

**MATERIAL SPECIFICATION AND  
REQUISITION FOR PIPELINE FULL  
BORE BALL VALVE**

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**MATERIAL SPECIFICATION AND  
REQUISITION FOR PIPELINE FULL BORE  
BALL VALVE  
(48 inch at SNGP)**

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## 1. INTRODUCTION

### 1.1 Project Description

Company intends to replace an existing valve in SNGP with a new valve.

## 2. PURPOSE

This document specifically covers minimum technical requirements for the manufacturing, inspection, testing, supply and shipment of pipeline full bore ball valve for company project.

## 3. DEFINITIONS AND ABBREVIATIONS

### **General Definitions**

The Company may generally declare the intent of the project and may nominate an agent or consultant authorized to act for and on behalf of the Company.

The **Contractor** is a Company approved party or a Company approved EPC contractor, which carries out all or part of the detailed and residual design, procurement, construction, commissioning and management of a project or operation of the facility. The Company may undertake all or part of the duties of the contractor as per contractual obligations.

The **Consultant** is a Company approved party or a Company approved subcontractor to contractor, which carries out all or part of the design, procurement support, construction support, commissioning support and management of a project or operation engineering support of the facility. The Company may undertake all or part of the duties of the consultant as per contractual obligations.

The **Purchaser** is company or company approved contractor/engineering consultant, which carries out all or part of the detailed and residual design,

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procurement, procurement support, construction, commissioning, spares arrangement and management of a project or operation of the facility with vendor support as applicable. The Company is not liable for all or part of the duties of the purchaser if contractor/engineering consultant is the purchasing action party as per contractual obligations. When the purchased item/service is accepted from company by the contractor/engineering consultant, they shall directly liaise with the vendor or service provider for future necessary support/resolutions including spares

The **Vendor/Manufacturer/Supplier** is a Company approved party, which manufactures or supplies pipeline components or equipment's or a related required service provider, deemed to perform the duties assigned by the Contractor through a purchase order or work order as applicable.

“**Shall**” identifies a requirement.

“**Should**” identifies a recommendation.

“**May**” identifies a possible outcome.

**Abbreviations**

AED	Anti Explosive Decompression
AG	Above Ground
ALARP	As Low As Reasonably Possible
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AVL	Approved Vendor List
CG	Centre of Gravity
CL	Class
CP	Cathodic Protection
CRA	Corrosion Resistant Alloy
CVN	Charpy V Notch
DD	Detailed Design
DEP	Design Engineering Practice
DF	Design Factor
DIB	Double Isolation and Bleed
DN	Diameter Nominal
DPE	Double Piston Effect
DSS	Duplex Stainless Steel

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EH	Electrohydraulic
E-SPiR	Electronic Spare Part Interchangeability Records
EPC	Engineering Procurement Construction
FB	Full Bore
FEED	Front End Engineering Design
FP	FEED Phase
GOOV	Gas Over Oil Valve
GTF	Gas Transportation Facility
H <sub>2</sub> S	Hydrogen Sulphide
HAZ	Heat Affected Zone
HFW	High Frequency Electric Resistance Welding
HIC	Hydrogen Induced Cracking
HOV	Hand Operated Valve
HP	High Pressure
HPU	Hydraulic Power Unit
HSE	Health Safety Environment
ICCP	Impressed Current Cathodic Protection
IP	Intelligent Pigging
ISO	International Standards Organization
ITP	Inspection Test Plan
MESC	Material and Equipment Standards and Code
MOC	Material Of Construction
MOP	Maximum Operating Pressure
MOV	Motor Operated Valve
MR	Material Requisition
NA	Not Applicable
NDE/NDT	Non Destructive Examination/Testing
GN	Gas Network
PCS	Paint and Coating Schedules
PDO	Petroleum Development Oman LLC.
PEEK	Poly Ether Ether Ketone
PEFS	Process Engineering Flow Scheme
PTFE	PolyTetraFluoroEthylene
PTW	Permit To Work
QA/QC	Quality Assurance/ Quality Control
RAL	Reichs-Ausschuß für Lieferbedingungen und Gütesicherung
RF	Raised Face
SAWL	Submerged Arc Welding Longitudinal
SMLS	Seamless
SP/SPE	Specification
SPE	Single Piston Effect
SS	Stainless Steel
SSC	Sulphur Stress Corrosion Cracking
SOW	Scope Of Work
TAT	Type Acceptance Test

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TBC	To Be Confirmed
TOC	Table Of Compliance
TPI	Third Party Inspection
UG	Under Ground
VDRL	Vendor Document Requirement Listing
WO	Weld Overlay

## 4. CODES, STANDARDS, SPECIFICATIONS AND REGULATORY REQUIREMENTS

### 4.1 General

The sections below contain details of all applicable Technical Standards and Specifications for the scope of supply.

If any of the documents listed below are not in the Vendor's possession, same may be obtained from the Purchaser. Not possessing the referred standards / specifications shall not be a cause for deviation or non-compliance.

Where the below listed Technical Standards and Specifications refer to or amend the International Codes and Standards (e.g. API, ASME, DIN, BS, etc.), these referenced Standards shall be deemed to be part of the Scope of work.

Where the Technical Standards and Specifications refer to other Project specifications or Shell Specifications (i.e. SPs, DEPs etc.), these shall be deemed part of the Scope of work.

Vendor shall provide and maintain the applicable revision / version of all-relevant Technical Standards and Procedures, International Codes and Standards, rules, regulations, specifications and documents as specified in the PO specifications.

Any deviation or amendments to the Technical Specifications shall be subject to Purchaser / Company's prior approval.

All correspondence and documentation shall be in English. All measurements and units shall be in SI units.

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**4.2 Specifications/Standards List**

Number, Version	Title
<b>Company PDO Specifications</b>	
SP-2041 (Feb'2014)	Specification for cracking Resistant Materials for H2S containing Environment
SP-2161 (Nov'2017)	Materials Selection & Corrosion Control for Surface Facilities (Amendments/Supplements to DEP 39.01.10.12-
SP-1246 (Jun'2017)	Specification for Painting and Coating of Oil and Gas Production Facilities
SP-1171 (Jun`2012)	Specification for Quality Assurance Management System for Product and Service
SP-1173	Welding of Metals (Amendments/Supplements to DEP
SP-1176 (Oct'2005)	Non-Destructive Examination - Amendments/Supplements to ASME BPV Code Section V
SP-1177 (May'2016)	Specification for Welding of Class 1 Pipelines- (Amendments/Supplements to API Std. 1104)
SP-1211 (Mar'2016)	Onshore Pipeline Engineering
SP-1208 (Mar'2016)	Pipeline Construction Specification
SP-1201 (Oct' 2016)	Procurement Specification for Pipeline Ball Valves
GME-QS-L2-202-R1 (Sep'2014)	Specification for Quality Assurance
QHSE-QS-L3-318-R2	Drawing, Document Numbering & Equipment Tagging
GMO-OS-L2-215 (Oct'2015)	Standard: CONTROL AND AUTOMATION PHILOSOPHY Procedure
<b>Shell Specifications/DEP(V41)/MESC</b>	
DEP 30.00.60.13-Gen	Human Factors Engineering -Valves
DEP 30.10.02.11-Gen	Metallic Materials – Selected Standards
DEP 30.10.02.13-Gen	Non-metallic materials - Selection and Application
DEP 30.10.02.15-Gen	Materials for use in H2S-containing environments in oil and gas production (amendments/supplements to ISO 15156:2009)
DEP 31.10.00.10-Gen	Positive Material Identification (PMI) Program
DEP 31.40.20.37-Gen	Line pipe for critical service (amendments/supplements to ISO 3183:2012 and API SPEC 5L 45th edition)

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DEP 31.36.00.30-Gen	Pipeline transportation systems - Pipeline valves (Amendments/Supplements to ISO 15848-2)
DEP 31.36.10.30-Gen	Hydraulic systems for the operation of on/off valves in protective functions
DEP 30.10.02.16-Gen	Hydrogen Induced Cracking Sensitivity Test (Amendments / Supplements to NACE TM 0284)
DEP 32.36.01.18-Gen	Selection and procurement of actuators for on-off valves
DEP 32.37.20.10	Instrument Signal Lines
DEP 39.01.10.12-Gen	Selection of materials for life cycle performance (Upstream facilities) - Equipment
DEP 70.10.90.11-Gen	Spare Parts
MESC SPE 77/130	Ball Valves (Amendments/Supplements to ISO 14313)
MESC SPE 77/300	Procedure and technical specification for Type Acceptance Testing (TAT) of industrial valves
MESC SPE 77/300A	Synopsis of procedure and technical specification for Type Acceptance Testing (TAT) of industrial valves
MESC SPE 77/300B	Valve Qualification Range
MESC SPE 77/300C1	Synoptic TAT Table -Bi-directional valves
MESC SPE 77/300C2	Synoptic TAT Table -Uni-directional valves
MESC SPE 77/302	Valves - General requirements
MESC SPE 77/312	Fugitive Emission production Testing (Amendments/ Supplements to ISO 15848-2).
MESC SPE 77/313	Valves with Corrosion Resistant Alloy (CRA) weld overlay cladding
MESC SPE 77/315	Autocatalytic (Electroless) Nickel Phosphorous plating of sealing surfaces for wear resistance or anti-galling
MESC SPE 81/002	Carbon and Alloy Steel nuts (Amendments/Supplements to ASTM)
MESC SPE 85/203	Graphite Packing Material (Amendments/Supplements to ASTM F2168)
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)
<b>International Codes and Standards</b>	

