طرح نگهداشت و افزایش تولید 27 مخزن

INSTRUMENT & CONTROL DESIGN CRITERIA

نگهداشت و افزایش تولید میدان نفتی بینک

D01	MAY.2022	IFA	P.Hajisadeghi	M.Fakharian	M.Merhshad	
D00	JAN.2022	IFC	P.Hajisadeghi	M.Fakharian	M.Merhshad	
Rev.	**Date**	**Purpose of Issue/Status**	**Prepared by:**	**Checked by:**	**Approved by:**	**CLIENT Approval**

Class:2 | **CLIENT Doc. Number: 'F0Z-708579**

Status:

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built –Approved

REVISION RECORD SHEET

PAGE	D00	D01	D02	D03	D04
1	X	X			
2	X	X			
3	X	X			
4	X				
5	X				
6	X				
7	X				
8	X	X			
9	X				
10	X	X			
11	X	X			
12	X				
13	X				
14	X				
15	X				
16	X				
17	X				
18	X				
19	X	X			
20	X	X			
21	X	X			
22	X	X			
23	X	X			
24		X			
25		X			
26		X			
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					
61					
62					
63					
64					
65					

PAGE	D00	D01	D02	D03	D04
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
79					
80					
81					
82					
83					
84					
85					
86					
87					
88					
89					
90					
91					
92					
93					
94					
95					
96					
97					
98					
99					
100					
101					
102					
103					
104					
105					
106					
107					
108					
109					
110					
111					
112					
113					
114					
115					
116					
117					
118					
119					
120					
121					
122					
123					
124					
125					
126					
127					
128					
129					
130					

CONTENTS

1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR(GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This document covers minimum necessary requirements for the design and selection of instrumentation and control/safety system of New Gas/Condensate Pipelines (from Binak New GCS to Siahmakan GIS/Binak PU) .

It shall be used in conjunction with data/requisition sheets for present document subject.

3.0 NORMATIVE REFERENCES

The Latest Edition of following codes & standard are applicable in this project:

3.1 LOCAL CODES AND STANDARDS

· IPS-E-IN-100	Engineering standards for general instrumentation
· IPS-E-IN-105	Instrument Workshop, Layouts, Test and Calibration Tools
· IPS-E-IN-110	Engineering standard for pressure instruments
· IPS-E-IN-120	Engineering standard for temperature instruments
· IPS-E-IN-130	Engineering standard for flow instruments
· IPS-E-IN-140	Engineering standard for level instruments
· IPS-E-IN-160	Engineering Standard for Control Valves
· IPS-E-IN-190	Engineering standard for Transmission systems
· 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 standards for pressure instruments
· IPS-C-IN-120	Construction and installation standard for temperature instruments
· IPS-C-IN-130	Construction and installation standard for flow instruments
· IPS-C-IN-140	Construction and installation standard for level instruments
· IPS-C-IN-160	Construction Standard for Control Valve
· IPS-C-IN-190	Construction Standard for Transmission Systems
· IPS-G-IN-200	General Standard for Instruments Air System
· IPS-I-IN-100	Inspection Standard for General Instrument Systems
· IPS-M-IN-110	Material and equipment standard for pressure instruments
· IPS-M-IN-120	Material and equipment standard for temperature instruments
· IPS-M-IN-130	Material and equipment standard for flow instruments
· IPS-M-IN-140	Material and quality control standard for level instruments

- IPS-M-IN-160 Material and Equipment Standard for Control Valve
- IPS-M-IN-190 Material and equipment standard for transmission systems
- IPS-G-IN-210 General standard for instrument protection
- IPS-G-IN-230 General standard for Analyzers
- IPS-G-IN-220 Engineering And Installation Standard For Control Centers
- IPS-G-IN-260 Engineering And Installation Standard For Indicating Lights, Alarms And Protective Systems
- IPS-G-IN-290 Engineering And Construction Standard For Programmable Logic Controllers (PLC)
- IPS-D-IN-101~119 Instrument standard drawings

