



پتروشیمی توسعه پارک
صنعتی گوهر افق

Toase-ehe Park Sanati Gohar Ofogh
Petrochemical Co.
**CONCEPTUAL, BASIC and DETAIL DESIGN
ENGINEERING OF STYRENE PARK OFFSITE**



Bina Consulting Eng. Co.

Document Title : Specification for Control Valve

Document No. : EI027-000-ED-IN-SPC-005

Rev. R2

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STYRENE PARK OFFSITE

Document Title:

Specification for Control Valve

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1 INTRODUCTION

Creation and development of chain units of Styrene Monomer is the mission of Gohar Ofogh Industrial Park. This Company joint investment of 4 companies including JPC, Asaluyeh Sadaf Chemical, Kimia Sanaye Dalahoo and Entekhab Group and is located in Assaluyeh.

Feed and utility lines and network construction Styrene Monomer tank construction, Peroxide and its sidelong equipment warehouse are among this company's missions.

Some of the ongoing Projects of this company are:

ABS-Rubber project

ESBR project

EPS project

Poly Styrene

2 PURPOSE

This specification together with the attachments describe the minimum requirements for the engineering, design, and manufacture, inspection, testing and delivery of Control Valves for use in STYRENE PARK OFFSITE Development Project.



The **VENDOR's** scope shall as a minimum include the following:

- i) The **VENDOR** shall supply the control valves complete with accessories to satisfy operational requirements under the conditions described in this document and datasheets.
- ii) **VENDOR** shall assume full responsibility for all aspects of the work within his scope of supply. This shall include timely delivery, liaison with the **PURCHASER** and with any **SUB-VENDORS** of specialized items or devices required in his scope of supply. The vendor shall provide a performance guarantee for the mechanical design of the control valves, including warranty, when operated at the design conditions specified in the data sheets furnished by the **PURCHASER**, the warranty shall extend to include the noise levels achieved on site during performance tests at the maximum operating conditions.
- iii) Where parts of the control valves are sub-contracted, these become part of **VENDOR's** package and it is the **VENDOR's** responsibility to ensure that the complete package complies with all the relevant specifications.

For reasons of proven reliability, standardization, maintenance familiarity and minimizing spare parts inventory, the **VENDOR** is to ensure that parts used in the assembly are as per specified in the **COMPANY's** approved Vendor List.

The control valves, complete with accessories shall be assembled and tested by the **VENDOR** in his manufacturing premises prior to delivery.

- i) Supply of spare parts for start-up and commissioning.
- ii) Provision of all engineering documents and drawings for installation, operations and maintenance.
- iii) Preservation, packing and transportation of the Control Valves to the module fabrication sites.

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3 APPLICABLE CODES, STANDARDS, SPECIFICATIONS, ABBREVIATIONS AND SITE ENVIRONMENTAL CONDITIONS & UTILITIES

3.1 Precedence of Codes, Standards and Specifications

It is VENDOR's responsibility to inform PURCHASER of any deviations from, or exceptions to, the listed codes, standards and specifications. PURCHASER will take non-listing of exceptions or deviations by VENDOR as being in full compliance with the codes, standards and specifications listed herein.

If there is a conflict between the various codes, standards and specifications, the VENDOR shall seek COMPANY's final interpretation and approval prior to the execution of work.

The latest edition of the codes and standards listed in sections 2.2 shall be used.

3.2 International Codes and Standards

The International Society for Measurement and Control

ISA Guide	Control Valves, Practical Guides for Measurement and Control
ISA S20.20	Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves
ISA S75.01	Flow Equations for Sizing Control Valves
ISA S75.03	Standard face to face dimensions for control valves
ISA S75.05	Control Valve Terminology
ISA S75.11	Inherent Flow Characteristic and Range ability of Control Valves
ISA SP75.17	Control Valve Aerodynamic Noise Prediction
ISA RP75.23	Consideration for Evaluating Control Valve Cavitation's



