



پتروشیمی توسعه پارک  
صنعتی گوهر افق

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



BINA Consulting Eng. Co.

Document Title :Instrument & Control Design Criteria

Document No. :EI027-000-ED-IN-DCR-001

Rev. R2

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## STYRENE PARK OFFSITE

**Document Title:**

**Instrument & Control Design Criteria**

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## 1. INTRODUCTION

### 1.1 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, Assaluyeh 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

### 1.2 Extent of Supply

VENDOR shall, as a minimum, supply the instruments, materials, accessories and full documentation with the features, performances and safety requirements as listed in this specification and accompanying drawings and reference standards.

Deviation from the requirements of these specifications shall not be permitted unless clearly identified in the Table of Compliance attached to the relevant Technical Specification and subsequently approved by CLIENT / CONSULTANT prior to the purchase order being issued.

Failure to clearly identify any specific deviation will be assumed by CLIENT / CONSULTANT as total compliance with all job specifications.



Omission from this specification of any item essential for the correct operation of any part of the specified instrument shall be brought to the attention of the CLIENT/CONSULTANT.

It is responsibility of VENDOR to inform CLIENT/CONSULTANT about errors, ambiguities, inconsistencies or discrepancies found in job documents, specifications or drawings. Failure to do this shall not relieve the VENDOR from supplying the appropriate instrument, complete in every respect.

Where alternatives are proposed, they shall be fully described and accompanied by all pertinent engineering information, to facilitate their evaluation.

The supply shall consist of, but not limited to, fully assembled, tested and documented instruments as follows:

- Instruments as described in the relevant Technical Specification and Data Sheets
- Inspection and Testing, as per point 21
- Packing and Shipment, as per point 22
- Documentation, as per point 24.1
- Spare parts, as per point 25

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### 1.3 Priority, Deviation and Responsibility

Applicable reference standards and specifications for the design of the instrumentation will be listed on the relevant job and detailed specifications. **VENDOR** shall ensure that the instrumentation complies with the requirements of this specification and the purchase order.

In the event of conflict between the provision of the above referenced documents, the requirements of this specification and the purchase order, the following priority of document shall be given:

- First priority: Purchase Order and variation
- Second priority: Material Requisition
- Third priority: Engineering Drawing, Data Sheets, CONSULTANT Specifications
- Fourth priority: This Specification
- Fifth priority: NIOEC Project Specifications and Standard Drawings
- Sixth priority: IPS Project Specifications and Standard Drawings
- Seventh priority: International Codes and Standards

Deviation (if any) from these standards, specifications and drawings, for example, to comply with local Laws and Rules, Government regulations and Codes, shall be agreed with **CLIENT/CONSULTANT**.

Compliance with this specification shall not relieve the **VENDOR** of the responsibility to supply Systems and Equipment of correct design, materials, workmanship and performance suited to meet the specified service conditions and regulations.

## 2. DEFINITIONS AND ABBREVIATIONS

For the purposes of this document, the following definitions and abbreviations shall apply.

### 2.1. Definitions

In the context of this specification the following definitions apply:

- |            |  |
|------------|--|
| PROJECT    | - STYRENE PARK OFFSITE   |
| CONSULTANT | - BINA Consulting Engineers  |
| VENDOR     | - Company that furnishes the materials, equipment and other performances                 |
| SUB-VENDOR | - The party that supplies equipment, technical documents/drawings and services to VENDOR |

In Addition, the words "will", "may", "should", "shall" when used have meaning as follows:

- "Will" is used normally in conjunction with an action by **CLIENT**.
- "May" indicates an acceptable course of action.
- "Should" indicates a preferred course of action.
- "Shall" indicates a mandatory requirement.



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## 2.2. Abbreviations

ACR	- Auxiliary Control Room
AFD	- Approved For Design
AMS	- Alarm Management System
AS BUILT	-As Built
ASCS	- Anti Surge Control System
BMS	- Burner Managing System
C&E	- Cause & Effect Diagram
CPU	- Central Processing Unit
CR	-Control Room
DCS	- Distributed Control System
DMR	- Dual Modular redundant
EMC	- Electromagnetic Compatibility
ESD	- Emergency Shut Down System
FAT	-Factory Acceptance Test
FI	-Final Issue
FGS	- Fire & Gas System
FO	-First Out Alarm Sequence
HART	- Digital Transmission Protocol
HAZOP	-Hazards and Operability
HMI	-Human Machine Interface
HVAC	- Heating, Ventilation and Air Conditioning
I/O	-Inputs/Outputs
I/P	-Current to Pneumatic Converter
IE	-Instrument Earth System
IFA	-Issue for Approval
IFAT	-Integrated Factory Acceptance Test
IFC	-Issue for Construction
IFI	-Issue for Information
IFO	-Issue for Order
IFR	-Issue for Review
Intools	-Instrumentation Engineering and Design Database
IRP	-Interposing Relay Panel
ITB	-Instruction to Bidders
LAS	-Link Active Scheduler for FF Instruments
LCD	-Liquid Cristal Display
MCC	-Motor Control Centre
MCR	-Main Control Room
MOM	- Minute Of Meeting
MOS	- Maintenance Override Switch
MOV	- Motor Operated Valve
MTBF	- Mean Time Between Failure
MTO	- Material Take Off
MTTR	- Mean Time To Repair
OPC	-Object Linking and Embedding for Process Control
P&ID	-Piping & Instrumentation Diagram
P/I	-Pneumatic to Current Converter
PCS	-Process Control System
PE	-Protective Earth System
PID	-Proportional, Integrative & Derivative Controller



