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ADNOC

ADNOC GROUP PROJECTS AND ENGINEERING

SPECIFICATION OF MANUAL PIPING AND PIPELINE VALVES

Specification

AGES-SP-09-003

ص ب 898، أبوظبي، الإمارات العربية المتحدة
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GROUP PROJECTS & ENGINEERING FUNCTION/ PT&CS DIRECTORATE

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DISTRIBUTION	Specification applicable to ADNOC & ADNOC Group Companies

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This document will be reviewed and updated in case of any changes affecting the activities described in this document.

INTER-RELATIONSHIPS AND STAKEHOLDERS

a) The following are inter-relationships for implementation of this Specification:

   i. ADNOC Upstream and ADNOC Downstream Directorates and

   ii. ADNOC Onshore, ADNOC Offshore, ADNOC Sour Gas, ADNOG Gas Processing. ADNOC LNG, ADNOC Refining, ADNOC Fertilisers, Borouge, Al Dhafra Petroleum, Al Yasat

b) The following are stakeholders for the purpose of this Specification:

   ADNOC PT&CS Directorate.

c) This Specification has been approved by the ADNOC PT&CS is to be implemented by each ADNOC Group company included above subject to and in accordance with their Delegation of Authority and other governance-related processes in order to ensure compliance

d) Each ADNOC Group company must establish/nominate a Technical Authority responsible for compliance with this Specification.

DEFINED TERMS / ABBREVIATIONS / REFERENCES

'ADNOC' means Abu Dhabi National Oil Company.

'ADNOC Group' means ADNOC together with each company in which ADNOC, directly or indirectly, controls fifty percent (50%) or more of the share capital.

'Approving Authority' means the decision-making body or employee with the required authority to approve Policies and Procedures or any changes to it.

'Business Line Directorates' or **'BLD'** means a directorate of ADNOC which is responsible for one or more Group Companies reporting to, or ope within the same line of business as, such directorate.

'Business Support Directorates and Functions' or **'Non- BLD'** means all the ADNOC functions and the remaining directorates, which are not ADNOC Business Line Directorates.

'CEO' means chief executive officer.

'Group Company' means any company within the ADNOC Group other than ADNOC.

'Standard' means normative references listed in this specification.

'COMPANY' means 'Abu Dhabi National Oil Company or any of its group companies. It may also include an agent or consultant authorized to act for, and on behalf of the COMPANY'.

'CONTRACTOR' means the party which carries out the project management, design, engineering, procurement, construction, commissioning for ADNOC projects.

'SHALL' Indicates mandatory requirements "**Group Company**" means any company within the ADNOC Group other than ADNOC.

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GENERAL

1 INTRODUCTION

This Specification covers technical requirements of valves intended to be used on ADNOC group of companies' facilities.

1.1 Purpose

This Specification provides the minimum requirements for the design, materials, construction, inspection and testing of manual piping valves for process and utility services. This specification also includes pipeline valves used within COMPANY facilities.

1.2 Scope

The requirements of this specification shall apply to all valves within ADNOC Group of Companies facilities irrespective of contractual or purchasing requirements for individual projects.

Valves covered are intended for application under the jurisdiction of ASME B31.3 for piping valves and ASME B31.4 & ASME B31.8 and other applicable codes for pipeline valves.

This specification supplements the Codes and Standards listed in Appendix 'A' of Section 'D' of this document and should be read in conjunction with the Piping Material Specification AGES-SP-09-002, purchase description on the Requisition and Valve Data Sheets.

This specification is also applicable to the On/Off valves with actuator (i.e. valves with Pneumatic / Hydraulic / Electrical actuators for example ESD, MOV, HIPPS valves etc.), however for technical requirements of actuator, relevant instrumentations specification for actuator shall be referred.

1.2.1 This specification covers following types of valves but not limited to following below.

1.2.1.1 Gate type

a) Solid wedge

b) Flexible wedge

c) Split wedge

d) Parallel slide

e) Through conduit gate valve

1.2.1.2 Ball type

a) Trunnion mounted and Floating

b) Soft seated & Metal seated

c) Integral Double block & Bleed, (IDBB)

1.2.1.3 Butterfly type

a) Single offset

b) Double offset

c) Triple offset

d) Rubber lined

1.2.1.4 Check Type

a) Piston lift

b) Ball Lift

c) Disk

d) Swing

e) Dual Plate

f) Non Slam Axial flow

1.2.1.5 Globe type

a) Straight pattern

b) Y pattern

c) Angle pattern

d) Diaphragm valve

1.2.1.6 Plug type

a) Lubricated & Non-lubricated

b) Jacketed etc.

1.2.2 The following types of valves are excluded from this Specification:

a) Wellhead & Christmas Tree valves which are covered by ADNOC Group of Companies Specification.

b) Subsea Valves

c) Cast iron valves.

d) Non-metallic valves.

e) Valves for the instrumentation tubing.

f) Valves for Heating, plumbing, ventilation and similar piping inside buildings.

g) Relief valves

h) Special valves (as noted on the Process and Instrumentation Diagrams (P&IDs)

1.3 Valve Data Sheet

The Valve Data Sheet is a critical document which defines all the technical requirements for each type of valve. Valve Data Sheets shall be created for individual projects to meet specific process or facility requirements and the requirements of this specification.

1.4 Technical Terms - Definitions

Pressure Containing Parts - Parts, such as the body, bonnet, cover, bolting and stem or shaft whose failure to function as intended results in a release of contained fluid into the environment.

Pressure Controlling Parts - Parts, such as obturator (ball, plug or disc) and seat, intended to prevent or permit the flow of fluids.

Supplier/Vendor - Entity entering into a contract with Company to provide materials, goods, supplies, equipment, or plant and includes the successors and (or) permitted assigns of such entity.

Valve Manufacturer - Entity or sub-supplier producing the valve.

Fire Safe - Means compliance with API 607 ISO 10497 or API 6FA unless otherwise specified.

Wafer Body - Describes a valve, which is installed between mating pipe flanges and held in place by the compressive force produced by the mating flange bolt forces.

Lug Body - Described "single flange" valve where all the flange bolts are covered by the valve body material. The valve is held in place either by the compressive force produced by the mating flange bolt forces (drilled-thru), or by the use of cap screws threaded into the valve body (drilled and tapped).

Flanged - Valve is a double-flanged valve that is installed in the piping system with two sets of stud bolts. Some flanged valves have a few drilled and tapped holes due to the valve design (e.g., butterfly valves).

NACE - Where specified, means that materials and valves are required to be in accordance with the requirements of NACE MR0175/ISO 15156 & NACE MR0103/ISO 17945 as applicable

Full Port (Bore) - The port shall meet the minimum full opening requirements of the design standard or as specified ASME B16.34 Annex A where no port size is defined.

Standard Port - Industry terms with varying meanings depending on the design standard. Usually used in conjunction with API 602 valves where a minimum port size is defined but no descriptive term is used. When used with ASME B16.34, API 600 or API 603 valves, these terms mean the port sizes as defined by those standards (i.e., full port per ASME B16.34 Annex A).

Reduced Port - A port smaller than full port, sometimes defined by the industry standard specified for the valve. For example, API 602 defines port sizes which are reduced port but does not specify a defining term. API 608 lists Reduced Port minimum diameters for each size valve.

Regular Port - A port smaller than full port, but larger than reduced port, defined by the industry standard specified for the valve. For example, API 608 lists regular port diameters for each size valve.

Venturi - A substantially reduced port valve with a smooth transition from the valve ends to the reduced opening.

ITP - Inspection & Test Plan prepared by the CONTRACTOR/ MANUFACTURER, reviewed and approved by COMPANY, highlighting the principal hold and witnessing points during and after the process of the product realization (i.e.: manufacturing, fabrication, construction, installation), to ensure that the quality level of the product is within the acceptable design standards and requirements

Dead End Service - A valve that shall be suitable for pressurized service during which the downstream piping is removed for equipment maintenance. The valve shall be designed such that no downstream flange is required to be installed during service, and the closure shall be leak tight.

Cap Screw - A headed bolt designed to secure two components together by engagement in a drilled and tapped hole (similar but not identical to a machine bolt).

Cryogenic – Valves identified as “Cryogenic” in the valve description are intended for service colder than -50 °C.

1.5 Abbreviations

Abbreviation / Acronym	Description
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AYS	Average yield strength

Abbreviation / Acronym	Description
BW	Butt Weld
CA	Corrosion Allowance
COMPANY	Either ADNOC or ADNOC Group Company
CRA	Corrosion Resistant Alloy
CS	Carbon Steel
Cv	Valve Coefficient
DBB	Double Block And Bleed
DIB	Double Isolation And Bleed
DPE	Double Piston Effect
DSS	Duplex Stainless Steel
ENP	Electro less Nickel Plating
ESD	Emergency Shutdown
Ext WE	Extended Weld End
FF	Flat Face
HBNR	Hydrogenated Nitrile Butadiene Rubber
HDSG	Hot Dip Spun Galvanised
HIC	Hydrogen Induced Cracking
HVOF	High Velocity Oxygen Fuel
ISO	International Organization for Standardization
ITP	Inspection And Test Plan
IDBB	Integral Double Block And Bleed
LA	Low Alloy Steel
LTCS	Low Temperature Carbon Steel
MOV	Motor Operated Valve

Abbreviation / Acronym	Description
MESC	Materials and Equipment Standards and Codes
MSS	Manufacturers Standardization Society
MT	Magnetic Particle Testing
NACE	National Association of Corrosion Engineers
NBR	Nitrile Butadiene Rubber
NDE	Non-Destructive Examination
NPS	Nominal Pipe Size
PCD	Pitch Circle Diameter (If Referring To Bolting Pattern)
PEEK	Polyetheretherketones
PMI	Positive Material Identification
PQR	Procedure Qualification Records
PT	Liquid Penetrant Testing
PTFE	Polytetrafluoroethylene
RPTFE	Reinforced Polytetrafluoroethylene
QL	Quality Level
QS	Quality Specification
QTC	Quality Test Coupon
RF	Raised Face
RPTFE	Reinforced Polytetrafluoroethylene
RT	Radiographic Testing
RTJ	Ring Type Joint
SDSS	Super Duplex Stainless Steel
SDV	Shut Down Valve
SPE	Specifications Document

Abbreviation / Acronym	Description
SPIR	Spare Parts Interchangeability Report
SMYS	Specified Minimum Yield Strength
TSO	Tight Shut Off
SS	Stainless Steel
UT	Ultrasonic Testing
WPS	Welding Procedure Specification
VDRL	Vendor Document Requirement List

SECTION A

2 NORMATIVE REFERENCES

International Code(s) and Standards are listed in Appendix ‘A’ Section ‘D’

3 REFERENCE DOCUMENTS

Reference documents are listed in Appendix ‘A’ Section ‘D’

4 DOCUMENTS PRECEDENCE

It shall be the CONTRACTOR’s responsibility to be, or to become, knowledgeable of the requirements of the referenced Codes and Standards.

The CONTRACTOR shall notify the COMPANY of any apparent conflict between this Specification, design drawings, the related data sheets, the Codes and Standards and any other Design General Specifications noted herein. Resolution and/or interpretation of precedence shall be obtained from the COMPANY in writing before proceeding with the design/manufacture.

In the event of a conflict between documents, the following hierarchy of adherence shall be followed:

1) UAE Statutory Legislation and Regulations
2) ADNOC Code of Practices
3) Purchase Order or Contract documents including PROJECT drawings and Specifications
4) COMPANY General Specifications and Standards
5) International Codes & Standards

In case of conflict between documents in the same level of hierarchy, the most stringent requirement shall apply. Such interpretation of the most stringent requirement shall be subject to COMPANY’s approval utilizing a technical query sheet. In all such cases of conflict, COMPANY’s decision shall be final.

5 TECHNICAL DEVIATION CONTROL

Deviations from this specification are only acceptable where the MANUFACTURER has listed in his quotation the requirements he cannot, or does not wish to comply with, and the COMPANY/CONTRACTOR has accepted in writing the deviations before the order is placed.

In the absence of a list of deviations, it will be assumed that the MANUFACTURER complies fully with this specification.

Any technical deviations to the Purchase Order and its attachments including, but not limited to, the Data Sheets and Narrative Specifications shall be sought by the VENDOR only through Concession Request Format. Concession requests require CONTRACTOR’S and COMPANY’S review/approval, prior to the proposed technical changes being implemented. Technical changes implemented prior to COMPANY approval are subject to rejection.

6 DESIGN BASIS

This specification provides the design basis for the specifications and requirements of Manual Piping and Pipeline valve types.

6.1 Design Parameters

6.1.1 The design parameters required for each valve shall comply with the requirements stated in the Index of Piping Classes, associated Piping Material Class documents and individual Valve Data Sheets.

6.2 Design Philosophy/Guidelines

This specification provides the basis of design for manual and pipeline valves used in all ADNOC Group of Company facilities. The design requirements shall be used as guidelines for the development of service and facility dependent Valve Data Sheets and Purchasing documentation.

6.3 Environmental / Site Data

Specific environmental requirements of individual sites / facilities are given within individual project 'Basis of Design' documentation.

6.4 Area Classification

There are no requirements given within this document for specific Area Classifications. However, considerations of individual area classifications are an integral part of the criticality s for all valves.

6.5 Minimum Design Requirements

The requirements for valves provided in this document and associated Valve Data Sheets, shall be considered 'the minimum' to be provided.

6.6 Design Life

Valves shall have a design life of 30 years and be suitable for continuous service in the environment specified

SECTION B

7 VALVE DESIGN

7.1 General

General design requirement of valves shall be as specified below.

7.2 Pressure Temperature

7.2.1 Pressure classes shall be specified in accordance with the applicable tables for material groups in ASME B16.34. All valves, including soft seated valves, shall be designed for full pressure temperature class specified in datasheet. Intermediate rated valves shall not be considered.

7.2.2 Materials that are not listed in ASME B16.34, the pressure-temperature s of valves shall be determined in conformance to Appendix B of ASME B16.34 and shall be subject to agreement by COMPANY

7.2.3 API 5000 and API 10000 rated valves shall be designed and fully rated in accordance with API 6A/ ISO 10423.

7.2.4 For unlisted material (in ASME B16.34) when specifically requested in valve datasheet, vendor shall submit the valve body and the valve seat pressure-temperature along with the quotation. Related calculation shall be submitted by the Vendor during the drawing review stage.

7.2.5 Non-metallic materials used as sealing components shall be suitable for use for the full range between the minimum and maximum design temperature at full rated pressure and other applicable design considerations.

7.2.6 For Ni-Al-Br valves, valve body and the valve seat pressure-temperature shall be submitted by the VENDOR along with the quotation.

7.2.7 Valves with ASTM A494 CW6MC material shall be designed for valve pressure temperature in accordance with ASTM B564 UNS N06625 material pressure temperature. (ASME B16.34, Table 2-3.8).

7.3 Corrosion Allowance

7.3.1 Unless specified otherwise on the valve data sheets, the minimum corrosion allowance for carbon and low alloy steel valves shall considered to be 3 mm, for valves used in Piping Material Classes with CA values 3 mm and below. For valves used in Piping Material Classes with CA values of 4.5 mm or 6 mm the valve design shall comply with that value. Some non-CS/LTCS Piping Material Classes specify CA values. Valves used in such piping material classes shall be designed and supplied with CA allowances to match the individual piping material class requirements.

7.3.2 The required corrosion allowance shall be in addition to the minimum thicknesses specified in the valve design code and ASME B16.34.

7.3.3 Additional thickness due to weld overlay cladding shall not be considered as a part of pressure retaining thickness of the valve.

7.4 Valve Face to Face or End to End Dimensions

7.4.1 The face-to-face dimensions for flanged end (flat face, raised face or ring joint) valves and end-to-end dimensions for butt-weld end valves shall conform to ASME B16.10/API 6D or other international standards as applicable.

7.4.2 Valves in larger sizes not covered by ASME B16.10/API 6D (or as per applicable international code/ standard) shall be to the VENDORS standard and the face to face dimension shall be submitted as a part of technical bid documents for COMPANY review/approval.

7.4.3 Valves with sizes higher than the standard code limits, design rules for the valves shall be submitted by the VENDOR during the bid stage itself and agreed with COMPANY. Such valves shall be subject to FEA study by the VENDOR.

7.4.4 Valves in API 5000 and API 10000 class shall be to API Spec 6A/ ISO 10423.

7.4.5 For double flanged pattern valves, vendor shall ensure nut space between flanges is adequate to allow for at least two threads to protrude above the nut (heavy series nuts ASME B18.2.2) without contacting each other.

7.5 Valve End Connections

7.5.1 The valve flanged ends shall be integral with the valve body or end closure forging or casting. Flanged end valves with welded on flanges are not permitted.

7.5.2 Flanged end dimensions, tolerance, face finishes, drilling templates, and flange facing including gasket surface finish, shall be in accordance with the following:

7.5.2.1 ASME B16.5 for NPS 24 and smaller.

7.5.2.2 ASME B16.47 Series A for flanges larger than NPS 24

7.5.2.3 ASME B 16.5, Applicable pressure class, drilling for non-metallic valves (e.g., PVC, CPVC).

7.5.2.4 Ring joint grooves shall be in accordance with ASME B16.20.

7.5.2.5 For Flanges not covered in ASME B 16.5 / ASME B16.47, the flanges shall be designed as API 6A, ASME Sec VIII, Compact flanges as per BS EN ISO 27509 or Hub connections as specified in the Valve datasheet

7.5.2.6 Gasket contact faces of valves shall receive the same finish machining as the contact faces of the piping flanges between which these valves will be installed. This flange face finish shall be in accordance with Piping Material specification AGES-SP-09-002

7.5.3 The back faces of flanges shall be machined flat, either as spot facings at the nut positions or machined over the entire back flange area. The nut seating area shall not present an “as cast” or “as forged” surface for the nuts. Additionally, the valve end connections shall be designed to allow heavy series nuts (ASME B18.2.2) to be used for the piping connections, allowing for at least two threads to protrude above the nut with a minimum of 5mm gap to other valve body parts or bolting.

