



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 Junction Box, Gland, Tube,  
Fitting & Piping

Document No. : EI027-000-ED-IN-SPC-007

Rev. R2

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## STYRENE PARK OFFSITE

### Document Title:

### Specification for Junction Box, Gland, Tube, Fitting & Piping

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**REVISION RECORD SHEET**

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	R0	R1	R2	R3	R4	R5	R6		R0	R1	R2	R3	R4	R5	R6
1	X	X						41							
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6	X							46							
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## 1. GENERAL 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 Scope

This General Specification defines the minimum technical requirements for bulk materials to be installed in "STYRENE PARK OFFSITE".

MANUFACTURER/SUPPLIER shall provide a complete system/equipment designed and fabricated in accordance with high standards of engineering, workmanship and suitable for intended service as described in this General Specification.

Any omission in this General Specification shall not relieve (EPC) CONTRACTOR from his obligation to supply a fully workable system intended for the service as specified.

Any deviation from this General Specification must be approved, in writing, by OWNER. Such written approval must be obtained prior to the commencement of any work, which constitutes such deviation.

Any unresolved conflicts between this General Specification and International Standards and Codes shall be resolved by (EPC) CONTRACTOR and shall be submitted to OWNER in writing.



## 2. APPLICABLE CODES, STANDARDS, SPECIFICATIONS, ABBREVIATIONS AND SITE ENVIRONMENTAL CONDITIONS & UTILITIES

### 2.1 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.

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## 2.2 International Codes and Standards

### American Petroleum Institute (API)

- API RP 551 - Process Measurement Instrumentation.
- API 552 - Transmission System
- API 555 - Process Analyzer
- API RP 941 - Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petrochemical Refineries and Petrochemical Plants.

### American Society of Mechanical Engineers (ASME)

- ASME B1.20.1 - Pipe Threads, General Purpose (Inch)

### International Electro-technical Commission (IEC)

- IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- IEC 60079-1 - Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
- IEC 60079-7 - Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
- IEC 60079-11 - Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
- IEC 60529 - Degrees of Protection Provided by Enclosures

### International Society of Automation (ISA)

- ISA RP 60.6 - Nameplates, labels and tags for control centre
- ISA RP 42.00.01 - Nomenclature for Instrument Tube Fittings

### International Organization for Standardization (ISO)

- ISO 9001 - Quality management systems

### NACE International (NACE)

- NACE MR 01.75 - Material Requirement - Sulfide Stress Cracking Resistant Material for Oilfield Equipment

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### 2.3 Associated Project Documentation

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

### 2.4 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 %

#### Indoor Conditions

Design Temperature.	45 °C
Relative Humidity	80 %



### 2.5 Abbreviation

ID	:	Internal Diameter
IS	:	Intrinsically safe
NPTF	:	National Pipe Thread Fine
OD	:	Outside Diameter
P&ID	:	Pipe and Instrument Drawing

## 3. FIELD MATERIAL CLASS

Field Material used as instrument piping materials shall be classified as per the followings:

- 900 lbs and higher rating services:  
Steel pipe schedule 80 minimum with forged steel fittings.  
Valves and/or manifold after the first block valve to be according to line classification.
- 600 lbs and lower rating services:  
Stainless steel tubing with stainless steel double seal compression type fittings.  
Stainless steel valves and/or manifold after the first block valve to be according to line classification.

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Pipe, Fittings and Flanges for installation at 900 lbs and higher rating service shall be in accordance with Piping Class Specifications  
The minimum schedule or wall thickness for carbon steel and low alloy pipe shall be sch.80.

#### 4. PRIMARY INSTALLATION MATERIAL

##### 4.1 Design Criteria

(EPC) CONTRACTOR shall ensure all Field Materials supplied in this PROJECT are suitable for the process applications of instrumentation installation. All the dimension of Field Materials shall follow NPTF threaded connections and shall be expressed in inch. (EPC) CONTRACTOR shall also ensure that the Field Materials (e.g. tubing, cable glands, compression fittings, etc.) are standardized throughout the whole Refinery Complex.