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- PLC - Programmable Logic Controller
- PMS - Power Management System
- POS - Process Override Switch
- PPU - Process Plant Units
- RFA - Requisition for Approval
- RR -Rack Room
- RTU - Remote Terminal Unit
- SAT - Site Acceptance Test
- SIL -Safety Integrity Level
- SOE - Sequence of Events Recorder
- SPI -Smart Plant Instrumentation
- SPIR - Spare Parts Interchange ability Record
- SRR - Satellite Rack Room
- SRU - Sulphur Recovery Unit
- SS -Electrical Substation
- STC - Steam Turbine Control System
- TB -Tender Bulletin
- TEFA - Technical Evaluation for Approval
- TGS - Tank Gauging System
- TMR - Triple Modular redundant
- UCP - Unit Control Panel
- UPS -Uninterruptible Power System
- VDU - Visual Display Unit

### 2.3. Codes, Standards and Reference Documents

The following documents, codes and standards are applicable to the present PROJECT.

Doc. NO	Description
IPS-C-IN-100	Construction and inspection standard for General Instrument field Inspection,Calibration and Testing of Instrument and Instrument System
IPS-C-IN-110	Construction standard for pressure Instrument
IPS-C-IN-120	Construction (Installation) standard for Temperature Instrument
IPS-C-IN-130	Construction and Installation standard for flow Instrument

### 2.4. International Codes and Standards

Applicable International Codes and Standards to be considered are those mentioned in the relevant Specifications.



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### 3. LOCATION AND ENVIRONMENTAL CONDITIONS

For more information, please refer to “Site Environmental Condition”.

### 4. LANGUAGE AND UNITS OF MEASUREMENT

#### 4.1. Language

All documents, drawings, catalogues, bulletins and correspondence shall be in English language.

#### 4.2. Units of Measurement

Instruments read out shall be as follows:

Flow rate liquid	m <sup>3</sup> /h	cubic meter per hour
Flow rate steam	kg/h	kilograms per hour
Flow rate gas/vapours	Nm <sup>3</sup> /h	Normal cubic meters per hour @ NORMAL conditions (0°C, 760 mmHg, dry)
Pressure above ATM	bar g	bar gauge
Pressure below ATM	bar a	bar absolute
	mbar a	millibar absolute
	mmWC	millimetre water column
Density @ operating TP	kg/m <sup>3</sup>	kilograms per cubic meter
Temperature	°C	degree Celsius
Level	%	percent of range
Length	mm	millimetre
	m	metre
Velocity	m/s	metres per second
Area	m <sup>2</sup>	square metre
	cm <sup>2</sup>	square centimetre

Differential pressure transmitters used for flow measurement shall be calibrated in:  
mbar ,millibar

Other read out units shall be agreed with CLIENT/CONSULTANT.

### 5. GENERAL DESIGN REQUIREMENTS

#### 5.1. Instrument Power and Air Supplies

Dual redundant feeding lines powered at 110 VAC  $\pm 10\%$  , 50 Hz  $\pm 2\%$ , Uninterruptible Power Supplies (UPS) will be available to power the DCS and other control, monitoring, safety systems and field instruments (e.g.; analyzer). Anyway these systems shall be capable to operate at the following dual redundant feeding lines conditions: voltage level 230 VAC  $\pm 10\%$ , frequency 50 Hz  $\pm 5\%$  and T.H.D.  $\leq 5\%$ .

On loss of both main and emergency power, the emergency battery power supply systems will be sized adequately to provide continuous power to the following systems during the specified time considering maximum load and steady state:



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System	Duration
Fire and Gas Detection System	30 min
Emergency Shutdown System	30 min
Distributed Control System	30 min

Field instruments will be fed at 24 V DC from Systems (where applicable).

230 V  $\pm$  10% , 50 Hz  $\pm$  5% 1 phase non UPS will be available for illuminators on level gauges, lighting cabinets and power sockets.

Instrument air is available at the following conditions:

- Minimum pressure : 4.5 bar g
- Normal pressure : 7 bar g
- Maximum pressure : 8 bar g
- Design pressure : 10.25 bar g
- Dew Point : -20°Cat 8 bar g

## 5.2.Selection of Materials

The selection of materials for in-line instrument such as control valves shall follow the associated piping material specification as a minimum. The selection of materials for on-line instruments such as level displacers shall follow the associated vessel material specification as a minimum.