7.5.4 For valves with FF flanges (ASME Class 150 & 300), VENDOR shall provide the full thickness of flange. Removing the 2mm raised face is not acceptable and the valve shall be considered as non-standard.

7.5.5 Socket Welded ends shall be as per ASME B16.11 and ASME B31.3.

7.5.6 Threaded ends shall be as per ASME B1.20.1, Taper

7.5.7 Butt Welded End Valves.

7.5.7.1 The material and wall thickness for the pipe extension spools shall be stated on the Valve Data Sheet.

7.5.7.2 Unless specified otherwise on the valve data sheets, weld end valves that contain elastomer or polymer seals or seats shall have extension spools (pipe pups) as specified below.

Valve Size	Pup Length
NPS 2 to NPS 8	200 mm
NPS 10 to NPS 20	Minimum 1*D* or Maximum 500 mm
NPS 24 and above	800 mm
NOTE '*D*' being NPS	

7.5.7.3 The manufacturer shall provide the pup pieces as forgings equal to the highest material grade specified, that being the valve body or the associated piping/pipeline.

7.5.7.4 Pup piece shall be of the same material as the adjoining line pipe. Outside diameter, wall thickness, material grade and composition of the pup pieces shall be as specified in the Valve datasheet. Vendor shall provide test rings (500mm long) from pup piece material for field weld procedure qualification in case pup piece is of forged execution.

7.5.7.5 Butt welding end valves manufactured by machining the flanges off a flanged end valve shall not be used.

7.5.7.6 Heat treatment shall be performed if required by the applicable material specification and applicable piping design code. Additional requirements for heat treatment to ensure suitability for service conditions shall be as specified on the valve data sheets.

7.5.7.7 Post weld heat treatment, if required, shall be performed prior to final valve assembly.

7.5.7.8 Pipe pups shall permit hydrostatic shell testing of the valve after welding. When the test pressure is limited by pup pieces, the manufacturer shall highlight it to the purchaser in order to establish adequate testing procedures and manufacturing sequence.

7.5.7.9 Valves requiring extension (pup) pieces welded to the valve body, shall be supplied complete from the manufacturer or their designated sub-contractor to ensure seal performance and welding compatibility with the body.

7.5.7.10 An intermediate adaptor to match pipe thickness to valve body thickness shall be provided where necessary, to allow for transition between the valve body (material grade and thickness) and the adjacent pipe (material grade and thickness) to which the valve is intended to be connected. Transition tapers shall not be steeper than 1:4 and shall comply with ASME B31.3:2016, Figure 328.4.3 (ASME B31.8:2016, Figure I 5 or ISO 13847, 7.7).

7.5.7.11 Conversion of flanged end to a butt-welding end is not permitted.

7.5.8 Compact Flange End Valves

When compact flanges specified in the valve datasheet, below shall be complied with.

7.5.8.1 Compact Flanges as per BS EN ISO 27509.

7.5.8.2 For sizes not covered in BS EN ISO 27509, Compact Flanges shall be as per manufacturer's standard and valve VENDOR shall coordinate with compact flange VENDOR to properly integrate the compact flange design into the valve body design and shall get the necessary flange details from compact flange VENDOR to incorporate the compact flanges at the valve ends.

7.5.8.3 Valve shall be supplied along with mating compact flanges, if compact flange size not covered in standard BS EN ISO 27509. Such flange joint shall be subject FEA analysis. Calculation report shall be submitted.

7.5.9 Hub End Valves

For case of hub ended valves when specified in datasheet, the hubs shall be integral part of the body and shall be of Graylok or Techlok or approved equivalent type. The valve shall be supplied with clamp

assembly, seal ring, bolting and two mating hubs with BW ends to match pipe dimensions (OD x wall thickness) and metallurgy specified in the valve data sheet.

7.6 Valves in Steam Service

7.6.1 For isolation service, gate valves shall be used for steam service.

7.6.2 Globe valves shall be Y type pattern to reduce pressure drop and erosion damage.

7.6.3 Gate valves in steam and condensate service will be subject to temperature changes, and any liquid trapped within the valve cavity will expand and cause excessive cavity pressure. To avoid binding of wedge and seat, flexible wedge/parallel wedge type gate valves shall be used.

7.6.4 The welded seat and backseat shall be designed to minimize possible erosion damage between seating elements and the body.

7.6.5 In steam and condensate systems the body cavity relief (pressure equalization) provisions shall be given in valves for NPS 2 and above.

7.6.6 For steam services, valves NPS 6 and larger in ASME class 600 and higher shall have a bypass valve for preheating and pressure balancing.

7.7 Auxiliary Connection of Valves.

7.7.1 Valve bodies specified with tapped openings shall be bossed, drilled and tapped in accordance with ASME B16.34. Threads shall be internally taper threaded in accordance with ASME B1.20.1.

7.7.2 Number of auxiliary connections on the valve body shall be minimized.

7.7.3 The valve body cavity drain, and vent connection shall be at the lowest and the highest point respectively. The projection of all auxiliary connections beyond valve body shall be minimized to avoid damage during valve handling. Positions for vent & drain connections shall be in accordance with ASME B16.34.

7.7.4 Vent and drain connections if provided, minimum sizes shall comply with MSS SP-45. For sizes NPS 26 and above, the minimum size of connection shall be NPS 2.

7.7.5 For valve sizes NPS 10 and above, auxiliary body connection for drain and vent shall be terminated in a flange and blind flange. The flange shall have pressure class and facing equal to that of the valve body flange. The flange shall be integral or welded to the valve body. If welded, flange shall be weld neck type. The bolt and gasket material shall be as specified in respective valve datasheets

7.7.6 Valves with a bore of NPS 3 and smaller may have a single drain and vent connection, at the lowest possible position on the valve body cavity.

7.7.7 Plugs at the body vent and drain shall be anti-blow out type and shall be with double O-ring with one fire safe seal. Bleed plugs shall be protected and secured against any involuntary or undue operation. Seal welding of plugs to valve body is not permitted. Material construction of the plug assembly shall be minimum equal to the valve trim material indicated in the valve datasheet.

7.7.8 .For corrosion resistant alloy (CRA) clad valve where drain and vent ports breach the CRA layer shall be suitably weld over-laid.

7.7.9 The sealant injection fittings shall incorporate a giant button head connection which is protected by a threaded cap. The protective cap shall have seal-off the button head connection by plugging the sealant port and shall allow any entrapped pressure to be released by the provision of a vent hole.

7.7.10 Injection devices shall be designed in accordance with ASME VIII Div 2 or a similar recognized industry design code.

7.7.11 Seat and stem sealant injection points shall have two non-return valves, each with a tungsten carbide ball and UNS N06625 spring, where one of the non-return valves shall be placed in a separate fitting inside the valve body. The non-return valve in the body wall shall be secured independent of the injection fitting. The internal check valve size shall be NPS 1/4 minimum. The threads shall be protected from the process fluid by seal and there shall be at least one fire safe seal.

7.7.12 Stem injection point shall be located above the primary sealing barrier. Graphite fire safe seal shall not be considered as a primary sealing barrier.

7.7.13 Design of the seat injection points to the seat shall enable cleaning and injection of sealant, to the ball and seat sealing surfaces.

7.7.14 The design of seat injection facility shall incorporate a sufficient number of injection fittings and canals to the seat area, to ensure good distribution of sealant or cleansing agent. A minimum of two injection fittings per seat shall be provided for valves NPS 16 (DN 400) and above. Injection fittings shall be equally spaced around the perimeter starting from the horizontal axis.

7.7.15 The requirement for auxiliary connection shall be as shown in the below table as applicable.

Type of connection / accessory	Isolation Valve
Vent	YES
Drain	YES
Sealant injection facility of upper stem for size NPS 6 and above	YES
Sealant injection facilities of seat for size NPS 6 and above for soft seated ball valves	YES

7.8 Additional Design Features

7.8.1 Valves supports (legs or saddles) shall be supplied and installed by the valve Manufacturer on valves of nominal mass of 250 kg and above. These supports shall only intend for shop testing, inspection, maintenance, storage & transportation. These valve supports are designed for the valve full of water, equipped with its actuator and gear box, excluding any other kind of loading. Such supports are not intended to be used as line support unless otherwise specifically indicated and approved by VENDOR. In such cases piping load at support point shall be furnished to valve vendor to design valve/support accordingly. Support design documents shall be submitted for approval including calculation notes.

7.8.2 Valve body shall withstand a compressive axial thrust equal to the design pressure times the maximum valve area. The thrust load shall not cause excessive distortion of the valve body, loss of sealing at the stem or between the closure member and the seats or affect the free movement of the closure member.

7.8.3 Valves with a closed body cavity shall have a means for relieving overpressure caused by thermal expansion of fluids.

7.8.4 Valves shall be clean and free of moisture and grease and assembled in clean conditions

7.8.5 Valves design shall minimize fugitive emissions. Particular attention shall be paid to have high integrity valve stem and seals with no leakage to the environment. All such valves shall meet fugitive emissions

test tightness as per BS EN ISO 15848 Part 1 & Part 2 and MESC SPE 77/312 with leakage class as per Section 11.1.1 unless otherwise specified in datasheet.

7.8.6 Cryogenic valves shall have extended bonnets. Valves requiring “Extended Bonnet” shall meet all the requirements as stated in MESC SPE 77/200 in addition to design and testing requirements specified in base standard of the valve & specified MESC SPEs. In addition Cryogenic Valves with a closed body cavity shall have a means for relieving overpressure caused by thermal expansion of fluids.

7.8.7 Valves shall be equipped with an anti-static feature/device as per applicable valve code/standards to ensure electrical continuity between ball, stem and body of valves. For this purpose, graphite seals are not considered to offer satisfactory electrical continuity. Anti-static device test shall be as per BE EN 12266-1 & 2

7.8.8 Fire Safe Requirements

7.8.8.1 Regardless of the valve type, all valves containing polymeric/elastomeric materials/installed on hydrocarbon/ flammable fluid lines shall have a “fire safe and fire type-tested certified design” in accordance with ISO 10497 or API 6FA or API 607 and shall include minimum a graphite fire safe barrier in the valve bonnet and stem sealing arrangement

7.8.8.2 Fire safe test shall be as per BS EN ISO 10497 or API 6FA or API 6FA or API 607 as applicable. All valves offered shall have qualified Fire test certification, details of which shall be available for PURCHASER review. The material of construction of valves in the certificate shall not be different/ vary from the material in data sheet.

7.8.8.3 Pre-existing design already qualified in conformance to ISO 10497, API STD 6FA or API 607 is also be used. The validation of the qualification will be limited to valves of the same design, showing same sealing materials as identified by ISO 10497 and same sealing arrangement as the “fire-tested” valve

7.8.8.4 Fire type test shall be conducted and witnessed by an independent agency

7.9 Valve Internal Components Design Features

7.9.1 Gland Packing /Seals, Associated Housing and Gaskets

7.9.1.1 Stem Packing and stem seals shall take into account the requirement for low emission, low maintenance service and shall be specifically engineered to achieve low emission.

7.9.1.2 The stem housing shall be overlaid with CRA material equivalent to valve trim to prevent corrosion between stem and housing. Depending on the design, the housing may be the bonnet, seal carrier and/or gland adjuster.

7.9.1.3 The gland follower shall be designed to protrude into the stuffing box by at least 1 mm before compressing the packing rings.

7.9.1.4 Threaded glands shall not be used.

7.9.1.5 The gland flange shall be one-piece. Split type gland flanges are not permitted.

7.9.1.6 Valve shall be supplied with the gland flange 90° to the stem.

7.9.1.7 Materials which are highly toxic to the environment or potentially carcinogenic shall not be used

7.9.1.8 The packing selected shall be non-Asbestos, compatible with the stem material, impregnated with sacrificial corrosion inhibitor.

7.9.1.9 Uninhibited graphite or carbon-type packing is not permitted, especially where in contact with stainless steels. Buna-N and Polyurethane are not permitted.

7.9.1.10 Graphite packing (excluding end rings) shall be low to medium density upper limit of 1.6 gm/cc and of high purity with a non-metallic, inorganic, phosphorous based, passivating, and corrosion inhibitor. Corrosion inhibitor shall be impregnated prior to die forming.

7.9.1.11 Graphite based valve stem packing, corrosion inhibited, die-formed flexible graphite with anti-extrusion rings, shall be used for proper sealing and further shall be adequate to control fugitive emission for appropriate services as specified.

7.9.1.12 Stem packing shall be serviceable / replaceable under full pressure, with valve open on stream.

7.9.1.13 Metallic body gasket shall have corrosion resistance equal, at least, to that of the body and bonnet materials and shall be suitable for the process design conditions.

7.9.1.14 CNAF jointing shall generally comply with BS 7531 Grade X or DIN 3754. The face shall be treated with graphite or graphite compound, except when in contact with Austenitic Stainless Steel where an aqueous solution is likely to be present.

7.9.1.15 Graphite packing shall not be used when the service medium contains seawater.

7.9.1.16 Split packing arrangements that incorporate a lantern ring shall be provided only if specified on the valve data sheets. For a split packing arrangement, lantern ring shall be a one-piece bushing of a material that is compatible with packing material and service conditions.

7.9.1.17 No gasket compounds shall be used on any flanged component other than a light application of either graphite and oil or light petroleum grease.

7.9.1.18 New gaskets shall be installed in valve bonnet and cover joints that were opened for any reason during the course of testing.

7.9.1.19 Any valve gland packing or stem seal that leaked during testing shall be replaced with new material following thorough drying of the gland and packing cavity. Shell and Seat hydrostatic testing shall then be repeated for these valves.

7.9.1.20 The type or style of valve stem packing or stem seals used during pressure testing shall be the same as that specified to be supplied with the valve.

7.9.1.21 All gasket surfaces shall be thoroughly cleaned and dried prior to preparation for packing and shipment.

7.9.2 Resilient Seat Inserts

7.9.2.1 Soft seated valves shall have a thermoplastic seat insert as specified on the valve data sheets.

7.9.2.2 The soft seat and seal materials specified in the valve data sheet are COMPANY preference and indicative only. Valves manufacturer and sealing manufacturer shall jointly validate the soft seat & seal materials for suitability for design, size and service condition

7.9.2.3 Soft seat shall withstand repeated open-close cycling without damage, cold flow, etc.

7.9.2.4 The following polymers shall are recommended and shall be confirmed by the valve Vendor & Sealing manufacturer: for the Design pressure temperature limits, size and service condition (example sour service, etc.). Soft seat materials listed in below table shall be limited to 150 °C.

Class	Type
600 and below	RPTFE/Modified RPTFE
Class 900 and above	PEEK

7.9.2.5 For wedge gate valves that employ soft seats:

a) Wear travel shall not be less than that required for the metal backup seat plus 2.3 mm (0.09 in), minimum.
b) Seat width shall be 2.4 mm to 6.4 mm (0.094 in to 0.25 in). The total remaining metal seat shall be no less than the width of the soft seat.

7.9.3 Elastomers for Valve Sealing

7.9.3.1 Elastomers used in valves, shall be compatible with:

- Operating conditions.
- Fluid Service / Product.
- Test fluid.
- Specified injected fluids.

7.9.3.2 Electrometric (elastomers) materials for seal shall be resistant to Explosive Decompression and shall be suitable for long term exposure to the transported fluid at design conditions

7.9.3.3 Rapid gas decompression resistant grades shall be used for all classes 150 and above

7.9.3.4 For seals at risk from rapid gas decompression in Class 300 and above, the O-ring section shall be limited to 0.275 in (6.99mm), unless specified otherwise.

7.9.3.5 Seal rings shall be fully contained to minimise the extrusion.

7.9.3.6 All Elastomeric seals shall comply with requirements of MESC SPE 85/301.

7.9.3.7 Vendor to propose the suitable sealing system when datasheet or purchase description specifies the vacuum design condition

7.9.3.8 Stem seals shall be self-energizing. Alternatives shall be subjected to Company approval.

7.9.3.9 Arrangements consisting of only a single O-ring or lip seal shall not be permitted for the stem sealing on Class 600 and above, instead there shall be two seals. It shall not be assumed that graphite “fire seals” provide an effective additional seal.

7.9.3.10 The housing design of elastomeric O-rings shall prevent risk of extrusion by use of thermoplastic back-up rings on both sides (PEEK or reinforced PTFE) for valves in piping class 900 and above.

7.9.3.11 For service temperature below up to -29°C, acceptable seal material are JW Elast-O-Lion series, JW-Aflas, Kalrez, Chem-O-Lion or approved equivalent. (with prior approval from Company). Service suitability of the selected seal materials are to be endorsed jointly by the Valve Vendor and seal supplier.

7.9.3.12 Seal material for chemical injection line shall be Kalrez or approved superior equivalent. Sufficient mixing length shall be provided for the first isolation valve downstream of the chemical injection point, otherwise selection of the seal materials shall be reviewed case by case for these locations.

7.9.4 Lip Seals

7.9.4.1 Lip seals shall be used in lieu of elastomeric seals (O-rings) for design rated pressures and temperatures below –20 °F (–29 °C) or where specified on the Valve Data Sheet.

7.9.4.2 Lip seals shall have an anti-collapse design incorpo RPTFE (limited to a maximum of class 600), PEEK or metal support ring, to prevent crushing against backpressure in the reverse direction. The jacket and spring design of lip seals shall be capable of accommodating these requirements.

7.9.4.3 Lip seals and V-packing (chevron) seals shall only be used on metallic surfaces of corrosion resistant material or with corrosion resistant overlay minimum equal to valve trim material (both at the dynamic and static sealing areas such as body joint).

7.9.4.4 Wherever valves with PTFE lip seal stem sealing, associated with sealant injection requirement, the seal shall be of anti-collapse design so that the injection of fluid does not compromise the integrity of the PTFE lip seal.

7.9.4.5 Vendor shall confirm lip seals are designed for service, with consideration to avoid dirt accumulation at the lip seal.

