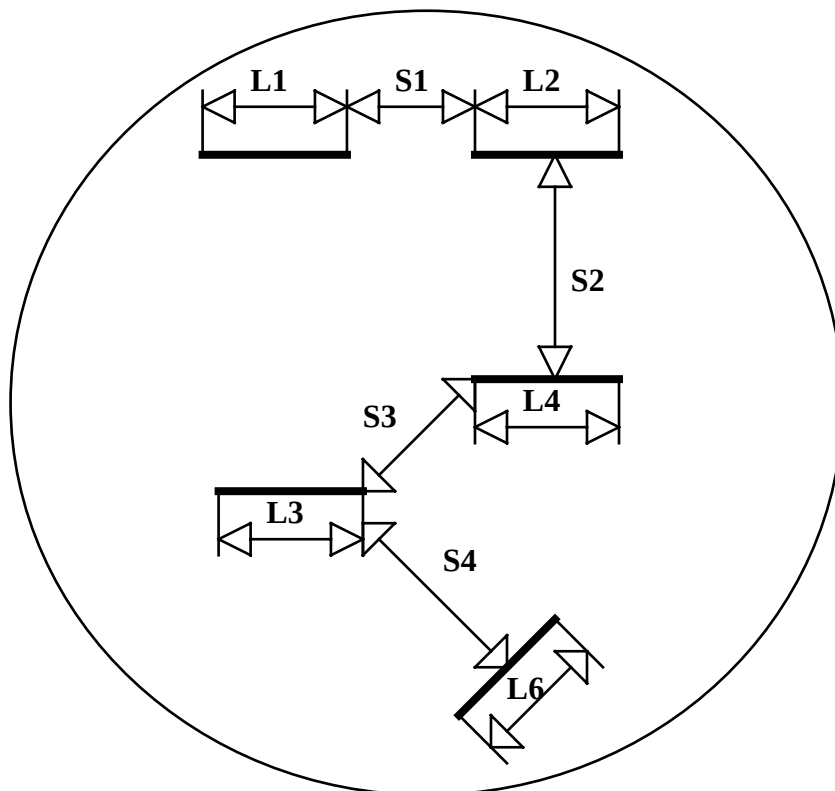


Figure 7.1 - Identification of indications

7. Testing

7.1 General

All valves shall be tested prior to shipment from VENDOR. The test procedures and sequences shall conform to **GS PVV 142** and to the following additional requirements.

All tests shall be witnessed by Total.

Valves shall not be accepted until all tests are completed successfully, in the specified sequence and to the satisfaction of Total.

Failure of any tests in the sequence shall require that the entire test sequence be repeated. The results of all tests shall be recorded by means of pressure and temperature recorders and charts.

The valves shall be tested at ambient temperature (15°C to 20°C), unpainted, and where required equipped with the specified actuator.

The liquid used for the hydrostatic shell tests shall be fresh and clean potable water and contain a water soluble rust inhibitor. The water shall be at ambient temperature.

Air used for the air test shall be clean, oil free instrument air.

7.2 Hydrostatic shell test with liquid

A minimum of four mechanical strain gauges shall be attached to the valve body during testing to monitor distortion. The number and positions of these gauges to be approved by Total and shall be calibrated with temperature changes.

After pressurising there shall be a stabilisation time of about 10 minutes before the leakage readings are taken. The valve shall be tested at the stated hydrotest pressure for 24 hours. Leakage shall be measured by blow drying valve prior to visual inspection. No leakage or pressure drop shall be permitted.

7.3 Hydrostatic seat test with liquid

The valve shall be depressurised and the ball closed. Pressure shall be applied at 110 % of rated pressure at ambient temperature to the upstream seat. The downstream parts of the seat shall be at atmospheric pressure. Leakage reading shall be carried out. Leakage tests shall be performed for both seats monitoring leaking into the body cavity. Valves shall be blow dried prior to inspection. The hydrostatic test shall then be repeated for the downstream seat. Duration of test for each seat shall be a minimum of 30 minutes and no leakage shall be permitted.

7.4 Seat leakage test with low pressure air

This test shall be performed with the valve in the closed position. Air pressure of 5.5 barg shall be applied on the upstream seat. The downstream parts of the seat shall be at atmospheric pressure. Leakage reading shall be carried out using soap film over a body cavity part. No leakage shall be permitted. Leakage tests shall be performed for both seats. Air seat tests shall be carried out after all other pressure tests.