Pressure and temperature design criteria shall be taken into account when selecting the field materials.

The field materials shall be supplied in accordance with instruments standard drawings and applicable PROJECT specification, such as “Piping Class Specification”.

When negative pressure is indicated on piping class specification, the Field Materials for the instrumentation connected to the piping system shall be reviewed on an individual basis. For the purpose of this document, instrumentation connected to the piping system will be used interchangeability with instrument piping material.

Field materials exposed to corrosive and/or toxic service (e.g. Hydrogen and Sulphur environments) shall be selected in accordance with API RP 941 and other relevant International Standards and Codes, such as IEC.

The use of particular tubing material, due to extreme process condition, shall be evaluated separately (e.g. use of incoloy 800 in high temperatures, Cu-Ni 70/30 or 90/10 in corrosive services)

Field materials supplied for Sour Water and Sour Gas services shall meet the NACE requirements, as specified for piping materials.

Commodities defined as General Hydrocarbons without having the specific quantities of either sulphur or hydrogen specified shall be considered to have up to 0.2 weight percent of sulphur or 0.01 mole percent hydrogen sulphide present.

Tubes and tubing shall not be installed in channel or cable-tray that contains electrical cabling.

Tubing shall not be routed along or supported from handrails.



##### 4.2 Colour Coding

Colour Codes shall be used to differentiate among alloy, stainless steel or special carbon steel instrument piping materials.

##### 4.3 Tubing

Tubing seamless, stainless steel hot finished or cold draw, shall be supplied to site in straight bar of 6 m. length.

The suggested tubing dimensions used for instrument installation will be as follow:

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**Table 3.3.1 Suggested tubing dimensions**

	Connection from process taps to instrument	Steam tracing	Instrument air	Analyser sampling system
1/2" OD x 0.049" ID	X		X	X
3/8" OD x 0.035" ID		X	X	X
1/4" OD x 0.035" ID		X	X	X

**Note:**

- The use of non-continuous tubing in rectilinear connection of length less than 6 m. shall not be allowed
- Tubing used for instrument installation will be AISI 316 minimum and shall be connected to process taps with stainless steel connectors or block valves.
- Steam tracing installation shall be realized so that the instrument dismantling for maintenance will be possible. The number of compression fittings shall be minimized to avoid steam loss.

**4.4 Connectors**

Connectors for tubing shall be realized with stainless steel compression fitting with double ferrules and their installation shall be executed with the correct tools. Fitting nomenclature shall be in accordance to ISA RP 42.00.01.

**4.5 Manifold**

Two-valve manifold shall be used with gauge and absolute pressure transmitter instruments type.

Five-valve manifold shall be used with differential pressure transmitter instruments type.

The integral manifold for transmitters shall be constructed from solid bar of stainless steel material as minimum. Rating of the manifold shall be according to the relevant piping class and suitable for the purpose of the transmitter installation.



All manifolds shall have ½ inch size for inlet and outlet connections and ¼ inch size for the drain/vent connections.

The manifold shall be equipped with stainless steel brackets to support itself and the transmitter on pipe stand/stanchion.

**4.6 O2 Service**

When "O2" service is stated on individual data sheet, (EPC) CONTRACTOR shall provide adequate cleaning in accordance to the service, in order to avoid possible explosion due to the mixing between oxygen and oil or grease matters.

"O2 service" Field Material will require separate packing with clear indication of use of this material.

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## 5. PIPING AND ACCESSORIES FOR INSTRUMENT AIR

A minimum pipe size of ½ inch shall be used for take offs to individual consumer, except where many instruments are in close proximity, in this case distribution pots may be used.

The size of the branch header shall be determined in accordance with the following rule:

- pipe size 1 inch, Instrument air distributor pot with 10 users equipped with ¼ inch block valves
- pipe size ¾ inch, Instrument air distributor pot with 5 users equipped with ¼ inch block valves.

The Field Material for instrument air distributor and header branches shall be galvanized carbon steel; the ¼ inch (to verify with STD drawings) block valves shall be made in stainless steel.

