SPECIFICATION

FOR METALLIC VALVES & SPECIAL PIPING (SP) ITEMS

APPROVED FOR BIDDING

0	20/01/2006	Approved for Construction	SS	A.ALI	M.SC
REV	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

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1 SCOPE

1.1 This Specification states the minimum technical, manufacturing and inspection requirements for Prequalification of Valves and Speciality Piping (SP) Items for use on OGDCL Surface Facilities.

1.2 This Specification is an integral part of any Enquiry, Material Requisition or Purchase order package for Piping Valves and Components, and shall be read in conjunction with the documentation referenced in the Enquiry, Material Requisition or Purchase Order Package.

1.3 In case of conflict between any requirement specified herein and the requirements of any other referenced document, the hierarchy for resolving the conflict shall be:

1. The Material Requisition (Inquiry /SOR)
2. Data Sheets
3. This Specification

2 REFERENCES

The following documents and specifications shall be read in conjunction with this specification:

- Item Data Sheets

3 CODES AND STANDARDS

The latest editions of following Codes, Standards and Statutory Regulations (where applicable) shall be used:

3.1 American Society of Mechanical Engineers

ASME V	Boiler and Pressure Vessel Code Section V – Non Destructive Examination
ASME VIII	Boiler and Pressure Vessel Code Section VIII Div.1 & Div. 2 Rules for Construction of Pressure Vessels
ASME IX	Boiler and Pressure Vessel Code Section IX - Welding Qualifications
ASME B31.3	Process Piping
ASME B1.20.1	Pipe Threads General Purpose (Inch.)
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
ASME B16.20	Metallic Gaskets for Pipe Flanges – Ring-Joint, Spiral-Wound, and Jacketed
ASME B16.21	Non-Metallic Flat Gaskets for Pipe Flanges
ASME B16.25	Butt welding Ends
ASME B16.34	Valves – Flanged, Threaded and Welding End
ASME B16.47	Large Diameter Steel Flanges
ASME B46.1	Surface Texture, Surface Roughness, Waviness & Lay

3.2 American Petroleum Institute

API 6D	Specification for Pipeline Valves
API 6FA	Specification for Fire Test for Valves
API 594	Wafer Check Valves
API 598	Valve Inspection and Testing
API 600	Steel Gate Valves - Flanged and Butt welding Ends
API 602	Compact Carbon Steel Gate Valves – Flanged, Threaded, Weld Extended Body Ends
API 607	Fire Test for Soft-Seated Quarter-Turn Valves
API 608	Metal Ball Valves – Flanged, Threaded and Butt-Welding Ends
API 609	Butterfly Valves: Double Flanged, Lug - and Wafer-Type

3.3 American Society of Testing and Materials

ASTM A105	Specification Carbon Steel Forgings for Piping Applications
ASTM A106	Specification for Seamless Carbon Steel Pipe For High-Temperature Service
ASTM A182	Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service
ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A194	Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High Temperature Service, or Both
ASTM A216	Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
ASTM A320	Specification for Alloy / Steel Bolting Materials for Low Temperature Service
ASTM A350	Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
ASTM A351	Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure Containing Parts
ASTM A352	Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
ASTM A694	Specification for Carbon and Alloy Steel Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service.
ASTM A890	Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion-Resistant, Duplex (Austenitic/Ferritic) for General Application
ASTM B62	Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B148	Standard Specification for Aluminium-Bronze Sand Castings
ASTM B150	Standard Specification for Aluminium Bronze Rod, Bar, and Shapes
ASTM B564	Standard Specification for Nickel Alloy Forgings
ASTM B584	Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM G48	Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by use of Ferric Chloride Solution.