3.2 INTERNATIONAL CODES AND STANDARDS

- AGA American Gas Association
- IEC-60584 Thermocouples
- IEC-60529 Classification of Degree of Protection Provided by Enclosures
- IEC-60751, BS1904 Industrial Platinum Resistance Thermometer Sensors
- ANSI-MC 96.1 Temperature Measurement Thermocouples
- BS EN 837 Specification for Bourdon Tube Pressure Vacuum Products
- IEC 60079 Electrical Apparatus for Explosive Gas Atmospheres
- IEC 60144 Ingress Protection for Dust and Water Jets
- IEC 60079 (Relevant Sections) Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres
- ASME VIII Unfired Pressure Vessels
- ANSI B1.20.1 Pipe Threads, General Purpose
- BS 1042 Measurement of fluid flow in closed conduits
- ISO 5167 Measurement of fluid flow by means of orifice plates, nozzles, and Venturi tubes inserted in circular cross-section, conduits running full
- NACE MR-0175 Sulphide stress cracking resistant metallic materials for oilfield equipment

· NACE RP-0775	Preparation, Installation, Analysis and Interpretation of Corrosion Coupons in oil field operation.
· ANSI B16.5	Pipe flanges and flanged fittings. inserted in circular cross section conduits running full
· API RP-521	Guide for Pressure-Relieving and Depressuring Systems
· API RP-526	Flange Steel Pressure Relief Valves
· API 527	Seat Tightness of Pressure Relief Valve
· API-607	Fire Test for Soft-Seated Quarter-Turn Valves
· API RP 550 Part I	Installation of Refinery Instruments and Control Systems
· ANSI/FCI 70-2	Control Valve Seat leakage
· ANSI/ASME B16.36	Orifice Flanges
· ASTM D3230	Standard Test Method for Salts in Crude Oil
· ISA S.5.1	Instrumentation symbols and identification
· ISA S.5.4	Instrument Loop Diagrams
· ISA RP7.3	Quality Standard for Instrument Air
· ISA S18.1	Annunciators - sequences and specification
· ISA S.20	Specifications forms for process measurement and control instruments, primary elements and control valves.
· ISA S75.01	Flow equations for sizing Control Valves.
· ISA S75.02	Control Valve capacity test procedure.
· ISA S75.03	Uniform face to face dimensions for flanged globe type Control Valves.

IEEE (Inst. of Electrical and Electronic Engineers)

· IEEE-C62	Guides and standards for surge protection.
· IEEE 802	Local area networks
· IEEE-830	Guide to software requirements specification.
· IEEE-1012	Standard for software verification and validation plans.
· IEEE-1016	Recommended practice for software design descriptions.

European Codes

- CENELEC — For electrical equipment in hazardous areas (for European Manufacturers only):
- EN 50.014 — General Rules
- EN 50.018 — Explosion-proof Equipment
- EN 50.020 — Intrinsic Safety Equipment
- EN 50019, 50039 — Electrical apparatus for potentially explosive atmospheres,

The latest published version or amendment shall apply unless otherwise stated.

3.3 THE PROJECT DOCUMENTS

D01

- BK-GNRAL-PEDCO-000-PM-RT-0001 — Endorsement Report For Basic Design & Scope of Work
- BK-GNRAL-PEDCO-000-PR-DB-0001 — Process Basis of Design
- BK-GNRAL-PEDCO-000-SA-SP-0002 — Spec. For Hazardous Area Classification
- BK-GNRAL-PEDCO-000-IN-SP-0001 — Spec. For Instrumentation
- BK-GNRAL-PEDCO-000-IN-SP-0009 — Spec. For Fire & Gas Sensor and Devices
- BK-GNRAL-PEDCO-000-IN-SP-0006 — Spec. For On Off Shutdown Valves
- BK-GNRAL-PEDCO-000-IN-SP-0010 — Spec. For Instrument& F&G Cables
- BK-GNRAL-PEDCO-000-IN-SP-00013 — Spec. For LBV

3.4 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DC-0001.

