STYRENE PARK OFFSITE

Document Title:

Specification for On/Off Valve

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REVISION RECORD SHEET

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3	X	X					
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1 INTRODUCTION

Creation and development of chain units of Styrene Monomer is the mission of GoharOfogh Industrial Park. This Company joint investment of four companies including JPC, AssaluyehSadaf Chemical, Kimia SanayeDalahoo 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 SCOPE OF WORK

This specification together with the attachments describes the minimum requirements for the engineering, design, manufacture, inspection, testing and delivery of Actuated Ball Valves (ABV), and associated actuators and accessories.

The supplied ball valves shall be as follows:

(1) Shutdown Valves (SDV)

(2) On/Off Valves (XV)

(3) Blowdown Valves (BDV)

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

i) The VENDOR shall supply the ABVs 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 COMPANY 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 ABVs, including warranty, when operated at the design conditions specified in the data sheets furnished by the COMPANY, 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 ABVs 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 ABVs, 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, operationsand maintenance.

iii) Preservation, packing and transportation of the ABVs to the designated sites.

3 APPLICABLE CODES, STANDARDS, SPECIFICATIONS AND ABBREVIATIONS

3.1 Precedence of Codes, Standards and Specifications

It is VENDOR's responsibility to inform COMPANY of any deviations from, or exceptions to, the listed codes, standards and specifications. COMPANY 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 3.2 shall be used.

3.2 International Codes and Standards

American Petroleum Institute

API 6D	Specification for Pipeline Valves
API 607	Fire Test for Soft Seated Quarter Turn Valves
API 6FA	Fire Test for Valves

British Standards

BS 6755 Part 2	Testing of Valves

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 B31.1	Power Piping
ASME B31.3	Chemical Plant and Petroleum Refinery Piping
ASME VIII	Rules for Construction of Pressure Vessels – Division 1

International Electro technical Commission

IEC 60079	Electrical Apparatus for Explosive Gas Atmosphere

IEC 60031 Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories

IEC 60331 Fire Resisting Characteristics of Electrical Cables

IEC60332 Fire Resisting Characteristics of Electrical Cables

Manufacturer's Standardization Society

MSS-SP-61 Pressure Testing of Steel Valves

Miscellaneous Standards

EEMUA 140 Noise Procedure Specifications

DIN 50049 Material Testing Certificate

ASTM 370 Standard Test Methods and Definition for Mechanical Testing of Steel Producers

NACE MR0175 Sulphide Stress Cracking Resistant Metallic Materials for Oil Field Equipment

3.3 Project Specific Document

EI027-000-ED-IN-DCR-001 Instrument & Control Design Criteria

EI027-000-ED-IN-DSH-004 Datasheet for Actuated Valves

EI027-000-EB-PI-SPC-0002 Piping Specification and Material Classes

3.4 Abbreviations Used in the Document

ABV Actuated Ball Valves (SDV/XV/BDV)

FAT Factory Acceptance Test

ICSS Integrated Control and Safety System

ITP Inspection and Testing Procedure

IP Ingress Protection

NPT National Pipe Thread

SDV Shutdown Valves

SPDT Single Pole Double Throw

SPIR Spare Parts Interchange ability Records

SS Stainless Steel

XV On/Off Valves

3.5 Site Environmental Conditions & Utilities

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 %

Indoor Conditions

Design Temperature.	45 °C
Relative Humidity	80 %

4 FUNCTIONAL DESCRIPTION

4.1 General Requirements

The VENDOR shall take prime responsibility for the supply of ABVs and accessories specified.

The actuators shall be supplied fitted to the valves, correctly adjusted and fully functiontested. The ABVs shall be designed to meet API 6D suitable for environmentalconditions specified in the Clause3.6. The ABVs shall have a minimum design life of1000 cycles. ABVs shall maintain tight shut-off (TSO) minimum class IV and capabilitythroughout the design life.

Unless otherwise specified, all electrical equipment including solenoid valves and limit switches shall have a degree of ingress protection IP65. For solenoid valves refer to section 4.2.2.4, limit switches refer to section 4.2.2.5.

All metallic and non-metallic surfaces forming the part of the Actuated shutdown (Ball) Valves shall be non-sparking and anti-static.

Cable glands and plugs shall be provided. Cable entries shall be M20 connections for signal and power supply cables. VENDOR shall provide certified adapter, if required.

4.2 Specific Requirement

4.2.1 Valves

Ball valves shall be specified to API 6D and applicable international codes and standards in addition to the relevant data sheets. It is the responsibility of the VENDOR to have the appropriate level of certification.

Valves shall be of two or three piece body construction (bolted) with raised face flangefor rating 600# and below and ring type joint shall be for rating 900# and above. Valve face to face dimension shall comply with ASME B16.10.

All valves weighing over 250 kg shall be provided with lifting lug points. Valves shall be certified fire-tested as per API 607. Copies of applicable certification shall be provided.

All actuated valves shall be supplied as a fully assembled unit including the actuator, solenoid operated valves, combined position indicator and open/close position switches, speed controllers, quick exhaust valves, reset push buttons and accessories. All shall be readily accessible from a single location. All accessories shall be of 316 stainless steel constructions.