API 5L (2018)	Specification for Line pipe
API 6D	Specification for Pipeline Valves



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API 6FA	Specification for fire test for valves
API 598	Valve inspection and testing
API 607	Fire test for quarter turn valves and valves equipped with Non Metallic Seats
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
ASME B16.34	Valves - Flanged, Threaded, and Welding End
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B31.8	Gas Transmission and Distribution Piping Systems
EN10204	Metallic Products-Type of Inspection Documents
ISO 3183 (2012)	Specification for Line pipe / Petroleum and natural gas industries - Steel pipe for pipeline transportation
ISO 4200	Plain end steel tubes, welded and seamless - General tables of dimensions and masses per unit length
ISO 5208	Industrial valves - Pressure testing of metallic valves
ISO 10474	Steel and Steel Products – Inspection Documents
ISO 14313	Petroleum and natural gas industries- Pipeline transportation systems - Pipeline valves
ISO 15590-3	Petroleum and natural gas industries - Induction bends, fittings and flanges for pipeline transportation systems-Part
NACE MR0175/ISO 15156	Materials for Use in H <sub>2</sub> S-containing Environments in Oil and Gas Production-Parts 1, 2 and 3
NACE TM0177	Laboratory Testing of Metals for Resistance to Sulphide Stress Cracking and Stress Corrosion cracking in H <sub>2</sub> S environment.
NACE TM0284	Standard Test Method – Evaluation of Pipeline and Pressure Vessels Steels for Resistance to Hydrogen-
IEC 60079-1	Electrical Apparatus for Explosive Gas Atmosphere
IEC 60332	Tests on Electrical Cables Under Fire Conditions
IEC 60529	Classification of Degrees of Protection Provided by Enclosures

**4.3 Conflicting Requirements**

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In the event of any conflict or contradiction between the above listed Technical Standards and Specifications the order of priority of the documents shall be as follows:

1. Government (local) Regulations
2. Project Specific Specifications
3. PDO SPs/PR's/GU's
4. Shell DEPs (Version 41).
5. National Standards
6. International Standards.

In case of any conflict between contract document and codes/ standards, most stringent shall be applicable.

In case any conflicts or contradictions noted between different sections with in the individual Technical Standards and Specifications (i.e. SPs, DEPs, Project specifications etc.), the more stringent requirement shall be applicable

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5. SCOPE OF SUPPLY

Item No.	Size	Description [Note 1, 4 & 5]	Total Qty [Note-3]	Unit	Remarks
1	48"	Trunnion mounted, side entry two-piece construction, FB, RF Flanged, HOV, Gear operated with hand wheel, provision for mobile HPU connection, DIB-2. Drain/Vent valves and piping (Note-8), with lifting lug and support, spares.  Limit switch for position indication(open/close),Lockopen/Lock close arrangement,  HIC & SSC tested and meet Sour Service requirements as per SP-2041/SP-2161, DEP 30.10.02.16-Gen, DEP 39.01.10.12-Gen and NACE MR0175/ISO 15156	1	Nos	Note 1,2,3,4
<b>Notes:</b>					
1.	For More Details, refer to the ball valve Specification and Data Sheets presented in this				
2.	Supplier shall be responsible for all of storage handling and transportation to the Purchasers Nominated Location. Purchaser to nominate storage yard location prior to the placement				
3.	Drain/Vent valves and piping shall be as per MESC piping class 61440, with trim materials matching with that of main valve trims.				
4.	Ball valve shall be with double barrier primary lip seal arrangement on DPE seat. Stem shall be with two primary seal protection for extended stem/gland arrangement. All non-metallic seals shall be fire safe and AED.				

6. TECHNICAL REQUIREMENTS

6.1 General

- Raw materials shall be sourced from Company approved supplier/sub vendors.
- The steel supplier shall have vacuum de-gassing facilities to manufacture sour service materials.

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**6.2 Specifications and Data**

- Pipeline Ball Valves shall be designed, manufactured, inspected, tested, marked and supplied in accordance with this specification used in conjunction with SP-1201, API 6D, DEP 31.36.00.30-Gen, SP-2154, MESC 77/130, MESC 77/300 and MESC SPE 77/302. In case of conflict, more stringent requirement shall be applicable.
- The minimum wall thickness of valve body and other pressure containing parts shall be in accordance with ASME B16.34, Table-3A or the manufacturer shall prove by calculation in accordance with Boiler Pressure Vessel Code ASME Sec. VIII, Div. I (when applicable see para. UG101) that the wall thickness satisfies the pressure/temperature rating of the class in ASME B 16.34. A corrosion allowance of 3 mm shall be considered when calculating the wall thickness of valve body.
- All the main isolation Ball Valves shall be full bore valves and suitable for passage of cleaning and intelligent pigs during commissioning, IP survey and maintenance operation.

The design of seat ring and valve body shall be such that the entrapment of any solids in the fluid shall not obstruct the free movements of seat ring and shall not reduce spring action. Valves shall be capable of being pigged without debris pushed in between valve seats and the ball or on to the seat ring assembly. The design of seat ring shall be in such a way that the bore of the valve in open position shall present a smooth profile for the passing pig.

- Ball valve body construction shall be Side entry for AG valves and Top entry for buried welded end valves.
- The Ball Valve shall be suitable for aboveground installation (without any shed/enclosure) and environmental conditions specified in Appendix-E of SP-1201.

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- The full bore ball valves shall match with the internal bore of the connecting pipeline at the location of installation as specified in the valve data sheet presented in Appendix-1.
  - The integral parts of the valve which will be interfacing with the fluid being transported shall comply with the internal corrosion requirements.
  - Valve design shall ensure replacement of stem seals / packing under full line pressure.
  - Ball Valve shall be fitted with a visible position indicator to show the open and closed position of the obturator.
  - Flow direction shall be engraved or marked on the Ball Valve body in line with SP-1201 and ISO 14313 requirements.
  - Valves shall be provided with trunnion mounted ball.
  - Ball Valve seat shall be DIB-2 featured as per B.12 of API 6D. The valve seat design shall have single piston effect (SPE) in the upstream side and double piston effect (DPE) in the downstream side of the valve.
  - DIB-2 indication tag shall be provided on the valve body in line with API 6D requirements. In addition to the same, SPE and DPE location shall be clearly marked on the Ball valve body by using a name plate.
  - Ball Valve non-metallic components shall comply with DEP 30.10.02.13-Gen requirements.
  - Valve design shall be such as to avoid bimetallic corrosion (as per clause 2.3.2 of SP-1201) between the valve components made of dissimilar materials with suitable insulation or with any special treatment if required.
- For Body Drain/ Vent accessories like valves, flanges, fittings etc. of sizes 2" and below, MESG specifications are acceptable as per clause 2.2.1 of SP-1201.

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- Testing of the Pipeline Ball Valves shall be in accordance with SP-1201 and shall meet the requirements of API 6D, MESC SPE 77/302 and MESC SPE 77/130.
- Ball valve shall be TAT certified in accordance with MESC SPE 77/300A.
  - The Ball Valve high alloy trim materials shall fully comply with data sheet and the PMI requirements as per DEP 31.10.00.10-Gen and SP1171.
  - Ball Valves shall meet the requirements of fugitive emission leak test in accordance with MESC SPE 77/312. Fugitive emission class shall be B
  - Impact test requirement shall be complied as per MESC SPE 77/302. All process wet components shall be subject to impact testing.
  - All valve body and trim materials shall be subjected to NDT as per requirements specified in SP 1201 and MESC SPE 77/302. In case of conflict, more stringent requirement shall be applicable.
  - Ball Valve and actuator external painted shall be as per SP-1246 PCS-1 and RAL 9010.
  - Face to face and minimum bore dimensions shall be strictly in accordance with Clause 2.2.2.4 of SP-1201.
  - Ball valve shall be with soft seat. Low pressure gas test shall be carried out for soft seats in accordance with annex B3.3 of ISO 14313, SP-1201 and MESC SPE 77/130.
  - The allowable leakage of soft seated valves shall not exceed ISO 5208 Rate A (no visible leakage).
  - All primary sealing arrangement shall be with Lip seal. Double barrier primary sealing arrangement shall be provided for high pressure pipeline ball valves. Accordingly DPE side shall be provided with two lip seals in tandem, SPE side with single lip seal and stem shall be provided with two lip seals in array or approved V packing. Fire safe

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and AED secondary sealing arrangement gasket shall be provided at SPE, DPE and stem sealing locations.