For environment data and site conditions, which is summarised as per the followings:

- Barometric pressure(Winter):13.7 Psia
- Barometric pressure(Summer):13.2 Psia
- Solar radiation: ٩٤٦ W /m2
- Maximum ambient temperature (°C) : ٥٠
- Minimum ambient temperature (°C): -5
- Maximum steel surface exposed to sun (°C): 85
- Maximum Design relative humidity (%): 100
- Minimum Design relative humidity (%): 0

D01

3.5 ORDER OF PRECEDENSE

The order of precedence shall be as follows (from higher to lower level):

- Data sheets

- Particular project specifications

- This specification

- The OWNER specifications and standard documents

- The codes and standards

It shall be the CONTRACTOR responsibility to raise to OWNER any discrepancy between documents. The CONTRACTOR shall not proceed with any such aspect of the work until he has received any necessary confirmation in writing from the OWNER

4.0 ABBREVIATION

Industry standard abbreviations shall take their usual meaning. Outlined herein are the most common, which may be used in this and other project documents:

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Material
BDV	Blow down Valve
BS	British Standard
CCR	Central Control Room
CSA	Community , Supported Agriculture
DCS	Distributed Control System
EMC	Electromagnetic Compatibility
EMF	Electromotive Force
ESD	Emergency Shutdown
ESDV	Emergency Shutdown Valve
F&G	Fire and Gas
FAT	Factory Acceptance Test
GA	General Alarm
HART	Highway Addressable Remote Transmission
HAZOP	Hazard and Operability Study
HMI	Human Machine Interface
HSE	Health ,Safety & Environment
HVAC	Heating Ventilation and Air Conditioning
IEC	International Electrotechnical Commission
IEE	Institution of Electrical Engineers
IP	Ingress Protection
IPS	Iranian Petroleum Standard
IRP	Interpose Relay Panel
IS	Intrinsic Safety

ISO	International Organization for Standardization
LAN	Local Area Network
NACE	National Association of Corrosion Engineers
PC	Personal Computer
PCS	Process Control System
PFD	Process Flow Diagram
PLC	Programmable Logic Controller
PSU	Power Supply Unit
RTD	Resistance Thermometers Detectors
SIL	Safety Integrity Level
SS	Stainless Steel
UCP	Unit Control Panel
UPS	Uninterruptable Power Supply

5.0 GENERAL REQUIREMENTS OF CONTROL /SAFETY SYSTEM;

Currently, there are 4 major points for control/safety of 2 pipelines in this project:

- Binak new compressor station: Only Instrumentation, Valves and F&G devices shall be provided as per P&IDs. New control/ESD/F&G system is going to be designed and installed by contractors of GCS work package. Required I/O and related cabling for instrumentation of pig launcher area shall be considered on the new systems in related work package scope. Refer to BK-GNRAL-PEDCO-000-IN-SP-0002 Spec. For Control System ,BK-GNRAL-PEDCO-000-IN-SP-0003 Spec. For ESD system and BK-GNRAL-PEDCO-000-IN-SP-0012 Spec. For Fire and Gas System for New GCS systems detail.

- Binak Production plant: There is no instrumentation, valves, system and F&G required for this area. Pipe line will be connected to the existing lines and existing equipment/ Devices shall cover the requirements.

- Siahmakan GIS: Control/ESD/F&G systems are existing in Siahmakan GIS. Extra I/Os or accessories shall be added in existing systems. Software/ hardware modification (if required) shall be considered for existing control and ESD systems. New devices which are included an ESD Valve and an annunciator panel with a push bottom for emergency and an indicator for showing the status with all relevant equipment is better to follow existing systems specifications. As per our Block Diagram Configuration all equipment of this area considered as SIL 3

D01

- LBV Stations: LBVs shall be self-actuated automate valves and no extra control /

D01

protection system is required to be considered. For additional information please refer to Specification For LBV - BK-GNRAL-PEDCO-000-IN-SP-0013

5.1 INSTRUMENT/ELECTRICAL INTERFACES(IF ANY)

The type of instrument/electrical interface to the motor starters and feeders will be hardwired to interface compartments (IRP) if any.

The local control panel interface with motor starters shall be limited to following commands and status indications/alarms:

- Start/Stop command (High/Low)
- Trip command (low signal for trip)
- Run/Stop Status (high signal for run status/Low signal for stop status)
- Local/Remote status (high signal for local status)
- Tripped on Fault (high signal for fault status)
- Available for remote control (high signal for available status)

The type of signal selected for each electrical device shall be shown on P&ID.