3.4 British Standards Institution

BS 1414	Steel Wedge Gate Valves (Flanged and Butt welding Ends)
BS 1868	Flanged Steel Check Valves
BS 1873	Steel Globe, Globe Stop and Check Valves (Flanged and Butt welding Ends)
BS 2080	Face to Face, Centre to Face, End to End and Centre to End Dim of Valves
BS 3799	Steel Pipe Fittings, Screwed and Socket Welding
BS 5146	Inspection and Test of Steel Valves
BS 5154	Copper Alloy Globe Stop and Check, Check and Gate Valves
BS 5155	Butterfly Valves
BS 5351	Steel Ball Valves
BS 5352	Steel Gate, Globe and Check Valves ≤ 50mm
BS 5353	Plug Valves
BS 6755	Testing of Valves
BS EN 10204	Metallic Products – Types of Inspection Documents

3.5 Det Norske Veritas

DNV OS-F101	Offshore Standard - Submarine Pipeline Systems

3.6 Manufacturer's Standardisation Society of the Valves and Fittings Industry

MSS SP25	Standard Marking System for Valves, Fittings, Flanges and Unions.
MSS SP44	Steel Pipe Line Flanges
MSS SP55	Quality Standard for Steel Castings for Valves

3.7 National Association of Corrosion Engineers

NACE MR-01-75	Sulfide Stress Cracking Resistant Metallic Materials for Equipment.

4 GENERAL REQUIREMENTS

4.1 Units of Measure

- Nominal valve sizes are to be shown in inches and fractions. General dimensions shall be in millimetres.
- Pressure classes are to be shown as ASME Ratings (i.e. Class 150 etc.), pressures shall be expressed in kilopascals gauge (kPag).
- Temperatures shall be expressed in degrees Celcius (°C).

4.2 The welding of flanges on to valves to meet the requirements for a flanged end valve specification is not acceptable without prior approval.

4.3 The use of asbestos material for non-metallic gaskets, gasket components or gland packing is prohibited.

4.4 Valve and SP Item end requirements shall be as follows:

i) Butt welding ends shall conform to ASME B16.25.

ii) Socket welding ends shall conform to ASME B16.11.

iii) Threaded ends shall conform to ASME B1.20.1.

iv) Flanged ends shall conform to ASME B16.5 for sizes DN 15 to DN 600 and ASME B16.47 Series A for sizes greater than DN 600.

4.5 Flange facing shall be as follows:

i) Raised face serrated finish, Ra 3.2 to 6.3µm

ii) Ring type joint contact faces, Ra 0.4 to 1.6µm

4.6 Ring joint flange groves shall have the following minimum hardness:

i.	Carbon Steel	-	110 HB
ii.	Low Temperature Carbon Steel	-	110 HB
iii.	Austenitic Stainless Steel AISI 316	-	180 HB
iv.	Duplex Stainless Steel	-	200 HB
v.	Super Duplex Stainless Steel	-	200 HB

4.7 Valve dimensional details shall be in accordance with the design standard specified in the valve data sheet. SP item dimensional details shall be in accordance with the applicable SP item data sheet. Face to face dimensions are critical and must be confirmed with bid, top works and overall dimensions shall also be provided with bid.

4.8 Where stated on the valve data sheet, valves shall be 'Certified Fire Safe' in accordance with BS6755 Part 2, API 6FA or API 607 as applicable. All valves offered shall be qualified by applicable fire test certification, details of which shall be available for Purchaser review, if requested.

5 MATERIAL REQUIREMENTS

5.1 Carbon Steel and Impact Tested Carbon Steel

The chemical composition of carbon steel castings and forgings shall be limited as follows:

Carbon content 0.25% max (non-NACE Castings)
Carbon content 0.22% max (NACE Forgings and Castings)
Carbon equivalent 0.43% max by ladle analysis where:

$$CEV = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu + Ni}{15}$$

Maximum permitted sulphur content shall be as follows:

ASTM A216 Gr. WCB (Non NACE)	0.045% Max.
ASTM A216 Gr. WCB (NACE MR0175)	0.025% Max.
ASTM A105 Gr B (NACE and Non NACE)	0.025% Max.
ASTM A106 Gr B (NACE and Non NACE)	0.035% Max.
ASTM A350 Gr LF2 (NACE and Non NACE)	0.025% Max.
ASTM A352 Gr. LCC (NACE MR0175 & Non NACE)	0.025% Max.

NACE MR0175 specified material shall also have limitation on sulphur content of 0.010% max.