Actuator internals shall have a special protective plating/coating to prevent corrosion.

4.2.2 Actuator Systems and Ancillaries

4.2.2.1 General

The actuator torque sizing shall be based on the specified minimum hydraulic supply pressure.

VENDOR shall specify in the bid documents, materials of construction for all key components of the actuator assembly and ancillary equipment. Aluminum components shall not be used for actuator or its ancillary equipment.

4.2.2.2 Actuator Sizing

Actuator sizing shall be based on developing torque sufficient to fully open and fully Close the valve subjected to maximum differential pressure as specified on the valves data sheet. This shall include an allowance for any increase in valve torque due to operational wear.

Actuators shall be sized to provide the torque values based on the requirements of a valve, at all points of its operating cycle, from fully open to fully close and vice-versa.

The results of the actuator sizing calculations, together with the selected actuator type / size and torque figures shall be submitted to COMPANY for approval.

The required torque shall be a minimum of 1.5 times the manufacturers maximum specified torque value at a pressure differential across the valve equal to the full ambient temperature rated pressure of the valve. The actuator torque shall be based on the specified minimum hydraulic supply pressure.

The valve torque shall be based on valve stroking of approximately three cycles every month.

The results of the actuator sizing calculations, together with the selected actuator type / size and torque figures shall be submitted to COMPANY for approval.

The VENDOR shall supply calculation sheet to show that the actuator forces against a locked valve will not exceed the maximum allowable sheer force of the stem.

4.2.2.3 Actuator

The actuator piston/rod seals shall be zero leakage. All actuators shall be equipped with a suitable filter to protect the actuator against possible contamination from the hydraulic supply.

The actuator body shall be of integral or all flanged/bolted construction.

All hydraulic tubing shall be 316L stainless steel. Tubing shall be bright annealed with minimum 2.5% molybdenum. Permissible OD/wall thickness shall be as follows:

1/2” OD x 0.065 inches wall thickness

3/8” OD x 0.065 inches wall thickness

Compression fittings shall be 316 SS, imperial size, double ferrule type. Threading shall be NPT.

Hydraulic actuators shall be configured such that they will hold open / closed against spring pressure at a minimum available pressure.

Mechanical position indicator devices shall be provided on the valve or actuator for visual local indication of valve stem travel, with Black – Yellow local position indicator.

The actuator shall be provided with two (2) nos. of 10 mm earthing studs for connection to COMPANY’s earth grid.

The actuator shall have fitted adjustable stops in the open and closed position.

The valve/actuator assemblies shall be provided with minimum accessories as per the data sheets. VENDOR shall supply all other accessories required for proper functioning of the actuator assemblies. VENDOR shall submit detailed control schematics for COMPANY’s approval.

The actuator shall be completely assembled and fitted with all required accessories. All control accessories under VENDOR’s scope shall be solidly mounted on 316 SS IP65 panel with front door closed coupled to the actuator and completely tube connected by 316L SS tubing. Easy access to instrument shall be particularly taken into account. VENDOR shall provide accessories details including make/model no. for approval from COMPANY.

Where maximum allowable working pressure (MAWP) of the actuator is below the maximum stated supply pressure, suitable protection shall be provided to limit the torque to an acceptable value.

The maximum stroking time shall not exceed the specified time on the datasheets. (Normal open/closure time for ABVs shall be 1 second per 25 mm of nominal size). Actuators shall be provided with lifting points. For hydraulic spring return actuator, the assembly shall consist of scotch yoke, spring and piston cylinder. Valve actuator and other accessories shall be supplied pre-assembled, tested and calibrated.

The sealing arrangement of the piston and piston rod shall be such that a single seal failure can be tolerated without affecting the functionality of the complete hydraulic system. The piston seal configuration shall be of a fire safe design, e.g.:

- A primary elastomeric seal
- A secondary metal seal to prevent excessive leakage across the piston in case the primary seal fails due to a fire

Actuators shall be equipped with a mechanical locking device to block valves in their safe position in case equipment maintenance, repair or testing is required. The locking arrangement shall be such that accidental actuation causing movement of a valve from its safe position is not possible. This locking device shall be clearly visible when installed. The locking device shall be designed to withstand the closing force of the actuator with the maximum specified hydraulic pressure applied.

4.2.2.4 Solenoid Valves

Unless otherwise specified, valve/actuator assemblies shall be supplied complete withexplosion proof Ex (d), solenoid valves. The solenoids shall be suitable for continuousoperation at the supply voltage specified in the data sheets. Body material shall be 316LSS and body rating shall be according to maximum hydraulic pressure. Valve

trim shallbe stainless steel with viton or similar resilient seat to provide tight shutoff. Solenoidswith flying leads shall be provided with a junction box for termination of the leads. Thejunction box shall be certified to EEx'e'.

Single solenoid valves & Double Single solenoid valves requirement for ABV shall be asper data sheets. The Solenoid valves shall be rated for 24VDC certified to Ex (d) withmaximum rating of 10W.