7.9.4.6 Backing ring at the lip seal is Elgiloy or approved equivalent.

7.9.4.7 Polymeric sheath at the seal shall be preferably RPTFE or PEEK.

7.9.4.8 Secondary back packing at the stem seal shall be chevron type V Pack followed by graphite packing.

7.9.4.9 Lip seal housing shall be designed for anti-ingress of solid particle.

7.9.4.10 Springs used in lip seals shall be UNS R30003 or UNS R30008.

7.9.5 Valve Stem

7.9.5.1 Stem shall be designed such that in the event of failure, it shall occur outside the valve pressure boundary.

7.9.5.2 Unless approved otherwise by the Purchaser, ball valve stems and plug valve/butterfly valve shafts shall be blow-out proof. "Blow-out proof" shall mean that no portion of the stem or shaft can be ejected from the valve due to internal pressure from the following causes: failure of the stem, shaft, stem-to-disc attachment or shaft-to-disc attachment; removal of the stem nut from the yoke; removal of the packing gland; removal of the handle.

7.9.5.3 Valve stems shall be designed such that the weakest section (thus the location which will fail preferentially) is outside of the pressure boundary.

7.9.5.4 Screwed connection between stem and closure member is not acceptable.

7.9.5.5 Stem design shall prevent galling potential between similar corrosion resistant materials.

7.9.5.6 Sealing surfaces (including packing area) on the stem shall have surface finish in conformance to the seal and packing material supplier's recommendation.

7.9.5.7 For all other valves where the stem and obturator/plug are separate components, stem shall be manufactured from wrought material (such as forgings or hot rolled bar) to a defined ASTM standard (or equivalent).

7.9.5.8 Rising stem designs shall include feature(s) that minimise the risk of rubbing or galling of the stem on either the seal/gland packing bore and/or gland packing retainer/cover.

7.9.5.9 Stems of valves in emergency shutdown applications and/or fast operating conditions (faster than 1 second per inch of bore) should have stem rubbing prevented by the use of tungsten carbide coating.

7.10 Design Requirements for Specific Valve Type

7.10.1 Gate Valves

7.10.1.1 Unless otherwise noted in Datasheet of respective gate valve type, following valve design code and gate valve type shall be applied

Valve Body material.	Size NPS	Design Standard	Wedge Design (Note-1, 3, 4)	Face to Face Dimension (Note-2, 3, 4)	Flange standard (Note 3, 4)
Carbon steel	≤ 1 1/2	API 602 + ASME B16.34	Solid Wedge	ASME B16.10	ASME B16.5/ B16.47
	≥ 2	API 600 + ASME B16.34	Flexible Wedge/ Parallel wedge		
	> 2	API 6D	Conduit Gate		
CRA Body	≤ 1 1/2		Solid Wedge		

(including fully CRA cladded	≥ 2	API 603 + ASME B16.34	Flexible Wedge		

Note-1: For steam service, parallel slide gate valve/flexible wedge shall be

Note-2: For sizes not listed, dimensions shall be as agreed with COMPANY during the Enquiry stage itself.

Note-3: API 5000 and API 10000 rated valves shall be designed and fully rated in accordance with API 6A

Note-4: In addition to the above standards the requirement of applicable latest MESC SPE like SPE 77/100, SPE 77/101, SPE 77/102, SPE 77/111, SPE 77/131, SPE 77/160, SPE 77/200, SPE 77/208 SPE 77/211, SPE 77/212, SPE 77/302, SPE 77/303 SPE 77/312, SPE 77/313, SPE 77/316 etc. shall be met.

7.10.1.2 Specific Requirements

a) Gates, in wedge gate valves shall be forged or cast. Welded fabrication is not acceptable.

b) Gate Valves shall be Outside Screw and Yoke (OS&Y), bolted bonnet, gland, rising stem, non-rising operator and provided with back seats. Valve wedge and back seat shall be hard faced. Seat and Seat rings shall be renewable and hard faced. Hard facing shall be with Stellite 6 or equivalent unless otherwise specified.

c) Solid wedge for gate valves NPS 1 ½ and larger shall be flexible type unless otherwise specified. A disc and stem connection shall be designed in such a way that the disc and the stem cannot be separated when the valve is oriented in any position or any loading the connection may see during valve operation.

d) All through conduit gate valves shall be of double block and bleed design.

e) All gate valve shall be provided with back seats features.

f) Unidirectional valves shall have the direction of flow marked by an arrow pointing downstream. The arrow shall be an integral part of the valve body, positioned at a prominent place so as to be easily visible.

g) Valves shall be designed to seal in both directions i.e. bi-directional against full pressure requirements for the relevant ASME 16.34 pressure class.

h) Unless noted otherwise in the valve data sheets, valves shall be provided with renewable seats.

i) Bonnet gaskets for the valves shall be suitable for the service conditions specified in the data sheets.

7.10.2 **Ball Valves**

7.10.2.1 Applicable Codes/standards

a) Flanged and butt weld end valves NPS 1 ½ and below shall be to BS EN ISO 17292/API 6D

b) Socket weld, threaded end and extended welded end valves NPS 2 and below shall be to BS EN ISO 17292.

c) Flanged and Butt weld end valves NPS 2 and above shall be to BS EN ISO 14313/API 6D

d) API 5000 and API 10000 rated valves shall be designed and fully rated in accordance with API 6A

e) In addition to the above standards the requirement of applicable latest MESC SPE like SPE 77/110, SPE 77/130, SPE 77/190, SPE 77/200, SPE 77/208, SPE 77/211, SPE 77/212, SPE 77/302, SPE 77/303 SPE 77/312, SPE 77/313, and SPE 77/316 etc. shall be met.

7.10.2.2 Specific Requirements

a) Soft (resilient) seals shall be used up to a design temperature of 150 Deg C subject to confirmation of Vendor of suitability of their seal design for required size and pressure temperature limits (refer 7.9.2)

b) The ball shall be of a trunnion mounted design in the following sizes; however individual material requisition. / MESC description / data sheets shall prevail. All other valves shall be Floating design.

Ball Valve type	Class	Size
Reduced bore	150	NPS 8 and above
Full bore	150	NPS 6 and above
Reduced bore	300	NPS 4 and above
Full bore	300	NPS 3 and above
Full and reduced bore	600, 900, 1500 and 2500	NPS 2 and above
Full and reduced bore	API 5000 & API 10000	All

c) All actuated Ball Valves shall be trunnion mounted type.

d) Trunnion mounted valves shall be provided with protection against accumulation of ingress particles in the trunnion house.

e) Seat rings of trunnion mounted ball valves shall be spring-energized.

f) Ball, stem and trunnion shall be one-piece solid construction, either cast or forged. Welded construction is not acceptable.

g) All ball valves in wet sour service shall be provided with upper and lower trunnion bearings of equivalent trim material. The bearing shall be self-lubricating type Torque calculations shall consider the friction coefficient of bearing material.

h) Bore for Ball Valves shall be 'Reduced Bore' unless otherwise specified either in the valve data sheet or P&ID. The bore size of the reduced bore valves shall be corresponding to that of full bore valve of one size reduction up to nominal size NPS 10 and two size reductions for nominal size NPS12 and above.

i) Full bore valve selection shall only for process engineering, pigging or safety requirements.

j) Ball Valves shall be of full bore up to NPS 1 ½ size

k) The ball shall be a solid one-piece forging or casting. A pressure relief hole or equalizing pressure hole in the ball is not allowed, whether on floating ball or on trunnion mounted valves

l) All Trunnion mounted valves sealing shall be with Double Block and Bleed seats with inline (body cavity over pressure) relieving capability. Sealing capability of these seats/seals shall be independent of line pressure. Unidirectional self-relieving type seats (single piston effect) shall be supplied in accordance with API 6D unless specifically requested in the datasheet

m) Double Isolation and Bleed (DIB with reference to API 6D) seats shall be selected only with approval or when specifically indicated in the Valve datasheet.

n) Stem design shall be blow out proof

o) Sealing system shall avoid the requirements body cavity pressure relief PSV/TSV on valve body.

p) For metal seated ball valves, the ball and seat sealing faces shall be coated with a hard faced with Tungsten carbide (unless specifically indicated otherwise in datasheet) to achieve a minimum hardness of 1050 Vickers. The thickness of the coating must be a minimum of 400 micron (thickness of finished/machined surface). These shall be individually paired and lapped together for efficient sealing. Coating process shall be HVOF (High Velocity Oxygen Fuel process).

q) The design of valve seal / seat arrangement shall be such that the soft seal shall not displace or get out of shape both under pressure and during the depressurization of the piping system

r) All ball valves shall be with position indicator to indicate the position of closure member.

s) Valve body design shall be of split body / end entry type unless specifically indicated as top entry type in the valve data sheet.

t) On top entry valves, the seat design shall be such as to allow for easy trim removal; this shall be based on the use of split seats. Specific designs such as "seat push-back" devices are subject to the Company prior approval. The seat design shall be such that the seat to ball tightness and the seat relief functionality can be easily recoverable after site re-assembly

u) All ball valves are to be of a design to provide automatic body cavity pressure relief to prevent over-pressurization of the valve body when valve is closed.

v) Valves shall be equipped with an anti-static feature/device as per API 6D to ensure electrical continuity between ball, stem and body of valves.

w) The ball port shall be cylindrical.

x) Ball valves shall be designed to seal in both directions, i.e. bi-directional, against all pressures up to the maximum service pressure for the class unless specified otherwise.

y) Two- or three-piece bodied valves shall be designed so that body joint gaskets and bolting can safely withstand piping loads without any leakage or affecting valve seat leakage performance. Body bolting studs shall be fully enclosed within the body components.

z) Ball valve designs with end entry body components that are retained by external body bolting shall be subject to COMPANY approval.

aa) Short pattern ball valves are not acceptable.

bb) Wherever ball valve is intended to be used for the throttling application (example kicker line at the pig traps), these valves shall be identified as specialty valve. Separate valve datasheet to be prepared for these valve and seat design feature to be reviewed and guaranteed by the vendor for the intended design condition.

7.10.3 **Integral Double Block and Bleed Valves (IDBB)**

7.10.3.1 Applicable Codes

a) IDBB valve shall be designed and manufactured as per ISO 10792/API 6D + Manufacturer standard and additional requirements of MESC SPEs of ball valves including MESC SPE 77/170 (for Piping to Instrument IDBB) as applicable.

b) API 5000 and API 10000 rated valves shall be designed and fully rated in accordance with API 6A.

c) IDBB valves supplied for process isolation purpose for sizes greater than NPS 2 (other than process to instrument isolation) in place of separate block valve and bleed valves , shall be based on approval of COMPANY and when specified in datasheet. Typically these are used in Offshore applications due to space constraints.

7.10.3.2 Specific Requirements

Refer to specific requirements of Ball valve above. Additionally, following should be complied.

a) The design, size and material requirements shall be as specified in the valve data sheets.

b) The double block and bleed valve shall be of integral design as single piece with two ball valves for isolation & bleed valve (type as indicated in datasheet). Bleed side shall be supplied with blind flange for sour service. Padded blinds are not acceptable

c) Trunnion mounted ball type construction shall be adopted for the sizes below. Others will be of Floating type.

- Class 150 Size NPS 8 and larger
- Class 300 Size NPS 4 and larger
- Class 600 to 2500 Size NPS 2 and larger
- API 10000 for all sizes

d) Minimum bore for Instrument to piping IDBB valve shall be minimum 14 mm

e) Handles / wrenches for primary and secondary isolation valve shall be in line with the pipe centre-line when valves are open. Handles / wrenches or levers shall be sufficiently robust to avoid excessive elastic or plastic distortion against the valve opening and closing forces

f) Unless specifically requested, handles / wrench position for primary isolation and secondary isolation valve shall be on the same side and direction.

g) The design, size, bore and material of construction shall be as specified in the valve data sheets.

h) All IDBB valves shall be `Fire Safe' in accordance with API 607 / API 6FA / BS EN ISO 10497 and have anti-static device fitted and tested in accordance with BS EN ISO 17292 / API 6D as specified in valve datasheets

i) Valve ends shall be as per datasheet i.e. both sides flanged or one side flanged & other side threaded. Valve ends shall have standard flanges. Ends with studded flanges are not permitted.

j) In sour and lethal service, internal threading in the IDBB valve body is not permitted.

k) In case ball type bleed valve is specified, design feature of the bleed valve shall be identical to the main valve construction. Unless specifically agreed, bleed ball valve shall be full bore type.

l) When needle type bleed valve is specified in the datasheet, it shall be provided with the following design features:

- OS&Y needle type globe valve.
- Packed gland bolted bonnet.
- Metal to metal seat.
- Adjustable gland flange.
- Stuffing box with self-centring and non-rotating tip.

7.10.4 **Check Valves**

7.10.4.1 Applicable Codes

7.10.5 Unless otherwise noted in Data sheet of respective valve type, following valve design code shall be applied for non-API 6A check valves:

Valve Type	Design Standard for Size, NPS		Face to Face dimension/Flange Design	Flange standard
	≤ 1½	≥ 2		
Spring loaded Lift Check Valve (Piston and Ball lift)	BS 1868 +ASME B16.34	BS 1868 +ASME B16.34	ASME B16.10	ASME B16.5/B16.47
Swing Check Valve	-	API 6D	ASME B16.10	ASME B16.5/B16.47
Dual plate Check Valve	-	API 594-Type A	API 594-Type A (Table 2 & 3)	ASME B16.5/B16.47

a) Swing Check valve & Non- slam check valve shall be designed and supplied in accordance with API 6D/ISO 14313 with additional requirements of MESC SPE 77/132.

b) Valves in API 5,000 and API 10,000 classes, shall be to API Spec 6A (including face to face dimension compliance and Pressure Temperature conditions).

c) In addition to the above standards the requirement of applicable latest MESC SPE such as SPE 77/101, SPE 77/104, SPE 77/133, SPE 77/132, SPE 77/160, SPE 77/190, SPE 77/200, SPE 77/208, SPE 77/212, SPE 77/302, SPE 77/303, SPE 77/313, etc. shall be met.

7.10.5.1 Specific Requirements

1. Valve construction feature shall be as per purchase description/valve datasheet.
2. Below is the generally preferred valve construction.

Size	First preference	Alternate
NPS 1 ½ and below	Spring loaded piston Lift Check Valve	Spring loaded Ball Lift Check valve
NPS 2 and Above	Dual plate check Valve	Swing Check Valve

3. Conventional wafer type valves clamped between flanges with long bolts or tie rods are insufficiently fire safe and shall not be used in hydrocarbon service
4. The end connection of Dual plate check valves to API 594 shall be double flanged type complying with Table 2 & Table-3 of API 594 for Hydrocarbon service. Wafer check valves (without lug) shall not be used for Hydrocarbon service. Wafer Lug type valves, if used in Hydrocarbon service (prior approval from COMPANY) shall be of solid lug type design with studs' length covering the entire length of the valve
5. For double flanged pattern check valves, vendor shall ensure nut space between flanges is adequate to allow for at least two threads to protrude above the nut (heavy series nuts ASME B18.2.2) without contacting each other.
6. The ends of "Wafer" check valves shall comply with API standard 594. The contact faces of check valves for which gaskets are specified shall receive the same machining finish as the contact faces of the flanges between which these valves will be installed. This flange finish facing is as specified in the relevant piping material class/ valve data sheets.
7. Check valve seat rings either shall be integral or fully welded for corrosion resistant valves.
8. Removable seats shall be positively secured against loosening.
9. Check valves shall be designed for improved Cv. VENDOR shall submit flow characteristic and Cv for Check Valves along with quotation for the offered check valves.
10. VENDOR shall state the minimum flow velocity required for keeping check valve fully open condition.

7.10.5.2 Dual plate check valve

1. The body of dual plate check valve shall be of a “retainer less” type design.
2. Plates and springs shall be replaceable type.
3. VENDOR shall ensure that there is no intrusion into gasket sealing element surface by the retaining mechanism on dual plate check valve design.
4. Lifting lugs for the dual plate check valve shall be oriented in the direction parallel to the disc stem so as verify the stem orientation during valve installation.
5. Reduction in valve throat area shall be minimized to obtain minimum pressure drop in fully open condition (improved CV).
6. Internal fastener materials (studs, nuts, washers and pins), hinge pin, disc seat and body seat shall be considered as trim
7. Designed for scrub free opening and low friction. The Valve shall be designed to have independent spring to allow higher torque to be exerted against each plate with independent closing in response. It shall have independent plate support design to reduce friction forces

7.10.5.3 Swing check valve

1. For Swing check valve, Seat rings shall be replaceable type. These seat rings shall not be rolled-in or threaded on to the body and shall be positively secured against loosening.
2. For swing check valve, body seat ring shall be inclined or the hinge shall have an offset.
3. The angle of the seat with the vertical axis of the valve shall be minimum 5 degrees, to prevent chatter.
4. Unless specifically requested in the purchase description/datasheet, Swing check valve shall be metal to metal seated type.
5. Closing and opening the disc shall not result in any slamming action.
6. Swing type check valves shall be suitable for horizontal and vertical upward flows.
7. If a hinge pin retaining disc is installed , the thread of the pin shall protected against exposure to the medium and a locking ring is required for the hinge pin
8. If a shaft retaining plug is installed, the thread of the plug shall be protected against exposure to the medium by a seal. Graphite seals shall have a stainless steel 316L back up ring.

7.10.5.4 Lift check valve.

1. Piston/ball lift check valve shall be bolted cover, standard bore and straight pattern type.
2. Piston/ball Lift Check Valves shall be spring loaded and shall be suitable for vertical and horizontal Installation.
3. Valves shall be designed such that the valve obturator shall be guided over the full length of their travel. The guide and disk combination shall be designed in such a way that a damping of the movement occurs towards the top end of disk travel. The guiding mechanism shall ensure perfect seating of the piston disk over the valve seat during valve closure.
4. Unless otherwise specified, valve seats shall be hard faced with Stellite 6 or equivalent.
5. Unless specifically requested in the purchase description/valve datasheet, Piston type check valve shall be bolted cover, standard bore and straight pattern.
6. Thickness of the cover shall not be less than that of the body.