All castings for sour service (NACE MR0175) and impact tested carbon steel castings shall be suitably heat treated after all welding operations have been performed. This requirement also applies to the weld repair of defects irrespective of size.

All ASTM A105 materials shall be supplied in a normalised condition.

All impact tested carbon steel to ASTM A350 LF2 shall be Class 1.

5.2 1 ¼% Chrome ½ % Moly

Cast valve and SP items bodies / components shall be supplied in accordance with ASTM A216 Gr. WCB and shall be supplied in the normalised and tempered condition. Heat treatment shall be carried out after all welding operations have been performed including any Purchaser permitted weld repair.

Forged valves shall be supplied in accordance with ASTM A105. Weld repairs are not permitted.

5.3 Austenitic Stainless Steel

Austenitic stainless steel shall be supplied in a solution annealed condition. Solution annealing shall be carried out after all welding operations have been performed including any Purchaser permitted weld repair.

Butt weld valves and SP items specified as 316 / 316L stainless steel shall be supplied dual certified i.e. having the mechanical properties of 316 SS and the chemical composition of 316L SS.

Butt weld valves and SP items specified as 304/ 304L stainless steel shall be supplied dual certified i.e. having the mechanical properties of 304 SS and the chemical composition of 304L SS.

The use of stainless steel to UNS S30400 or equivalent is not permitted for any pressure containing or bolting application in an Offshore or saliferous environment.

5.4 Duplex and Super Duplex Stainless Steel

All materials shall meet the mechanical requirements and chemical composition defined by the following product specifications:

Duplex stainless steel (22 Cr.)
Cast Valves - ASTM A890 UNS J92205
Forged Valves - ASTM A182 F51 (UNS S31803)

Super Duplex stainless steel (25 Cr.)
Cast Valves - ASTM A890 UNS J93380
Forged Valves - ASTM A182 F53 (UNS S32750)

Alloy composition shall provide a minimum Pitting Resistance Equivalent (PRE) as defined by the equation:

PRE = %Cr + 3.3% Mo + 16% N (Calculated by % weight)
Duplex stainless steel (22 Cr.) PRE shall be 35
Super Duplex stainless steel (25 Cr.) PRE shall be 43

All components shall be supplied in a solution annealed condition. Solution annealing shall be carried out after all welding operations have been completed. Maximum hardness shall not exceed the following:

Duplex stainless steel (22 Cr.)	- 28 HRC
Super Duplex stainless steel (25 Cr.)	- 32 HRC

Micrographic examination is required for both Duplex and Super Duplex stainless steels and shall cover the mid-thickness region. The ferrite content shall be determined according to ASTM E562 or approved equivalent and shall be within 35 - 55 %. The microstructure, as examined at 400X magnification on a suitably etched specimen, shall be free from intermetallic phases and precipitates. For Procedure Qualification Records (PQR) of casting weld repairs, examination shall be carried out on both the base and weld material.

Corrosion Testing is required for both Duplex and Super Duplex stainless steels and shall be carried out on each heat and heat treatment batch of material to establish sigma phase intergranular attack in accordance with ASTM G48 Method A. The samples shall be exposed to 10% $FeCl_3$ solution at 25°C for 72 hours. Test specimens shall be in the 'as delivered / manufactured' condition, no surface preparation is permitted, except for cut edges. The test specimens shall include the full section thickness. Where thickness exceeds 50mm, the samples shall include at least one original surface and shall extend at least to the centre-section of the thickness. Visual examination shall be performed on all of the specimens with at least 20x magnification. No pitting is acceptable. Weight loss shall not exceed 4.0 g/m².

Vendors shall submit for review with bid, details of all Manufacturers and include any further standard production testing which demonstrates resistance to Pitting and Crevice Corrosion for evaluation.

Charpy impact testing is required for cast duplex and super duplex stainless steel components in accordance with ASTM A370 at minus 46°C. The minimum absorbed energy values shall be 45 Joules min average, 35 Joules min individual.
Test samples for impact testing, microstructure, hardness and corrosion testing shall be carried out for each heat and heat treatment batch. For forgings the test sample shall be taken from the 'rough forging' or a prolongation representing the heaviest wall thickness. Castings shall have integrally cast coupons or test blocks which shall be heat treated together with the castings they represent.