5.2 EARTHING

Earthing philosophy of the existing plants to be respected.

Normally For instrumentation, three (3) dedicated earthing network shall be used.

- Instrument Protective Earth (IPE) :
  Field instrument enclosures, cable armor, supporting arrangements, tray and junction boxes, cabinets shall be earthed to the IPE.

- Instrument Earth (IE) :
  It shall be used for earthing the screens of cables, except those carrying intrinsically safe signals.

- Intrinsically safe earth (ISE) :
  It shall be used for earthing the screens of cables carrying intrinsically safe signals through the galvanic isolated barriers bus bar.

D01 Impedance of IE & ISE shall be less than 0.5 Ohm.

6.0 GENERAL INSTRUMENT REQUIREMENTS

This basis will be expanded in the General Specification for Instrumentation. Refer to "Specification for Instrumentation; Doc. No. BK-GNRAL-PEDCO-000-IN-SP-0001.

All instrumentation for installation in exposed locations shall be rated for the hazardous conditions that shall be experienced on the platform. Any instrumentation that cannot be supplied with weatherproofing (IP rating) suitable for the specified conditions shall be protectively housed accordingly. Instruments and equipment externally mounted shall be rated to a minimum of IP65 and also shall be applicable to work on humidity range of 0~100% RH. The temperature range is -5°C ~ 85°C below direct sun light and between -5°C ~ 55°C in the shadow. For items that can be subjected to direct deluge the rating shall be IP66. Internally mounted instruments shall be rated to a minimum of IP 54.

All instruments that may be exposed to direct sunlight shall be provided with sunshades to prevent the temperature of the instrument rising above ambient temperature.

The preferred material for wetted parts of instruments and fittings is 316/316L stainless steel.

The use of plastic shall be avoided due to the degradation of the material when exposed to high levels of UV radiation.

Stainless steel subjected to temperatures higher than 60degC and a saline atmosphere will suffer from stress corrosion cracking. Process conditions in general will not subject the instrument process connections to temperatures higher than 60°C. Instrument tubing and fittings in external locations that are subject to direct sunlight may rise above this temperature. Where this can take place the tubing and fittings shall be provided with suitable shading or insulation.

Frost protection for instruments on fresh water service is not required.

All instruments to be located in external locations hazardous shall be certified for a minimum protection of Zone 1 IIB T4.

General instrumentation, excluding solenoid valves, IR flame detectors and UV gas detectors which shall be EExd, shall by preference be made safe by intrinsic safety using galvanic isolation. If intrinsic safety is not available then explosion proof enclosures (EExd) shall be used.

Instruments used in safety applications may require fire proofing. This requirement is to be identified during HAZOPs.

All process value measurement signals (4-20 mA) such as PT , TT , FT , LT, Control valve positioner and control valve feedback signal shall be supported by hart protocol and shall be with digital local indicator. The transmitter communication technology shall be fully matched with process control system. Reveres Polarity Protection shall be Provide for All Transmitters.

All field instruments shall be furnished with a stainless steel corrosion resistant nameplate permanently fastened with screws and stamped as follows and as applicable:

- Vendor’s name

- Model number
- Serial number
- Instrument tag number
- Supply voltage
- Operating range
- Output
- hazardous area certification & certification agency name
- Pressure rating
- Set point (if required)

All transmitters, local panels, auxiliary racks, cabinets, junction boxes, cables and etc, shall be provided with a nameplate, showing the identification data.

All transmitter housing material shall be die cast aluminium. All JBs shall be EExd/e manufactured from Die cast aluminium with epoxy coating.

All Transmitters Must be have Zero and Span Adjustment From out Side.

All equipment, laptop and other accessories shall be selected as industrial.

6.1 TEMPERATURE MEASUREMENT

Bi-metallic every angle dial thermometers shall be used for local indication. Dial size shall be 150 mm diameter unless otherwise specified in the data sheet.

Casing and pointer shall be AISI 304 or aluminum. Dial material shall be aluminum, unless otherwise specified.

Dial colour shall be white, non-rusting metal with black figures.

Local zero adjustment shall be possible.