7.10.5.5 Non-Slam Check Valve

1. When specified in P&ID as Non-Slam Check Valve it shall be Axial flow Non Slam Check Valve.
2. Axial flow Non- slam check valve shall be designed and supplied in accordance with API 6D with additional requirements of MESC SPE 77/132.
3. Axial Flow Non-Slam Check Valve shall have following feature:
   - Short stroke length to reduce closure time and eliminate water hammer
   - Seat shall be self-aligning and provide tight shut off
   - Shall be designed for minimum pressure drop loss and designed for excellent dynamic performance
   - Shall be metal seated until and unless specified otherwise.
   - Face to Face dimension shall be in accordance with API 6D.

7.10.6 Butterfly Valves

7.10.6.1 Applicable Codes

Unless otherwise noted in Data sheet of respective valve type, following valve design code shall be applied for Butterfly Valves:

Valve type	Class	Valve size /size range	Design Code	Face to face dimension	Flange standard/template
Lug-Category A/B	150, 300, 600	NPS 24 and Below	API 609	API-609	ASME B16.5
	150, 300, 600	NPS 26 to NPS 48	API 609	ISO 5752 Table1 series 14	ASME B16.47
	150, 300, 600	NPS 50 and Above	BS EN 593	ISO 5752 Table1 series 14	ASME B16.47
Double Flanged –Short pattern	150	NPS 48 and Below	API 609	ISO 5752 Table1 series 13	ASME B16.5/B16.47
	300	NPS 48 and Below	API 609-	ISO 5752 Table1 series 14	ASME B16.5/B16.47
	600	NPS 24 and Below	API 609-	ISO 5752 Table1 series 14	ASME B16.5/B16.47
	150, 300	NPS 48 and Above	BS EN 593	ISO 5752 Table1 series 14	ASME B16.47
	600	NPS 26 and Above	BS EN 593	ISO 5752 Table1 series 14	ASME B16.47

7.10.6.2 In addition to the above standards the requirement of applicable latest MESC SPE like SPE 77/134, SPE 77/200, SPE 77/208, SPE 77/212, SPE 77/302, SPE 77/303, SPE 77/313, SPE 77/316, etc. shall be met.

7.10.6.3 Specific Requirements

1. For Hydrocarbon and in any critical services, only Triple offset Butterfly shall be used. For utility services double/triple offset butterfly shall be considered
2. Triple offset valve when used in critical services as isolation valve shall
   a) Meet all requirements of High performance as per API 609 Category B
   b) Metal seated with bi-directional zero leakage (Class A as per API 598)
   c) Metal-to-metal torque seating
   d) Double flanged construction
3. Concentric disc butterfly valves shall be used only for lined butterfly valves
4. Unless specified in the datasheet/purchase description, double flange short pattern butterfly valves shall be preferred. Valves shall be provided with either double flanged-short pattern or fully flanged/lugged end connections as indicated in the valve data sheet.
5. All butterfly valves shall be designed for use in throttling and the valve shall be designed to lock at any intermediate position.
6. Valves shall be bi-directional, designed to seal against the maximum class rated service pressure in either direction. However, in case the design requires a preferred direction of flow, an arrow pointing downstream shall indicate the same.
7. The Valve disk shall be capable of withstanding the maximum differential pressure, in either flow direction, as per the appropriate pressure designation.
8. Butterfly valves shall be provided with integral shouldered shaft to prevent shaft/stem blowout and to ensure precise positioning of the disc.
9. The valves shall be anti-static. The design shall ensure electrical continuity between the stem, disk and the body. For this purpose, graphite seals are not considered to offer satisfactory electrical continuity.
10. Valve shall be able to open and close against a differential pressure equal to the maximum rated pressure of the valve, unless specified otherwise on the valve data sheets.
11. Valves shall be equipped with adjustable mechanical stop limiting devices to prevent travel of the valve disc in open and closed position.
12. Tapped holes in body lugs for through bolting are not acceptable. Tapped holes where necessary because the valve design does not allow through shall be subject to Contractor/Company approval and these bolts shall be part of the valve supply. These tapped holes and bolts shall be identified, with the diameter and effective thread length, quantity on the relevant Vendor drawing for each valve where required. Part list in the vendor drawing shall include the design code of the bolts at tapped holes.
13. The disc shall not interfere with the bore of the connecting pipe specified on the valves data sheet including any lining or coating, at any point of shaft rotation. Pipe ID details shall be available in the purchase description.
14. Valve gasket seating surface area shall not contain any interruptions (screw holes or retainer edge) within the effective sealing area of an ASME B16.20 spiral wound gasket.
15. Screwed connection between stem and closure member is not acceptable.

cc) The stem shall be furnished with two bearings one at the top and the other at the bottom of the disc. MOC of bearings shall be of equivalent trim material. The bearing shall be self-lubricating type. Torque calculations shall consider the friction coefficient of bearing material.

16. The shaft shall be a through shaft of one piece construction.
17. Bottom flange shall be a bolted design having at least 4 bolts.
18. Valves that require stem extensions will be indicated on the valve datasheet with the length. Stems shall be constructed of one piece.
19. Valve Operator: Butterfly valves in size NPS 3 and above in wet fire water service shall be mandatorily provided with low efficient (e.g. worm and Wheel type) gear operator.
20. Internal fastener materials (studs, nuts, washers, etc.), disc seat, body seat, retainers, retainer plates and bearings shall be considered part of trim (material of construction shall be minimum equal to trim material). In case of high performance valves disc shall be treated as trim material
21. For replaceable seat ring suitable gasket shall be provided between the seat ring and the body or disc
22. Unless specifically agreed or indicated in the purchase description/datasheets, minimum requirement of seat ring and disc seal ring shall be as per below table.

Sealing component	Utility service (Double offset valve)	Hydrocarbon service (Triple offset valve)
Seat ring	Solid CRA Ring	Solid CRA Ring. Seat ring harder than the seal ring assembly.
Seal ring (Body/Disc)	PEEK / RPTFE	Laminated : CRA material and Graphite (Or metal to metal seated with hard facing when specifically required)

7.10.7 **Globe Valves**

7.10.7.1 Applicable Codes

Unless otherwise noted in Datasheet of respective valve type, following valve design code shall be applied for Globe valves:

Valve Type	Design Standard for Size NPS		Testing code	Face to Face dimension	Flange standard
	≤ 1 1/2	≥ 2			
Globe Valve	API 602 + ASME B16.34	API 623 + ASME B16.34	API 598	ASME B16.10	ASME B16.5 / B16.47
Note: For sizes not listed, dimensions shall be as agreed with COMPANY during the Enquiry stage itself.					

7.10.7.2 In addition to the above standards the requirement of applicable latest MESC SPE like SPE 77/101, SPE 77/101, SPE 77/200, SPE 77/208, SPE 77/212, SPE 77/302, SPE 77/303, SPE 77/312, SPE 77/313, SPE 77/316, etc. shall be met

7.10.7.3 Specific Requirements.

1. Valve design shall be suitable for the process design / operating conditions as per applicable valves data sheets.
2. Globe Valves shall be Outside Screw and Yoke (OS&Y), bolted bonnet, gland, rising stem, non-rising operator, Straight pattern/angle/Y-pattern and provided with back seats. Valve wedge and back seat shall be hard faced.
3. All globe valves shall be provided with back seats features.
4. Valves shall generally be designed in accordance with applicable portion of ASME B16.34.
5. Valves in size NPS 2 and above, seat rings shall be renewable and hard faced. Hard facing shall be with Stellite 6 or equivalent unless otherwise specified. Globe valve seats for sizes NPS 2 and above shall be threaded and removable type. Welded seats are not acceptable.
6. Globe valves shall be provided with guided plug type disc for classes 600 and higher and for sizes NPS 4 and higher unless otherwise specified.
7. All globe valves shall be suitable for throttling duties. An arrow to indicate the correct flow directions shall be part of the body casting or forging or shall be embossed on the valve body. Gear operated valves shall have operators of a design that will allow the valve to be set in intermediate throttling positions for long periods without having lash down the hand wheel.
8. Globe valves shall be designed for improved CV. VENDOR shall submit flow characteristic and Cv for Globe Valves along with quotation for the offered Globe Valves.
9. Valve plug/piston shall be non-integral with the stem however the disc-to-stem design shall be such that the disc cannot become detached from the stem as a result of vibration emanating from either flow through the valve or attached piping movement.
10. Valve pattern shall be as specified in the datasheet/purchase description.
11. The disc type shall be plug disc / ball disc and hard faced.
12. If a separate bonnet backseat bushing is provided, it shall be tack welded to the bonnet to prevent loosening or unscrewing.
13. Threaded seat rings, if specified, shall be secured in place to prevent loosening in service. This may be done by tack welding.

7.10.8 **Plug Valves**

7.10.8.1 Applicable Codes

1. Plug valves shall be designed to API 599
2. In addition to the above standards the requirement of applicable latest MESC SPE like SPE 77/107, SPE 77/200, SPE 77/208, SPE 77/212, SPE 77/302, SPE 77/303, SPE 77/312, SPE 77/313, SPE 77/316, etc. shall be met

7.10.8.2 Specific Requirements

1. Valves shall be pressure balanced and tapered inverted plug type.
2. Valves NPS 1/2 inch (nominal) and larger, shall comply with this specification and API 599.
3. Unless otherwise specified the valve pattern and operation for the lubricated and non-lubricated plug valves shall be in accordance with API 599

4. Only the taper with rectangular ports is acceptable. However valves NPS 1/2 and NPS 3/4 may have round ports full bore.
5. The port shall have a dimensional ratio, between height and width, not exceeding 3:1
6. Round-port full bore pattern shall be used when required by the process and so defined in valve datasheet for pipeline and low pressure drop applications.
7. Stem retention: when stem/plug is separate pieces, stem shall be of blowout-proof type.
8. Shouldered stem design is required. Stem retention shall not depend on the packing gland. Refer to ASME B16.34, section 6.5.1.
9. Plug may be provided with pressure balanced hole or equivalent feature
10. Plug valve application shall be limited to 175 Deg.C
11. Soft seats to achieve a seal between plug and body are not permitted.
12. Plug valves shall be capable of opening and closing under full differential line pressure
13. Valves shall be provided with a suitable stop for the plug assembly to enable locking in both open and close positions
    - Open: In line of flow
    - Close: Perpendicular to the flow
14. Valve shall incorporate an antistatic feature that ensures electrical continuity between the plug and the body. This continuity shall be verified by testing a new, dry valve that has been pressure tested and cycled at least five times.
15. Additional supplementary test F22 (Antistatic design test) shall be performed by the MANUFACTURER for TSO plug valves in accordance with BS EN 12266-2
16. TSO valves shall comply with leakage Rate A only in accordance with ISO 5208.

7.10.8.3 Lubricated Plug Valves (Metal Seated)

1. For valves that are supplied with a lubricant screw or a combination of sealant fitting and lubricant screw, steel check valve with minimum of two independent check elements are required. For valves supplied with a sealant fitting, steel check valves with one check element can be used provided the lubricant fitting has a separate checking element.
2. The material of check valve, including the check elements and the housing shall be at least as corrosion resistant as the metal of the valve trim.
3. Valves shall be provided with secondary sealant injection connections.
4. Lubricant / sealant shall protect internals of the valve against corrosion and wear as well as reducing the valve torque. Vendor / Supplier shall furnish the minimum and maximum torque values to operate (open/close) and maintain the valve sealing integrity
5. Vendor shall review & advise the compatibility & working of the sealant with design/operating temperature of the valve and fluid in service (e.g., hydrocarbon etc.).
6. Lubricated plug valves shall be furnished with hydrocarbon resistant lubricating sealant that has a temperature range from -29 Deg C through 107 Deg C. This sealant shall have both proper plasticity for tight sealing and lubricity for ease of operation. Fluid operating temperature shall be specified in the data sheet for the selection of lubricant
7. Vendor shall advise the frequency of lubrication based on the valve service and type of lubricant for maintaining the valve. Vendor shall supply the necessary tools/gun for lubrication and lubricant kits with storage conditions and their expiry date if any

8. Valve body-to-cover seals or non-metallic diaphragms or gaskets shall be suitable for the service conditions and the valve's pressure temperature s.

7.10.8.4 Non-Lubricated Plug Valves (Soft Seated)

1. If approved by COMPANY, in sleeved, lined and soft-seated plug valves, a means shall be provided to adjust, either manually or automatically, the position of the plug as wear occurs.
2. Sleeve shall be mechanically locked in the valve body.

7.10.8.5 Jacketed Plug Valve

Jacketed plug valves shall be provided with 2 number flanged connections of NPS 3/4 to steam jacket.

7.11 Valve Operator Mounting Flange

7.11.1 Mounting flanges of ball, butterfly and plug valves shall conform to ISO 5211. Alternatives shall be subject to agreement by COMPANY. Torque values of ISO 5211 shall be used.

7.11.2 Top mounting flanges of gate valves shall conform to ISO 5210. Alternatives shall be subject to agreement by COMPANY. Thrust values of ISO 5210 shall be used.

7.11.3 Top flange shall be rated for a minimum of twice the valve break torque.

7.11.4 Bolting securing the top flange to the valve body shall have, as a minimum, the same value of torque/thrust as the mounting flange.

7.12 Body-Bonnet and Cover Gaskets

7.12.1 Gaskets shall be in accordance with the standard to which the valve is manufactured, Piping Material specification AGES-SP-09-002 and Valve datasheet unless otherwise specified.

7.12.2 Metallic and non-metallic bonnet and cover gaskets shall have corrosion resistance equal, at least, to that of the body and bonnet material.

7.12.3 Valves body to cover seals or non-metallic diaphragms or gaskets shall be suitable for the service conditions and the valve's pressure temperatures

a) Cover shall be bolted to the valve body and screwed connections are not acceptable.

b) Valves design shall ensure repair of gland packing under full line pressure.

7.13 Valve Operation

7.13.1 Manual valves shall be lever, hand wheel or gear operated as specified on the valve data sheets.

7.13.2 Operation of valves by means of actuator (pneumatic, hydraulic, or electric motor) are outside the scope of this specification. Actuated part of the Valve (i.e. valves with Pneumatic/Hydraulic/Electrical Actuators) are not covered in this specification and is to be read in conjunction with the relevant specification for Actuator. However, the valve part shall fully conform to this specification. For actuated valves, bonnets, mounting flange, stems, stem extensions etc. shall be designed and calculated to withstand the maximum torque delivered by the actuator at the maximum allowable actuator power (i.e. pressure or otherwise). Operation shall be smooth at all times

7.13.3 Valves shall function normally with the stem in any orientation between vertical and the horizontal, unless specified otherwise.

7.13.4 For valves operated manually, the maximum force required under design and test conditions, when applied at the rim of the hand-wheel or lever, shall not exceed 360 N. This applies to seating, unseating, and operating at maximum pressure differential at both minimum operating temperature and ambient temperatures.

7.13.5 Valve operator shall be non-rising type.

7.13.6 Lever Operation

7.13.6.1 Levers lengths for ball and plug valves shall not exceed the lesser of 500 mm, twice the face-to-face, or the end-to-end dimension of the valve, whichever is lower. For butterfly vales it shall not exceed 600 mm.

7.13.6.2 Levers shall be parallel to the pipe axis with the valve in the open position. Design shall ensure incorrect orientation relative to the position of the ball, plug, or disc, etc. cannot occur.

7.13.6.3 Valve stem shall protrude a minimum of 1" above the top of the lever and shall have a robust connection with the Wrench/Lever.

7.13.6.4 Lever operated valve stem heads shall be circular with a keyway for attaching the lever in one and only one position. Circular stem heads with one or two flats are acceptable, but in either case the design shall be such that the lever cannot be installed in a manner that would permit the valve to move through more than 90 degrees. Square stem heads are not acceptable.

7.13.6.5 Lever operated valves shall be fitted with stops at the full open and full closed positions to prevent over travel of the valve obturator. These stops shall be in the form of raised bosses, integrally cast or forged with the valve body or welded to the valve body. Removable stops and/or spring-loaded pins which drop into holes at the full open or full closed positions, are not acceptable

7.13.6.6 As a positive protection against valve operation when the wrench/lever is removed, the plate or pin that strikes these stops shall be permanently affixed to the valve stem and shall not be a feature of the lever operator.

7.13.6.7 Lever shall be made from solid material, suitable for the environmental conditions. Hollow components shall not be allowed. Wrenches and hand wheels shall be rigidly constructed of carbon steel or ductile iron. Flat bar levers are NOT acceptable on valve sizes over NPS 1.

7.13.6.8 Valves installed in insulated lines will have box type insulation. Hand wheel or lever for such valves shall be outside the insulation for all quarter turn valves. The maximum insulation thickness which can be applied without interfering with the lever or gear hand wheel shall be shown in the drawing along with the bid/after bid.

7.13.7 Hand wheel Operation

7.13.7.1 The hand wheel shall be of a solid construction for both gear operator and directly stem mounted operator. Hollow components shall not be allowed.

7.13.7.2 The hand wheel diameter shall not exceed the end-to-end length of the valve for classes 300 and above.

7.13.7.3 Hand wheel dimensions for Class 150 valves shall not exceed twice the end to end dimensions or 800 mm, whichever is the smaller.

7.13.8 Gear Operation

7.13.8.1 Gear box design shall be in accordance with BS EN ISO 5210.

7.13.8.2 Valves with sizes equal to or greater than those specified in table below shall have gearboxes. Alternatives shall be subject to agreement by COMPANY

Class	Ball Bore Size (1)	Gate Valve Size	Globe valve Size	Plug Valve Size	Butterfly Valve size
150	≥ NPS 6	≥ NPS 14	≥ NPS 8	≥ NPS 8 (2)	≥ NPS 8
300	≥ NPS 6	≥ NPS 10	≥ NPS 8	≥ NPS 8 (2)	
600	≥ NPS 6	≥ NPS 8	≥ NPS 6	≥ NPS 6	≥ NPS 6
900	≥ NPS 4	≥ NPS 6	≥ NPS 4	≥ NPS 4	-
1500	≥ NPS 3	≥ NPS 4	≥ NPS 3	≥ NPS 3	-
2500	≥ NPS 2	≥ NPS 4	≥ NPS 3	≥ NPS 3	-
API 5000 & 10000	≥ NPS 2	≥ NPS 2	≥ NPS 2	≥ NPS 2	-

Note:

a) For ball valve the above is based on bore size
b) For lined plug valves class 150 and 300, NPS 6 and above, shall have gear operator

7.13.8.3 Hand wheel rotation for gear operated valves shall be minimized; VENDOR shall furnish data for number of hand wheel turns to full stroke. Number of gear hand wheel turns shall not exceed 80 turns to full stroke unless specific prior approval is taken from COMPANY.