However, it shall be noted that the wetted parts materials for in-line instruments shall be 316 stainless steel as minimum. e.g. Trim materials of control valves, internal of flow meters, internals of level displacers etc.

Thermo wells and orifice plates shall be 316 stainless steel as a minimum.

Off-line instruments such as transmitters shall be 316 stainless steel unless process conditions require a more suitable material.

Positive Material Identification (PMI) shall be carried out on all instrumentation including valves.

## 5.3.Diaphragm Seal



Diaphragm seals shall be ordered as an integral part of the transmitter or pressure gauge.

The diaphragm seal assembly shall be welded at diaphragm end and screwed at transmitter end.

The capillary material shall be stainless steel AISI 316(L) and shall be shielded by flexible stainless steel tubing and properly mechanically protected during installation.

Diaphragm seal shall be used in viscous services (BTN, VB, and SLP).

## 5.4. Electrical execution

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Instrumentation shall be selected in accordance with IEC 60079 and CENELECrules. All electronic field instruments shall be intrinsically safe with exception of solenoid valves and hand switches, which shall be EExd.

EEx-i IIB T3 classification shall normally be specified, unless for cases where hydrogen is present which shall conform to EEx-d IIC T3.

Instruments shall be I.S. certified for zone 2 gas group IIB, temperature class T3.For Ex(i) instruments only galvanic isolators shall be used.

### 5.5. Instrument Tagging/Nameplates

Instrument nameplates shall be embossed stainless steel labels, permanently attached to the instrument using stainless steel screws or stainless steel bolts or welded. Stainless steel wires may be used under exceptional circumstances only, subject to CLIENT/CONSULTANT written approval.

Instrument nameplates shall include, as a minimum, the following information:

#### Field Instruments

- Instrument tag number
- Manufacturer and date of production
- Purchase Order number
- Serial and Model numbers
- Adjustable measuring range
- Calibrated range
- Span limit
- Type of signal
- Protection class and classification
- Body material
- Design Pressure and Temperature
- Instrument connections and Rating
- Float size, Range, and curve of specific gravity versus proportional band for level instruments

#### Control and on-off valves (Body)

- Valve tag number
- Manufacturer and date of production
- Purchase Order number
- Serial and Model numbers
- Connections size, rating and facing
- Body and trim materials



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- Port size and characteristic
- Cv coefficient
- Max operating pressure/temperature, if more restrictive than body rating

Control and on-off valves (Actuator and accessories)



- Manufacturer and date of production
- Purchase Order number
- Serial and Model numbers
- Actuator spring bench setting
- Actuator material
- Electrical certification and reference
- Certificate (electrical accessories)
- Mechanical degree of protection (IP)
- Electrical supply (solenoid)

Safety Relief valves

- Valve tag number
- Manufacturer and date of production
- Purchase Order number
- Serial and Model numbers
- Connections size, rating and facing
- Orifice designation and area
- Body and trim material
- Set pressure

Rupture Disks

- Disk tag number
- Manufacturer and date of production
- Purchase Order number
- Serial and Model numbers
- Connections size
- Relief Capacity
- Rupture pressure
- Test pressure

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## 5.6. Painting

All surfaces shall receive an appropriate paint system as specified relevant Specification with the following exceptions:

- any equipment furnished completely painted by the manufacturer unless it is specially required to match a color scheme or to repair damage to the paint film;
- hot-dip galvanized steel, weathering steel, stainless steel and non-ferrous metals, monel, brass, copper, aluminium jacketing, unless it is specially required;
- non metallic surface;
- nameplates, code stampings and push-buttons;
- surfaces to be fireproof;
- concrete, brickwork, tile, glass and plastics, unless specially required;
- machined surfaces;
- insulation weatherproofing material or sheeting;
- rubber, hoses, belts, flexible braided connectors, stainless steel tubing and fittings, gages, valves, and motor shafts;
- and any surface particularly indicated as not to be painted.

## 5.7. Instrument Protection

All control, monitoring, safety, auxiliary, marshalling cabinets and workstations shall be located in a temperature and humidity controlled buildings as Main Control Room (MCR) and Electrical Sub-Stations (SS).

Electronic Cabinets or Systems, whenever possible, shall not be installed in the field.

All field instruments shall be protected to IP65 as a minimum and finished to manufacturers standard suitable for the environmental conditions. Particular attention shall be paid to possible effects of corrosion, vibration, humidity, and extremes of temperatures.



The term 'Instruments' shall mean all instrument items, including associated instrument tubing and piping (i.e. impulse lines), which are mounted external to the process line or equipment. In-line items such as control valves, variable area meters, etc. Level devices such as level gauges, displacers shall be reviewed for protection as part of the process piping, rather than as instruments, and are not covered by this standard. This also applies to line mounted pressure gauges.