Where Bi-metallic types are not suitable, gas or liquid filled capillary instruments may be used. Mercury filled systems shall not be used. Guaranteed gauge accuracy shall be +0.5% of full scale range.

RTD shall be used as means of temperature measurement. The choice between resistance thermometers and thermocouples shall take the following into consideration:

- Where accuracy of measurement is required greater than obtainable with a thermocouple, a resistance thermometer shall be used.

- Resistance thermometers shall not be used where high frequency vibration is present, e.g. in high velocity steam or gas streams.

- Where narrow range duty is required i.e. less than 100°C range a resistance thermometer shall be used.

RTD's shall be platinum preferably 3-wire. Two-wire is not permitted. RTD PT100 shall comply with BS 1904 and have a resistance of 100 ohms at 0°C and a fundamental interval of 38 ohms. They shall be of the grade of accuracy appropriate to the application.

Thermocouples shall be two wire types. Thermocouple elements shall be in accordance with ISA/ANSI-MC 96.1 except where averaging or differential thermocouples are required.

Thermocouples and resistance thermometers pocket assemblies shall be provided with weatherproof terminal heads certified for the appropriate area classification. Heads shall be orientated to prevent ingress of water.

Thermowells shall be constructed in accordance with project standards from one-piece Stainless Steel 316/316L material as minimum.

Flanged Connection: 1 ½" Flanged Type for Pipe Connection.

Instrument Connection: ½ "NPT

Thermowell shall be used for all temperature instrument

On small lines where adequate immersion cannot be obtained by the thermowell inserted perpendicular to the line, the well shall be inserted at 90 degrees bend in the line.

Transmitter shall be designed to allow the fitting of either an integral or remote located process variable indicator, where specified on the instrument Data Sheet. The design of transmitter and local indicator combination shall be such that failure of the indicator electronics will not affect the operation of the transmitter.

The input signal shall be galvanically isolated from the output and ground. Accuracy of the transmitter shall be ±0.1% percent of calibrated span, includes combined effects of linearity, hysteresis and repeatability. Electrical connection shall be ISO M20 x1.5.

Temperature switches shall be bracket mounted type, and should be selected as liquid / gas filled system or thermocouple actuated/differential expansion, depend on applicable working range of each type. The switches shall be fully compensated against variations in the ambient temperature. The accuracy of switches shall be better than ±1% of span. Microswitch shall be snap action type, hermetically sealed, with gold or silver plated contacts. Switch contact shall be DPDT and shall suit the electrical area classification. The contact rating shall be 5A at 24 VDC.

6.2 PRESSURE MEASUREMENT

Dials shall have diameter of 150 mm and shall be white with black figures, non-rusting metal. Blow out disc shall be located in the back of the casing.

Over-range stops shall be provided for the over-range limit.

Unless otherwise specified, Min SS 316L alloy shall be used for pressure elements, sockets, Movement and tips material.

All gauges shall be equipped with screw driver slot type adjustment for calibration purposes.

Min SS 316L, 2 valve block manifold shall be provided.

Transmitter shall be designed to allow the fitting of either an integral or remote located process variable indicator, where specified on the instrument Data Sheet. The design of transmitter and local indicator combination shall be such that failure of the indicator electronics will not affect the operation of the transmitter. The transmitter shall be 4-20mA supporting HART protocol.

Electrical connection: ISO M20 x1.5

Accuracy: better than ±0.4% of instrument scale for SMART type.

Tree-way (Two Valve) Stainless Steel manifold shall be supplied and integrated to pressure transmitters. The manifold process connection is ½" NPT female, the vent/drain connection is 1/4" NPT female.

For pressure switches, pressure element shall be of diaphragm, Min SS 316L capsule or piston type. Pressure element connection shall be ½" NPT male and have wrench flats.

Pressure elements shall be designed to have an over range protection rating of at least the design pressure of the process line or vessels, and as a minimum 130% of full scale. The accuracy of the pressure switch assembly shall be at least ±0.5% of span and repeatability shall be at least ±1% of full scale, the set point shall be field adjustable over the full range of the switch. The set point adjustment shall be internal.

Electrical connection shall be ISO M20 x1.5.