7.5 Performance testing of valve

Prior to hydrostatic seat tests but after shell tests, an operational torque test shall be carried out as detailed in Appendix 2 of [API 6D](#), to ensure operating torque on the stem complies with that specified by the **VENDOR**. Three torque readings shall be taken with a differential pressure equal to the design pressure applied first to one side and then to the other. The average of the six torque readings shall be used. Where an individual torque reading taken is higher than that specified by **VENDOR** for operation, then that valve must be reworked and retested until the lower torque level has been confirmed.

Continuous record of torque versus pressure in the valve shall be provided for all cases, with and without pressure.

7.6 Vacuum testing of valve

The valve bore shall be evacuated by a vacuum pump until a pressure of 1 millibar (absolute) is reached. The bore shall be isolated and the vacuum pressure monitored for 1 hour.

The test shall have failed if the vacuum cannot be maintained over a 1-hour period.

7.7 Submerged testing of valve and actuator assembly

The valve and actuator assembly shall be submerged in a tank filled with potable water. At **VENDOR**'s option the tests shall be done under hyperbaric conditions.

With the valve subjected to full line pressure, a number of actuation cycles shall be completed. On completion of the test, the assembly shall be checked for water tight integrity. Refer also to Actuator Specifications (Section 2) for other tests to be performed on submerged actuators.



7.8 Jam test

On completion of the above tests, the seal-off caps or flanges shall be removed, the valve opened and blocked in an open position by suitable means which shall not cause any damage to the seating surfaces. A torque equivalent to the maximum torque available from the actuator required to close the valve under full differential design pressure (see Section 7.5) shall be applied to the actuator for a period of 5 minutes. No visual distortion of the actuator shall be permitted. Valve stem, splines, etc, and actuator shall be visually inspected on completion of test.

7.9 Hydrostatic test of caps

The seal-off caps, designed to protect the valve stem when the actuator is not mounted to the valve, shall be hydrostatically tested to 150 % of the valve design pressure for a period of 6 hours. Caps shall not be tested while fitted to valves unless agreed in writing by Total. No external leaks or pressure drop shall be allowed.

7.10 Final Inspection

Final visual inspection of all valve components shall be performed following testing.

8. Corrosion protection

VENDOR to propose coating system and associated procedures for review and approval by Total.

After completion of all pressure testing, the external surface of the valve shall be coated in accordance with Total approved procedures.

Interior surfaces of valve shall be sprayed with a temporary corrosion protective as approved by Total and compatible with seal materials.

Machined faces including ring grooves shall be protected with a corrosion inhibitor which may be easily removed on site (e.g. by non-toxic solvents).

Bevelled weld ends shall be fitted with protectors approved by Total to prevent mechanical damage during loading, transit and unloading. The ends of all valves shall be sealed to prevent the ingress of dirt or moisture.

9. Identification

Each valve shall be legibly marked on an attached nameplate or label. Both the label and the method of attachment shall be approved by Total.

The following details are to be shown on the label:

- a) Information laid down in Section 7 of **API 6D**.
- b) Total order number and lot number where applicable.
- c) Other marking as specifically requested.

In addition, items a) (where demanded in **API 6D**) and b) shall be legibly stamped on the valve body.



10. Handling and transport

Where possible, valve and actuator lifting lugs shall be provided for handling.

Valves shall be packaged to prevent any damage during handling, storage and transit. Packaging details shall be submitted to Total for approval.

11. Documentation

The following documentation written in the English language shall be submitted to Total:

- Material Certificates signed to signify compliance with all the requirements of the Specification
- Analysis reports giving product analysis. All elements for which a Specification limit is set shall be reported
- Mechanical and Corrosion Test Reports
- NDT Test Reports
- Fabrication Drawings
- Design Calculations
- Certified Weight
- Spares Lists
- Special Tool Requirements
- Intervention and Repair Procedures.

Certificates to [DIN 50049](#) Type 3.1.B shall be provided for all pressure-retaining ball valve materials, as well as for ball and stem materials.



Appendix 1 Data sheets

Valve Environment Data Sheet

Client:

Project:

Field/Location:

Water Depth (meters):

Temperature range (°C): Pipeline (minimum/maximum):

Seabed (minimum/maximum):

Design Life (years):

**Valve Service Data Sheet****Pipeline Data**

- Name:
- Outside diameter:
- Max operating pressure (bars g):
- Pipeline Hydrotest pressure (bars g):
- Max operating temperature (°C):
- Min operating temperature (°C):
- Design internal pressure (bars g):
- Linepipe Specification:

Gas Composition

Component	Mol %
H ₂ S	
N ₂	
CO ₂	
C1	
C2	
C3	
IC4	
NC4	
IC5	
NC5	
C6	
C7	
C8	
C9	
C10	

Expected pipeline contents during precommissioning, decommissioning and recommissioning shall be:

- Line fill during installation: Inhibited and filtered sea water
- Drying method: Methanol swab and vacuum dry
- Line fill after drying: Nitrogen
- Injected chemicals during commissioning and operation shall be: Methanol, Tri-ethylene glycol, IPA, corrosion inhibitors, biocides, etc.