7.13.8.4 Gear operator hand wheel on valves that require more than 50 turns to full stroke, shall be fitted with a 25.4mm male square drive for the use of a pneumatic wrench unless specifically agreed otherwise.

7.13.8.5 The gearbox output torque shall be at least 1.5 times the maximum required operating torque of the valve. The gearbox is selected based on the valve maximum operating torque and not on the drive train/stem strength safety factor. Design rules for all parts of the drive train shall include a minimum 2.0 times safety factor.

7.13.8.6 Valve design shall be such that damage due to malfunctioning of the operator or its control will only occur in the operator gear train or power cylinder and that damaged parts can be replaced without the valve cover being removed.

7.13.8.7 Body/bonnet closure bolting shall not be used to directly mount a gearbox to the valve.

7.13.8.8 Hand wheels on gearboxes shall be securely fastened to the shaft with expansion pins or through bolted connections. Friction grip and grub screw (set screw) retainers shall not be used.

7.13.8.9 Manual gear operators shall be mounted with the pinion shaft perpendicular to the flow through the valve, with the plane of the hand wheel parallel to the valve stem and to the pipe axis, unless specified otherwise by COMPANY.

7.13.8.10 Operators and stem extension assemblies shall have a means to prevent pressure build-up in the mechanism that results from stem seal leakage.

7.13.8.11 Gear operator drive shall connect with the yoke bush or sleeve.

7.13.8.12 Gearbox operated valves shall have rolling element thrust bearings.

7.13.8.13 Gear operator for valves shall be the "Self-Locking" Gear Type, completely housed within a weatherproof and dust poof enclosure suitable for the environmental conditions as per COMPANY specification and equivalent to IP65.

7.13.8.14 The gear box shall be fitted with one or more easily accessible standard grease nipples, completely housed in a covered grease-case, to enable the “lifetime” lubrication using oil which can be renewed while the valve and gearbox are in service. The SUPPLIER’s drawing for each gear operator shall show and identify the grease nipples and shall include the name(s) and type(s) of lubricant that can be used. There shall be sufficient air volume to allow the lubricating oil to expand in service and not force leakage.

7.13.8.15 Lubricants used with gear operators shall be suitable for use at site ambient temperatures in addition to the valve design temperature stated on the Valve Data Sheet.

7.13.8.16 Gearbox material shall be suitable for the environmental conditions of use (maximum and minimum temperature, etc.) specified. All internal parts of gearbox shall be metallic except for seals and gaskets. Gearbox bolting shall be coated to prevent corrosion and enable maintenance.

7.13.8.17 Gear operators shall be supplied complete with hand wheels and shall be permanently marked within the word “OPEN” or “CLOSE” with a permanent arrow indicating the direction of rotation. Gear operators on valves with ASME class 600 or higher shall be supplied with impact type hand wheels i.e. hand wheel resistant to impact loading.

7.13.9 Position Indicator

7.13.9.1 All valves shall be supplied with position indicators.

7.13.9.2 The position indicators shall be clearly graduated to indicate intermediate position of the valve obturator and direction of closure.

7.13.9.3 Position switches indicating the open and or closed position shall be provided when specified in valve data sheet

7.13.9.4 Indicators on the valve and/or gearbox shall be positively fixed to the valve / gearbox shaft. Grub screws, set screws or similar, which can permit loss of position shall not be used.

7.13.9.5 Indicators on the valve and/or gearbox shall have symmetric bolt securing arrangements. To provide additional position assurance additional location dowels shall be used.

7.13.9.6 On completion of final valve assembly and test, two pins/rivets shall be installed in line on the valve and gearbox flanges, to indicate the “as manufactured” condition for the valve, as shown in Fig.1:

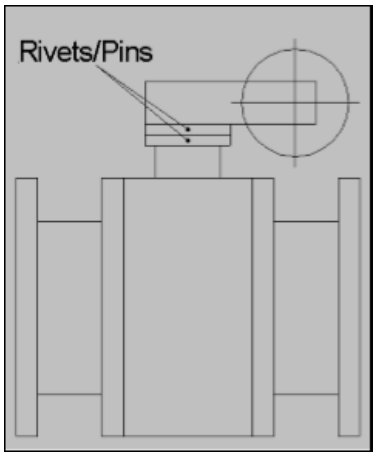

Figure 1 - Rivets/Pins installed location

7.13.10 Locking Device Provision

Manually operated valves shall be supplied with brackets, locking plates or other devices to allow the valves to be locked in the open or closed position, using padlocks supplied by others.

7.14 Lifting Requirements for Valves

7.14.1 Lifting lugs shall be provided for valves over 250 kg weight (including accessories).

7.14.2 Valves requiring lifting lugs shall be provided with permanent lift lugs or screwed in proprietary lifting devices rated for the weight of the valve with at least a 4:1 safety factor.

7.14.3 Positions of lifting lugs on valves shall allow for safe handling operations of the valve fully equipped with its gearbox or hand-wheels from the installed orientation.

7.14.4 The orientation of the lifting lugs on the valves shall be suitable for lifting the valve from the installed location/orientation.

7.14.5 Lifting lugs shall be proof tested by the Manufacturer.

7.14.6 Welded on lifting lugs shall be subjected to 100% visual inspection and 100% surface examination (MT or DPT). If integrally cast, they shall be subjected to 100% volumetric (RT or UT).

7.14.7 Valves shall be marked to indicate the mandatory safe lifting points and each lifting lug shall designed for full SWL. The SWL shall be specified on the general arrangement drawings.

7.14.8 MOC of the Lifting lugs and valve support attachment shall be same material type as valve body, except that 316 may be used on valves of duplex stainless steel and nickel alloys.

7.14.9 Proprietary screwed type lugs and shackles shall be provided with certified load test certificates. These shall be replaced, retested or revalidated as required by HSE requirements/regulations.

8 VALVE MATERIALS

8.1 General

8.1.1 Material construction of valve components shall be as stated in the Valve Purchase Descriptions or Valve data sheet.

8.1.2 All material shall meet the mandatory requirements specified in the ASTM/ASME standards. Restrictions in chemical composition including carbon content, carbon equivalent and other requirements including testing etc. shall be fully in compliance to Piping Material Specification AGES-SP-09-002, MESC SPE 77/302 and relevant MESC SPEs & Material selection Guidelines AGES-GL-07-001.

8.1.3 Valves up to and including size NPS 1.5 shall be from forged body material.

8.1.4 Valve bodies, end adapters, extended bonnets and other valve components, if manufactured from forged materials, shall be forged close to their final Shape and incorporate a 20% minimum size reduction from the billet.

8.1.5 Valve bodies manufactured from bar stock are not acceptable.

8.1.6 The use of forgings for valve bodies are acceptable in place of castings, subject to approval, however, castings are not an acceptable alternative to forgings.

8.1.7 Material of construction for all auxiliary connection (material related to assemblies of vent/drain) shall be in CRA metallurgy with minimum equal to valve trim material (in solid CRA metallurgy).

8.1.8 The CONTRACTOR shall provide full details of all components materials and material condition including procedures and qualification for overlay and any other surface treatment.

8.1.9 Carbon steel parts are not permitted on stainless steel valves.

8.1.10 VENDOR shall verify all the materials to avoid galvanic corrosion between dissimilar materials.

8.1.11 Where applicable, bearing material shall be supplied with material of construction minimum equal to valve trim material.

8.1.12 Stem and sliding elements, including threaded components particularly in stainless steel, should have a minimum 50 HBW hardness difference between contacting surfaces and an appropriate surface finish to prevent galling.

8.1.13 VENDOR to note that ENP coating on carbon steel surfaces is not accepted as an acceptable method to protect valve components from corrosion.

8.1.14 Vendor to note that use of castings for bodies, bonnets and flanges is prohibited for API 6A compliant valves.

8.1.15 Material class and Temperature for API 6A valves shall be as specified in valve datasheets. All API 6A valves shall be made with Manufacturers written specification which shall include the minimum requirements to meet Table 8, including impact strength (Table 9), hardness (Table 20), chemical composition (Table 11 & 12) and design stress intensity Sm (as defined in API 6A 6.3.1.2) or from equivalent 60K material(s) in order to comply with API 6A as well as PSL 3 requirements or PSL 3G requirements in Gas Service.

8.1.16 Bolt material selected for API 6A valves shall comply with API 6A clause 8.2.3.

8.1.17 The size of bolting and size of ligaments shall be confirmed by Vendor as being sufficient for effective trim sealing including the seat to body or to end closure sealing for the various loadings/loading combinations

8.1.18 All materials in contact with sour service shall, as a minimum, meet the requirements of NACE MR0175 / ISO 15156 (latest edition), Piping Material Specification and Material selection Guidelines AGES-GL-07-001 with all additional requirements as specified in the MESC SPE specifications and COMPANY/ADNOC specification for Material for Use in H2S Containing Environments

8.1.19 For sour service, Vendor shall conduct hardness test on finished components to ensure that the hardness requirements of NACE MR0175 / ISO 15156 are met. Where hardness values in excess of the requirements of NACE / ISO Standard are obtained, the part shall be rejected.

8.1.20 For material requirements, chemical composition, heat treatment, impact testing, corrosion testing, welding & hard facing and NDE requirements SUPPLIER shall refer to MESC SPE 77/302 & MESC SPE 77/303.

8.1.21 All materials in carbon and low alloy steel (excluding screwed, galvanized and castings) shall have a maximum carbon content of 0.23%. A carbon content of 0.25% max may be permitted for castings. For 'Sour Service' application, steel shall be with low sulphur (S < 0.003%) and treated with calcium (Ca).

8.1.22 The Carbon Equivalent (CE) based on the Product Analysis for CS & LTCS Valves shall not exceed 0.42, calculated by the following formula:

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

8.1.23 Carbon content of 5% Cr, 1/2% Mo steel shall not exceed 0, 15% (by weight).

8.1.24 All carbon steel forgings shall be supplied in the normalized condition. Casting shall be the normalized or quenched and tempered condition.

8.1.25 All cold worked items subjected to greater than 5% Fibre Strain shall be stress relieved

8.1.26 Impact testing shall be as per applicable ASTM Standards, in compliance with ASME B 31.3 Para 323.3. The “Charpy V-notch Testing” shall be in accordance with ASTM A370 and additional requirement as specified in MESC SPE 77/302.

8.1.27 Welded Components with SS316 metallurgy shall be from a dual certified grade (e.g. 316/316L) steel shall be supplied in solution annealed condition, Duplex and Super Duplex Stainless Steel shall be in solution annealed and water quenched condition, and Inconel shall be in annealed condition.

8.1.28 All SS material shall be tested for IGC and shall be capable of passing IGC test as per ASTM A262 Practice E and other requirements as specified in MESC SPE 77/302.

8.1.29 Austenitic stainless steel, including Alloy 20, shall be supplied in the solution annealed and water quenched condition.

8.1.30 If alloy 718 forgings and bar is used for the valve stem, it shall be supplied in accordance with API 6A 718.

8.1.31 All Duplex and Super duplex stainless steel material shall meet the requirements specified in MESC SPE 77/302.

8.1.32 For Super Duplex corrosion test shall be performed as per ASTM A923 Method C and as specified in MESC SPE 77/302.

8.1.33 For Duplex material, corrosion test shall be performed as per ASTM A923 Method C and as specified in MESC SPE 77/302.

8.1.34 Stainless steel material (316/316L), Duplex Stainless Steel (22%Cr), Super Duplex Stainless Steel (25%Cr) and Inconel 625 shall undergo pickling and passivation as per ASTM A380.

8.1.35 All Inconel 625 material shall be capable of passing IGC test as per ASTM G28 Method A and as specified in MESC SPE 77/302.

8.1.36 Cast Ni-Al Br valve body to ASTM B148 (UNS C95800) shall be given temper anneal heat treatment before machining.

8.1.37 All austenitic stainless steel forgings shall be 100% liquid penetrate examined as per ASTM A -182 supplementary requirements S5, with acceptance criteria to ASME B 16.34, ANNEX D.

8.1.38 Positive Material Identification (PMI) shall be conducted for all SS / CRA material as specified in MESC SPE 77/302.

8.1.39 All bearings shall be of a self-lubricating design (anti-friction material is acceptable) and shall be minimum equal to valve trim material.

8.1.40 “Free cutting” (re-sulfurized) steels shall not be used for the following:

a) Pressure boundary parts

b) Parts in contact with the process fluid.

c) Parts that are welded.

8.2 Bolting for Valve Body/Bonnet

Bolting material shall be minimum in accordance with materials specified in piping materials classes and as per valve datasheet.

9 VALVE MATERIAL TESTING / INSPECTION REQUIREMENTS

9.1 All items shall be tested and inspected in full accordance with their referenced product specification and applicable standards as per valve data sheet.

9.2 Inspection level and certification shall be as stated in COMPANY Quality system requirements and Criticality Rating specification.

9.3 Unless specifically requested, valves designed to API 6A, shall be Inspected and Tested as per API 6A PSL 3, PR1. PSL 3G requirements shall be applicable for Gas service

9.4 NDT and NDE acceptance shall be in accordance with MESC SPE 77/302, Piping Material Specification Document and COMPANY Quality system requirement.

9.5 All valves shall be tested in accordance with their applicable ASTM, ASME, MSS, BS codes/ standards and in accordance with NACE MR0175/ISO 15156 (where required for sour service), with additional requirements of MESC SPE 77/302 and SPE 77/303 as applicable.

9.6 Vendor shall ensure that Austenitic and Nickel alloy materials used in the valve manufacturing process shall meet the relevant material specification requirements through in house quality control.

9.7 All CRA material shall subjected to 100% PMI (body and trim). In case of CS/LTCS valve, PMI shall be conducted for trim material.

9.8 COMPANY reserves the right to conduct 100% 'Positive Material Identification (PMI)' on Austenitic and Nickel alloy materials upon delivery of the valves as a part of receiving inspection process. Materials not accepted in PMI because of indications of incorrect or No Match conditions, shall be rejected and returned unless otherwise proved negative through further testing at an independent test house by vendor.

10 PRESSURE TESTING

10.1 Unless specifically requested, valves designed to API 6A, shall be Inspected and Tested as per API 6A PSL 3, PR1. PSL 3G requirements shall be applicable for Gas service.

10.2 Valves designed to code other than API 6A shall be subject to below mandatory tests (including supplementary tests) as per API 6D, API 598 (or other Testing code when specifically agreed with COMPANY).

10.3 The valve hydro test pressure shall be as per ASME B 16.34 based on Material Group and Class.

10.4 Pressure testing for valves shall be carried out at the factory in the fully assembled condition (including auxiliary components, fittings, and gland packing's) and before coating or painting.

10.5 Pressure test shall be carried out in accordance with the referenced codes and product specifications called out in the valve data sheet.

10.6 Valve body castings shall not be impregnated with sodium silicate or any other material to prevent leakage during pressure testing.

10.7 For valves NPS 10 (DN 250) and larger, the valve shall be tested in the orientation specified in the purchasing documentation. If no orientation is specified, the valve shall be tested with horizontal flow bore and stem vertical upward.

10.8 After the valve has been successfully pressure tested and accepted, at least 75% of the gland adjustment travel shall be available for use in service.

10.9 After testing is completed, valve internals shall be thoroughly cleaned and dried, and the surfaces especially valve body cavities ensured to be free from test fluids, cleaning agents, loose particles and organic substances. Then prepared for preservation and shipment as detailed in section 16.7.

10.10 Test fluid used for hydrostatic testing of valves shall be hydraulic oil or an emulsion of water with a water-soluble oil to prevent rust.

10.11 Pressure testing of stainless steel/ Nickel alloy valves shall ensure only water containing less than 30 ppm (30 mg/litre) chloride ion shall be used for pressure testing.

10.12 Whenever TSO (tight Shut off) requirement is stated in the purchase, unless otherwise specifically agreed below seat leakage shall be applicable per seat of the valve.

a) Metal seats shall be in accordance with API 6D (ISO 5208) Leakage Rate B;

b) Soft seated valve shall be accordance with API 6D (ISO 5208) Leakage Rate A.

10.13 Valves designed to code other than API 6A shall be subject to below mandatory tests (including supplementary tests) as per applicable design/testing codes.

a) Shell test (test media-Water) –Each valve and all type of valve.

b) Stem Backseat Test (test media air or water) when specified in data sheet for Gate valve & Globe valve having back seat feature

c) High pressure closure test (test media-Water)-Each Valve and all type of valve.

d) Low pressure closure test (with air or nitrogen)-Each valve and all type of valve & globe valve in sour service

e) Double block and bleed test (test media-Water)-Each valve (For Valve with DBB feature).

f) High pressure closure test (with air or nitrogen) When specified in the Datasheet/Purchase or as per applicable code -Each valve. (Ball & Gate valve for valves in gas service only with sour toxic & lethal application).

g) Seat relief test (test media-Water)-For valves with DBB feature-Each Valve.

h) Fugitive emission testing - -As per ISO-15848 part 2. (For Ball, Gate, Butterfly, Plug & Globe valve)

i) Cryogenic valve testing – For each valve when specified.

j) Functional test-Each valve and all type of valve.

k) Anti-static test-One valve of each unique design/size//material (valves with Non-metallic inserts)

l) Torque test test-One valve of each unique design/size//material (for Ball, Gate Globe & Plug valve)

10.14 Acceptance Criteria for Seat Leakage Rates shall be as follows:

Valve Type	Hydro Seat Test (Note 1) Maximum Leak Rate (ISO 5208)	LP Gas Seat Test 6±1 bar. Maximum Leak Rate (ISO 5208)	HP Gas Seat Test 1.1 x Rated Pressure. Maximum Leak Rate (ISO 5208)
Ball	Soft Seat: A Metal Seat: B	Soft Seat: A Metal Seat: C	Soft Seat: A Metal Seat: 2 x C
Butterfly	Soft Seat: A Metal Seat: B	Soft Seat: A Metal Seat: B	Soft Seat: A Metal Seat: C
Lubricated, Balanced Plug	A	A	B
Check	Soft Seat: A Metal Seat: F	Soft Seat: A Metal Seat: E	Soft Seat: A Metal Seat: E
Gate	Soft Seat: A Metal Seat: B	Soft Seat: A Slab Type: C Expanding Type: B Wedge Type: B Parallel Type: C	Soft Seat: A Slab Type: C Expanding Type: 5 x B Wedge Type: 5 x B Parallel Type:3 x D

Valve Type	Hydro Seat Test (Note 1) Maximum Leak Rate (ISO 5208)	LP Gas Seat Test 6±1 bar. Maximum Leak Rate (ISO 5208)	HP Gas Seat Test 1.1 x Rated Pressure. Maximum Leak Rate (ISO 5208)
Globe	Soft Seat: A Metal Seat: B	Soft Seat: A Metal Seat: B	Soft Seat: A Metal Seat: 5 x B
Note: 1) The leakage rate for the backseat test on gate and globe valves shall be the same as that of the leakage rate for the hydrostatic seat test.			