- The body connections (i.e. vent, drain & sealant injection) shall be as per section 2.2.2.5 of SP-1201. Vendor shall show the details of sealant / grease /vent /drain arrangement in the valve general arrangement drawings for company approval.
- As per 2.2.4 of SP-1201, the static / dynamic sealing surface area on the carbon steel or low alloy body/bonnet shall be weld overlay with same material of trims. The thickness of weld overlay shall be minimum of 3mm. Weld overlay shall be carried out as per MESC SPE 77/313 and the Weld Overlay procedure shall submitted for approval.
- The valves shall be provided with seat and stem sealant injection as per SP-1201.
- the stem or shaft retainer ring or collar shall be integral with the ball to ensure stem design is anti-blow out proof. But, the stem or shaft retention by means of body / stem threads / packing gland is not acceptable.
- As per SP-1201, the stem shall have a maximum surface roughness (RA) of 0.8 µm to ASME B46.1 and be free from any defects.
  - Ball Valve shall be fitted with antistatic device in line with SP-1201/ clause H.5 of API 6D/ clause B.5 of ISO 14313 requirement with same material grade as valve trims. Antistatic connectivity shall be through Body-Stem and Body-Ball connection.
  - Cavity relief requirements shall also comply with section 2.2.5 of SP-1201. Excess cavity pressure for DIB-2 arrangement shall be internally relieved through the single piston effect seat. HP marks shall be provided on the high pressure side of unidirectional ball valve.

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- Vendor shall carry out functional testing of SPE and DPE seat to demonstrate the designated seat functioning capabilities.
- Fire safe certification shall be as per Section 2.2.8 of SP-1201.
- All valve mechanisms, gaskets and lip seals used shall be of a fire safe and gaskets and lip seals shall be AED type. Internals and design of the valve shall be similar to the fire tested prototype.
- Ball Valve assembly shall withstand vacuum drying to a pressure of 5 millibar within the time period of 25 years declared as its life cycle after site installation, testing and pre-commissioning.
- Ball Valve servicing/maintenance interval shall be identified and recommended by the manufacturer accordingly for the depicted life cycle. This requirement shall also be taken into consideration while finalizing E-SPIR in accordance with DEP 70.10.90.11-Gen. Accordingly vendor shall supply pre-commissioning, commissioning and two years operational spares.
- Locking device designed to lock the valve in both open and close positions with pad lock arrangement is not envisaged. This shall be clearly identified in the project specific data sheet based on operation requirement
- Valves weighing more than 250 kg shall be fitted with lifting points. Tapped holes and eye bolts shall not be used for lifting. Lifting lug position shall allow for safe handling of valves with Gear box.
- In addition to the pressure testing of Ball valves at Manufacturer's facility, valves shall be subjected to hydrostatic testing for body and seat and low pressure pneumatic seat testing at site by others (Contractor's site workshop) with the presence of Vendor representative. The Vendor shall submit field hydrostatic test procedure along with final documentation. In case of failure of seat testing at site, corrective action shall be provided by the vendor



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without any additional cost to the company. In case of conflict in carrying out valve Body and seat testing at Contractors facility, Vendor shall assign an authorized valve testing and maintenance agency facility locally in Oman or Middle East with the same terms and conditions as mentioned above.

- All procedures for testing shall be provided to Company for review well in advance.
- Seat rings shall be renewable and comply with the requirements of section 2.2.4 of SP-1201. Seat rings shall have soft insert positively locked in position.
- The Valve O-ring material shall comply with the requirements of MESC SPE 85/301.

The Valve maintenance manual shall indicate the following, a) How the body cavity relief operates.

b) How the closure member must be assembled.

c) Demonstrate with sketches DPE and SPE feature

d) How the DIB-2 feature is achieved.

- Valve shall have saddle or leg bottom support and the supports should be designed to take care of the vertical and lateral loads of valves including that of actuator (with 20% additional valve weight) with weight of the operator. The support height shall be as minimum as possible. Friction factor shall be considered as minimum 0.4 for lateral force calculation of support design. Support shall be designed considering valve final assembly CG requirements.
- Gear operator shall be heavy duty, totally enclosed, grease filled, self-locking type and dust and weather proof to IP 66, suitable for outdoor installation.

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- The forged valve components shall be forged close to nearest final shape. Machining direct from bar stock is not allowed. Forging requirements shall comply with clause 2.4.5 of SP-1201.

**6.3 Additional Requirements for Hydraulic Actuator**

- The hydraulic actuators may be double-acting scotch yoke type.
- The material specification for the Hydraulic Actuator shall be in accordance with DEP 31.36.10.30-Gen/ Appendix-C of SP-1201. Any ancillary item on the actuator which is pressure retaining including the actuator cylinder (double acting type) shall be in accordance with DEP 31.36.10.30-Gen.
- The Hydraulic actuator assembly shall be such that it can be removed and replaced with a manual operator while the valve remains in service. The actuator housing shall not accumulate any pressure in the event of a leakage in the stem seal of the valve.
- The hydraulic actuator shall be compatible with Company mobile power unit including the coupling. Mobile Power unit specification (i) Capacity of HPU (ii) Minimum and maximum supply pressure of HPU unit shall be provided during placement of Order by Purchaser / Company for Vendor Compliance.
- Valve Manufacturer/ Vendor to supply the suitable Valve-Actuator integration Hardware complete with Bolts & Nuts properly designed.
- The actuator design shall be in accordance with DEP 32.36.01.18
- the Actuator assembly to hydraulically block-in the actuator in the desired position i.e. stayput/ fail in place feature, if the hydraulic pressure is accidentally lost. This shall be in accordance with DEP 31.36.10.30-Gen.

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- Vendor shall ensure that sufficient hydraulic fluid for the initial inventory of the hydraulic system shall be supplied with the actuator system and Hydraulic fluid shall be "SHELL TELLUS T/32".
- As per clause 2.2.7 of SP-1201, the actuator shall be designed for maximum differential pressure with factor of safety of minimum 1.5. However, the design torque of actuator including the factor of safety shall not be lesser than torque required for the differential pressure of valve rated pressure. The maximum allowable torque of the valve stem shall be at least 1.1 times higher than the maximum torque exerted by actuator.
- Vendor to ensure that the maximum Torque generated by the hand pump while the actuation of Hydraulic actuator shall be much lower than the stem/shaft shear torque.
- The allowable stresses on the valve actuator flange, flange bolts and valve stem shall be specified by the valve Manufacturer prior to selection of the actuator by Actuator Manufacturer.
- Ball valve drive gear measured torque shall be less than 40% of the design torque as per clause 2.5.4.6 of SP-1201.
- The Actuator sizing calculations shall be submitted for the review by Purchaser upon the placement of order. Vendor to provide the Torque data (Break to Open, End to open, Running, Break to close, End to close) at 150 bar g and 200 bar g actuating medium supply/return pressure.
- Valves and Actuators shall be individually type tested. However, actuator shall be type tested as per Shell requirements. In addition, a combined valve and actuator type test shall be performed as per DEP 31.36.10.30-Gen.
- All Hydraulic actuators shall be provided with lifting eyes in accordance with SP-1081.

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- The actuator shall be sized to provide sufficient torque to fully stroke (open and close) the valve with maximum design pressure acting on one side and atmospheric pressure on the other side within the specified opening and closing times. The required safety factor between the actuator output torque and the required valve torque shall be as per DEP 32.36.01.18-Gen, Clause No. 4.
- Instrumentation design requirements
  - Manual Operation: Hand wheel for manual operation may not be required. Provision for manual operation shall be through hand pump unless stated otherwise in the project requisition.
  - Local Indication: A mechanical dial indicator shall be provided to indicate whether the valve is fully open, fully closed or is in intermediate position and the open and closed positions shall be clearly marked. The position indicator (open and closed position) shall be installed directly on the valve stem such that it shows valve position rather than actuator position. The lever or position indicator shall be in line with the pipeline when the valve is open and transverse when the valve is closed. The fully open position of the valve bore shall be in perfect alignment with the valve body bore. The open/close /intermediate position shall be visible from a distance. The position indicator shall be mounted on the top of the valve.
  - Remote Indication: Hydraulic actuators shall be provided with limit switch for remote monitoring of valve open/close status (in case of operation requirement). Limit switch shall be mounted in Exd enclosure, min. IP66, ATEX certified for use in Zone 1 application. Cable entry shall be 2xM20 with Exd blind plugs. Limit switch shall be wired to terminal blocks on one side with other side for customer connections. Flying leads are not acceptable. Operating voltage of limit switch shall be 24VDC.

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- Provision for connection with mobile HPU and connection compatibility shall be verified and confirmed with Vendor during bidding stage itself.
- Ingress protection shall be IP66 as per IEC 60529. Repeatability of the switching points shall be better than 0.5 degrees for rotary valves and better than 1% of lift for linear valves. Hysteresis of the switching points shall be better than 1 degree for rotary valves and better than 2 % for linear valves. the enclosure of proximity switch shall be certified for EExd, IIB, T4, weather-proof to IP66 and of stainless-steel material. The contacts of the switches shall be provided with prefabricated cable terminated in a Junction Box on the Actuator or wired to terminals within the switch enclosure. Each enclosure shall be provided with a minimum of 2 numbers of M20 x 1.5 cable entry points.

#### **6.4 Sour Service Requirements**

All materials shall HIC+SSC tested and meet the Sour Service requirements as per SP-2161, DEP 30.10.02.16-Gen, DEP 39.01.10.12-Gen and NACE MR0175/ISO 15156. All HIC and SSC testing shall be carried out in company approved lab. The re-testing of failed heat shall not be permitted. The failed heat shall be rejected. IGC testing shall be carried out on all SS, DSS and CRA materials.