## 5.8. Accuracy

Unless otherwise stated, the minimum accuracy of instruments shall be:

- Electronic transmitters:  $\pm 0.15\%$  of calibrated span
- Displacement type electronic Level transmitters:  $\pm 0.5\%$  of calibrated span
- PT-100 elements: IEC 751 class "A" up to 450 °C
- Thermocouples: IEC 584-2 class 1
- Pressure gauges:  $\pm 1\%$  of span
- Thermometers:  $\pm 1\%$  of span

Instruments for Custody Transfer, Fiscal metering and Stock/Product Inventory shall meet therequirements of accuracy as defined in the best practice of recognised International Authority.

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## 6. INSTRUMENT BULK MATERIAL

### 6.1. Instrument cables and wiring

Instrument cables and wiring shall be in accordance with the following specifications:

- Doc. No. EI027-000-ED-IN-SPC-012, "Instrumentation Cables Specification".
- Doc. No. EI027-000-ED-IN-DIG-007 "Instrument Installation & Hook-up Diagram".

### 6.2. Manifold and Valves

Manifold and valves shall be in accordance with the relevant specifications.

### 6.3. Instrument Installation

Instrument Installation shall be in accordance with the following specifications:

- Doc. No. EI027-000-ED-IN-DIG-007 "Specification for Instrument Installation".

### 6.4. Junction Box

Junction boxes shall be in accordance with the following specification:

- Doc. No. EI027-000-ED-IN-SPC-007 "Specification for Junction Box, Gland, Tube, Fitting & Piping".

## 7. DESIGN REQUIREMENTS FOR TEMPERATURE INSTRUMENTS

### 7.1. General

Field mounted temperature transmitters shall be used on all temperature control loops, monitoring, ESD and interlocks.



Temperature transmitters shall be head mounting type (i.e.; built in T/C or RTD head) except those for skin thermocouples and reactor multi-thermocouples.

Rack mounting type transmitters are preferred for grouping rather than individual 2" pipe stanchion mounted transmitters.

Temperature instruments, except those used for surface or ambient measurements, shall be provided with a flanged thermowell of adequate immersion depth into the line or vessel. Non-intrusive surface measurement may be utilised where fitting of a thermowell is impractical, if adequate response and accuracy can be obtained.

Field mounted temperature transmitters shall be used for all kinds of temperature measurements; digital type sensors (i.e. temperature switches) shall be avoided as far as possible.

Generally, thermometers selected shall be bimetallic type and shall have 150 mm dial with every angle adjustable device.

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## 7.2. RTD's and Thermocouples

RTD's and thermocouples shall be in accordance with Specification for temperature Elements.

## 7.3. Thermowells

Thermowells shall be in accordance with relevant specification.

## 8. DESIGN REQUIREMENTS FOR FLOW INSTRUMENTS

### 8.1. General

Field mounted flow transmitters shall be used on all flow control loops, monitoring, ESD and interlock services.

Instruments for mass balance calculations (when identified as such on the P&IDs and individual Data Sheets) shall be specified with no relaxation on any of the design factors affecting accuracy. These include the physical restraints such as straight lengths, etc., but may also cover requirements for density and temperature corrections and other physical variables, when indicated on the P&ID.

Instruments used for fiscal metering (when identified as such on the P&ID and individual Data Sheets) shall be approved by the local Authorities. This will include the primary element, transmission system and instruments required for density corrections (e.g. temperature).

## 9. DESIGN REQUIREMENTS FOR LIQUID LEVEL INSTRUMENTS

### 9.1. General

Every kind of level instrument provided shall have a level gauge mounted adjacent to it for cross reference, except if prohibited by vessel code.

Level gauges shall cover the complete operating range of any other level instrument installed on the same level section.

The water column and attachments shall meet the requirements of latest applicable edition of ASME code for boilers.

Each individual instrument shall be provided with a dedicated process isolation, drain and vent valves. All continuous level measurement instruments shall be provided with a means of in-situ calibration and testing. Particular attention should be given to the problems associated with the calibration of direct mounted level instruments.



### 9.2. Local Indication

Local level instruments shall be in accordance with the relevant specification:

### 9.3. Level Instruments and Transmitters

Displacer and float type level transmitters shall be used in accordance with the following specification:

However displacer type level transmitter shall generally be used for maximum length 1200mm;

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differential pressure level transmitters shall be used for length over 1200mm .  
Ultrasonic and radar type level transmitter shall be used only upon CLIENT/CONSULTANT's written approval and in accordance with the following specification:

## 10. DESIGN REQUIREMENTS FOR PRESSURE INSTRUMENTS

### 10.1. General

Field mounted pressure transmitters shall be used on all pressure control loops, monitoring, ESD and interlocks.

Pressure and differential pressure transmitters shall be diaphragm type.