The connection between the ¼ inch block valve and the consuming instrument shall be performed with ¼ inch OD stainless steel tubing and stainless steel compression fittings (double ferrules).

Each Air distributor pot shall be provided with a permanently welded and engraved stainless steel identification nameplate.

## 6. INSTRUMENT CABLE TRAY

Above ground multi-cable routing shall be adequately supported in cables tray with cover (to ensure cable mechanical protection) manufactured from stainless steel material (or galvanized steel or aluminium, according to environmental conditions) and installed in accordance with the manufacturer's recommendation.

Cable trays shall be of two types:

- Ladder type cable tray
- Perforated bottom cable tray

Ladder type cables tray will be used for the "home run cable", namely the cables/multi-cables from field to satellite buildings or control rooms.

Perforated type cables trays will be used for the cables from junction boxes to the instruments.

The cable tray shall be supported using deep galvanized materials to minimize the effect from atmospheric corrosion. Additionally, supporting brackets which are welded screwed or bolted shall be thoroughly cleaned and protected using primer and two coats of zinc-epoxy paint finish.



Cable ladder shall have suitable strength and rigidity to provide adequate support of all contained wiring as per weight designed for. Support every 3 meter shall be provided.

The minimum thickness of ladder and tray shall be 2 mm.

## 7. CABLE GLAND

Certified flameproof (Type 'EEx.d') cable glands with double seal shall be used on all instruments and field junction boxes regardless of the installation location (hazardous and non-hazardous areas).

Cable glands shall be specified in accordance with cables as detailed in the Instrument cable specification (EI027-000-ED-IN-SPC-012).

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Cable glands, adapters and plugs shall be stainless steel with protection degree of IP-65 min as per IEC 60529.

The dimensions of the cable gland shall be compatible with the dimensions of the cables.

The usage of other type of cable gland (e.g. filled epoxy-type) shall be referred to OWNER for approval.

## 8. JUNCTION BOX

As general rule, separate Junction boxes shall be provided, each one per each multi pair / core cable.

Field junction box, regardless of the installation location (hazardous and non-hazardous areas), shall be a single door type with a mechanical protection degree at least of IP-65 (as per IEC 60529). Explosion proof type junction box shall be provided where required. The box construction shall meet the following requirements:

- Fiberglass reinforced polyester (preferred) antistatic design, aluminium alloy, painted carbon steel or 316 Stainless steel body and door and stainless steel hardware.
- Galvanized carbon steel body and door for explosion proof type.
- Data/Print pocket on inside of door.
- External mounting brackets.
- Ground stud for terminating A/C safety ground wire.
- Junction boxes having an internal volume exceeding 2000 cm<sup>3</sup> shall be provided with stainless steel breather and drain fittings, or a combination breather and drain fitting.

Junction box colour shall be blue RAL 5015 for Intrinsically safety (EEx-i) execution and grey RAL 7032 for explosion-proof (EEx-d) execution.

Doors shall be fitted with an oil-resistant gasket. This gasket shall be held in place by glue or corrosion-resistant clips.

Junction box shall have a labelled front with a plastic nameplate (2" x 4") fixed by stainless steel screws.

The same label shall be fixed inside the junction box body. This will ensure that correct lids may be replaced when removed from boxes.

The number shall be in black letters on a white background. For dedicated Safety Instrumented Systems junction boxes, white letters on a red background shall be used.



The earth wire shall be connected to a common screen earth bar, in the junction box, isolated from any other earth bar and the case of junction box.

Junction box shall be supplied complete of terminals and links, assembled on terminal rails and permanent labelled on both side, in accordance with project drawings.

Number of terminals and junction box size shall be specified in the individual Data Sheet and Drawing by (EPC) CONTRACTOR.

All junction boxes shall be provided with Weidmüller (klippon) type WDU 2.5 or similar terminals with flat head screws. Intrinsically safe terminals shall be blue and not-IS shall be beige. Terminal shall be mounted on Weidmüller (klippon) type TS-35 or similar DIN rail.