American Society of Mechanical Engineers

ASME B1.20.1	Pipe Threads, General Purpose (inch)
ASME B16.5	Steel Pipe Flanges and Flanged Fittings
ASME B16.10	Face to Face and End to End Dimensions of Valves
ASME B16.20	Ring-Joint Gaskets and Grooves for Steel Pipe Flanges
ASME B16.34	Valves – Flanged, Threaded, and Welding End
ASME B16.104	Control Valve Seat Leakage
ASME B31.1	Power Piping
ASME B31.3	Chemical Plant and Petroleum Refinery Piping
ASME B46.1	Surface Texture
ASTM E94	Standard Recommended Practice for Radiographic Testing
ASME E142	Standard Method for Controlling Quality of Radiographic Testing
E142 ASME VIII	Rules for Construction of Pressure Vessels – Division 1

Fluid Control Institute

FCI 70-2	Control Valve Seat Leakage
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National Association for Corrosion Control (where applicable)

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NACE MR0175

Sulphide Stress Cracking Resistant Metallic Materials for Oil
Field Equipment

International Electro technical Commission

IEC 60534-8-3	Control Valve Aerodynamic Noise Prediction Method
IEC 60529	Classification of degrees of protection provided for enclosures
IEC 60079	Electrical Apparatus for Explosive Gas Atmospheres

Manufacturer's Standardization Society

MSS SP 54	Quality Standard for Steel Casting Radiographic Examination Method
MSS SP 55	Quality Standard for Steel Casting Visual Method
MSS-SP-61	Pressure Testing of Steel Valves

Associated Project Documentation

EI027-000-ED-IN-DSH-0002	Data Sheet for Control Valves
EI027-000-ED-IN-DCR-0001	Instrument & Control Design Criteria
EI027-000-ED-IN-SPC-0001	Technical Specification for Field Instruments
EI027-000-EB-PI-SPC-0002	Piping Specification and Material Classes

3.3 Abbreviations Used in the Document

FAT	Factory Acceptance Test
ICSS	Integrated Control and Safety System
ITP	Inspection and Testing Procedure
IP	Ingress Protection
SS	Stainless Steel
NPT	National Pipe Thread
SPIR	Spare Parts Interchangeability Records

3.4 Site Environmental Conditions & Utilities

The Equipment shall be suitable for outdoor installation on offshore saline atmosphere at the following operation conditions:

Outdoor Conditions

Max. Ambient Design Temperature.	48 °C
Expected Extreme Temperature	55 °C
Min Ambient Temperature.	5 °C
Max. Relative Humidity	80 %
Min. Relative Humidity	65 %

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Indoor Conditions

Design Temperature.	45 °C
Relative Humidity	80 %

4 FUNCTIONAL DESCRIPTION

4.1 General Requirements

Control valves shall be sized in accordance ISA S75.01, “Flow Equations for Sizing Control Valves”.

The maximum possible flow through the control valve under the selected flow coefficient shall be calculated and noted on the detailed specification sheets.

If the calculated control valve size is two or more sizes smaller than line size, a valve body shall be one size smaller than line size with reduced inner valve trim.

Control valves with equal percentage characteristics shall be sized to operate at approximately 75 percent travel under design flow conditions and less than 95 percent travel under maximum flow conditions.

Control valves with linear valve characteristic shall be sized to operate at approximately 70 percent travel under design flow conditions and less than 90 percent travel under maximum flow conditions.

Control valves shall pass the minimum design flow at no less than 20 percent of valve travel.

VENDOR shall size and select the control valve and actuator assembly and accurately evaluate the maximum trim performance requirements. VENDOR shall provide valve and actuator sizing calculations. Control valve selection shall ensure that the reduced energy can be dissipated without exceeding the maximum vibration levels in the piping system and without exceeding the wear properties of the trim material. VENDOR shall select control valve trim design that facilitates maximum reduction of control valve induced vibration and trim wear.

Seat leakage classification shall be in accordance with FCI 70-2.

VENDOR shall select and size the control valves and actuators assembly and accurately evaluate the minimum trim performance requirements.

VENDOR shall ensure that the installed range ability (actual available range ability) of each control valve in the process system shall meet all flow conditions (minimum and maximum flow rate) specified.



Body rating and flange rating and facing shall be in accordance with the piping class specification for the associated piping.

Radiation fins and extension bonnets shall be of the same material as the body. Whenever bonnet is required it will either be:

- a) Extended type for operating temperatures -29 °C and below.
- b) Finned if the operating temperature exceeds 230 °C.
- c) With pressurized or bellows type seal for lethal process fluids.
- d) Normal for all other cases.