##### **6.4.1 Tubing**

All compression fittings shall be of make as per approved vendor list.

- a) Stainless Steel 316 shall be used for local panel. Local panel shall be suitable for outdoor installation.
- b) Valve pneumatic connections shall be ½" NPT (F) as a minimum, to be sized and confirmed by vendor. Field tubing's will be connected with suitable sized NPT (M) bulkhead fitting connectors supplied by Contractor.
- c) Pneumatic tubing and fittings shall be to min. SS 316L imperial type.
- d) All non-metallic components, including O-rings and seals, shall be designed for use over the temperature range specified.

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- e) All the accessories shall be pre-tubed. All tubing shall be neatly laid out and adequately supported by tubing saddles to prevent kicking, facilitate trouble shooting and present a neat appearance. The tubing is considered to be self-supporting up to lengths for 0.5 meters. For longer lengths, tubing shall be supported every 0.5 meters over the whole length and fixed with non-metallic blocks.
- f) The materials to be used for general components such as tubing, fittings etc. shall be as per DEP 32.36.01.18 and shall conform to the NACE requirements as per SP 2041, NACE MR 0175/ISO 15156 (Latest Revision).

### **6.5 Marking**

Marking requirements shall be as stated in section 2.6.2 of SP-1201. Actuator marking shall be as per C.6.0 of SP-1201.

## **7. COATING**

### **7.1 Ball Valve Body**

The painting and coating of valve body is recommended as per SP-1246. Type of coating system shall be selected based on the design temperature of the valve. Refer SP-1201 section 2.6.1 for necessary details.

### **7.2 Actuator Coating**

The actuator shall be painted in accordance with SP-1246. Refer SP-1201 section C.5.0.

## **8. INSPECTION REQUIREMENTS**

The valves shall be inspected and tested in accordance with SP-1201, this document, approved ITP for the project and shall meet the requirements of API 6D and SPE 77/130. NDT acceptance criteria shall be in accordance with ASME B16.34 Section 8. The actuator shall be inspected as per DEP 31.40.70.30 / DEP 31.36.10.30 Gen.

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**8.1 FAT**

Factory Acceptance Test (FAT)

Vendor will be responsible for all inspection work, in general. However, Contractor shall have right to

nominate his own Third-Party Inspection (TPI), in addition to the inspection by Vendor. Cost of this

additional inspection shall be borne by Contractor.

Contractor shall nominate a TPI from any of the approved agency for this job and shall submit

the CV of the proposed TPI to for approval. Vendor shall provide access to and normal support at his

works for the TPI.

Performance test (as a minimum) shall include the followings:

- a) Hydrostatic shell test
- b) Hydrostatic seat test
- c) Pneumatic air seat test
- d) Operational torque test
- e) Functional test of valve with actuator as per DEP 32.36.01.18
- f) Fugitive emission production testing

Inspection shall include, as a minimum the following:

- a) Dimensional Check
- b) Documentation / Certification
- c) Complete Functional Testing
- d) Calibration Check
- e) Welding shall be approved by authorized Third Party Inspection prior to FAT

## 9. THIRD PARTY INSPECTION (TPI)

Company will appoint a full time resident TPI at their cost to monitor the inspection and testing activities at the factory, including coating activities. The Vendor/ Supplier shall refer to Vendor quality requirement sections of this document in line with SP-1201 for Third Party Inspection requirements.

## 10. CERTIFICATION

Material Certification shall be as per EN 10204-3.2. For more details, Vendor/ Supplier shall refer to Vendor quality requirement sections of the document. The TPI required for this certification purpose shall be at Vendor's cost and the TPI shall be from Company approved TPIA list.

## 11. QUALITY ASSURANCE

The Vendor/ Supplier shall refer to Vendor quality requirement sections of this document for specific Quality requirements.

## 12. WARRANTY

The Supplier shall provide warranty for the supplied items for 18 months from date of delivery or 12 months from date of commissioning whichever is longer.

## 13. SHIPPING REQUIREMENTS AND DELIVERY LOCATION

### 13.1 Shipping requirements

Shipping preparation shall be in accordance with API Specification 6D. Refer SP-1201 section 2.6.3 for necessary compliance. The Vendor shall comply with the following shipping requirements:

Type of vessel : Box hold type, Open hatch, properly geared (secured in wooden box inside an enclosed container).

Stowage / Handling : Stowage under deck only.



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Terms of shipment : CIF, DDP (as applicable), direct discharge onto  
trailers,  
with secured wooden box in container.

1. Charter party shall include dispatch / demurrage clause.
2. All customs duty and port clearance charges shall be borne by Supplier.
3. Supplier is responsible to ensure that any damage to item shall be repaired prior to loading on board the vessel. Damage and repair criteria to be agreed between Supplier and Purchaser.
4. The shipping manifest shall clearly state that the consignment consists of Ball valve assembly and Purchaser shall approve the storage protection prior to shipment. In addition, written instruction shall be given to the stevedore's to store the item with care such as to eliminate damages during transportation/loading/unloading.
5. All handling, loading and unloading shall be performed in such a manner as to avoid mechanical damage.
6. All handling shall be performed in line with company approved lifting procedure.
7. No on-deck overseas shipment is allowed without prior written approval by Contractor/ Company.

### **13.2 Delivery Location**

The Supplier/Vendor shall send the ball valve consignment to company designated stores (To be confirmed by the Purchaser prior to placement of order) in Sultanate of Oman.

## **14. SUPPLIER RESPONSIBILITY**

### **14.1 General**

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- The Supplier shall be responsible for all activities including transportation, intermediate storage, etc. until safe delivery of the material to the Purchaser. Any damage, coating shall be repaired free of charge by the Supplier.
- Supplier shall also carryout or facilitate ball valve site hydrostatic testing with Purchaser/ contractor, and confirm the readiness after successful testing for ball valve installation on to the pipeline.
- All ball valve assembly shall be supplied with necessary protection arrangement (agreeable to company) to avoid ingress of sand or other foreign objects.

**14.2 Adherence to Requisitions, Specification and Data Sheets**

- The Supplier shall ensure that the design complies with the requirements of this specification and its cross-referenced documents. The Supplier shall highlight any non-compliance in the Table of Compliance (TOC). The Supplier shall submit duly filled-in, stamped and signed Table of Compliance, Data Sheets and VDRL.
- Unless referred to in the Table of Compliance as exceptions, it will be assumed that all documents are adhered to and that there are no implications with respect to cost, delivery and integrity of the Item.

Only those comments/exceptions that are specifically agreed to by the Company prior to award of the order will be incorporated into any eventual purchase order. No deviations from this specification will be allowed later.

## 15. INFORMATION TO BE SUBMITTED WITH THE OFFER

Vendor to submit the information / documentation as per VDRL available in the Material Requisition & according to the list provided below.

The Vendor shall provide the following technical information along with their offer.

- Source and location of the body, ball, trim manufacturing
- Identification of ball valve factory (Vendor Name & Location)

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- Identification of internal & external coating yards (Coating Applicator Name & Location)
- Preliminary ITP (for both ball valve assembly & coating)
- External Coating details including but not limited to primer, adhesive and outer layer details, number of layers & thickness of the individual layers, coating system designation / trade name, material safety data sheet, service temperature range etc. and details of internal flow coating.
- Hydrotest capabilities including limitation of pressure
- TPI detail (for 3.2 certification)
- Transportation detail (like mode of transport, limitation on each form of transport, seasonal restrictions, special permits etc.)
- Manufacturing and delivery schedule, inclusive indication of number of shipments.
- Deviations to specification (if any) shall be addressed in the deviation form by duly stamping and signing.
- Table of compliance (TOC) duly filled signed & stamped by Manufacturer/Supplier.
- Data Sheets duly filled signed & stamped by Manufacturer/Supplier.
- VDRL and QA/QC related attachments in MR shall be signed and stamped by Manufacturer/Supplier.
- Reference list of similar ball valves manufactured and supplied in last seven years indicating all relevant details including project, year, client, location, size, rating, service etc.
- Torque curves for the power actuated valves along with the break torque, running torque for the valve stem and maximum allowable stem torque.
- Copy of valid API 6D Certificate.
- Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
- Details of support foot including dimensions and distance from valve centreline to bottom of support foot.

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- List of recommended spares required during start-up and commissioning & 2 years of normal operation and maintenance.

## 16 TABLE OF COMPLIANCE

The Supplier/Vendor shall submit filled, signed and stamped Table of Compliance as a part of the technical offer. The Supplier shall confirm compliance with each clause of this specification by writing, "yes" in the column headed "Compliance". Where the Supplier is unable to comply with a particular clause, the Supplier shall write "no" in the column headed "Compliance" and shall describe the deviation with a justification in the appropriate adjacent cells, which may be extended on separate pages as required.

Technical bid shall be considered incomplete during evaluation if Table of Compliance (TOC) is not submitted duly filled-in, signed and stamped.