Millscale debris, rust, etc. may also be present in the line remaining as a residual from the commissioning operations.



Subsea Pipeline Ball Valve VENDOR Response Data Sheet

Client:

Project:

Valve

- Nominal Bore (mm):
- ANSI class:
- Full/Reduced Bore:
- Operating Pressure Range (barg):
- Valve Design Pressure (barg):
- Manufacturing Code: API 6D:
- MANUFACTURER Name:
- Model:
- Type of Construction:
- End Connections:

Materials

- Body
- Ball
- Stem
- Seals
 - a) Ball:
 - b) Stem:
- Seats
- Bearings
- Sealant Injection
- Method of subsea repair.

Actuator Interface

- Interface drawing number:
- Spindle diameter (mm):
- Spindle drive type:
- Actuator mounting provision:
- Maximum valve stem torque capacity (Nm):



Operating Torque (Nm) at maximum operating pressure

	Breakout from closed	Breakout from open	Running
Maximum			
Typical			
Minimum			

Overall Dimensions of Valve (mm)

- Length:
- Width:
- Height:
- Height from bore centre line:
- Weight (kg):
- Acceptable Mounting attitude:

Appendix 2 NDT acceptance criteria

Table 1 - Radiographic acceptance standards for castings

Discontinuity type	Designation or category	Severity level
ASTM E 446 (thickness up to 2 inches)		
Cracks	D	None permitted
Gas porosity	A	Class 2 acceptable
Sand and slag inclusions	B	Class 2 acceptable
Internal shrinkage	C	Class 2 acceptable
Hot tears	E	None permitted
Unfused chaplets	F	None permitted
Internal chills	G	None permitted
ASTM E 186 (thickness 2 inches to 4.5 inches)		
Cracks	D	None permitted
Gas porosity	A	Class 2 acceptable
Sand and slag inclusions	B	Class 2 acceptable
Shrinkage:		
Type 1 linear shrinkage	C	Class 1 acceptable
Type 2 dendritic shrinkage	C	Class 2 acceptable
Type 3 spongy shrinkage	C	Class 3 acceptable
Hot tears	E	None permitted
Inserts:		
Type 1	F	None permitted
Type 2	F	None permitted
ASTM E280 (thickness 4.5 inches to 12 inches)		
Cracks	D	None permitted
Gas porosity	A	Class 2 acceptable
Sand and slag inclusions	B	Class 2 acceptable
Shrinkage:		
Type 1	C	Class 2 acceptable
Type 2	C	Class 2 acceptable
Type 3	C	Class 2 acceptable
Hot tears	E	None permitted
Inserts:		
Type 1	F	None permitted
Type 2	F	None permitted

Table 2 - Ultrasonic inspection - Forgings

- [ASTM E 428](#): Fabrication and Control of Steel Reference Blocks used in Ultrasonic Inspection.
- [ASTM A 388](#): Recommended Practices for Ultrasonic Examination of Heavy Steel Forgings with basis for acceptance as follows:
 - The instrument shall be set so that the first back reflection is 75 + 5 % screen height when the transducer is placed on an indication-free area of the forging
 - For angle beam examination, 25 x 25 mm or 25 x 12 mm, 45 degree transducer shall be used at a frequency of 1 MHz. Angle beam examination shall be calibrated with a notch of a section thickness (10 mm maximum), a length of approximately 25 mm, and a width not greater than twice its depth.

A forging shall be unacceptable if straight beam examination results show one or more discontinuities which produce indications accompanied by complete loss of back reflection not associated with or attributable to the geometric configuration.

Table 3 - Ultrasonic inspection of castings

- [BS 6208](#): Methods for Ultrasonic Testing and for Specifying Quality Levels for Ferritic Steel Castings.
 - Quality Level 0 for planar defects
 - Quality Level 1 for non-planar defects
 - Loss of 75 % back wall echo not attributable to casting geometry shall be further investigated
 - Calibration shall be based on a 5 mm notch.