The material bonnet shall be suitable to withstand the ambient temperatures and operating temperatures indicated in the Datasheets.

Cable entries shall have metric threads or be supplied with adaptors to 20 mm ISO (female). Electrical flying leads shall not be used.

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Valve packing boxes shall be flange bolted to the bonnet. Valve packing shall be spring loaded and adjustable. PTFE (Teflon) shall be used for operating temperature between -20 °C and 220 °C, and graph oil shall be used for operating temperature above 220 °C and below -20 °C. For service under vacuum and for special services the packing to be used shall be determined case by case. Packing lubricator with steel isolated valves shall be provided if required.

The control valves and its accessories shall be suitable for Zone 1, gas group IIA or IIB, temperature class T3, hazardous area. The equipment shall be weatherproofed to IP65 as a minimum in accordance IEC 60529. Electronic equipment installed on the valve shall be certified for use in this area. Certification shall be carried out by a recognized testing authority e.g. BASEEFA.

4.2 Noise

Noise levels of control valves and accessories shall be in accordance with ISA SP75.17 and IEC 60534-8-3 guidelines including the following requirements:

The noise generated by a control valve installation in gas or vapor service shall not be greater than 85 dBA measured at 1 meter from the valve assembly under all normal operating conditions.

Upstream and downstream silencers and special noise-control trim shall be considered for valves with a calculated noise level above 85 dBA at 1 meter. The **VENDOR** shall be responsible for supplying all components necessary to achieve this level. The vendor shall be responsible for ensuring that the installed system will meet the specified criteria when in operation at full capacity. The **PURCHASER** will supply piping design drawings, if requested by the vendor, in order to establish the optimum design for the piping to achieve the maximum noise attenuation and minimize acoustic vibration.

Exceptions to noise level requirements may be granted based on such factors as frequency of valve operation and worker proximity. Exceptions shall require the written approval of **PURCHASER**. Only during shutdown or extreme upset conditions may noise levels exceed 85 dBA. Under no circumstances shall noise levels exceed 105 dBA. The **VENDOR** should be cognoscente of the fact that the valves subject this requisition will be operation at all times.

Hydrodynamic noise, caused by cavitations in control valves, shall be controlled by selecting valve type and trim to preclude cavitations within the control valve and downstream piping.

4.3 Control Valve Actuators

Actuators shall be adequate to stroke the valve and sized based on the maximum differential pressure to which the valve will be exposed.



Valve actuators shall be pneumatic type with spring return to the safe position. For higher torque outputs, a double-acting piston actuator shall be considered but subject to **COMPANY** approval. Other types of actuators may be offered to match valve design however; these shall be subject to the approval of the **COMPANY**.

A valve stem position indicator shall be provided. All Control Valves shall be calibrated for 0 - 100%.

4.4 Valve Construction

The minimum pressure ratings for the valves shall be in accordance with ANSI B16.5, Pipe Flanges and Flange Fittings. Materials for valve bodies shall be in accordance with Piping Class, Material and Valves Specification. NACE material shall be used when there is H₂S in fluid. NACE requirement shall be followed as per project specification no. EI027-000-EB-PI-SPC-002, "Piping Specification and Material Classes".

The face-to-face dimensions of globe style flanged control valves with integral flanges shall be in accordance with ISA S75.03, Uniform Face-to-Face Dimensions for Flanged Globe Style Control Valve Bodies.

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4.5 Valve Accessories

All accessories specified with the control valve such as reservoir, booster pump, solenoid valve and etc. will be supplied, installed, connected / wired, to the valve by the Vendor.

The control valves accessories such as solenoid valves and limit switches shall be weatherproof, have an ingress protection rating of IP-65 minimum and be suitable for operation in a humid and corrosive atmosphere. No copper or copper bearing alloys shall be used.

When specified in the data sheets limit switches for control valve shall be provided.

A positioner shall always be provided on piston-operated valves in throttling service regardless of the response speed of the process systems.

The limit switches shall be hermetically sealed, inductive, two wire proximity type according to DIN 19234 NAMUR and shall be explosion proof type.

The vibration shall not affect limit switches mechanically or functionally.

Limit switches shall be equipped with termination box weather proof to IP65. Termination boxes shall have M20X1.5 cable entry suitable for connecting cable glands.