The Vendor shall confirm below that he has accepted all the clauses contained in the specification or otherwise made clarification's exceptions to be noted below:

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Table of Compliance (TOC)				
<b>Company</b> : Gas Network :		<b>Supplier Ref:</b> XXXXXXXXX		
<b>MS&amp;R NO.</b>		<b>Purchaser:</b> XXXXXXXXX		
SPEC. REC. NO.	CONFORMS Y/N	ALTERNATIVE Y/N	NOTED Y/N	CLARIFICATIONS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
<b>Appendix-1</b>				
<b>Appendix-2</b>				

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**Appendix-1. Design Data Sheet**

Sl.No.	General Information	Details	
<b>A: Pipeline</b>			
1.	Pipe Size [NPS/DN]	48	1200
2.	Pipe Outside Diameter	1219	
3.	Pipeline Design Pressure [barg]	92.7	
4.	Design Temperature (Min./Max.) [°C]	0/82	
5.	Pipeline Design Code	ASME B31.8/ SP	
6.	Location Class as per ASME B31.8	Class 3 (Installation within plant)	
7.	Pipeline ID & Wall thickness	Not applicable	
8.	Process Fluid	Rich Gas (Hydrocarbon)	
9.	Service	Sour	
10.	ANSI PT Rating	600#	
11.	Pipeline Corrosion Allowance [mm]	1	
12.	Pipeline criticality class as per SP	1	
13.	Installation Temperature [°C]	21	
14.	Design life [years]	25	
15.	Pipeline site installation mode	Above Ground	
16.	Cathodic protection for Pipeline	Impressed Current Cathodic Protection	
17.	Pipeline Piggability	Designed for Pigging (IP, construction & maintenance)	
18.	Pipeline hydrostatic test pressure (90% of	DF=0.72	NA
		DF=0.6	NA
		DF=0.5	NA

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	SMYS) [barg]	DF=0.4	NA
19.	Pipeline flanges	As per ASME B16.5/ISO 15590-3/ASME B16.47 Series A	
<b>B: Ball Valve</b>			
1.	Type [or]	Full Bore (FB)	
2.	Operation [&]	HOV	
3.	Driving mechanism	Actuator	
4.	Body/Bonnet Wall Thickness [mm]	As per API 6D, ASME B16.34 & ASME Sec.VIII Div.I	
5.	Ball Valve ID [mm]	If SI.No.7 / API 6D requirement value is Larger/within by a difference of 6 mm to each other, API 6D requirement shall govern. Otherwise larger ID value shall be complied.	
6.	Valve Corrosion Allowance [mm]	3	
7.	Thickness of cladding/Lining/Weldoverlay [mm]	3 [Undiluted WO with SS 316L/DSS/SDSS/CRA as applicable]	
8.	Ball valve PT rating	As per SI.No.10	
9.	Pattern	Standard	
10.	Face to Face dimension [mm]	As per API 6D	
11.	Installation Mode [&/or]	Above Ground /Horizontal	
12.	Ball valve rated pressure [barg]	As per 600#	
13.	Ball valve differential pressure [barg]	As per 600#	

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14.	Entry type	Side Entry	
15.	Construction type	Split body/bonnet Two piece	
16.	Ball Support	Trunnion Mounted	
17.	Seat	Soft	
18.	Seat arrangement as per API 6D	DIB-2	
19.	Seating effect	Upstream Side	SPE
		Downstream Side	DPE
20.	Primary Seal Requirement	Upstream - SPE	Lip seal quantity - 1
		Downstream - DPE	Lip seal quantity - 2
		Stem	Lip seal quantity – 2/ V or chevron pack (Note-3)
21.	Sealant injection arrangement	As per SP-1201	
22.	Grease injection arrangement	As per SP-1201	
23.	Extension for drain/vent/sealant injection lines [Yes/No]	Not applicable	
24.	Drain/Vent port isolation	SB Ball Valve	
25.	Drain/Vent port	Internal Flange	
26.	Stem	Anti-blow out type design	
27.	Stem extension [Yes/No]	No	
28.	Stem extension from FGL [mm]	NA	
29.	Bonnet extension [Yes/No]	No	



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30.	Antistatic connection [Yes/No]	Body to Ball	Yes	
		Body to Stem	Yes	
31.	Ball valve end	Flanged		
32.	Ball valve end/face type	Raised face		
33.	Pup piece material grade	NA		
34.	Pup piece length/wall thickness [mm]	Not Applicable		
35.	End Preparation [Yes/No]	Not Applicable		
36.	End Protection [Yes/No]	Standards for flanged end valve		
37.	Lifting Lugs [Yes/No]	Yes - Integral		
38.	Support [Yes/No]	Yes - Integral		
39.	Ball valve assembly weight [kg]	Vendor to provide		
40.	Quantity [Nos]	Item.No	Detail	Qty
		1)	48 inches	1
		2)	Recommended Commissioning Spares	Form-L
		3)	Recommended 2 year Operation and maintenance Spares	Form-S
<b>C: MOC</b>				
1.	Body	ASTM A105N/ASTM A350 LF2N CL1/ASTM A216 Gr.WCB/ASTM A216 Gr.WCC		
2.	Bonnet	ASTM A105N/ASTM A350 LF2N CL1/ASTM A216 Gr.WCB/ASTM A216 Gr.WCC		
3.	Ball	SS 316L		
4.	Stem	SS 316L/ DSS/ CRA		

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5.	Trunnion	Axial and radial bearing	Same as trim
		Bearing retainer	Same as body
6.	Seat Ring	ASTM A182 Gr. F316/F316L	
7.	Spring	ASTM B537 UNS N07718	
8.	Antistatic Device	SS 316L	
9.	Seat inserts	PEEK/PTFE	
10.	Seals – Primary (Static)	Lip Seal – PTFE/PEEK+Elgiloy	
11.	Seals – Primary (Dynamic)	Lip Seal – PTFE/PEEK+Elgiloy	
12.	Seals – Secondary (Static)	Graphite	
13.	Seals – Secondary (Dynamic)	Braided Graphite	
14.	Gasket	SPWD, AISI 316, Graphite, SS center ring	
15.	Bolts/Nuts	ASTM A193 Gr.B7M/ ASTM A194 Gr.2HM	
16.	Gears	Vendor to provide	
17.	Hand Wheel/Lever	Vendor to provide	
18.	HOV tank and fittings/tubings	SS 316L/304	
19.	Drain/Vent Valve	Same as mainline valve with same trim material	
20.	Drain/Vent/Sealant injection tubing	SS 316L	
21.	Sealing surface WO	SS 316L- 3 mm undiluted	
22.	Body/Bonnet WO	NA	
23.	Stem primary seal [if V /Chevron pack]	PTFE/PEEK	
24.	Lifting Lug	Same as body	
25.	Support	Compatible to body(S275JR/A36/body MOC)	
26.	Hydraulic fluid/oil	Shell Tellus-T/32	
<b>D: Actuator</b>			

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1.	Operator - Actuation	Actuator with HOV and provision for portable HPU connection.
2.	Type of actuator (ie; Action: Linear/ Rotating)	Double acting scotch yoke type ( as per DEP 31.36.10.30-Gen)
3.	Operating pressure for actuator(min./max) [barg]	150 to 200
4.	Actuator function [& /or] Actuator Operation Both Local and Remote using a local/remote selector switch located at the valve.	Local
		Provision for remote operation
		Fail last
5.	Actuator Type	Self-Contained Gas Over Oil Piston Actuator with Hand pumps and Back up gas storage tank for 3 strokes. Shall have quick release connection provision for nitrogen gas cylinder as well as for hydraulic power unit. (Note-5). The following specification shall be followed as a minimum: - 3 strokes - Provision for future N2 connection. - Double Block and Bleed for isolation N2 cylinder. - Quick release fittings for portable hydraulic unit.
6.	Local Operation requirement	Local Open/Close operation shall have the following: - Local panel with Open/ Close Push buttons for and status lamps for valve open and close indication. - Local panel shall have 24V DC power supply unit for the panel circuits. - Local/Remote selector switch feedback to MCC through the RTU

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7.	Remote interface/ feedback	Open Position feedback Confirmed Close Position feedback Open Command for SOV Close Command for SOV Gas Storage tank Pressure Low alarm L/R switch not in Remote
8.	Back up facility for actuator	Yes, Oil cylinder
9.	MOP of actuator [barg]	Fully rated to CL 600#
10.	Piston/Vane driven mechansim	Piston
11.	Safety factor	As per DEP 32.36.01.18-Gen
12.	Material for actuator housing	Vendor to specify
13.	Piston rod assembly material	Vendor to specify
14.	Cylinder material	Vendor to specify
15.	Interconnecting tubing material	SS 316L
16.	Interconnecting tubing size	Vendor to specify
17.	Speed of operation	As per DEP 31.36.10.30-Gen
	Min. (s)	30
	Max. (s)	60
18.	Stroking time (s)	30-60
19.	Cylinder axis (to pipe axis)	Parallel Perpendicular Inclined
20.	Actuator length	To be mentioned in GA drawing
21.	Actuator height	To be mentioned in GA drawing
22.	Cable Gland Entry	No. M20 cable entry for Two Limit Switches + 2 Nos. M20 cable entries for Two SOVs + 1 No. M20 cable entry for Gas storage pressure low + 1 No. M20 cable entry for Local/Remote selector switch +(optional) 1 No. M20 cable entry for Power supply