Switch element shall be microswitch snap action type hermetically sealed, with gold plated contact. Microswitch shall be DPDT type, Contact rating shall be 10A at 110VAC nominal.

Diaphragm seals shall be utilized for the following services,

a) High viscous heavy oils,

b) Fluid with solid materials,

c) Vapor containing H2S,

d) Corrosive chemicals.

Where capillary extension is specified for transmitters, the capillary length shall be stated on the Instrument Data Sheet and be provided with spiral wound stainless steel armor.

Process connections for clean fluids shall be ½" NPT screwed bottom connections.

Transmitter must be have Local zero and span adjustment included and accessible from outside shall be provided.

6.3 CORROSION COUPON/PROBE

Corrosion coupons/probes shall be located at all points as indicated in the P&ID's where significant corrosion or erosion is anticipated.

Coupons may be used to determine the average fluid corrosivity by measurement of weight loss. The method facilitates an assessment of the corrosivity of an environment with respect to the specific material of construction of that part of the plant in which the corrosion monitoring is taking place.

Careful consideration shall be given to the proposed monitoring location and coupon position during the development of the corrosion monitoring strategy.

Coupons shall be installed through on-line retrievable access fittings, with a flanged line connection. Coupon retrieval and positioning tools shall be included.

On-line corrosion monitoring should be installed at points where accessibility during scheduled maintenance is anticipated.

6.4 MAINTENANCE SYSTEM

The diagnostics provisions shall be provided at an engineer station(if any since existing system is used in this project) in the Control Room. Additionally diagnostic interrogation shall be possible via a hand-held device at the field cable marshaling cabinets, without infringing any hazardous area certification requirements.

Refer to Specification for Control System Doc.No.BK-GNRAL-PEDCO-000-IN-SP-0002 and Specification for ESD system, Doc.No.BK-GNRAL-PEDCO-000-IN-SP-0003 for diagnostic detail and other system specifications.

6.5 INSTRUMENT HOOKUP/INSTALLATION

Process impulse connections up to and including the primary isolation valve shall conform to the piping, vessel or equipment specification. The tubing and fittings up to the instrument shall conform to the General Instrumentation Specification. All pressure measuring devices shall have 2 valve manifolds and all differential pressure measuring devices shall have 5 valve manifolds. As general, Instrument Hookup/Installation to be performed in accordance with IPS standards No. IPS-D-IN-010, IPS-D-IN-100, IPS-D-IN-101…107, IPS-D-IN-112, IPS-D-IN-115, IPS-D-IN-116 and IPS-D-IN-119.

Where possible manifolds shall be of the type suitable for direct mounting to the instrument.

Instruments can be close coupled to the tapping point and supported by the process connection as long there is good maintenance access and the instrument is not subjected to detrimental vibration.

All Pressure Transmitters/ switches & Flow Transmitters / Switches must be Located 2'' Pipe Mounting Support (with bracket).

6.6 ACTUATED VALVES

6.6.1. ESD VALVES

ESD valves shall be in accordance with "Specification for On/Off and ESD Valve" document.

The ESD valves shall be of fire safe type complying with the piping specification.

The valves shall be tight shutoff (leakage class VI), fire-safe to BS 6755 or CLIENT standard.

Single acting, pneumatic actuators with spring return to the safe position shall be employed. The type of actuator used shall be based on cost, space and weight considerations.

The valve actuators shall be sized to have 150% of the torque required to open and close the valve with an assumed maximum upstream process pressure and zero downstream pressure and with the minimum air supply.

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

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 supply pressure applied.

The actuator maximum possible torque under maximum supply pressure conditions shall not exceed 80% of the valve stem shear torque.

A manually operated three-way valve with a lock closed facility shall be provided for each actuator to enable the valve to be closed locally and be locked closed for operations / maintenance purposes. The valve shall be provided with a stainless steel label that shall indicate the normal and the locked positions.

Solenoid valves shall be 24VDC certified EExd. The valves shall be made from 316 stainless steel as minimum.

Unless otherwise specified all electrical equipment including solenoid valves and limit switches shall have a degree of ingress protection IP 65.

Partial stroking facility to be considered for ESD and BDVs.