Cast duplex and super duplex valve bodies and SP items bodies shall have a pressure / temperature rating in accordance with ASME B16.34 material group 2.8.

5.5 17/4 PH Stainless Steel

17/4 PH stainless steel shall be heat treated in accordance with NACE MR0175 and be supplied with a maximum hardness of 33 HRC.

Where the minimum design temperature stated on the valve and SP item data sheet is below minus 29° C, Impact testing of 17/4 PH stainless steel is required in accordance with ASME B31.3

For valves with a minimum design temperature of minus 46°C, impact testing shall be carried out at minus 46°C. The minimum transverse absorbed energy values for a 10mm x 10mm specimen shall be 38 Joules min average, 28 Joules min individual. Minimum lateral expansion shall be 0.38mm.

17/4 PH SS is not an acceptable substitute for 316 SS were valve or SP item body of 316 SS is specified.

5.6 NACE MR0175 Requirements

Valves and SP items specified to NACE MR0175 shall be certified as meeting all requirements for all parts which can be contacted by the sour environment. All materials shall be fabricated, tested and inspected in accordance with the requirements of NACE MR 0175.

Cast duplex not listed in NACE must be qualified and certified for use in sour service, with the requirements and hardness of wrought duplex UNS S31803 (28 HRC) being met. Vendor shall submit previous qualification data with bid, together with sour service history for material, from casting source offered.

5.7 Amine Service Requirements

In addition to the requirements of Para 6.1, carbon steel and impact tested carbon steel valves and SP items, specified for use in amine service, shall have all welds stress relieved by post weld heat treatment. The weld heat affected zone hardness shall be less than 248 HV10.

Copper and copper based alloys, monel and aluminium alloys shall not be exposed to amine service.

5.8 Soft Seat and Seat Materials

All seat and seal materials shall be suitable for the maximum design conditions and service fluids stated in the Valve and SP item Data Sheets. Material data sheets shall be submitted with the bid and detail pressure / temperature ratings for all non-metallic materials.

All non-metallic materials in hydrocarbon gas service shall be resistant to explosive decompression.

Vendor shall confirm suitability of seat and seal material where Methanol or Amine service is indicated on the Valve or SP Data Sheet.

5.9 Welding and Weld Repairs

Weld repairs are permissible for castings only, forgings shall not be weld repaired. No weld repair shall be completed until Purchaser approval of procedures has been obtained.

5.10 Corrosion Resistant Overlays and Plated Materials

Bidders shall provide details and extent of any corrosion resistant overlays provided or plating of internal components with their bid.

6 CORROSION ALLOWANCE

6.1 Valve and SP item bodies in carbon steel and impact tested carbon steel shall be of sufficient thickness to allow for a corrosion allowance of 3mm, unless specified otherwise in the data sheet.

6.2 Where a corrosion allowance of 6mm is specified in the data sheet, the Vendor shall confirm the valve or SP item includes this corrosion allowance over and above that -0required for pressure containment and the component will be fully functional in the fully corroded condition.

7 VALVE DESIGN

Valves shall comply with the relevant standards and codes as specified herein and in the valve data sheets.

7.1 Ball Valves

All ball valves shall be of a fire tested design to BS6755 Pt 2, API 6FA or API 607. Test certification shall be provided by the manufacturer to verify the valves performance.

Valves shall be fitted with fire safe seals.

Valves shall be of anti-static design with 'blow-out' proof stems.

The design of all ball valves shall incorporate body cavity pressure relief, which shall be achieved through seat design. A hole drilled in the ball to achieve body cavity relief is not acceptable.

Ball valves shall be reduced bore pattern DN 50 and above, unless otherwise specified as full bore on the individual data sheets. Reduced bores shall be limited to one line size smaller than body size.

All balls shall be solid, one piece design.

Where a 6.0mm corrosion allowance is specified in the valve data sheet, valves shall include a 316 SS weld overlay on seat pocket areas.

7.2 Gate, Globe, Check and Needle Valves

Regular port design shall be supplied unless noted otherwise on the individual valve data sheets.