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<b>D1: Valve Torques at rated pressure/max. differential pressure</b>				
1.	Opening break way	Vendor to specify		
2.	Mid-point	Vendor to specify		
3.	Closing positions	Vendor to specify		
4.	Max. allowable torque of valve stem	Vendor to specify		
<b>D2: Actuator Design Torques and testing Shall be as per DEP 32.36.01.18</b>				
1.	Opening break way	Vendor to specify		
2.	Mid-point	Vendor to specify		
3.	Closing positions	Vendor to specify		
4.	Max. torque produced by actuator	Vendor to specify		
5.	Operating time: Opening (s)	Vendor to specify		
6.	Operating time: Closing (s)	Vendor to specify		
7.	Stem size: Diameter/square side and height	Vendor to specify		
8.	Coupling Dimensions	Vendor to specify		
<b>D3: Controls</b>				
1.	Actuation	Local	Remote	Remote provisions
2.	Fail position	Fail locked		
3.	Automatic line break function	No		
4.	Pressure sensing device	Not required for locally operated actuators		
<b>D4: Other Requirements</b>				
1.	Painting	As per SP-1246, PCS-1, RAL 9010		
2.	Electrical area classification	Zone-1, GAS GR, IIB, T4		
3.	Identification tag number	Stamped SS tag screwed to body		

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4.	Actuator Certification		
	Body material	3.1	
	Pressure Test	3.1	
	Electrical	Atex Exd	<input checked="" type="checkbox"/> Not Applicable
<b>E: Additional Requirements</b>			
1.	Fire Testing	As per section 2.2.8 of SP-1201	
2.	Anti-static	Valve shall be provided with antistatic device in accordance with clause B5 of API 6D	
3.	Lifting lugs	Vendor to show detail in GA drawing. Design to be approved by company/engineering	
4.	Fugitive emission	Class B as per MESC SPE 77/312	
5.	TAT [Yes/No]	Yes, as per MESC SPE 77/300	
6.	Nonmetallic material requirements	As per Company material specification, AED and fire safe	
7.	Witness of tests	By company/purchaser TPI/company TPI (TPI always approved by company). ITP shall capture stage wise inspections and tests with hold points. Company approved ITP shall be	
8.	Material compliance	ISO 15156/NACE MR0175 & company material specification	

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9.	Inspection and testing	API 6D/ISO 10497/API 607and the SP-1201
10.	HIC Testing	As per company material specification (Note-1)
11.	SSC Testing	All process wet components shall be subjected to SSC testing as per NACE TM0177, NACE MR 0175/ISO 15156 and company material specification (Note-1).
12.	Mill Hydrostatic Testing	As per API 6D
13.	SPE seat functional testing	As per API 6D & this MR

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14.	DPE seat functional testing	As per API 6D & this MR
15.	Valve marking	As per SP-1201
16.	Spare requirement	As per SP-1201
17.	Vacuum withstanding capability	Drying pressure up to 5.0 millibar
18.	Minimum wall thickness of valve body and other pressure containing parts	Refer Note-2



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19.	Ball valve functional test	As per MR
20.	Ball valve SPE and DPE seat function test	As per MR
<b>F: NDE</b>		
1.	Valve inspection class	As per MESC SPE 77/302 and SP-1201
<b>G: Dimensions</b>		
1.	Dimensional/tolerance requirement	As per API 6D and SP-1201
<b>H: Coating</b>		
1.	Painting	As per SP-1246
<b>I: Certification</b>		
1.	Material Certification	As per company QA/QC requirements

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Notes:

- 1) The test laboratories shall be company approved.
- 2) Ball valve minimum wall thickness determined by the manufacturer as per ASME B16.34 or ASME Sec.VIII Div.I plus 3mm corrosion allowance shall not be compromised, for valve body screw holes/other drilling made. All compromised thickness value shall be added on to the valve nominal wall thickness plus corrosion allowance during ball valve body manufacturing stage itself.
- 3) For above ground-installed ball valves, one lip seal should be sufficient for stem primary sealing in CL 600# and below.
- 4) Vendor shall submit gas & hydraulic schematic drawing, wiring drawing and GA drawing along with offer.
- 5) All interconnection tube & fitting are in vendor scope. Vendor shall size the tubing with at least 1/2" size, suitable for the design.
- 6) Actuator shall be designed for the pipeline gas pressure as indicated in process data.
- 7) Valve design shall meet the actuator design.

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**Appendix-2. VDRL**

**Document Type Code Key:**

A	Master Data Schedule
B	Commercial Data
C	Drawings
D	System Diagrams/Schematics
E	Data Sheets/Specifications
F	Schedules/Listings
G	Calculations
H	Performance Data
I	Welding & Materials Engineering Data
J	Certification Data
K	Quality Assurance
L	HSE Data
M	Installation/Spares & Maintenance
N	Post Manufacturing Procedures

**Minimal document attributes:**

- Vendor Document Number
- Project Document Number
- Vendor Revision Code
- Project Revision
- Issue Code
- Status
- Discipline and Doc type Code
- Document Title
- Issue Date
- ID/signature of originator, checker and approver
- Purchase order number
- Official name of Vendor and/or sub-vendor company
- The item/tag number or equipment

**General Instructions to Vendors:**

All documents shall be supplied in English and free of copyrights prohibiting use within PROJECT. All

units of measure shall be in SI.

All documents that have been marked in this VDRL have to be submitted electronically.

If "In Data Book" is marked for any document, the Vendor shall include all documents marked as "In Data Book".

"Date 1st Review" is noted as weeks after or before one of the following milestones  
The Contractors or Vendor submittal requirements will be denoted on the VDRL as follows with regard

to documentation listed on the VDRL. Usage of such symbols can clearly be seen on the VDRL.

A = Date receiving Approval of Drawings (e.g. A+1 = 1 week after Approval)

P = Date of purchase order

P + X =X weeks after purchase order or Loi

T = Date of Test

T + -X =X weeks after or prior test

D = Date of Dispatch

D + - X =X weeks after or prior to dispatch

Q = Date of process

Q - X =X weeks prior to manuf./job process



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CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post- Order stage)	AS- BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
<b>MASTER DATA SCHEDULE</b>							
A00	Manufacturer Record Book (MRB)		1	D		O/S	Yes
A01	Vendor Master Data Schedule (VMDS)		1	P+2		O	Yes
A02	Manufacturer Record Book (MRB) Index		1	P+12		O	Yes
<b>COMMERCIAL DATA</b>							
B01	Fabrication/Production Schedule		1	P+2		O	
B02	Sub-Order Schedule/Sub vendor list	1	1	P+2		O	Yes
B03	Weekly Progress/Monthly Progress Reports		1	Q		I	
B04	Company Profile						
B05	Customer List						
B06	Certificate of Origin		1			F	Yes
B07	Certificate of Compliance		1	D		S	Yes

CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post- Order stage)	AS- BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
B08	Exceptions to Codes & Specifications Technical Deviations	1		P+2		O	Yes
B09	Original Invoices						
B10	Certificates of Ownership						
B11	Waivers and Release Notes		1	Q		O	Yes
B12	Independent Verification Body Release Notes						
B13	Table of Compliance Section II Section III Section IV	1				O	Yes



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DRAWINGS							
C01	General Arrangements of Vessel including Vessel	1	1	P+2		O	Yes
C02	Foundation Loading Diagrams & Support Details						
C03	Detail Drawings	1	1	P+2		O	Yes
C04	Exploded View/Cross Sectional Drawings	1	1	P+2		O	Yes
C05	Mechanical Seal Detail						
C06	Panel Cabinet Layouts						
C07	Electrical/Instrument Layouts Instrument Layout JB Layout						
C08	Instrument Outline Drawings						
C09	Insulation/Lining Details						
C10	Isometric Drawings						
C11	Material Balance Drawing including Utilities						
C12	Plot plan						
C13	Package Layout						
SYSTEM DIAGRAMS/SCHEMATICS							
D01	Process/Utility Flow Schemes (PFS/UFS) & Heat Mass						
D02	Process/Utility Engineering Flow Schemes (PEFS/UEFS)						
D03	Electrical Single Line Diagrams (SLD's) Lighting & Small power DB HVAC Power Distribution Board HVAC Control (DDC)						
CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post-Order stage)	AS-BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
D04	Instrument/Electrical Logic Diagrams		1	P+2		O	Yes

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D05	Control Philosophy & Block Diagrams Design control philosophy for HVAC system Design control philosophy for Battery room exhaust fans						
D06	Electrical Schematic Diagrams Lighting & Small power DB HVAC Power Distribution Board HVAC	1	1	P+2		○	Yes
D07	Internal Wiring Diagrams (Connection Diagrams)						
D08	Interconnection Diagram Lighting & Small power DB HVAC Power Distribution Board HVAC Control (DDC)						
D09	Instrument Termination & Hook-Up Details	1	1	P+2		○	Yes
D10	Terminal Block Diagrams						
D11	Electrical Termination & Hook-Up Details		1	P+2		○	Yes
D12	Loop Diagrams						
D13	Hydraulic & Pneumatic Schematics		1	P+2		○	Yes
D14	Interface Drawings Input/Output Power Supplies		1	P+2		○	Yes
D15	Cause & Effect Diagrams						
D16	Visual Display Unit (VDU) Graphics						
D17	Power Distribution Drawings						
D18	Serial Data Mapping Detail						
D19	Interface Control System						
D20	Junction Box Schematics		1	P+2		○	Yes
D21	Control/Automation Details						
D22	Control System Architecture						
D23	Foundation Field Bus segment Calculation Validation report						
D24	SAT Report		1	P+2		○	Yes
D25	SAT Procedure for HVAC						
DATA SHEETS/SPECIFICATIONS							