Pressure Instruments shall be located so that the head of the liquid between the instrument and the points of measurement does not alter the process measurement value. For this reason, the Pressure Transmitters may be supplied complete of Zero Elevation Feature.

Diaphragm seal shall be used for pressure and differential pressure instruments in viscous services (Bitumen, Vacuum Bottom and Vacuum Slops).

Suppressed range instruments may be furnished with CLIENT/CONSULTANT approval where necessary to provide additional measurement sensitivity for control purposes.

Adjustable pulsation dampeners shall be furnished for all pressure instruments and gauges on the discharge of reciprocating pumps and the suction and discharge of reciprocating compressors, and pulsating services. Pulsating dampeners shall be externally adjustable type.

Instruments shall be designed and installed for absolute protection of viewer in the event of element rupture.

### 10.2. Local Indication

Pressure gauges for local indication shall be used in accordance with relevant specification.

### 10.3. Pressure and Differential Pressure Transmitters

Pressure and Differential Pressure transmitters shall be used in accordance with relevant specification.

## 11. EARTHING SYSTEMS



The earthing of measurement, control and computer systems shall be arranged to prevent electrical interference.

Particular attention shall be given to the arrangement of earthing circuits to prevent unwanted circulating currents in earthing, signal and measurement conductors and screens.

Three separate and independent earthing systems shall be provided as required.

- **Chassis (electrical) earth**

Bonded to the structure and utilized for electrical safety of metal enclosures and chassis on all instrument and electrical components.

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- **Instrument (I.S.) earth**

Insulated from the structure and other metal work and utilized for I.S. instrument signal screens.

- **Instrument (N.I.S.) earth**

Insulated from the structure and other metal work and utilized for Non I.S. instrument signal screens. Screening shall be grounded at the control panel and insulated in the field. Refer to Doc. NoEI027-000-ED-IN-DIG-007"Instrument & Hook up Diagram ".

## 12. DESIGN REQUIRMENTS FOR CONTROL VALVES

### 12.1. General

Globe type control valves with spring-return pneumatic diaphragm actuator and electro-pneumatic positioner generally be used for all process and utilities controls.

Other valve styles or actuator type may be used where process conditions are such that above configuration is not suitable or not recommended.

Cavitation shall be avoided by selection of suitable pressure recovery factors, and choice of valve type. Where cavitation are expected the valve selection is to be approved by CONSULTANT.

Control valve body size shall not be smaller than 1". 1" body with reduced trim shall be used for very low flow application. Body size smaller than 1" may be applied for pressure regulator.

Body sizes 1¼", 2½", 3½", 5", 7" and 9" shall not be used.

Materials for sour service shall conform to the requirements of NACE Standard.

### 12.2. References

For process control valves refer to Doc. No. EI027-000-ED-IN-SPC-005 "Specification for Control Valves".

## 13. DESIGN REQUIREMENTS FOR PNEUMATIC OPERATED ON-OFF VALVES



### 13.1. General

Pneumatic operated On-Off valves shall be supplied as one assembly valve body and actuator; accessories, as indicated in the individual Specification, shall be fully piped/wired as part of the valve assembly and shall be suitably terminated.

The assembly shall include: Solenoid Valves, Limit Switches, Volume Boosters, Air sets, Tubing, etc.

## 14. EMERGENCY SHUTDOWN SYSTEM

The Emergency Shutdown System shall be designed in accordance with the following specification:

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- Doc. No. EI027-000-ED-IN-SPC-003, "Specification for Emergency Shut-Down System".

## 15. DESIGN REQUIREMENT FOR ANALYSERS AND SAMPLING SYSTEMS

Analyser installations shall generally be in accordance with API RP 555 "Process Analyzers".  
Analyser houses shall be designed in accordance with relevant specification:  
Analyser sample systems shall be designed in accordance with the following engineering specification:

## 16. DESIGN REQUIREMENTS FOR PRESSURE/VACUUM RELIEF DEVICES

### 16.1. General

Pressure and vacuum safety relief devices are normally used to terminate an abnormal internal or external rise in pressure above a predetermined design value in boilers, pressure vessels and related piping and process equipment.

Pressure and vacuum relieving devices include safety valves, relief valves, rupture disks, vacuum relief valves and single units composed of both pressure and vacuum relief sides. Other types of relief devices are not within the scope of this Specification.

Generally all safety relief valves (except thermal relief valves) with the inlet nozzle size 1" and larger shall be flanged, spring loaded, total lift, high capacity type with a top guided disk and full nozzle adjustable blow down type, designed in accordance with API Std 526. 3/8", 1/4", 2/2", 3/2", 5", 7" and 9" inlet/outlet connections shall not be used.

### 16.2. References

Pressure and vacuum relief devices shall be in accordance with the following specification:



- Doc. No. EI027-000-ED-IN-SPC-006: "Specification for safety/ReliefValves"

## 17. INSTRUMENT / ELECTRICAL INTERFACE

The interface between instrument and electrical systems shall be achieved by use of interposing relays located in the switch rooms in accordance with relevant specification.