The requirement of manual and auto reset for valves shall be considered based on thetypical actuated valve requirement.

All keys for override facility on solenoid valves will be identical.

4.2.2.5 Limit Switches

Two independent proximity type limit switches shall be provided on the actuator/valve assembly. One to indicate the valve is in fully open position and the other in fully closed position.

The proximity switches shall be configured such that the metal is detected when the end position is reached.

The proximity switches shall be Intrinsically Safe EEx(i) type wired to a separate terminal block with the terminals clearly identified and marked accordingly.

4.2.2.6 Local Hydraulic Control Panel

All the accessories such as filter, solenoid valves, restrictors, pilot valves, 3-way valves, etc shall be installed in a stainless steel IP65 control panel, which shall be fixed to the actuator. The accessories shall be pre-tubed. All mounting brackets, bolts, nuts, etc used for instruments shall be of stainless steel material. Refer to data sheet and P&ID for detail configuration of each valve type.

5 UTILITIES INFORMATION

PURCHASER will make available 24V DC ±10% power supply to solenoid valves from the ICSS.

6 INSPECTION AND TESTING

6.1 General

The actuated ball valve assembly shall be subjected to inspection and testing in accordance to API 6D.

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 at least one month prior to the start of manufacture. The ITP shall be as a minimum to cover:

- Manufacturing sequence, including inspection
- Proposed physical inspection of equipment
- Proposed check of documentation
- Proposed functional test of ABV

All panel and its 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. All valves 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. All valves are to be hydro tested with test water of low chloride content. Valves hydrostatic test shall in accordance to ASME B16.34. The complete actuator valve assemblies shall be subjected to functional FAT at the VENDOR premises. This test shall be considered only as an acceptance that the valves are fit to be shipped and not as an unqualified acceptance of the order. VENDOR shall provide all personnel and all other services to enable the FAT to be carried out.

If the manufacturer proposes to perform the test on the valves together with the actuator in the factory prior to shipment and they can guarantee that the valves are fully functional after delivery. However, if the valve complete with actuator is to be tested outside the manufacturer's factory or premises, testing must be done locally.

6.2 Leak Test

6.2.1 General

Before assembly the leak rate test of the actuators shall be executed to prove the functionality of the back-up seal arrangements.

The COMPANY may waive these tests if compliance with the maximum leak rates is obvious from the nature of design of the back-up seals.

6.2.2 Leak rate test of actuators

For actuators with a secondary metallic seal the leak rate shall be established with the primary seal removed before assembly. For other than secondary metallic seals the Manufacturer shall propose a test arrangement to simulate a

primary seal failure. The leakage rate of the metallic seals during closing shall be less than 500 cm3 pneumatic per minute at the maximum allowable differential pressure across the piston.

6.3 Assembly Tests

The actuators shall be tested with the ABV as one unit, complete with operating controls.

Proper adjustments and settings of the shut-off valve and actuator assembly shall be the responsibility of the VENDOR.

Each combination of shut-off valve, actuator and control unit shall be tested. The VENDOR shall submit to the Principal a functional testing procedure which shall in addition to the VENDOR'S requirements, also include the requirements mentioned below.

6.3.1 Functional system test

The functional test shall include the following:

- Shut-off valve opening and actuator size test:

At maximum differential pressure, the shut-off valve shall be slowly opened with mobile (handpump) unit and the hydraulic pressure needed to open the shut-off valve shall be noted. This pressure shall be less than the pressure calculated for the actuator size and the required torque according to the valve VENDOR. After this test the shut-off valve shall be thoroughly dried.

6.3.2 Test 1

From the local operating panel, the shut-off valve shall be put in the following positions:

- fully open;
- 80% open;
- Fully closed.

Each position shall be maintained for at least 15 minutes with fully charged, without any additional control being required. There shall be no system pressure drop and/or movement of the valve, which could result in leakage.

The shut-off valve shall be opened from the local operating panel, and closed from the emergency shut-off panel and the operating time shall be registered. The above test shall be done at the maximum and minimum system pressure.

6.3.3 Test 2

Via remote actuation from ICSS, the shut-off valve shall be closed. This position shall be under pressure. There shall be no system pressure drop and/or movement of the shut-off valve, which could result in leakage.

6.4 Factory Acceptance Test (FAT)

The ABVs 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.

6.5 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

7 PRESERVATION, PACKING AND SHIPPING

VENDOR shall be responsible for preservation, packing and protection (in accordance with API 6D section 8) of the ABVs adequately for shipment to the job site in accordance with the Purchase Order.

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".

Weights (in kg) and centre of gravity diagrams should be marked on package as per Appendix 5.0.

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 .

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 Number of on/off Valves

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.

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.

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 items. 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:

- 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

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-DOM documentation shall be prepared in PDF format and indexed.

9.2 Documents Required with Bid

The following documents shall be included:

- 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 (following the Technical Bid submission).

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 VENDOR ASSISTANCE

VENDOR is required to provide as option a service engineer to assist during start up and commissioning.

12 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.