Valve positioner and booster cases shall be of corrosion resistant material.

The positioner shall have a weatherproof enclosure in accordance with IEC-60529, IP65 as a minimum with 20 mm ISO Metric cable entry. Air supply connection shall be NPT.

The Vendor shall properly adjust valve positioner with selectable characterizing cam.

The valve positioner shall be provided with an identification plate, marked with air supply pressure and air signal.

4.6 Materials

All material supplied under this specification shall be adequate for the proposed service. Proper consideration shall be given to their function with regard to the environmental condition, corrosion, chemical attack, electrical and process hazards. Such precaution shall include but not limited to the following:

The selection of material shall be adequate to meet design requirements together with foreseeable contingency.

Protective coatings shall be as required to preserve the utility, efficiency and appearance of the equipment under the conditions listed in the reference standards.

The materials of construction for the valve components shall be as indicated in the data sheets. Control valve body materials shall meet or exceed the requirements of the application.

Materials of construction of the valves and accessories and painting and coating system when applied shall be suitable for long term exposure to a marine type environment. Aluminum components shall not be used for actuator or its ancillary equipment.

All pressure retaining parts and parts wetted by the process fluid shall be stamped with the respective same material heat number to allow full material traceability to the original mill certificates.

In case of H₂S presence, NACE certified material shall be used. NACE requirement shall be followed as per project specification no. EI027-000-EB-PI-SPC-002, "Piping Specification and Material Classes".

Instrument tubing shall be seamless, bright-annealed 316 L stainless as per ASTM A269 with minimum 2.5% molybdenum content and maximum hardness Rb80.

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4.7 Lifting Of Equipment

Lifting lugs to be provided for the control valves weighting more than 50kg to facilitate lifting/installation and position shall be approved by the COMPANY.

5 INSPECTION AND TESTING

5.1 General

The VENDOR shall provide a testing program, which shall reflect the specific requirements for the equipment specified.

The VENDOR shall give PURCHASER, or his designated agents a minimum of 3 weeks' notice for attending certain critical witness inspections required by PURCHASER.

The VENDOR shall conduct a preliminary function test to ensure all parts of the equipment are operating satisfactorily prior to the arrival of the PURCHASER's representative and/or nominated agent.

If it is found necessary to dismantle any equipment during a test, because of malfunction, the test may then be invalidated, and a further test shall be required after the repair of the fault.

Acceptance of shop tests shall not constitute a waiver of requirements to meet the field tests under specified operating conditions, nor shall inspection relieve the VENDOR of his responsibilities in any way whatsoever.

The VENDOR shall furnish at his expense all spares and consumables required during the testing of the equipment and systems. Rectifying of defects revealed by such tests shall be at the VENDOR's expense.

The VENDOR shall provide all the identified certifications and relevant cost, including but not limited to Material Certification, Third Party design verification, third party inspection & certification.

VENDOR to note that PURCHASER shall engage a Design Verification and Certification Agency (DVC). VENDOR shall be obliged to provide all relevant documents and information required by the DVC to verify that the equipment/ material being supplied is in compliance to the requirements of the Purchase Order Specification and attachments.

VENDOR shall submit an Inspection and Testing Procedure (ITP) for review and approval by PURCHASER prior to the start of manufacture. The ITP shall as a minimum cover:

- Manufacturing sequence, including inspection.
- Proposed physical inspection of equipment.
- Proposed check of documentation.

All valves and their components shall be subjected to a visual check to verify quality of workmanship and general conformance with all requirements of the purchase requisition. All associated documentation and certification shall be reviewed for completeness.

VENDOR shall submit his proposed test procedures to PURCHASER for approval at least one month before the scheduled test date.

5.2 Stroke Speed Requirements

VENDOR shall select control valve and actuator assembly to achieve the stroke speed requirements specified on the Datasheets.

All applications need to be verified for the actual stroke speed requirements. Stroke times shall be tested on a 100% control signal step change without the aid of process pressure conditions. Stroke times shall be tested during VENDOR'S inspection. VENDOR shall document the test criteria and results of the

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functional tests performed during **VENDOR'S** inspection to verify operability and stroke speed. Boosters may be applied to meet stroke time requirements, but stroke movements shall remain stable at 20%, 50% and 80% control signal step changes.