11 ADDITIONAL SPECIFIC REQUIREMENTS

Following additional specific requirements shall be applied for valves in general as applicable and if specified in Valve Data Sheets or Purchase requisitions.

11.1 Fugitive Emission Testing

11.1.1 Valves design shall minimize fugitive emissions. Particular attention shall be paid to have high integrity valve stem and seals with no leakage to the environment. All such valves shall meet fugitive emissions test tightness as per BS EN ISO 15848 Part 1 & Part 2 and MESC SPE 77/312 with leakage class as per below table unless otherwise specified in datasheet.

Service conditions	Emission leakage Class
Lethal service	Class AH
Sour, Toxic and other Hydrocarbon services	Class BH
Note 1: The specific details of service severity and emission leakage rate and valve requirements should be determined and confirmed for each project based on HSE requirements and specified on associated valve data sheets.	

11.2 Cryogenic Valves Testing

11.2.1 Valves for cryogenic applications shall be designed and tested in conformance to requirements of MESC SPE 77/200.

11.2.2 Valves shall be clean and free of moisture and grease and assembled in clean conditions.

11.2.3 If the service is non-lubricating, materials shall be selected to prevent galling between mating parts.

11.3 Vacuum Application Valve Testing

11.3.1 Valves for vacuum service requirement, if applicable, shall be as specified on the valve data sheets.

11.3.2 Valves shall be designed for a vacuum level of 100 mbar (1.45 psi) unless specified otherwise on the valve data sheets.

11.3.3 The test procedure shall be submitted for approval by COMPANY.

11.3.4 Valves shall not have protective coating applied prior to the vacuum testing.

11.4 Functional Test

11.4.1 One valve per size and per batch of valves shall be subject to the test described in API 6D and as below:

a) The valve shall be cycled close-open-close with rated pressure in the valve.

b) End stops and position indicators/switches shall be shown to function correctly and give correct alignment of the obturator.

c) Hand wheel force required to operate the valve (open or closed) against design differential pressure shall be measured and shown to be not greater than 360N.

d) Input torque of the gear box shall be measured and verified by torque wrench or torque tool.

11.5 Field Testing of Valves

11.5.1 Vendor to note that all valves may be subject to additional testing prior to installation / commissioning. Tests may include nitrogen gas seat leak testing at 1.1 x design pressure and low-pressure nitrogen seat test at 7 barg. Valves shall be supplied to facilitate field testing.

11.5.2 Vendor to confirm that all the valves shall withstand these tests without any leakage or failure. Any subsequent repairs required as an outcome of site testing shall be carried out by Vendor.

11.5.3 Vendor need to arrange repair of valves locally in COMPANY approved workshop under their warrantee.

11.6 Repair/Repair by Welding

11.6.1 No major repair welds to valve bodies shall be permitted. However minor weld repairs are permissible with prior approval of COMPANY. Any minor weld repair as defined in ASME and ASTM standard shall be mapped and submitted to COMPANY for review and approval prior commencing any repairs. WPS & PQR along with NDE and PWHT shall be submitted for approval. All minor repairs shall be subjected to PWHT.

11.6.2 Welds or Weld Repairs (on fabricated body) shall be subject to a Stress Relieving (PWHT) as per ASME B16.34 and shall be certified.

11.6.3 The welding procedures and qualifications of the welding procedures and welders to be employed in making the repairs must be in accordance with ASTM A488 or ASME section IX.

11.7 Weld Overlay requirement

11.7.1 Weld overlay requirement if specified in valve data sheets, shall be in accordance with MESC SPE 77/313 (Valves with Corrosion Resistant Alloy (CRA) Weld Overlay Cladding.

11.7.2 Unless specified on the Valve Data Sheets, weld overlay shall be applied to the following as minimum:

a) Dynamic sealing areas like seal housing and related contact surfaces at seat to body and stem seals, stem packing areas, etc.

b) Other areas where corrosion of carbon steel is likely to prevent required sealing like Body seat pockets, Trunnion cavity, etc.

11.8 Hard Facing

Hard facing shall be as per High Velocity Oxygen Fuel" (HVOF) type with additional requirements specified in MESC SPE 77/302

SECTION C

12 QUALITY CONTROL AND ASSURANCE

Quality control and assurance shall be as per COMPANY Quality System requirements and applicable Quality procedures and specifications.

12.1 SUBCONTRACTORS/SUBVENDORS

12.1.1 Valves shall only be purchased from Vendors approved by ADNOC Category Management. This approval indicates that the VENDOR has an approved Quality management system and a proven track record in supply of this valve type.

12.1.2 The VENDOR shall assume unit responsibility and overall guarantee for the valves

12.1.3 The VENDOR shall transmit all relevant purchase order documents including specifications to his SUBVENDORS and SUBCONTRACTORS.

12.1.4 It is the VENDOR'S responsibility to enforce all Purchase Order and Specification requirements on his SUBVENDORS and SUBCONTRACTORS.

12.1.5 The VENDOR shall submit all relevant SUBVENDOR and SUBCONTRACTOR drawings and engineering data to the CONTRACTOR.

12.1.6 The VENDOR shall obtain and transmit all SUBVENDOR and

12.1.7 SUBCONTRACTORS warranties to the CONTRACTOR/COMPANY, in addition to the system warranty.

13 TESTING QUALITY REQUIREMENTS

13.1 INSPECTION AND TEST PLAN

Vendor shall submit a detailed Inspection and Test Plan (ITP) for approval based on COMPANY Quality System requirement. Purchaser will complete the ITP with scheduling of tests, scope of test, standard followed for test, acceptance criteria, their review, witness and hold points. Purchaser or its authorized representatives shall be permitted at all times free access to all parts of Vendor's workshops that concern the construction, inspection and testing of the valve.

13.2 SPECIFIC INSPECTION REQUIREMENTS

Quality requirements, including inspection, testing, surveillance, material certification and traceability for the Valves shall be in conformance to the Purchase Order Quality Requirements.

14 SPARE PARTS

14.1 The vendor shall recommend and submit, within the tender package, the priced spare list. This shall be strictly in accordance with COMPANY Spare Parts Procedure and cover the commissioning, start up and first and quote for two year (minimum) operation spare parts.

14.2 Manufacturer shall recommend and quote for two year (minimum) operation spare parts along with the tender package strictly in accordance with COMPANY Spare Parts Procedure including Standard Form for "Spare Parts" referred in the Purchase Requisition

14.3 The vendor shall identify (part of bid) and supply any commissioning spares and special tool requirement if required along with the valve.

14.4 Spare parts list shall indicate clearly the following:

a) Parts serial/manufacturing Number

b) Parts materials specification

c) Availability limitation of these spares

d) Any special tool requirements

e) Any special training required

15 CRITICALITY

15.1 Criticality rating are comparative indications of the 'importance' of a given item with respect to factors relating to service conditions and the consequences of failure. This is then used as a guide in determining the level of inspection to be applied to vendors, and the extent of documentation to be supplied by them. Criticality Rating System shall be as per COMPANY Criticality Specification.

16 CERTIFICATION REQUIREMENTS

16.1 Certification requirements shall be in accordance to Project specification and as per COMPANY Criticality Rating Specification.

16.2 For items intended for sour service, the manufacturer shall provide a statement of compliance with NACE MR 0175/ISO 15156 in addition to the other material certificates required with all additional requirements of COMPANY specification.

16.3 For valves designed to API Standards (API 6A, API 6D API 600, API 602, API 603 API 608, API 609, etc.), manufacturer shall hold valid API license and all valves shall be supplied with respective API Monogram.

16.4 All certifications shall be in English language

16.5 The requirements for certification, reports & any other documents shall be in accordance with the MESC specification and "Vendor Document Requirement List" (VDRL) attached with the material requisition.

16.6 As a minimum, the Material Test Certificates (MTC) shall contain the following data:

a) Project Number, PO Number & Item Number.

b) Item Description, Size and Quantity.

c) Standard & Material Grade.

d) Heat/Melt/Manufacturing Number.

e) Heat Treatment Details.

f) Chemical Analysis for all components.

g) Mechanical Tests Result (Along with values required by specification) for all components.

h) Hardness Test Result (Along with values required by specification).

i) Pressure Test Result.

j) Cryogenic test results (if applicable)

k) Results of Supplementary Test(s) as called out in the Purchase Order (along with values required by specification).

l) NDE Results (as applicable).

m) HIC Test Results: CSR, CLR, CTR values (where applicable).

n) Ferrite test results (if applicable)

p) Radiography report (where applicable).

q) NACE Compliance Statement (where applicable).

r) Dimensional Check Report.

s) WPS and PQR (for welds including weld repairs & overlays).

t) Valve painting report.

u) Certificate of compliance for valve operator.

16.7 All materials shall have their chemical analysis certified by Product Check Analysis.

16.8 Material Test Certificates (MTC) shall be furnished covering each heat supplied.

16.9 Supplier shall ensure that appropriate certification showing mill heat or batch markings are received for all furnished materials. Materials furnished without documentation are not acceptable.

16.10 Where applicable all certificates shall be original or authenticated mill certificates.

16.11 All certificates shall state the manufacturer's name, location. Forging, casting and plate certificates shall be from original steel manufacturers

17 PAINTING

17.1 All non-moving exposed surfaces shall have a protective coating in accordance with COMPANY specific Painting and Coating Specification.

17.2 The finish coating of the paint provided on the valves shall be such that, field application of re-painting can be done without the requirement for any surface preparation on top of the full-cured factory-finished coat. Finish colour of the coating shall be as specified in the valve datasheet/Purchase description.

17.3 When painting is required for protection of the valve(s), it shall only be applied after all tests and examinations have been carried out. The flange contact faces and various valve identifying markings shall not be painted.

17.4 Colour coding of valves shall be done in line with the COMPANY Painting & Colour coding specification unless specifically indicated in Valve datasheet.

18 MARKING AND TAGGING

18.1 Marking shall be designed to be clearly legible for the valve design life.

18.2 The nameplate rivet holes shall be pre-drilled prior to FAT.

18.3 Marking shall be as per relevant ASME, ASTM, MSS or other standards as mentioned on the Purchase Description. Unless noted otherwise, the location, style, symbols, abbreviations etc. of markings shall be in accordance with MSS-SP-25. Carbon steel material shall be marked by cold stamping using low stress round nosed stamps or manufacturer's rolling stamp method.

18.4 Marking for stainless steels (Austenitic and Duplex), Titanium and 90/10 Cu Ni components shall be by vibro-etching on rim on each item.

18.5 Galvanized items shall be marked by stencilling in letters not less than 20mm high with a water-proof material that is not injurious to the coating.

18.6 Heat number for the castings or material specification for the forgings shall be permanently marked on the valve body.

18.7 An identification nameplate, made from 316 SS material, shall be fixed securely to the valve body with type 316 stainless steel fasteners after coating is complete.

18.8 As a minimum, the following data shall be indicated on the nameplate, in bold (uppercase) lettering, a minimum of 3 mm in height

18.9 All valves shall be equipped with a proper identification name plate, which is made by SS or nickel alloy sheet and shall report following as minimum:

a) Project number & Purchase order number

b) Item no

c) Name of valve manufacturer

d) Supplier serial number.

e) Nominal size

f) Valve Rating

g) Valve type

h) Valve datasheet number

i) Valve Tag no (in case these are indicated on valve data sheet/ purchase description).

j) Valve design pressure and temperature

k) Hydrostatic / Pneumatic test type and pressure

l) Body, trim and seat material specifications

m) Material stock code number (if applicable).

n) NACE compliance details

o) Fire safe compliance.

p) Year of manufacture

q) Paint system

18.10 In case the above information cannot be accommodated on the valve manufacturer's standard nameplate, the following information may be provided in bold uppercase lettering at least 6mm in height, on a separate plate. The additional plate shall be made from 316 SS material, shall be fixed securely to the valve body with type 316 stainless steel fasteners after coating is complete.

a) Project Number & PO Number.

b) Item Number.

c) Valve datasheet number.

d) Valve tag number. (in case these are indicated on valve datasheet / PO)

e) Valve serial number.

18.11 In addition to Valve Name Plate (detailed above), each valve shall be supplied with an additional 316 SS tag plate permanently fixed to the valve with SS316L flexible wire. This additional plate shall be marked in 6mm high uppercase lettering with the valve V-number if indicated in the P&ID (unique number as per PID) stamped or engraved (For EPC projects, this activity may be performed by the EPC contractor).

18.12 When applicable, Valves, which are "type tested or gas tested", shall be tagged accordingly

19 PACKING AND PRESERVATION

19.1 General

19.1.1 Vendor shall submit their standard packing procedure together with packing, protective coatings and preservation materials to COMPANY for approval. Once agreed this procedure and details shall be followed consistently. Any intended changes shall be notified for approval by COMPANY before use.

19.1.2 Each box or crate shall be marked with identical data to that of the name plate and shall be provided with a list of parts, assembly method and transmittal papers in a waterproof envelope firmly attached to it.

19.1.3 Material Certificates shall accompany each lot or part lot to each delivery location.

19.1.4 Lifting-lug points shall be clearly indicated on the containers.

19.1.5 Valves supplied shall be dry, clean and free from moisture, dirt, grease, oil and loose foreign material of any kind.

19.1.6 Valves shall be packed in a manner which allows easy handling and prevents damage using materials suitable for all type of transport (Sea, Rail and Road).

19.1.7 All valves shall be shipped in suitable containers to give sufficient protection during transit and storage. Valves shall be packed, boxed securely and crafted in the containers such that valve movement during shipment is prevented.

19.1.8 All types of Crates, boxes etc. used, shall be lined internally with waterproof plastic, minimum 150 µm thickness, with sufficient weep/vent holes to prevent internal condensation.

19.1.9 Valves shall be supplied with protective coating for protection against rust, corrosion and mechanical damage during transportation and storage within open and internal areas in onshore and offshore environments.

19.1.10 Waterproof barrier material shall be used for stainless steel valves to protect against chlorine attack by exposure to salt water atmosphere.

19.1.11 Carbon steel and stainless steel valves shall be packed separately and shall not be stored together.

19.1.12 Open ends of valves shall be protected with heavy duty plastic end caps.

19.1.13 Hand wheels and Levers 350mm or longer shall be removed and packed in the valve crate firmly attached to the valve to prevent movement and damage during shipment. Any associated small items shall be packed within a waterproof plastic envelope and attached by plastic tie wrap to the valve.

19.1.14 Threaded ends shall be greased and fitted with a plastic cap or plastic thread protector to ensure adequate thread protection. SW or BW ends shall be fitted with plastic end cap to ensure that all openings are closed.

19.1.15 Gasket contact surfaces on flanged valves shall be protected by means of one-piece covers secured by a minimum of four bolts. The cover material shall be 10mm thick plywood or 3mm thick steel. In addition, a corrosion preventive shall be applied to the flange faces. When plywood flange covers are used, a Polythene sheet shall be placed between the coated flange face and the cover to prevent the wood absorbing the preventative.

19.1.16 Flange covers are not to be used as surfaces for any marking or tagging.

19.2 Packing requirements specific to valve type.

19.2.1 Gate Valves

a) Gate valves that have blocking between the seat and wedge to prevent in-transit damage to the seat shall be tagged to indicate that blocking is installed. The tag shall indicate that the blocking is required to be removed before installation. The manufacturer shall be responsible for determining if valves require blocking.

b) The Gate valve shall be shipped with the obturator in closed position.

c) Gate Valves shall have the glands and spindles shrouded by a wrapping of petrolatum tape around the valve yoke.

19.2.2 Ball Valves

a) The ball shall be in OPEN position.

19.2.3 Check Valves

a) Check valves that have blocking between the seat and piston/disk/ball to prevent in-transit damage to the seat shall be tagged to indicate that blocking is installed. The tag shall indicate that the blocking is required to be removed before installation. The manufacturer shall be responsible for determining if valves require blocking.

19.2.4 Globe Valves

a) Globe valves that have blocking between the seat and Disc to prevent in-transit damage to the seat shall be tagged to indicate that blocking is installed. The tag shall indicate that the blocking is required to be removed before installation. The manufacturer shall be responsible for determining if valves require blocking.

b) The Globe valve shall be shipped with the obturator in closed position.

c) Globe Valves shall have the glands and spindles shrouded by a wrapping of petroleum tape around the valve yoke.

20 SHIPMENT

20.1 Preparation of equipment for transportation shall conform to the packing, marking, and shipping instructions or other documents identified in the Purchase Order.

20.2 Shipping shall be as specified in the purchase documentation.

20.3 Valves shall be released for shipment only after COMPANY's approval of all documentation as per the Vendor Document Requirement Schedule, attached to the requisition.

20.4 Packing shall be inspected by COMPANY (or their authorized representatives), before acceptance for shipment.

20.5 All valves shall be subject to Receipt Inspection at destination, comprising visual inspection and satisfactory review of COMPANY approved certification/ documents/ manuals/ dossiers required by the purchase order. Incomplete documentation is not acceptable.