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		WITH BID	FIRST ISSUE				A00
E01	Weight Data Sheets						
E02	Equipment Data Sheets for vessel internals like scheopentoeter, demister in Shell format. User Design Specification						
E03	Instrument Data Sheets		1	P+2		O	Yes
E04	Noise Level Data Sheets						
E05	Mechanical Alignment Data Sheets						
E06	Valve data sheets	1	1	P+2		O	Yes
E07	Electrical Data Sheets Lighting & Small power DB HVAC Power Distribution Board HVAC Control (DDC) Panel DB Motor data sheet Exhaust fan data sheet						
E08	Functional design		1	P+2		O	Yes
E09	Painting specification						
E10	Piping and Valve						
<b>SCHEDULES/LISTINGS</b>							
F01	Instrument Schedule						
F02	Cable Schedule						
F03	Load/Motor Schedule						
F04	Distribution Board Schedule						
F05	Input/ Output Schedule/ Bit Maps						
F06	Bolt Schedule						
F07	Lubrication Schedule						
F08	Terminal Point Schedule						
F09	Transit Schedule						
F10	Utilities Schedule						
F11	Erection Fastener Schedule						
F12	Bill of Materials/Equipment List		1	P+2		O	Yes
<b>CALCULATIONS</b>							



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CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post- Order stage)	AS- BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
G01	Pressure Vessel/Tank Mechanical Strength Calculations						
G02	Process/Utility Design Calculations for vessel internals like sizing calculation Scheopentoeter and pressure drop calculation, etc.						
G03	Structural Steel Calculations - Design of Spreader beam						
G04	Foundation Support						
G05	System Head Loss Calculations						
G06	Lateral Critical Speed Calculations						
G07	Torsional Critical Speed Calculations						
G08	Bearing Life Calculations						
G09	Thrust Bearing Size						
G10	Heat Emission Calculations						
G11	Reliability, Availability & Safety Integrity Level (SIL)						
G12	Hydraulic Calculations (Torque table)	1	1	P+2		O	Yes
G13	Exchanger Thermal Rating Calculations						
G14	Instrument Calculations						
G15	Acoustic Enclosure Ventilation System Calculations						
G16	HVAC load Calculations (including exhaust fan sizing calculations)						
G17	Coupling Selection						
G18	Lube & Seal Oil System Calculations						
G19	Anti-Surge Valve Sizing						
G20	Rotor/Shaft System Imbalance Response Analysis						

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G21	Piping Stress Analysis						
G22	Failure Mode & Effects Analysis						
G23	Finite Element Analysis (if required)						
G24	Nozzle Loads & Movements						
G25	Externally Applied Loadings Calculations						
CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post-Order stage)	AS-BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
G26	Gaseous (Inergen)/Water Mist Fire Extinguishant flow, pressure & time design						
G27	Electrical calculations Lighting design						
<b>PERFORMANCE DATA</b>							
H01	Electrical Protection Curves & Relay Characteristics						
H02	Current, Potential & Power Transformer Curves						
H03	Motor Performance Curves						
H04	Lighting Performance Data						
H05	Battery Charge/ Discharge Curves						
H06	Power System Analysis Data						
H07	Electrical Generator Performance Curves						
H08	Combustion Gas Turbine Performance Curves						
H09	Compressor Performance						
H10	Centrifugal Pump Performance Curves						
H11	Rotary Pump Curves						
H12	Reciprocating Pump Performance Curves						
H13	Fan Performance Curves						
H14	Engine Performance Curves						
H15	Speed/Torque Starting Curves						
H16	Crane Load/Radius Curves						

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H17	Computer System Manuals						
H18	Catalogue Data						
H19	Cooler Performance Curve						
H20	HTRI, HTFS Simulation files						
H21	Utility Consumption Data Including Instrument, Air, Water, Chemicals						
<b>WELDING &amp; MATERIALS ENGINEERING DATA</b>							
J01	Weld Location & NDE Plans (including weld repairs & casting defects) <input type="checkbox"/> Weld Maps		1	Q	1	S	Yes
CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post- Order stage)	AS- BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
J02	Welding Procedure Specifications (WPS) & Qualification Records		1	P+1	1	O	Yes
J03	Non Destructive Examination (NDE) Procedures <ul style="list-style-type: none"> <li>• Ferrite Testing Procedure</li> <li>• PMI Procedure</li> <li>• Pickling &amp; Passivation Procedure</li> <li>• Low Temperature Test Procedure</li> <li>• UT, RT, MPT and PT procedure</li> </ul>		1	P+1	1	O	Yes
J04	Surface Preparation & Coating Specification Surface Preparation & Painting/Coating Procedure		1	P+2	1	O	Yes
J05	Forming & Heat Treatment Procedure						
J06	Hydrostatic/Pneumatic Test Procedures <ul style="list-style-type: none"> <li>• Hydrostatic Test Procedure</li> </ul>		1	P+1	1	O	Yes

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J07	Material selection report, material selection diagram Corrosion Test Procedure		1	P+1	1	O	Yes
J08	Material selection report, material selection diagram						
<b>CERTIFICATION DATA</b>							
K00	Quality Dossier						
K01	Type Approval Certificates Fire Test, IP certification, ATEX certification	1	1	T+1		O	Yes
K02	Hazardous Area Certificates						
K03	Performance test results			D-2		S	Yes
K04	Factory Acceptance Test			D-2		O	Yes
K05	Vibration Reports						
K06	Noise Reports						
K07	Weight Reports/Certificates			Q+2	1	S	Yes
K08	Dimensional Control Reports			Q+2	1	S	Yes
CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post- Order stage)	AS- BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
K09	Material Test Certificates			D-2	1	O	Yes
K10	NACE Requirements			D-2	1	S	Yes
K11	Welder Qualification		1	Q-2	1	S	Yes
K12	NDE Operator Qualification Certificates		1	Q-2	1	S	Yes
K13	Pre-Production Qualification & Production Test Results			Q+2	1	S	Yes
K14	Heat Treatment Records			T+2	1	S	Yes
K15	NDE Records (Visual, Radiography, DPI, MPI, UT,			T+2	1	S	Yes
K16	Material Traceability Records			T+2	1	S	Yes
K17	Calibration Certificates			T	1	S	Yes
K18	Pressure Test Certificates			T+2	1	S	Yes
K19	Leak Test Certificates						
K20	Proof Load Test Certificates – for lifting beam (if required)						

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K21	Coating/Insulation Reports & Compliance Certificates • Painting / Insulation Inspection		1	T+2	1	S	Yes
K22	Cable Record Cards						
K23	Nameplate Rubbing/Photo						
K24	Approved Concessions & Concessions Register • Technical Deviation Register			Q-2		S/I	Yes
K25	Inspection Release Certificates (Principal/Purchaser)			E+2		K	Yes
K26	Inspection/Survey Reports (Certifying Authority, Regulatory Authority, etc.)						
K27	Non Conformance Reports (Principal/Purchaser) • Close-outs			E+2		S/I	Yes
K28	Non Acceptance Reports (Certifying Authority, Regulatory Authority, etc.)						
K29	Technical Passport Contents						
K30	Technical Passport						
K31	Certificate of Conformity						
K32	Permit to Use Foreign Made Hazardous Equipment						
CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post-Order stage)	AS-BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
K33	Electromagnetic Compatibility (EMC) Declaration of						
K34	Weldability Data						
<b>QUALITY ASSURANCE AND CONTROL</b>							
L01	Quality Manual		1				
L02	Quality Plan						

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L03	Quality Control Plan <ul style="list-style-type: none"> <li>• Inspection &amp; Test Plan for Ball Valve</li> <li>• Inspection &amp; Test Plan for coating</li> <li>• Inspection &amp; Test Plan for Actuator</li> </ul>	1	1	P+2		O	Yes
L04	Quality Management Accreditation (including any manufacturing licenses held by Vendor, e.g. API,	1					
L05	Audit Schedule						
L06	Audit Reports (incl. Quality Assessments)						
L07	Corrective Action Reports						
<b>HSE DATA</b>							
M01	Material Safety Data Sheets (MSDS)						
M02	Emissions to Atmosphere Data						
M03	Safety & Environmental Evaluation						
M04	Safety Standards						
M05	HAZOP Reports						
M06	Project Safety Plan						
M07	Safety Management System						
M08	Environmental Management System						
<b>INSTALLATION &amp; OPERATING MANUAL (IOM)</b>							
N01	Installation, Commissioning, Operating &			D		I	Yes
CODE	DOCUMENT DESCRIPTION	NO. OF COPIES REQUIRED		DATE REQD. (Post-Order stage)	AS-BUILT	REVIEW CLASS	IN DATA BOOK
		WITH BID	FIRST ISSUE				A00
N02	Installation, Commissioning, Operating &			D		I	Yes