Gate, globe and needle valves shall be suitable for re-packing under pressure in the fully open position.

The direction of flow shall be cast or steel stamped on the globe valve and check valve bodies and on uni-directional valves. Low stress stamps must be used where required, but are not permitted on valves with a minimum design temperature below minus 46°C.

Valves DN 50mm and above with Outside Screw and Yokes shall be provided with stem protectors and visual position indicators.

Vendor shall submit CV values for Globe Valves with bid.

7.3 Butterfly Valves

All butterfly valves shall be fully lugged type with holes through drilled and tapped ASME B1.1 coarse thread series (UNC) 1" diameter and smaller and 8 thread series (UN) $1^1/_8$" diameter and greater. If valves are required to accommodate galvanised bolting, then this requirement will be stated on the individual valve data sheet.

The valve supplier shall stipulate the number and length of bolts required for each size and type of valve where partial penetration tapped holes are used in their design.

Valves shall be suitable for installation between ASME B16.5 RF flanges DN 80 to DN 600 and ASME B16.47 Series A RF flanges DN 650 and greater, up to and including Class 600.

For rubber lined valves the Vendor shall submit with bid, full details of how the liner is locked into the body, and how it is sealed around the valve stem.

The Vendor is responsible for checking the liner and seal rings suitability for the design conditions and service fluids stated on the valve data sheets. Confirmation of the suitability shall be stated in the Vendor's bid.

Where specified on the data sheet, valves shall be of a fire tested design to BS6755 Pt 2 or API 607, certified accordingly and fitted with fire safe seals.

7.4 Monoflange and Modular Valves

The technical requirements specified herein shall be applicable to valves of 'Monoblock' or 'Modular' construction where single block and bleed valve or double block and bleed service is required for instrument isolation or similar services in size DN15 to DN50.

Monoblock' or 'Modular' valves shall be in full compliance with the requirements of ASME B16.34.

The pressure and temperature rating of the valve body and pressure containing parts shall be in compliance with ASME B16.34. Resilient seats shall be fully rated to 150 deg. C.

Valve dimensions shall be in accordance with Manufacturer's written standard.

'Monoblock' or 'Modular' valves shall be integral single block and bleed valve or double block and bleed valves with one of the following types of assemblies as identified in the data sheets:

- Integral one piece forged body with one or two individual isolation valves with a bleed valve for vent / drain the isolated section.
- Slim-line type assembly, consisting of Monoflange body with one or two isolating valves and a bleed valve.

All Isolation and Bleed valves shall have bolted bonnets.

Needle valves shall have non-rotating tip and open from the flow side.

Gate valves shall be of conical plug or solid wedge type.

Pressure passage hole in the monoflanges shall be minimum 6.0mm and maximum 6.5mm.

End connections shall be as indicated in the data sheets. Vent connection shall be anti-tamper type. Vent port shall be fitted with a plug.

Stems shall be blow out proof.

The monoblock valve shall provide for instrument connections as indicated in the data sheets. Where threaded connection for instrumentation are indicated, the threading shall be ½" NPTF.

Fully assembled valves shall be production shell hydrostatic tested and seat hydrostatic tested in accordance with BS 6755 Part 1 or similar. Leakage rate shall be zero.

7.5 Hot Oil Service Requirements

Where specified on the valve data sheet, valves shall be suitable for hot oil service and have a previous history of use in this service, details of which shall be submitted with bid.

8 VALVE OPERATOR REQUIREMENTS

8.1 Levers and hand wheels on valves including gear operators shall be permanently marked "OPEN" or "CLOSE" with an arrow to indicate direction of rotation.

8.2 Where stated on the valve data sheet, valves shall be fitted with a facility for locking in the open or closed position. Locking shall be achieved by the insertion of the shank of a standard padlock. Keys and padlocks will be supplied by 'others'.

8.3 All valves shall be suitable for the retrofitting of Valve Interlocks after installation at site, by others, without affecting the pressure envelope of the valve or valve manufacturers warranty. The Vendor shall be responsible for liaison with the selected interlock manufacturer to ensure compatibility of valve and locking device. All valve topworks details required by interlock manufacturer shall be supplied by Vendor free of charge.