## 18. INSTRUMENT PANELS

All control, monitoring and safety functions of the process units, utilities and mechanical packages shall be carried out by the main plant control, monitoring and safety systems, e.g. DCS, ESD, FGS, etc. Where local panels may be required for commissioning/start-up of equipment then these panels shall contain simple repeat instruments such as pushbuttons, switches, lamps, and indicators only. Generally Electronic receiver instruments or microprocessor systems are not permitted to be located in a local panel for the project. Different solutions will be accepted after agreement with CLIENT / CONSULTANT.

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## 19. FIRE AND GAS SYSTEMS

Fire and Gas Detection System shall be designed in accordance with the following specification:  
-Doc. No. EI027-000-ED-IN-SPC “Specification for Fire & Gas Detection Equipment”.

## 20. INSPECTION AND TESTING

### 20.1. General

All instrumentation shall be subject to the tests and check, before packing and shipment, according to the documents listed in the job and detailed specifications.

VENDOR shall be primarily responsible for ensuring conformance of the materials to the relevant specifications. CONSULTANT/CLIENT inspection shall not relieve VENDOR of ultimate responsibility of the material conformance.

Positive Material Identification (PMI) shall be carried out on all instrumentation including valves.

The shop inspection and tests shall be in accordance to:

- The requirements indicated in the relevant Instrument Technical Specification.
- The Inspection Data Sheets (IDS) attached to the relevant Instrument Technical Specification.

VENDOR shall provide all testing facilities and equipments to allow testing of each part of the supply.

VENDOR shall guarantee that his supply complies with the project technical specifications and is suitable for the specified use.

VENDOR, who is fully responsible of the supply, may perform additional test in accordance with his quality control plan.

VENDOR shall be fully responsible for inspections and tests on SUBVENDOR materials.

The factory tests shall be carried by the VENDOR. CONSULTANT and CLIENT reserve the right to send their own inspectors to witness tests to ensure that equipments are in accordance with the project specification, codes, drawings and any other document referred to in the purchase order.

The presence of CONSULTANT and/or CLIENT inspectors shall not relieve the manufacturer of his responsibilities.

### 20.2. Description of tests

As minimum VENDOR shall carry out the following tests, additional test are detailed in Instrument Technical Specification and listed in the relevant IDS.

Visual and dimensional test:



To be carried out for all instruments and materials.

Performance test:

To be carried out for all instruments.

Hydrostatic test:

The instrument internal parts that will not withstand the full hydrostatic test pressure, will be omitted from the body hydraulic test. These internal parts will be tested at full instrument design pressure, according to what indicated on technical specifications and VENDOR documentation.

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Non-destructive tests:

In case of welding, VENDOR shall produce a welding procedure qualified in accordance with ASME Section IX and provide for the non-destructive tests required in, "Additional Requirements to Specification NIOEC-SP-90-02 Rev.A0 for Welding of Plant Piping Systems". This kind of test is the technical instrument test to improve performance.

### 20.3. Required test certificates

VENDOR shall provide the certificates according to:

The requirements indicated in the relevant job and detailed specification.

The Inspection Data Sheets (IDS) attached to the relevant job and detailed specification.

As a minimum VENDOR shall provide the following certificates:

Test certificates for the Positive Material Identification (PMI).

Test certificates for the tests listed at the previous section.

Routine tests performed by VENDOR.

Instrument calibration forms.

## 21. PACKING AND SHIPMENT

The packing for shipment shall meet the provisions contained in the purchase order instructions and to be in compliance to the Packing and marking specification.

All equipment shall be adequately protected to withstand several months' outdoor storage at the job site prior to installation.

Packaging of spare parts shall be for long term storage, and shall be separate from the packing of main supply.

All the connections (pneumatic, process, electrical, etc.) and instrument/equipment holes and threads shall be protected with suitable solid plugs in order to avoid dirty inlet during transportation and erection.

VENDOR shall advise of any special transportation and storage precautions to be undertaken by CONSULTANT in order that the equipment guarantee remains valid.

An additional copy of the technical documentation instructions, including manuals for installation, operation and maintenance, shall be included in the equipment packing.



## 22. METHOD OF TENDERING

For the proposed materials the Vendor shall present a list of previous applications.

### 22.1. Technical information

The tender shall be submitted complete with the following information and/or documents, failure to fulfill the following requirements will cause the rejection of the tender:

- Vendor's product obsolescence policy.
- Location of Vendor's manufacturing facilities.
- Description of Vendor's maintenance support capabilities.
- Instrument and/or equipment specification including:
- Dimension, weight, position requirements for all equipments.