Fast stroke time requirements under failure conditions shall be separately specified. **VENDOR** may use quick-exhaust valves, provided that they do not interfere with the normal control operation of the actuator system.

5.3 Factory Acceptance Test (FAT)

The control valves shall be subjected to tests to demonstrate their compliance to all functional requirements specified in this document including seat leakage. FAT procedure shall be submitted for **PURCHASER** approval.

Any item (including hardware and documentation) which is found to be unsatisfactory by the **COMPANY** shall be rectified or corrected by the **VENDOR** at his own expense. Similarly, any test failure on the equipment and accessories shall be re-tested to the satisfaction of the **COMPANY**.

A full set of deliverable documentation shall be furnished, for review during the FAT.

5.4 Inspection

All hardware must be inspected for physically acceptable components and general workmanship standards. Particular note should be made of;

- a) Ease of access for maintenance work
- b) Seals and paint finish with reference to the final site environmental conditions
- c) Tubing and fitting connections

6 SPARE PARTS

6.1 General

Recommended spares shall take into account related factors of equipment reliability, cost of parts and availability of equipment service facilities.

All spare parts supplied by **VENDOR** shall be wrapped and packaged such that they will be preserved in the original as-new condition under storage conditions, which are to be anticipated in Middle East Region. They shall be properly tagged and coded for ease of identification as to intended equipment usage at a later date. They shall further be packaged separately, clearly marked as "Spare Parts" and transported with the equipment.

Packing lists shall be provided, so that the parts can be stored without uncrating if so desired.

6.2 Spares

VENDOR shall provide a recommended spare parts list for commissioning, and start-up. **PURCHASER** will decide the final list of commissioning and start-up spares which to be supplied by **VENDOR** as part of the package. **VENDOR** shall also provide a recommended two years operation spare parts list with price. The prices shall be listed itemize and shall be valid for the period as indicated in commercial terms and conditions.

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6.3 SPIR

VENDOR shall provide an SPIR database using the format of the attached three sheets as a guide. SPIR database shall be submitted to the PURCHASER in electronic media using Excel spreadsheet.

7 PRESERVATION, PACKING AND SHIPPING

7.1 Packing

The equipment shall be securely packed for shipment from VENDOR's location to the actual equipment destination. All items must be protected from handling damage either by protective packing with cartons, crates, etc. or by securing to pallets.

All material must be packed in a way that handling with forklift truck or crane is possible. If there is a risk of damage to equipment and other appurtenances during transportation, they shall be disconnected and tagged. All components shall then be securely packed as above.

Equipment shall be adequately packed to withstand at least 12 months storage at construction site prior to installation. The VENDOR shall recommend any necessary procedures to be imposed during storage.

Spare Parts shall be packed separately and clearly marked "Spare Parts".

7.2 Preservation

All equipment shall be thoroughly cleaned internally and packaged free of loose foreign materials. VENDOR shall replace all parts which have defects due to loose debris left from fabrication / shop tests of his own cost.

All surfaces not painted with the prescribed painting system, shall be coated with corrosion protective grease for transportation and 12 months storage on Iran, Persian Gulf Yard.

All openings shall be covered or capped to protect the inside from dust, rust and moisture. Dry ant shall be enclosed in the package for absorption of moisture.

Flanged openings shall be provided with gasket metal closures securely fastened with bolts or clamps.

7.3 Marking

The VENDOR shall attach a packing list, in a waterproof enclosure, to the outside of the package. The packing list shall clearly show:

- Purchaser's order number.
- Purchase Order item number
- Partial or complete delivery for each order number
- Description of Contents
- Tag Numbers of Control Valve

The VENDOR shall also provide a list, within the packing list, showing rust preventatives used and where. The rust preventatives list shall give instructions for removal of preventatives where required, and also necessary procedures to be imposed during storage.

VENDOR shall provide a Delivery Specification, which shall describe all loose items furnished in a completely or not completely assembled condition. Delivery Specification must clearly indicate PURCHASER's order number and item number for each loose item shipped by the VENDOR.

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One copy of the delivery specification shall follow the package, one copy to be sent to the receiving port and one copy to be sent to the PURCHASER.