8.4 Valves shall be capable of satisfactory operation with the valve stem in any position i.e. vertical, horizontal or inclined.

8.5 Valve operators shall be as stated on the valve data sheets provided the torque or direct force does not exceed 350N under maximum differential pressure. Where this torque is exceeded the Vendor shall highlight this in the bid.

8.6 Wrench and Lever Operators

8.6.1 Wrench and lever operators shall be fitted with stops at the fully open and closed positions to prevent the ball or blades moving through more than 90°. These stops may be raised bosses, integrally cast or forged with the valve body. Preferred location for the plate, which strikes the stops, is permanently attached to the stem as opposed to attached to the wrench, which may be removed allowing mal-operation.

8.6.2 Butterfly valves shall have lever locating spigots and holes at intermediate points of their travel to regulate the flow as well as at the fully-open & fully-closed positions, this is not a locking device unless otherwise called for in the valve data sheet.

8.6.3 Valves shall be fitted with the facility of a stem extension to clear insulation if stated in the valve data sheet. Valves shall also be suitable for retro-fitting vendor's extension devices at site.

8.7 Gear Operators

8.7.1 Bevel or worm gear types shall be complete with handwheels and position indicators. The operators shall be weatherproof, totally enclosed and packed with suitable lubricant. Where the units are not "sealed for life" they shall be suitable for re-packing with grease whilst the valve is installed in line. Gear operators shall be mounted in such a way that they can be easily unbolted from the valve body and subsequently be re-positioned in 90° increments.

8.7.2 Bevel or worm gear types shall be complete with handwheels and position indicators. The operators shall be weatherproof, totally enclosed and packed with suitable lubricant. Where the units are not "sealed for life" they shall be suitable for re-packing with grease whilst the valve is installed in line. Gear operators shall be mounted in such a way that they can be easily unbolted from the valve body and subsequently be re-positioned in 90° increments.

8.8 Cryogenic Service

8.8.1 Valves required for 'Cryogenic Service' shall have extended bonnets of with sufficient length and vapour space between body and stuffing box to maintain the gland packing and/or seals near ambient temperature and to keep them soft and pliable for optimum sealing. All valve extensions shall have a stuffing box packing or seal at the top.

8.8.2 Valves shall be provided with an insulating collar/drip plate welded around the extended bonnet. In case of a flanged bonnet construction, there shall be a sufficient distance between the drip plate and bonnet flange to facilitate mounting of the bonnet flange bolts.

9 SPECIALTY PIPING (SP) ITEM DESIGN

9.1 SP items shall be in accordance with the relevant Codes and Standards unless otherwise stated on the individual data sheets. If there is no relevant code or standard then these shall be in accordance with ASME B31.3 1999 – 'Process Piping'.

9.2 The Vendor is responsible for selecting all seats, seals or pressure-limiting component to ensure that these are of suitable grade to meet the design conditions specified on the data sheet. Confirmation of the suitability or limitation e.g. maximum pressure at the specified temperature shall be stated in the Vendor's bid.

10 PRESSURE RETAINING BOLTING REQUIREMENTS

10.1 Body, bonnet and gland bolting on valves and SP items shall be as stated on the data sheet and shall generally comply with the following:

Bolting Material	Bolting Material Specification	Nut Material Specification (Heavy)	Design Temperature °C	NACE MR01-75 Compliant
Alloy steel	ASTM A193 Gr. B7	ASTM A194 Gr. 2H	-46 to 350	No
Alloy steel	ASTM A193 Gr. B7M	ASTM A194 Gr. 2HM	-46 to 300	Yes

Low Temp Alloy steel	ASTM A320 Gr. L7M	ASTM A194 Gr.7M	-50 to 300	Yes
316 SS Note i	ASTM A193 Gr.B8M Class 2	ASTM A194 Gr.8MA	-100 to 200	No
Duplex SS (22 Cr)	Duplex SS (UNS S31803)	Duplex SS (UNS S31803)	-50 to 100	Yes
Super Duplex SS (25 Cr) Note iii	Duplex SS (UNS S32750)	Duplex SS (UNS S33750)	-50 to 145	Yes