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- Equipment layout drawings.
- Equipment environmental limits for operation and storage (temperature, humidity, vibration/shock, RFI, etc.).
- Spare parts lists to be issued on the Spare Parts Interchangeability Record form.
- A copy of the Vendor's Quality Assurance Plan.
- Conditions of guarantee.
- A production schedule showing, as a minimum and where applicable, the manufacture and assembly periods, order and delivery dates for bought-out items, drawing issue and approval dates, inspection and test dates, packing and shipment dates. The schedule shall commence with receipt of a purchase order and end with the material delivery.
- Certificate of conformity for the electrical apparatus.
- Electrical power and/or instrument air consumption.

### 22.2. Economical information

Even if not explicitly required, the tender shall include the quotation of assistance service at the final destination site in accordance with the Purchase Order conditions. Itemised pricing shall remain firm for the duration of the project.

The followings itemised prices lists are requested:

A unit price list of the supply. The price list shall have splitted prices for each itemised instrument and/or equipment.

A price list for consumable for the operating conditions.

A price list for any special tools and test equipment and accessories for use during instrument and/or equipment maintenance.

Spare parts price lists for spare parts listed.

### 22.3. Deviations

The Vendor intent shall be to supply standard equipment. The deviations noted in the Table of Compliance shall clearly indicate where the Vendor is being requested by the Specification to deviate from his standard equipment. Any recommended alternatives shall be listed and priced separately with full supporting documentation to allow evaluation.

The tender shall be in strict accordance with Purchaser documentation.



No deviations from the Specification shall be allowed, except those in the Table of Compliance and subsequently approved by CONSULTANT and incorporated within the purchase order or order supplement documents. Failure to clearly identify specific deviations shall be assumed by CONSULTANT, imply total compliance with the Specification.

Any deviation from the requirements listed on the requisition forms shall be clearly highlighted.

If no exceptions are listed, the tender, and the possible supply, shall be regarded as being in full conformity with the Purchaser's requirements, and will be accepted, after that tests and checks have confirmed that, the performances complies with the requisition forms.

## 23. METHOD OF SUPPLY

The supply shall be in strict accordance with the Purchase Order conditions and the specifications issued for Order and shall be constructed in accordance with the requirements of good engineering

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practice.

### 23.1. Documentation

VENDOR shall forward the documentation required in the technical specifications and in the "General conditions" attached to the purchase order, in the number of copies and within the time period indicated in said documents.

VENDOR documentation shall be in accordance with the following specifications:

Vendor's documentation requirement and procedure

Instructions for Vendor QA/QC Manufacturer Record Book

An additional copy of the technical documentation shall be forwarded with the equipment packing.

Each document will carry the order number, item number and relevant description.

Each document originated by VENDOR shall be numbered according to Specification No., "Document Numbering Procedure".

All drawings will be delivered in proper number of copies plus electronic format using the software tools specified at the following points.

Only in exceptional case, requiring prior CLIENT/CONSULTANT approval, scanned documents in raster format as specified in the following will be accepted.

Standard documentation, such as Manual, Catalogues, etc. shall be supplied on paper.

Specifications, Data Sheets and other documents shall be produced with Microsoft Office 2007 products as Word, Excel, PowerPoint and Access.

The files shall be delivered in a "workable stand-alone" format, without any special features (links to other files, special fonts, macros, etc.), which may affect the possibility of viewing and editing.

All drawings will be prepared using AutoCAD 2014.

Drawings files shall be delivered as "single complete file", without any referenced file attached.

The format of scanned documents will be ADOBE ACROBAT (PDF).

### 23.2. Responsibility

VENDORS have the full responsibility for the project, construction, assembly and tests of the supply, CONSULTANT approval of VENDOR documentation shall not relieve VENDOR of ultimate responsibility of the material conformance.

### 23.3. Guarantees



The guarantee shall cover the quality of materials, manufacture and assembly and shall be as indicated in the Purchase order general conditions.

### 23.4. Make good

Vendor, for the duration of the Guarantee Period, shall be responsible for:

- The repair or correction, or at the option of Purchaser, the replacement of any defectiveservices, materials, equipments or workmanship.
- The carrying out of all work including uncovering, removal, procurement, reinstallation and construction as may be necessary.

The liability of Vendor to provide corrective services or carry out work as set forth in this paragraph shall be without financial limitation.

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#### 24. SPARE PARTS, CONSUMABLE, SPECIAL TOOLS

VENDOR shall provide a recommended spare parts list (filling in the SPIR form) with itemised prices as follow:

- Fully detailed and priced spare parts on SPIR format for equipments within the scope of supply for commissioning and start-up;
- Fully detailed and priced spare parts on SPIR format for equipments within the scope of supply for two (2) years operation.

Spare parts list shall detail:

- Identifying model and/or figure number of the piece of equipment for which the spare part is being supplied;
- Spare part number and identifying name;
- Drawing of sketch number which references the spare part;
- Source of the part when the part is not manufactured by the VENDOR, the original MANUFACTURED identification must be given.