20.6 Copies of the following documents shall be included with each valve delivery. These documents shall be contained in sealed a waterproof envelope and securely attached to the valve within the shipping container:

a) 1 copy of the Packing Lists.

b) Manufacturers release note (MRN).

c) Procedure for receipt and installation.

d) Agreed deviations.

e) A list of any rust preventative showing the brand name, type number and manufacturer's name. A copy of the manufacturer's instructions for the renewal and/or removal of any rust preventatives.

f) For packages containing desiccants, a list showing the brand name, type number, manufacturers name, the date the package was sealed and the recommended renewal frequency.

g) Any other documentation as requested in the purchase requisition.

21 DOCUMENTATION / MANUFACTURER DATA RECORDS

21.1 GENERAL

21.1.1 The format of documentation shall comply with Project requirements and COMPANY specific vendor drawing requirements.

21.1.2 Documents shall be provided shall follow the requirements listed below and Project specific purchase requisitions/ order.

21.1.3 VENDOR shall submit the type and quantity of drawings and documentation for CONTRACTOR'S authorization or information as listed in the individual Material Requisitions and Purchase Orders.

21.1.4 Mutual agreement on scheduled submittal of drawings and engineering data shall be an integral part of any formal Purchase Order.

21.1.5 After order placement, SUPPLIER shall submit for approval, all listed drawings / documents, strictly in accordance with the agreed schedule and program.

21.1.6 Comments made by CONTRACTOR on drawing submittal shall not relieve VENDOR or SUBVENDORS of any responsibility in meeting the requirements of the specifications. Such comments shall not be construed as permission to deviate from requirements of the Purchase Order unless specific and mutual agreement is reached and confirmed in writing.

21.1.7 Each drawing shall be provided with a block in the bottom right-hand corner incorporate the following information:

a) Official trade name of the VENDOR.

b) VENDOR'S drawing number.

c) Drawing title giving the description of contents whereby the drawing can be identified.

d) A symbol or letter indicating the latest issue or revision.

e) PO number and item tag numbers.

21.1.8 Revisions to drawing shall be identified with symbols adjacent to the alterations, a brief description in tabular form of each revision shall be given, and if applicable, the authority and date of the revision shall be listed. The term "Latest Revision" shall not be used.

21.2 DOCUMENTATION AND MANUALS

21.2.1 Vendor shall provide the minimum documentation as stated in the Purchase Order and the general minimum documents required by the VENDOR listed below:

a) List of Vendor's Documents and Drawings

b) Manufacturing, testing and inspection procedures (Inspection & Test Plan)

c) Sub-Vendors and Main Suppliers List

d) Cross Sectional Assembly Drawings (with Part List)

e) Calculation reports

f) Welding Procedures (WPS, PQR, Weld Map of key)

g) NDE Procedure, PMI Procedure, Testing Procedures

h) PWHT Procedure

i) Type test certifications: Fire Safe Certification, Cryogenic valve Type Test Certification, AED

j) Non-conformance records;

k) Listing of applicable and authorized concessions, waivers and/or material substitutions

l) Painting Specification

m) Material test certificates for Body, Bonnet/Cover

n) Material test certificates for Stem, Body plug.

o) Material test certificates for Obturator, Bolt, Nuts, Gaskets, seat rings, screws, pins, cotters etc.

p) Galvanizing and coating certificates for fasteners

q) NDE, PMI including overlay NDE, thickness check, Ferrite check, etc., Tungsten carbide coating inspection, thickness,

r) Visual and Dimension check

s) Hardness testing of seat, RTJ grooves

t) Pressure Tests (Body, Seat including)

u) Painting inspection

v) Marking, Name Plate, Tagging, IDENT Code, Colour Coding and Preservation

w) Material Test Certificates along with MCS and Test Records

x) Manufacturer Data Book as per Approved MRB Index

y) List of Spare Parts for Erection/Installation, Commissioning and Start-up

z) List of Spare Parts – Two Years operation

aa) Instruction book/Maintenance manuals.

21.3 FINAL DOSSIER

21.3.1 Final dossiers shall be submitted per instructions to Vendor for the Preparation of Vendor Data Books.

21.3.2 Final dossier shall contain AS-BUILT documents including design documents, manufacturing data record book and instruction for installation.

21.3.3 The manufacturing data records book shall contain all documentation referenced in Inspection and Test plan, all test certificates and records and code stamp certification documents.

21.3.4 The test reports shall be traceable to each component through the legible paint stencilled, heat numbers or equivalent.

21.3.5 All documents shall be identified with COMPANY'S purchase order numbers and item code numbers and shall be signed by the manufacturer's authorized signature.

21.3.6 An Instruction book/ Maintenance Manual provided along with final dossier shall as a minimum contain the following information:

a) Instructions regarding installation and maintenance of the valve

b) A detailed GA drawing of the valve

c) Section drawings including the assembly sequence of the valve.

d) Section drawings indicating Location and Depth of Weld Overlay (in case weld overlay is performed)

e) Component listing with Bill of Materials.

f) Spare Parts List (COMPANY's form attached to the P.O)

22 GUARANTEE AND WARRANTY

22.1.1 The VENDOR shall guarantee, in accordance with the general conditions, the equipment shall meet the performance conditions specified in this specification, associated documents and Data Sheets.

22.1.2 SUPPLIER is required to provide guarantee for the trouble – free performance of the valves covered under this specification. SUPPLIER is fully responsible to ensure that the valve materials are suitable for the service, pressure/temperature specified in the data sheets/piping classes and design life. SUPPLIER is free to offer alternative materials in order to provide such a guarantee subject to COMPANY approval.

22.1.3 Notwithstanding the valve's governing code requirements, valves shall be warranted by the Manufacturer against defective material, poor workmanship, and improper design for a period of eighteen (18) months from the date of commissioning or twenty-four (24) months from the date of delivery, whichever is later. The Manufacturer shall repair or replace, without charge, any valve not meeting the terms of the warranty within this period.

SECTION –D

23 APPENDIX A – REFERENCE DOCUMENTS

23.1 International codes and standards

The following Codes and Standards shall form a part of this Specification. When an edition date is not indicated for a Code or Standard, the latest edition in force at the time of the contract award shall apply.

American Petroleum Institute (API)	
API 6A	Wellhead and Christmas Tree Equipment.
API 6FA	Specification for Fire Test for Valves.
API 6ACRA	Age-hardened Nickel-based Alloys for Oil and Gas Drilling and Production Equipment
API 6D	Specification for Pipeline and Piping Valves
API 594	Wafer and Wafer Lug Check Valves
API 598	Valve Inspection and Testing
API 599	Metal Plug Valves -Flanged, Threaded, and Welded Ends
API 600	Steel Gate Valves Flanged and Butt Welding Ends
API 602	Steel Gate, Globe and Check Valves for Sizes DN100 and Smaller for the Petroleum and Natural Gas Industries
API 603	Corrosion Resistant, Bolted Bonnet Gate Valves-Flanged and Butt-Welding Ends
API 607	Fire Test for Soft Seated Quarter Turn Valves
API 608	Metal Ball Valves-Flanged, Threaded, and Welding Ends
API 609	Butterfly Valves: Double Flanged, Lug-and Wafer-Type
API 615	Valve Selection Guide
API 622	Type Testing of Process Valve Packing for Fugitive Emissions.
API 623	Steel Globe Valves Valves—Flanged and Butt-welding Ends, Bolted Bonnets
API 624	Type Testing of Rising Stem Valves Equipped with Graphite Packing for Fugitive Emissions
API Spec Q1	Specification for Quality Programs for the Petroleum, Petrochemical and Natural Gas Industry.
API-RP-14E	Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems

American Society of Mechanical Engineers (ASME)	
ASME Section V	Non-destructive Examination
ASME Section VIII	Pressure Vessels
ASME Section IX	Qualification Standard for Welding and Brazing Procedures, Welders, Brazers and Welding & Brazing Operators
ASME B1.1	Unified Inch Screw Threads
ASME B1.20.1	Pipe Threads General Purpose (Inch)
ASME B16.5	Pipe flanges and Flanged Fittings
ASME B16.9	Factory Made Wrought Steel Butt Welding fittings
ASME B16.10	Face-to-Face and End-to-End dimensions of Valves
ASME B16.11	Forged fittings, Socket Welding and Threaded
ASME B16.20	Metallic Gaskets for Pipe flanges
ASME B16.21	Non-metallic Gaskets for Pipe Flanges
ASME B16.25	Butt Welding Ends
ASME B16.34	Valves – Flanged, Threaded and Butt Welding Ends
ASME B16.47	Large Diameter Steel Flanges.
ASME B 18.2.1	Square and Hex Bolts and Screws (Inch Series)
ASME B 18.2.2	Square and Hex Nuts (Inch Series)
ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASME B31.4	Pipeline Transportation Systems for Liquids and Slurries
ASME B31.8	Gas Transmission and Distribution Piping Systems
ASME B46.1	Surface Texture (Surface Roughness, Waviness, and Lay)

American Society for Testing and Materials (ASTM)	
ASNT-TC-1A	Personnel Qualification and Certification in Non-destructive Testing
ASTM A105	Standard Specification for Carbon Steel Forgings for Piping Applications.
ASTM A106	Seamless Carbon Steel Pipe for High - Temperature Service
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
ASTM A182	Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
ASTM A193/A193M	Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
ASTM A194/A194M	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
ASTM A216	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A 217	Steel Castings, Martensitic Stainless and Alloy for Pressure Containing Parts Suitable for High Temperature Service
ASTM A 234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Services
ASTM A 240	Heat Resisting Chromium and Chromium – Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM A262	Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM A275	Standard Test Method for Magnetic Particle Examination of Steel Forgings.
ASTM A320/A320M	Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service.
ASTM A333	Seamless and Welded Steel Pipe for Low-Temperature Service
ASTM A350	Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components.
ASTM A352	Standard Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
ASTM A370	Mechanical Testing of Steel Products

American Society for Testing and Materials (ASTM)	
ASTM A380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
ASTM A388	Standard Practice for Ultrasonic Examination of Steel Forgings.
ASTM A 395	Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A435	Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates.
ASTM A 453	High Temperature Bolting with Expansion Coefficients Comparable to Austenitic Stainless Steels
ASTM A479	Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
ASTM A494	Standard Specification for Castings, Nickel and Nickel Alloy
ASTM A564	Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A577	Standard Specification for Ultrasonic Angle-Beam Examination of Steel Plates.
ASTM A578	Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications.
ASTM A609	Standard Practice for Castings, Carbon, Low-Alloy, and Martensitic Stainless Steel, Ultrasonic Examination Thereof.
ASTM A694	Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service
ASTM A705	Standard Specification for Age-Hardening Stainless Steel Forgings
ASTM A744	Casting, Iron-Chromium-Nickel, Corrosion resistant, for Severe Service
ASTM A747	Standard Specification for Steel Castings, Stainless, Precipitation Hardening steel castings
ASTM A788	Standard Specification for Steel Forgings General Requirements.
ASTM A890	Standard Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion Resistant, Duplex (Austenitic/Ferritic) for General Application
ASTM A923	Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels

American Society for Testing and Materials (ASTM)	
ASTM A 928	Ferritic/Austenitic (Duplex) Stainless Steel Pipe Electric Fusion Welded with Addition of Filler Metal
ASTM A995	Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel for Pressure Containing Parts
ASTM B148	Standard Specification for Aluminium-Bronze Sand Castings
ASTM B 150	Aluminium Bronze Rod, Bar and Shapes
ASTM B 381	Titanium and Titanium Alloy Forgings
ASTM B564	Standard Specification for Nickel Alloy Forgings
ASTM B637	Standard Specification for Precipitation-Hardening and Cold Worked Nickel Alloy Bars, Forgings, and Forging Stock for Moderate or High Temperature Service
ASTM E94	Standard Guide for Radiographic Examination.
ASTM E165	Standard Practice for Liquid Penetrant Testing for General Industry.
ASTM E384	Standard Test Method for Micro indentation Hardness of Materials
ASTM E562	Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count.
ASTM E709	Standard Guide for Magnetic Particle Testing.
ASTM F468	Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use.
ASTM F467	Standard Specification for Nonferrous Nuts for General Use.
ASTM G28	Standard Test Methods for Detecting Susceptibility to Intergranular Corrosion in Wrought, Nickel-Rich, Chromium-Bearing Alloys

British Standards (BS) / International Organization for Standardisation (ISO)	
BS 6364	Specification for Valves for Cryogenic Service
BS 6755-2	Testing of Valves Part 2: Specification for Fire Type Testing Requirements
BS EN ISO 12490	Petroleum and Natural Gas Industries - Mechanical Integrity and Sizing of Actuators and Mounting Kits for Pipeline Valves

EN 287-1	Qualification Test of Welders - Fusion Welding Part 1: Steels
EN 1092-1	Flanges and Their Joints - Circular Flanges for Pipes, Valves, Fittings and Accessories - PN Designated Steel Flanges
EN 10204	Metallic Products - Types of Inspection Documents
ISO 1461	Hot dip galvanised coatings on fabricated iron and steel articles - Specification and test methods.
ISO 5208	Industrial valves - Pressure testing of metallic valves
ISO 5210	Industrial Valves - Multi-Turn Valve Actuator Attachments
ISO 5211	Industrial valves - Part-turn actuator attachments.
ISO 9001	Quality management systems - Requirements.
ISO 9606 1	Approval Testing of Welders - Fusion Welding - Part 1: Steels.
ISO 9712	Non-destructive testing. Qualification and certification of NDT personnel.
ISO 10423	Petroleum and natural gas industries - Drilling and production equipment - Wellhead and Christmas tree equipment (API Spec 6A).
ISO 10497	Testing of valves- Fire type testing requirements.
ISO 15156 Parts 1 to 3	Petroleum and natural gas industries - Materials for use in H2S-containing environments in oil and gas production (NACE MR0175).
ISO 15607	Specification and qualification of welding procedures for metallic materials - General rules.
ISO 15609	Specification and qualification of welding procedures for metallic materials - Welding procedure specification.
ISO 15614	Specification and qualification of welding procedures for metallic materials - Welding procedure test.
ISO 15848 Parts 1 and 2	Industrial valves - Fugitive emissions - Measurement, test and qualification procedures

Det Norske Veritas and Germanischer Lloyd (DNVGL)	
DNVGL-ST-F101	Submarine Pipeline Systems

Engineering Equipment and Material Users Association (EEMUA)

EEMUA 192	Guide for the Procurement of Valves for Low Temperature (Non-Cryogenic) Service

Manufacturers Standardization Society - Standard Practice (MSS SP)	
MSS SP-25	Standard Marking System for Valves, Fittings, Flanges, and Unions
MSS SP-45	Bypass and Drain Connection
MSS SP-54	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components - Radiographic Examination Method
MSS SP-55	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components - Visual Method for Evaluation of Surface Irregularities
MSS-SP-67	Butterfly Valves
MSS SP-91	Guidelines for Manual Operation of Valves
MSS-SP-92	Valve User Guide

National Association of Corrosion Engineers (NACE)	
NACE MR0103	Standard Material Requirements - Materials Resistant to Sulphide Stress Cracking in Corrosive Petroleum Refining Environments.
NACE MR0175	Petroleum and Natural Gas Industries - Materials for Use in H2S Containing Environments in Oil and Gas Production

23.2 ADNOC Specifications

Std/Spec Number	Title
AGES-GL-07-001	Material Selection Guidelines
AGES-GL-08-001	Process Design Criteria
AGES-PH-08-001	Isolation, Drain and Vent Philosophy
AGES-SP-04-005	Emergency Shutdown and On/Off Valves Specification
AGES-SP-07-003	Materials and Fabrication Requirements for Metallic Piping & Equipment in Severe (sour) Service
AGES-SP-09-001	Piping Basis of Design
AGES-SP-09-002	Piping Material Specification Index
AGES-SP-10-003	Onshore Pipelines Design and Construction Specification

In addition to above ADNOC Specifications, COMPANY specific Piping Specifications, Process Specifications, Quality Specifications, Criticality Rating Specification, Painting and Coating specification, Material & Corrosion Specifications, Civil Specifications etc. as applicable shall be applied as applicable and shall be read in conjunction to this specification.