Note:

i) The use of stainless steel bolting to UNS S31600 (B8M or B8M Class 2) or equivalent is not permitted for any pressure containing application in an Offshore or saliferous environment were the operating temperature is above 60°C.

ii) The use of stainless steel bolting to UNS S30400 (B8) or equivalent is not permitted for any pressure containing application in an Offshore or saliferous environment.

iii) Pressure containing bolting to UNS S32750 (or approved equivalent) shall be supplied with mechanical properties equal to or greater than ASTM A193 B7. Pitting resistance equivalent shall be PRE 40 or greater.

11 TESTING

11.1 Floating ball, gate, globe, needle and piston check valves, shall be pressure tested in accordance with BS6755 Part 1, leakage rate 'A' (i.e. zero) unless specified otherwise in the data sheet.

11.2 Trunnion mounted ball, butterfly, swing check and dual plate wafer check valves, shall be pressure tested in accordance with API 598. Butterfly valves DN 350 and larger shall also be subjected to a disk strength test in accordance with BS5155.

11.3 See Table 1 and 2 for additional non-destructive testing requirements and Table 3 for specific pressure testing requirements.

11.4 SP items shall be tested in accordance with manufacturers and accepted industry standards. Vendor shall provide details of all testing offered for purchaser review with bid.

11.5 Valves and SP items shall be clean built, unpainted and free from preservatives and grease during testing.

11.6 Hydrostatic testing shall be completed using potable water containing 1% by volume of biodegradable wetting agent. Maximum chloride content shall be 25ppm and the pH value shall be between 6.0 and 8.0.

11.7 Castings shall not be impregnated with any material to prevent leakage.

11.8 Upon completion of satisfactory testing all components to be thoroughly drained and dried prior to preparation for packing.

12 PAINTING

12.1 All carbon steel valves, SP items and corrodible external parts shall be supplied finish painted to Purchaser approved manufacturers standard. Details of preparation and painting offered shall be supplied by Vendor at bid stage for review and shall include the following:

- Manufacturers data sheet for the paint system offered
- Manufacturers procedure for surface preparation and application of the paint system, including a repair procedure.

The paint system offered shall be suitable for final coating by others, using the manufacturers standard paint system as an intermediate coat. Finish colour shall be Pastel Grey.

12.2 Painting shall be carried out after successful completion of all testing and inspection.

13 MARKING

13.1 In addition to the markings required by MSS SP-25 each valve / SP item shall be provided with a stainless steel tag 50mm x 20mm x 3mm with the valve / SP item tag number, purchase order number and purchase order item number punched on. The tag shall be attached to the valve with stainless steel wire.

14 PREPARATION FOR SHIPMENT

14.1 Gate, globe, needle and butterfly valves shall be dispatched in the fully closed position. Ball valves shall be dispatched in the open position.

14.2 All valves and SP items shall be protected against corrosion and mechanical damage and the Vendors / Manufacturers procedures, a copy of which shall be supplied with bid for Purchaser review.

14.3 All flange faces shall be supplied with proprietary heavy duty plastic flange protectors or bolted on wooden covers. Butt weld and threaded ends shall be supplied with suitable bevel and thread protectors and plugs to prevent the ingress of dirt.

15 INSPECTION REQUIREMENTS

15.1 Typical Inspection & Test Plan shall be submitted for review with the bid. All valves and SP items will be subject to inspection in accordance with the Purchaser approved Vendor Inspection & Test Plan.

15.1 Bidder to submit manufacturing schedule with the bid in order arrange third party inspection during manufacturing process. All cost related to 3rd party will be borne

by OGDCL. Bidder to provide accommodation and necessary support to 3rd party during manufacturing process.

16 GUARANTEE

16.1 Vendor shall guarantee all equipment as being suitable for the design conditions and service fluids stated on the valve & SP item data sheets. Confirmation of suitability shall be stated in the Vendors bid e.g. seats, seals etc.