All Junction boxes shall be provided with the required number of certified cable gland or plugs. Gland plates shall be drilled according to (EPC) CONTRACTOR detail

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design requirements. Drilling of gland plates at site shall be avoided. Top entry into the junction box shall not be permitted.

## 9. PAINTING

(EPC) CONTRACTOR painting specification shall be in accordance to Manufacturer's standard and shall refer to site and climatic conditions including ambient temperature extremes and external corrosion problems.

## 10. DOCUMENTATION

Documentation (including certifications) is intended as main party of the supply. In case of total or partial missing of the requested documents it shall be considered incomplete.

All the technical documentation shall be in English language, exception made for certificates, issued by official authorities, which shall be in the language of the origin country with English translation. Completed instrument data sheets shall be prepared and submitted for OWNER's review and approval.

Data sheets shall include all specifications for purchasing bulk materials, including manufacturer and model number and main process details.

## 11. QUALITY, INSPECTION AND TEST

### 11.1 Quality

MANUFACTURER/SUPPLIER shall establish, implement and maintain a Job Quality Management system based on ISO 9001 edition 2008, in order to ensure that the requirements of this technical specification are met.

MANUFACTURER/SUPPLIER shall establish suitable control mechanisms to ensure quality in all work processes from design and development, inquiry, fabrication/construction up to final delivery. All necessary quality records shall be maintained for evidence of performing the works as per Procedures.

MANUFACTURER/SUPPLIER shall establish and implement QA/QC management in Sub-supplier's premises wherever outsourcing is done.

Whenever non-conformity is detected by Vendor or by others, MANUFACTURER/SUPPLIER shall ensure that the non-conforming product is segregated, in order to prevent unintended use, and Owner shall approve the resolution of each NCR.



The said above requirements remain still valid also for MANUFACTURER/SUPPLIER's.

MANUFACTURER/SUPPLIER is requested to duly transfer in the relevant suborder all the technical and quality requirements included in his main PO, as applicable.

MANUFACTURER/SUPPLIER shall establish and implement the necessary inspection and verification to ensure that the sub-MANUFACTURER / SUPPLIER products/works meets these technical requirements.

### 11.2 Inspection

All materials and equipment fabrication included in the supply are subject to expediting and/or inspection by Owner and/or its delegate(s).

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Acceptance criteria are stated in the recalled International Standards or in the specification itself or other contractual documents.

The extent of inspection activities, such as documents review, random or complete inspection of material, spot test or witnessed test is defined in the documents attached to Material Requisition.

The Owner reserves the right to participate to Pre-Inspection meeting and to any inspection carried out during the project.

The Manufacturer shall allow free access to Inspectors to workshop, shall give all information required and shall make available all copies of internal orders to other sub-suppliers.

Adequate prior notification of test must be secured to Contractor and Owner.

Lack of Contractor/Owner's inspection shall not relieve the MANUFACTURER/SUPPLIER from compliance with purchase documentation.

Adequate time, space, facilities, utilities, test equipment, and assistance to allow performance of inspection and testing shall be provided at the MANUFACTURER/SUPPLIER's facility

Materials supplied are subject to inspection, either in MANUFACTURER / SUPPLIER workshop or Sub -suppliers factories, in order to verify the delivery time schedule and the construction material compliance to the contractual Codes and Standards.

Any defect detected during the test phase, shall be repaired at no cost to Owner.

### 11.3 Testing and Acceptance Test

Detailed list of test will be defined in the documents attached to the material requisition

Procedure for conducting acceptance test shall be subject to review and approval.

Test shall include as minimum:

- Visual dimensional check
- Non-destructive examination as per applicable codes, this specification and Material requisitioning documentation.
- Verification of calibration of the instruments
- Documentation

Known discrepancies, including any found during MANUFACTURER/SUPPLIERs acceptance test, shall be documented in MANUFACTURER/SUPPLIER's test report.

Correction of discrepancies (including scheduling and method of performing the work) and responsibility for correction of work shall be agreed to in writing by Owner and MANUFACTURER/SUPPLIER before shipment.