23.3 MESC SPE Specifications

Std/Spec Number	Title
MESC SPE 74/001	Carbon steel pipe (Amendments/ supplements to API Spec. 5L)
MESC SPE 74/002	Carbon Steel Pipe (Amendments/Supplements to ASTM A 106)
MESC SPE 74/004	Carbon Steel Pipe (Amendments/Supplements to ASTM A 333)
MESC SPE 74/008	Stainless Steel Pipe (Amendments/Supplements to ASTM A 312)
MESC SPE 74/014	Pipe, Duplex/Super Duplex Stainless Steel ASTM A 790
MESC SPE 74/017	Pipe, Nickel – Copper Alloy ASTM B 165
MESC SPE 74/019	Nickel alloy Pipe to ASTM B 423
MESC SPE 74/026	Nickel alloy Pipe to ASTM B 444
MESC SPE 76/030	Branch Outlets
MESC SPE 76/100	Flanges (Amendments/Supplements to ASME B16.5)
MESC SPE 76/101	Flanges (Amendments/Supplements to ASME B16.47)

Std/Spec Number	Title
MESC SPE 76/110	Fittings (Amendments/Supplements to ASME B16.9)
MESC SPE 76/200	Carbon and Alloy Steel Fittings (Amendments/Supplements to ASTM A234)
MESC SPE 76/201	Carbon Steel Fittings (Amendments/Supplements to ASTM A 420)
MESC SPE 76/202	Stainless Steel Fittings (Amendments/Supplements to ASTM A 403)
MESC SPE 76/210	Carbon Steel Forgings (Amendments/Supplements to ASTM A 105)
MESC SPE 76/211	Carbon and Alloy Steel Forgings (Amendments/Supplements to ASTM A 350)
MESC SPE 76/212	Alloy and Stainless Steel Forgings (Amendments/Supplements to ASTM A 182)
MESC SPE 76/213	Nickel Alloy Forging to ASTM B 564
MESC SPE 76/220	Carbon Steel Plate (Amendments/Supplements to ASTM A 516)
MESC SPE 76/221	Alloy Steel Plate (Amendments/Supplements to ASTM A387)
MESC SPE 76/222	Stainless Steel Plate (Amendments/Supplements to ASTM A 240)
MESC SPE 76/223	Nickel Copper Plate (Amendments/Supplements to ASTM B127)
MESC SPE 77/100	Ball Valves to. BS 5351
MESC SPE 77/101	Gate, Globe and Check Valves (Amendments/Supplements to ISO 15761)
MESC SPE 77/102	Gate Valves (Amendments/Supplements to ISO 10434)
MESC SPE 77/103	Globe Valves (Amendments/Supplements to BS 1873)
MESC SPE 77/104	Check Valves (Amendments/Supplements to BS 1868)
MESC SPE 77/105	Gate, Globe and Check Valves to BS 5154 Copper Alloy, Flanged or Threaded Ends
MESC SPE 77/110	Ball Valves (Amendments/Supplements to ISO 17292)
MESC SPE 77/130	Ball Valves (Amendments/Supplements to ISO 14313)
MESC SPE 77/131	Through Conduit, Rising Stem Gate Valves to ISO 14313
MESC SPE 77/132	Swing Check Valves to ISO 14313 and API 6D.
MESC SPE 77/133	Dual Plate Check Valves to API 594

Std/Spec Number	Title
MESC SPE 77/134	Butterfly valves to API 609
MESC SPE 77/160	Gate, Globe and Swing Check Valves to ASME B16.34
MESC SPE 77/170	Process to instrument valves
MESC SPE 77/190	Ball and Check Valves, Lined, to Manufacturers Standard, Flanged
MESC SPE 77/200	Valves in Low Temperature and Cryogenic Services
MESC SPE 77/208	Gate, Globe, Ball and Butterfly Valves with Restricted Gland Packing Tolerances Used for Special Services as Listed in SPE 77/303 Section 1.1
MESC SPE 77/211	Valve stem, adapter and bracket dimensions for floating Ball valves
MESC SPE 77/302	Technical Specifications-Valves – General Requirements
MESC SPE 77/303	Technical Specifications-Valves in Special Service
MESC SPE 77/307	Production Testing of Valves in Vacuum services
MESC SPE 77/309	Production Testing of Soft Seated Gate Valves Used for Double Block & Bleed Service
MESC SPE 77/311	Lining for Valves
MESC SPE 77/312	Technical Specifications-Fugitive Emission Production Testing
MESC SPE 77/313	Valves with Corrosion Resistant Alloy (CRA) Weld Overlay Cladding
MESC SPE 77/315	Electro less Nickel Plating sealant surface
MESC SPE 81/001	Alloy and Stainless Steel Bolts (Amendments/Supplements to ASTM A 193)
MESC SPE 81/002	Carbon and Alloy Steel Nuts (Amendments/Supplements to ASTM A 194)
MESC SPE 81/003	Stud Bolts, ASTM A 320
MESC SPE 81/006	Nickel Alloy Bolts & Nuts (Amendment/Supplement to EN 10269)
MESC SPE 81/007	Coating Requirements for bolts and nuts
MESC SPE 85/100	Gasket, Metal Grooved to BS EN 12560 -6
MESC SPE 85/101	Non-Metallic Flat Gaskets, With or Without Insert (Amendments/Supplements to ASME B16.21)
MESC SPE 85/103	Spiral Wound Gaskets (Amendments/Supplements to ASME B16.20)

Std/Spec Number	Title
MESC SPE 85/112	Metal Ring Joint Gasket to ASME B 16.20
MESC SPE 85/201	Flange Insulation Sets
MESC SPE 85/203	Graphite (Amendments/Supplements to ASTM F 2168)
MESC SPE 85/204	Packing material, graphite and carbon braided yarn (amendments/supplements to ASTM f 2191)
MESC SPE 85/301	Toroidal sealing ring (O-ring) test Procedure (amendments/supplements to Norsok M-710)

SECTION E

24 APPENDIX B – PIPELINE VALVES

The below additional requirements shall be considered for pipeline valves in addition to the requirements stated above.

B.1 Introduction

B.1.1 Pipeline valves shall be supplied in compliance with the requirements given in pipeline valve data sheets. Minimum technical requirement for design, materials, testing shall be in accordance with that of piping valves in the above sections are applicable with following additional requirements.

B.1.3 This Appendix is applicable for Valves (Piggable / Non Piggable valves) in pipeline system and associated system (block / sectionalising valve stations, pumping & metering stations, etc.) designed as per ASME B 31.4 or B 31.8 or DNV OS-F101 or B31.3 as specified in valve datasheet.

B.1.4 This specification shall be applicable to all manual valves and the valve part of the actuated isolation valves (MOV, GOV, ESD, etc.). However actuated part of the Valve (i.e. valves with Pneumatic/Hydraulic/Electrical Actuators) are not covered but this specification is to be read in conjunction with the relevant specification for Actuator by others.

B.2 Design Considerations / Minimum Design Requirements

B.2.1 The design code of Pipeline valves NPS 2 and above and up to class 2500 shall be API 6D unless otherwise specified, Pipeline Valves in API 5000 and API 10000 class shall be to API Spec 6A/ ISO 10423. In addition, requirements of applicable MESC SPE like 77/130, 77/131, 77/132, 77//302, 77/313, etc. shall also be met as specified in the valve datasheet.

B.2.2 Pipeline Valves shall be flanged ends / butt-welded ends as specified in valve datasheet.

B.2.3 For Sales gas transportation/distribution applications and for buried pipeline valves (irrespective of services), the valves ends connections shall conform to clause B 7 and Table-A.

B.2.4 All piggable valves shall be furnished as full bore (API 6D, Table 1) or specific bore matching pipeline internal diameter as specified in valve datasheet. Bore of the valve shall be suitable for the passage of all types of pipeline scraper and inspection pigs on regular basis without causing damage to either the valve component or the pig. In addition it shall provide an unobstructed profile for pigging operations in either direction. Bore of valve shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded

B.2.5 Pipeline Valve shall be designed to withstand a sustained internal vacuum during drying operation of pipeline system

B.2.6 Welding ends of Butt end valves shall conform to requirements in the section 7.5.7 above. Where specified soft seated/seal weld end valves shall be supplied with pipe pups, material and thickness of pipe pups will be specified on the data sheet.

B.2.6 <u>Auxiliary Connections for Pipeline valve</u>

a) All Pipeline valves shall be provided with vent and drain. Drain connection shall be at the lowest possible position on the valve body and vent connection at the highest possible position.

b) For onshore pipeline valves (excluding offshore islands and offshore platforms), body vents and drains shall be provided with below features

Pipeline Valve size	Requirement of Valve on Vent & drains	Vent & Drain size	End Connection of vent & drain valve

NPS 6 and below	No	As per clause 7.7	Refer Clause 7.7
NPS 8 to NPS 24	Single valve (Note 1)	NPS 1	Butt weld one end & NPT with Plug at open end
NPS 26 and above	Single valve (Note 1)	NPS 2	Butt weld one end & Flange with Blind at open end
Note 1 : For sour service, vent & drain shall be provided with double isolation valve (primary isolation valves shall be but welded both ends)			

c) All the auxiliary connection and valves shall meet the design, material & service conditions of the main valves. The projection of all auxiliary connections beyond valve body shall be minimized and supported to avoid damage during valve operation/ handling.

d) Valves 6″ and above, shall be provided with sealant injection to seats (for ball valve only) and stem seals. The requirement of sealant injection shall be as described in piping valves, clause 7.7

B.3 Ball Valves

B.3.1 Valve body design (top entry, side entry, welded body etc.) shall be as specified in the purchase description/valve datasheet.

B.3.2 All Butt welded pipeline valves shall be top entry or fully welded unless specified otherwise in valve datasheet

B.3.3 All ball valves shall be trunnion mounted type. Fire-safe design for all ball valves shall be specified in accordance with API 6FA (same as piping valve requirement above). All ball valves shall be provided with double seat seals. (Also refer section 7.8.8 above)

B.3.4 The seat rings shall be spring energized to ensure sealing at low differential pressures. Design of seat ring and body shall be such that entrapment of any solid present in the fluid will not obstruct free movement of the seat rings and will not reduce spring action. Seat rings shall be self-relieving type (single piston effect). Double piston effect seat design shall be provided for gas service if specified in the datasheet. Safety relief valve for body cavity relief shall not be permitted.

B.3.5 A lip seal all shall be provided in the lower bearing, stem and seat to prevent ingress of particulate materials and improve the fugitive emission rate. Design of seals shall be verified & endorsed by the vendor and seal supplier for each service applications

B.3.6 Pressure relieving holes and pressure balancing holes (hole in ball connecting stem pocket and ball ID) in the ball are not allowed.

B.3.7 Inline full-bore pipeline valves shall be drift tested. The drift test shall demonstrate that full-bore valves have minimum bore specified in Table 1 of API 6D. A drift mandrel shall be passed through the valve, without sticking or damage the valve with the ball in fully open position.

B.3.8 Face to Face dimension shall be as per API 6D. Short pattern valves are not acceptable.

B.4 Gate Valves

B.4.1 Pipeline gate valves shall be designed, fabricated, tested and inspected in accordance with API Spec 6D and ASME B16.34 except as modified by the requirements of this Specification, for the service conditions specified on the Data Sheets. Allowable stress requirements shall comply with the provisions of ASME B31.4. End-to-end and bore dimensions shall be in accordance with API Spec 6D.

B.4.2 Pipeline gate valves shall be designed as per requirements of API 6D and applicable standards as specified the valve datasheet.

B.4.3 This Specification covers the following Gate Valve types:

a) Through Conduit

b) Double disc

c) Parallel slide

B.4.4 Unless otherwise specified, all Gate Valves shall be Reverse acting, Bidirectional, Self-Relieving seat, 'Through Conduit' design, with Position Indicators. The stem packing shall be dust proof design and designed for easy online replacement. The valve shall be designed to have stem sealant injection system.

B.4.5 All piggable pipeline gate valves shall be full bore design. Inline full-bore pipeline valves shall be drift tested

B.4.6 The Valve shall be Double Block & Bleed design with automatic release of excess cavity fluid pressure into valve bore. The use of a pressure equalising hole in the disc(s) is prohibited.

B.4.7 Full port valves specified with "Full Bore" or FB in the data sheet shall be as per API 600/602 and the valve bore size shall be in accordance with API 6D.

B.4.8 Trim of gate valves in all services including steam/gas service valves shall be hard faced.

B.4.9 Gate Valves shall be of a fire safe design and shall be certified to API SPEC 6FA / BS EN ISO 10497. (Also refer section 7.8.8 above)

B.4.10 If valves are Uni-directional, they shall be clearly marked.

B.5 Plug Valves

B.5.1 Pipeline plug valves shall be designed, fabricated, tested and inspected in accordance with API Spec 6D, API 599 and ASME B16.34 except as modified by the requirements of this Specification, for the service conditions specified on the Data Sheets. Allowable stress requirements shall comply with the provisions of ASME B31.4. End-to-end and bore dimensions shall be in accordance with API Spec 6D/API 599.

B.5.2 The Plug Valves in sizes two inch (nominal) and larger for ASME up to class 2500 shall comply with this specification and API 6D.

B.5.3 Plug valves shall be pressure balanced and full-bore type.

B.5.4 Cylindrical plugs shall only be used with COMPANY approval.

B.5.5 Valves shall be provided with sealant injection connections. Design shall incorporate an internal single or double ball check valve with a vented cap giant button head grease nipple.

B.5.6 Valves shall be of Fire Safe Design in accordance with API 6FA. (Also refer section 7.8.8 above)

B.5.7 For Pipeline plug valves, Full bore design with round port pattern with minimum bore as specified in Table 1 of API 6D.

B.5.8 Valve design shall meet the requirements of API Specification 6D/ API 599 and shall be suitable for the service conditions indicated in the Valve Data Sheets.

B.6 Check Valves

B.6.1 Pipeline check valves shall be designed, fabricated, tested and inspected in accordance with API Spec 6D and ASME B16.34 except as modified by the requirements of this Specification, for the service

conditions specified on the Data Sheets. Allowable stress requirements shall comply with the provisions of ASME B31.4. End-to-end and bore dimensions shall be in accordance with API Spec 6D/API 594.

B.6.2 Check valves shall be of the horizontal swing, full opening, and through-conduit type with contoured clapper designed for passing all types of pipeline scraper and inspection pigs on a regular basis without causing damage to either the valve components or the pig.

B.6.3 Valves of sizes larger than covered in API Spec 6D as concerns dimensions shall be dimensioned by the valve Supplier, and the dimensions submitted to Purchaser for approval. Certified drawings including the approved dimensions shall be submitted to Purchaser as soon as possible following approval of the dimensions.

B.6.4 Check valves shall have replaceable seats.

B.6.5 Check valves shall be fully repairable in place, including replacement of seal, clapper and seat, without removal of the valve body from the pipeline. Valves shall be designed for bolted bonnet top entry.

B.6.6 Valves shall be of a design that by nature of its features is capable of passing a fire safe test per API Spec 607 or API Spec 6FA. (Also refer section 7.8.8 above)

B.6.7 Valves shall be designed so that the valve body is self-supporting thus eliminating the use of support legs or other types of support devices.

B.7 Sales Gas Transportation and Distribution Pipeline Valves

The below are specific requirements for all Butt welded, Butt weld ends and Buried valves used in Sales gas Transportation and Distribution networks. These can be also applied for applications which has zero/minimal shutdown requirements on case to case basis based on COMPANY approval.

B.7.1 Auxiliary Connection.

In addition to the requirements specified in B 2.6, the following additional requirements shall be applicable for buried pipeline valves

a) For pipeline valves, body vents and drains shall be provided with below features

Pipeline Valve size	Requirement of Valve on Vent & drains	Vent & Drain size	End Connection of vent & drain valve
NPS 2 to NPS 4	Single valve	NPS 1/2	Butt weld one end & NPT with Plug at open end
NPS 6 to NPS 8	Single valve (Note 1)	NPS 3/4	Butt weld one end & NPT with Plug at open end
NPS 10 to NPS 24	Single valve (Note 1)	NPS 1	Butt weld one end & NPT with Plug at open end
NPS 26 and above	Single valve (Note 1)	NPS 2	Butt weld one end & Flange with Blind at open end
Note 1 : For sour service, vent & drain shall be provided with double isolation valve (primary isolation valves shall be but welded both ends)			

b) Double valves are required in the vent and drain lines for all buried valves, one valve close to the connection to valve body and one valve at the end of the extension line at the highest possible location. All connection shall of welded type. Sealant injection line shall have grease

fitting at the highest point and design shall incorporate an internal double ball check valve with a vented cap giant button head grease nipple.

B.7.2 Specific Requirements for Buried valves

B.7.2.1 All buried valves shall be provided with stem extension as per relevant specification. A stem extension long enough for the operator to be approximately 1200 mm above ground level shall be provided for buried valves. The extension shall be fully enclosed.

B. 7.2.2 The buried valves shall normally have 1m soil cover from top of pipe to ground level. The actual soil cover and extension length for each buried valve shall be stated on the applicable valve data sheet.

B. 7.2.3 Enclosure for the extension stem shall be waterproof and have pressure relief system to prevent pressure built-up in the event of a stem seal failure.

B. 7.2.4 Extension lines for drain, vent, sealant injection shall be adequately clamped to the valve body or stem extension to avoid damage due to vibration and reaction forces of sealant injection or escaping medium.

B.7.3 Field Tests At Site

B.7.3.1 Shell, Seats and Drain/Vent connections of all main line full bore pipeline valves, ROVs/MOVs on station, hot tap / Tie-in valves and tight shut off valves (TSO) indicated in P&ID shall be tested by CONTRACTOR at Abu Dhabi Workshop before installation. Test shall be witnessed by COMPANY representative.

B.7.3.2 Hydrostatic testing shall be done for Shell, Seats and Drain/Vent connections of the valves. Compressed air testing shall be done for seats only. Testing shall be done as per API 6D. The minimum duration of the tests shall be no less than that specified in API 6D.

B.7.3.3 Vendor to confirm that all the valves shall withstand these tests without any leakage or failure. Any subsequent repairs required as an outcome of site testing shall be carried out by Vendor/CONTRACTOR.

B.7.4 Specific Location Wise Pipeline Ball Valve Design and End Connection.

Table A – Applicable for Sales Gas Transportation & Distribution Pipelines

Valve Location	**Valve Body Design**	**Valve Ends**	**Remarks**
Pipeline Buried Valves	Fully Welded	Butt Welded	All Services
Pipeline Sectionalizing Valves (Buried)	Fully Welded	Butt Welded	All Services
First Isolation Valve for Scraper Launcher/Receiver (Near Pigging Tee)	Top Entry	Butt Welded	All Services, Above Ground
Second Isolation Valve for Scraper launcher/ receiver (Installed with Minor Barrel)	Split Body (Bolted)	Flanged	All Services, Above Ground
Station Isolation Valves (on Branch line to/from Pipeline Pigging tees)	Top Entry	Butt Welded	All Services, Above Ground
Hot Tap Valves (All Locations)	Fully Welded	Flanged	All Services, Above Ground
Isolation Valve for Filters, Metering Skid and Pressure Reducing Skid (Note-1)	Fully Welded	Butt welded	All Services, Above Ground
Tie-in Valves on Pipeline	Fully Welded	Butt welded (Note-2)	All Services, Above Ground
Valves on branch connection from pipeline	Fully Welded	Butt welded	All Services, Above Ground
Valves for Instruments and Vents/drains etc. on Scraper Launcher/Receiver Barrels	Fully Welded	Flanged	All Services, Above Ground
Valves for Instruments and Vents/drains etc. in Station Piping Area. (Note-1)	Fully Welded	Butt Welded	All Services, Above Ground
Note-1) Ball Valves for Filters and Metering Skid can be bolted body design with flanged ends for Liquid Hydrocarbon Services. Note-2) Valves ends could be one end welded and another end flanged.			