7.4 Tagging & Name plating

All items of equipment and material are to be clearly tagged via a nameplate.

Each Control Valve shall have a SS 316 Name Plate attached firmly to the body furnishing the following information:

- Tag number
- Body and Port size
- Stem Travel
- Action on air failure
- Spring range
- Manufacture Model Number for valve body, actuator, and positioner.
- P.O. Number
- Serial Number
- Leakage Class
- Body rating and material grade
- Signal range
- Trim Characteristics
- Body Test Pressure
- Bench Test Pressure

8 WARRANTY

VENDOR shall have the final and total responsibility for the design and performance of all equipment supplied under this specification. VENDOR shall warrant the equipment furnished by him and the performance of said equipment in accordance with this specification. The warranty shall cover both, the supply of material and manpower to make good any defective components or equipment offshore.

The Warranty period shall extend for a minimum of 1 year after the unit is placed into operation but not more than 30 months after delivery.

VENDOR shall warrant that the system shall remain commercially available for at least 10 years after the purchase and the availability of spares and services for all parts for a minimum of 5 years thereafter

9 DOCUMENTATION

9.1 General

As a minimum, VENDOR is responsible to provide documentation for the equipment . VENDOR is responsible for all documentation in strict accordance with the requirements of the specifications. The VENDOR shall furnish soft copies of drawings/documents that are of suitable first generation quality. Drawings that are, in PURCHASER's opinion, not of suitable quality will be returned to the VENDOR for resubmission or at PURCHASER's option may be redrafted by PURCHASER or their representatives at the VENDOR's expense.

The VENDOR shall submit all approval documents (design calculations, detailed drawings etc.) within the time frame as specified after receipt of purchase order.

Fabrication shall not commence until calculation and drawings are approved by PURCHASER. VENDOR shall obtain and provide all VENDOR data, drawings, test results as specified in codes, regulations, standards and specifications including, but not limited to:

	Toase-eh Park Sanati Gohar Ofogh Petrochemical Co. CONCEPTUAL, BASIC and DETAIL DESIGN ENGINEERING OF STYRENE PARK OFFSITE	 Bina Consulting Eng. Co.
	Document Title : Specification for Control Valve	
	Document No. : EI027-000-ED-IN-SPC-005	Rev. R2

- All material and final inspection test reports and certification certificates.
- General arrangement drawings including plans, elevations, sections, details and bills of material.
- Parts list, recommended spare parts inventory, operating and maintenance instructions.

VENDOR shall complete the equipment weight/centre of gravity datasheet as per APPENDIX 5.0 and submit along with the bid.

In addition to hard copy, the VENDOR shall provide two (2) sets of CD-ROM, which shall include operation and instruction manual, as built drawings, result of factory test and commissioning test. CD-ROM documentation shall be prepared in PDF format and indexed.

9.2 Documents Required with Bid

The following documents shall be included with the bid:

- Overall scope definition.
- Drawings detailing package envelope, including installation and maintenance requirements, and interface connections.
- List of references.

9.3 Documents for Review/Approval

Consistent with the attempt to minimize documentation only documents, which provide key information, will be required for review by the PURCHASER. In addition, in order to verify compliance with the project requirements, certain other documents will also be subject to PURCHASER's approval. The scope of documentation for review will be discussed and agreed jointly by the PURCHASER and the VENDOR during the technical discussions.

10 COMMISSIONING SPARE PARTS AND SPECIAL TOOLS

VENDOR shall provide special tools and spare parts for the installation and commissioning. Sufficient quantity of consumables e.g. sealant and lubricants shall be included in the VENDOR scope of supply for installation and commissioning.

In addition, the VENDOR shall recommend spares for Two (2) years operation. Recommended spare parts with price should take into account related factors of equipment reliability, effect of equipment downtime upon production or safety, cost of parts and availability of equipment service facility.

All special tools and commissioning spare parts shall be properly tagged, coded, wrapped and packaged so that they are preserved as new in original packaging under normal condition of storage.

VENDOR shall provide the recommended 2-year operation spare part list.

11 LOCAL INVOLVEMENT

VENDOR shall furnish the scope of supply by local company.

VENDOR shall provide evidence of adequate local support and involvement for site service and repair.

VENDOR shall also provide evidence of capability of overhauling / refurbishing the valves offered within the region.