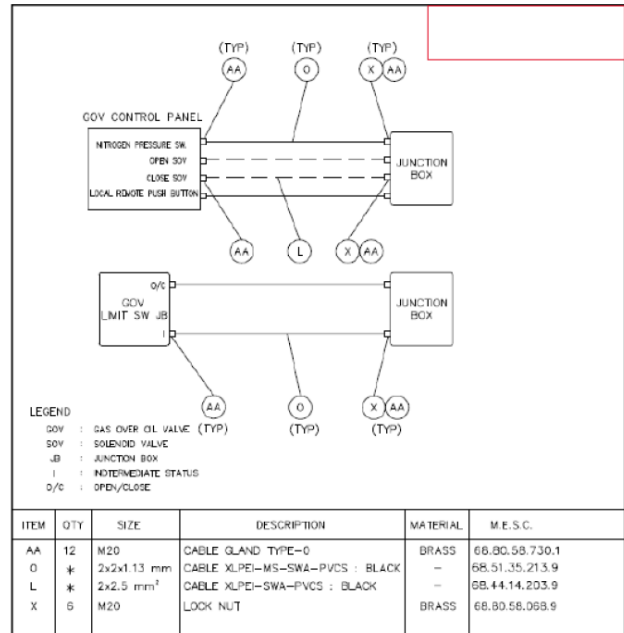
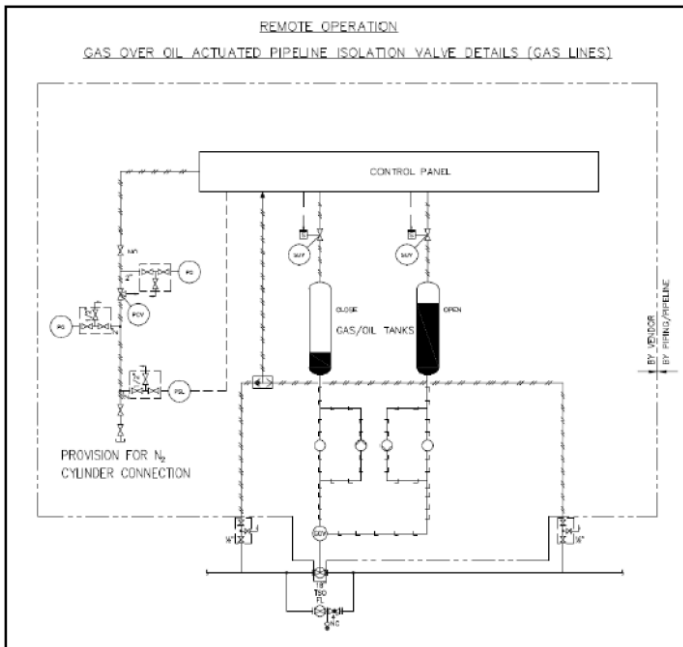


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		WITH BID	FIRST ISSUE	(Post- Order		REVIEW	A00
P13	Design Basis Report						
P14	Cable/Trench Routing						
P15	Power consumption for instrumentation items						
P16	Instrument installation MTO						
P17	Alarm and Trip setting						
P18	Field work procedure for fabrication,						
P19	Pump Hydraulics						
P20	Safeguarding Narrative						

**Note: VDRL shall be duly filled, signed and stamped by both Valve and Actuator Manufacturers Separately and submitted along with the Technical Proposal.  
GA Drawing, Torque Values, Functional & Test procedure**





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## 17. Additional requirements by Quality

Performance test (as a minimum) shall include the following:

- Hydrostatic shell test; As per API 6D
- Hydrostatic seat test; As per API 6D
- Low pressure gas seat test; @500 kPa (g) & API 6D
- High pressure gas seat test; As per section H4.3 of API 6D
- Cavity relief testing; As per section H8.2 of API 6D
- Double isolation and bleed; As per section H11 of API 6D
- Operational torque test; As per section H6 of API 6D and section 2.5.4.6
- FE Production testing; As per MESC SPE 77/312
- Anti-static test; As per section H5 of API 6D

In addition,

Valve shall be tested with minimum test duration of 1 hour for high pressure shell test. High pressure shell test for 1 hour shall be at rated pressure instead of 1.5 times of rated pressure and this requirement is applicable only for all casting valves.

Valve shall undergo 15 minutes seat test at rated pressure (applicable for both forged and cast valves). In the event of failure, the valve shall be repaired and retested and another two (2) valves from the same category to be selected in random for 15 minutes seat test.

\*All above tests shall be conducted in unpainted condition.

\*Hydrostatic and air seat test pressures shall be held for a maximum settling period of five minutes in addition to the test duration.

Actuator pressure leak test and piston pressure leak test as per CL;5 of DEP31.38.01.31-Gen

Assembly test (VAC) shall be performed as per CL;5 of DEP31.38.01.31-Gen

FAT procedure shall be submitted by vendor and approved by the company prior to testing

Vent and drain valve shall comply with SP1254 requirements.

\*Pipes, fittings and flanges shall be standard butt weld type and bending (cold or hot) shall not be allowed. MESC numbers of flanges, fittings, bolting, gaskets, vent\drain isolation valves etc. shall be taken from corresponding piping classes of the main valves and shall comply all MESC and PDO SP requirements.

\* Vendor shall show the details of vent\drain arrangement in the valve general arrangement drawings along with corresponding parts MESC numbers for company approval before starting manufacturing of valves.

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**FORM - L**

**LIST OF SPARES AND ACCESSORIES FOR START UP & COMMISSIONING OF VALVES**

S. No.	Item No.	Description	Quantity

**To be filled, signed and stamped by Bidder.**

**Notes:**

- 1) Bidder shall include the price of the start up and commissioning spares for valves in the quoted price for Ball Valves.
- 2) Start-up and Commissioning spares including description and quantity shall be listed separately for each quoted item.

**Bidder's seal**

**Signature of Bidder**

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**FORM – L-1**

**LIST OF SPARES AND ACCESSORIES FOR START UP & COMMISSIONING OF ACTUATORS**

**(TO BE FILLED SEPARATELY BY EACH PROPOSED ACTUATOR MANUFACTURER)**

S. No.	Item No.	Description	Quantity

**To be filled, signed and stamped by Bidder.**

**Notes:**

- 1) Bidder shall include the price of the start up and commissioning spares for actuators in the quoted price for actuators.
- 2) Start-up and Commissioning spares including description and quantity shall be listed separately for each quoted item.

**Bidder's seal**

**Signature of Bidder**

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**FORM - S**

**LIST OF SPARES AND ACCESSORIES FOR TWO YEARS OF NORMAL OPERATION OF VALVES**

S. No.	Item No.	Description	Quantity

**To be filled, signed and stamped by Bidder.**

**Note:**

- 1) Bidder shall quote separately spares for two years normal operation for valves as per price schedule Performa.
- 2) Spares for two years normal operation including description and quantity shall be listed separately for each quoted item.

**Bidder's seal**

**Signature of Bidder**

**MATERIAL SPECIFICATION AND  
REQUISITION FOR PIPELINE FULL  
BORE BALL VALVE**

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**FORM – S-1**

**LIST OF SPARES AND ACCESSORIES FOR TWO YEARS OF NORMAL OPERATION OF ACTUATORS**

**(TO BE FILLED SEPARATELY BY EACH PROPOSED ACTUATOR MANUFACTURER)**

S. No.	Item No.	Description	Quantity

**To be filled, signed and stamped by Bidder.**

**Note:**

- 1) Bidder shall quote separately spares for two years normal operation for actuators as per price schedule Performa.
- 2) Spares for two years normal operation including description and quantity shall be listed separately for each quoted item.

**Bidder's seal**

**Signature of Bidder**

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**FORM - T**

**DATA SHEET FOR TORQUE VALUES  
(TO BE FILLED SEPARATELY BY EACH PROPOSED ACTUATOR MANUFACTURER)**

MR SR. NO.	TAG NO.	DATA FROM BALL VALVE VENDOR FOR			BALL VALVE TORQUE FIGURES WITH A SAFETY FACTOR OF 1.25		ACTUATOR GENERATED TORQUES (NOTE 1)		MODEL SELECTED (8)
		BREAK TORQUE [Nm] (1)	RUNNING TORQUE [Nm] (2)	MAX ALLOWABLE VALVE STEM TORQUE [Nm] (3)	BREAK TORQUE [Nm] (4)	RUNNING TORQUE [Nm] (5)	BREAK TORQUE [Nm] (6)	RUNNING TORQUE [Nm] (7)	

**NOTES:**

1. **Column numbers 1 to 5 shall be filled by the valve manufacturer. Column numbers 6, 7 & 8 shall be filled by Actuator manufacturer.**
2. These figures shall be used as basis for testing the actuator performance during factory testing. The actuator acceptance would be carried out after verifying successful testing complete ball valve with actuator assembly.
3. Actuator running torque under col. (7) shall be greater than or equal to minimum required torque indicated under col. (5) and actuator Break torque under col. (6) shall be greater than or equal to minimum required torque under col. (4).
4. Actuator Break torque shall be less than max allowable torque for valve stem. Valve manufacturer shall ensure that valve stem is designed to withstand actuator Break torque.
5. All values shall be indicated in Nm.

**Actuator Manufacturer's seal**

**Signature of Actuator Manufacturer**

**Bidder's seal**

**Signature of Bidder**