The spare parts recommendation shall include all tools, auto test facilities or equipment necessary for preventive maintenance and/or trouble shooting.

VENDOR shall guarantee the availability of all spare parts and replacement parts required by any equipment item supplied for a minimum of twenty (20) years operational period. VENDOR shall state the location of the nearest spare parts depot.

#### 25. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The Vendor shall prepare, detail, revise and further develop an Implementation Plan within 4 weeks after award. The Implementation Plan shall be revised by the Vendor in accordance with CONSULTANT comments and submitted to CONSULTANT for approval.

The Implementation Plan shall include:

- Schedule for the work in design, manufacturer, testing, and hand-over, including data required from CONSULTANT.

Schedule for submission, review by CONSULTANT, revision and approval of CONSULTANT of all documentation and drawings.

In addition the Vendor and any Sub-vendor shall comply with the requirements of "QA/QC Requirements for Suppliers of Materials and Equipment".

If the Vendor elects to sub-contract part of the work, he shall ensure that the above requirements are transferred to all such Sub CONSULTANTs and Sub vendors.



The vendor shall give his Sub CONSULTANTs or Sub vendors assistance in attaining the required standard if necessary. This shall not relieve the vendor of his responsibility for the quality of the final product.

CONSULTANT reserves the right to audit the Vendors Quality System and this can be carried out by CONSULTANT or its nominee (3rd party Inspection Authority).

The Vendor shall assign sufficient full time personnel to the project to ensure the Quality Assurance / Quality Control System is maintained throughout the duration of this purchase order.

The Vendor will have an implemented quality management system which meets the intent of ISO 9001 (2008).

The minimum quality assurance and quality control requirements to be implemented for the project and the SUPPLIER quality documentation to be supplied with the bid and after award of the purchase order are defined in the document.

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## 26. DOCUMENTS TO BE SUBMITTED WITH THE OFFER

The following Quality Assurance documents shall be submitted with vendor's offer:

Evidence that a Quality System is in use by means of:

- Copy of vendor's Quality Assurance System independent 3rd party registration certificate or,
- A recent audit reports of vendor's Quality Assurance system by an independent 3rd party or,
- A recent audit report of vendors Quality Assurance system by other clients which fully demonstrates that a system audit has been carried out.

Vendors Quality Manual including:

- Quality policy statement
- Quality objectives and Scope of Quality Assurance system.
- Index of procedures with brief description how the procedure aims to comply with ISO 9000 series.
- Vendors Specific Organisation Chart identifying by name all Quality Assurance and Quality Control Personnel and their reporting relationship.
- Copy of a Quality project plan of a previous similar order.

## 27. DOCUMENTS TO BE SUBMITTED AFTER AWARD OF ORDER

The following documents shall be submitted within 2 weeks of award of the purchase order and shall be finalised and implemented within 6 weeks of the Purchase order.



Updates of the Quality Manual if applicable.

Vendor's Quality Plan for this purchase order containing:

- A statement outlining the Quality Assurance objectives of this project.
- Updated Organisation Chart for this Project, particularly stating the QA and QC personnel, who are responsible for controlling the quality of work, and the way the reporting relations are defined.
- Job description of the QA and QC staff. Where duties different from Quality Assurance and Inspection are to be carried out, details are to be submitted with an indication of the time spent on these activities.
- Detail of Procedures and Work instructions to be used on this project and which shall be issued to all parties requiring the information to carry out their tasks. A Copy of the Procedures and word Instructions shall be sent to CONSULTANT.

The Quality Control Plan showing all activities to be monitored. The plan shall identify each work activity from award up to delivery and despatch. Details to be provided as follows:

- Activity List
- Vendors Control Procedures
- Specified acceptance/rejection criteria with cross reference to source
- Test equipment to be used
- Personnel responsible for Quality Control
- Hold and Inspection points
- Records of objective evidence
- Format of records
- Details of Quality Assurance Records to be kept on the Project.
- Vendor Internal Audit Plan. This Plan shall identify how the Vendor shall audit his Quality Assurance System during the course of this purchase order.
- The Plan shall also include details of External Audits the Vendor will carry out on Sub-suppliers and Sub vendors. CONSULTANT reserves the right to attend these Internal

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and External Audits as an observer. CONSULTANT shall be included on the distribution list for all Vendor's Internal and External Audit Reports.

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### 27.1. Inspection

CLIENT/CONSULTANT reserves the right to inspect the equipment at any stage of manufacturing. Scheduled inspection points for CONSULTANT shall be included in the QC Plan.

Any defects found by CLIENT/CONSULTANT'S inspector shall be rectified in his presence.

Where this is not possible, check lists shall be prepared and signed by CONSULTANT's inspector stating all 'pending' items. Copies of these lists shall be sent to CONSULTANT to enable their subsequent checking.

The instruments shall not leave the factory before all discovered defects have been rectified.