17 CERTIFICATION & TRACEABILITY

17.1 All valves and SP items shall be certified and copies of all documentation shall be supplied for each valve and SP item. Blanket certification is not acceptable. Certificates shall be provided in accordance with material requisition Document Data Submittal Requirements (DDSR) covering each item supplied. All certificates shall be fully traceable to the item covered and shall be marked with the Purchasers order number, item number and tag/part number. They shall be clearly legible, in the English language.

17.2 Material Certificates for basic material i.e. plate, forgings, or castings used in the manufacture of flanges and valve/SP item bodies, bonnets and pressure retaining parts shall be furnished as test certificates of the EN 10204 3.1B type. Vendor shall confirm which parts are considered pressure retaining (see RFQ/PO Exhibit 'E' Attachment No 1) and shall include a list in the bid for Purchaser review.

17.3 The certificates shall be issued, stamped and signed by the material Manufacturer's inspector, who shall be independent of the Manufacturer's Production Department. This certificate shall also be stamped and verified by the valve Manufacturer's QA/QC Department.

17.4 Where basic material is further processed by the Vendor to form the valve/SP item body or internal components and such process may change the mechanical properties, etc., the Vendor shall also furnish EN 10204 -3.1B type certificates for the Manufacture of the furnished item.

17.5 For valve and SP item internals and non-pressure containing parts, works reports of the BS EN 10204 2.2 type shall be acceptable.

17.6 The valve/SP item supplier shall supply certificates of conformity for non-metallic components of valves/SP items.

18 DOCUMENTATION

18.1 Documentation shall be submitted in accordance with material requisition Document Data Submittal Requirements (DDSR).

TABLE 1 - NON-DESTRUCTIVE TESTING REQUIREMENTS

Material	Pressure Rating Class	Manufacturing Method	Visual Inspection	Radiography / Ultrasonic Inspection	Magnetic Particle Inspection	Liquid Penetrant Inspection	Liner Spark Test
All	150 to 2500	Forging	100%	N/A	N/A	N/A	N/A
LT Carbon Steel Carbon Steel Bronze	150 to 600 900 1500 to 2500	Casting	100% 100% 100%	N/A 10% 100%	N/A 10% 100%	N/A N/A N/A	N/A N/A N/A
Duplex SS Austenitic SS	150 to 600 900 1500 to 2500	Casting	100% 100% 100%	N/A 10% 100%	N/A N/A N/A	N/A 10% 100%	N/A N/A N/A
Rubber Lined Ductile Iron / Carbon Steel	All	All	100%	N/A	N/A	N/A	100%

1.1 All prototype castings shall have been subjected to 100% volumetric examination in accordance with ASME B16.34 Section 8.0.

1.2 Radiography shall be carried out on critical areas as defined by ASME B16.34.

1.3 MPI or DPI shall be carried on all accessible interior and exterior surfaces, including machined surfaces.

1.4 Ultrasonic examination of castings may be carried after specific approval by the Purchaser, where radiographic inspection is not feasible.

1.5 Testing to be carried on the percentage of casting quantity shown, within a minimum of one.

1.6 Refer to Table 2 for NDE method and acceptance criteria.

TABLE 2 - NON-DESTRUCTIVE TESTING STANDARDS

NDE Method	Standard & Acceptance Criteria
Visual Casting Forging	 MSS SP 55 ASME V Article 9
Radiography Casting	 ASME B16.34 ANNEX B
Ultrasonics Castings	 ASME B16.34 ANNEX E
Magnetic Particle Casting	 ASME B16.34 ANNEX C
Liquid Penetrant Casting	 ASME B16.34 ANNEX D

TABLE 3 - PRESSURE TESTING REQUIREMENTS

Valve Type	Hydrotest Body (1.5 x DP)	Hydrotest Seat (1.1 x DP)	Hydrotest Backseat (1.1 x DP)	Pneumatic Test Seat (6 bar)	Disc Strength Test (1.5 x DP)
Ball	100%	100%	N/A	100%	N/A
Gate	100%	100%	100%	100%	N/A
Globe/Needle	100%	100%	100%	100%	N/A
Check	100%	100%	N/A	100%	N/A
Butterfly	100%	100%	N/A	100%	Valves 14” NPS & Larger