Unless otherwise specified, the maximum valve stroking time to achieve the safety position shall be defined according to size of the body (5 seconds for body up to 4”, 1 second per inch for body greater than 4”).

ESD valves’ accessories shall be considered in accordance with Doc. No.: Specification for on/Off and ESD Valve.

6.6.2. PROCESS ISOLATION VALVES

Process isolation valves shall be in accordance with “Specification for on/Off and ESD Valve” document.

These valves are used to isolate a section or a line and are controlled by process control logic. The result of process control logic is closure of valve in accordance with the P&ID and data sheets.

Isolation valves shall be designed to open and close remotely from the control room through the DCS. Failure position shall be stated on the valve data sheets and P&ID’s. Actuators shall be sized to fully open and close the valves at the maximum differential pressures and within the time spans as specified in the individual data sheets.

Isolation valves shall be full bore or reduced bore ball or plug valves according to the piping specification requirements. Unless otherwise specified in the data sheets.

6.6.3. LINE BREAK VALVE

Self-actuated gas-over-oil actuator shall basically design for pipeline protection with required sensing devices for low and high pressure.

Refer to BK-GNRAL-PEDCO-000-IN-SP-0013 ''Specification for LBV ''for more details.

D01

6.7 PIG SIGNALER/INDICATOR

pig launcher/receivers are required to be equipped with pig signaler/indicator installed on the device and also in line. The intrusive, mechanically operated and generally specified as bi-directional type pig signaler shall be prepared. For pig receiver in siahmakan, mechanically operated signal flag which can be reset is suitable for mounting on pipeline. For pig launcher in binak compressor station pig signaler with 24VDC digital signal to DCS shall be considered.

6.8 SERVICES

6.8.1 INSTRUMENT AIR

In general, pneumatic systems for new plants of this project (if any) shall be designed for instrument air supply with design pressure of 11 barg and the specification at instrument air header according to below table:

Operating Conditions at Producer's Battery limit(Instrument Air Header) D01

System	Temperature (°C)			Pressure (bar g)		
	Min	Norm.	Max	Min	Norm.	Max
Instrument Air	-	65	-	-	8	-
Plant Air	-	65	-	-	9	-

Operating Conditions at User's Battery limit

System	Temperature (°C)			Pressure (bar g)		
	Min	Norm.	Max	Min	Norm.	Max
Instrument Air	-	65	-	4	7.5	8.5
Plant Air	-	65	-	4.5	8.5	9

All devices shall be designed to operate at minimum instrument air pressure of 3 barg.

For Siahmakan GIS, air service shall be provided by existing compressor. Design and operating pressure/temperature of existing service shall be finalized later.

6.8.2 POWER SUPPLIES

No power supply system and devices has been considered in this package scope of work. Required power shall be supplied by existing equipment or by other work packages.

7.0 ACCESSORIES

7.1 JUNCTION BOXES

D01

Junction boxes shall generally be used with multi-conductor cables to reduce the number of cables.

The minimum ingress protection of junction box and cable glands hall be IP65.

Junction boxes shall be fabricated in 316 Stainless Steel or flame retardant Glass Fiber Reinforced Plastic, GRP.

Protection class of junction box shall be Eexe. Each junction box shall be sized with 20% spare terminals for the termination of spare conductors of the multi-conductor cable.

All Junction Boxes shall have external fixing lugs provided for installation. All Junction boxes shall be supplied with an internal/external earth stud for safety earth.

All junction boxes shall be supplied with an approved certificate and certification label attached to the lid.

All labels shall be securely affixed so as not to degrade IP rating of enclosure. Junction boxes shall be supplied, complete with certified screw terminals and links, assembled on terminal rails and terminals shall be labeled on both sides.

A junction box shall contain only signals of the same class. I.S. signal lines and non-I.S. signal lines shall not be contained in the same junction box. This rule shall be also applied for ESD signals, PCS signals, PSS Signals and F&G signals.

All Junction boxes shall be supplied pre-drilled with cable entries, suitable blanked off with certified plugs which shall be installed on spare connection.

All junction boxes shall be manufactured from stainless steel, with a finish suitable for the environment.

Protection class of cable glands shall be Eexd. It is preferable all single and multipairs cables enter into the junction box from bottom side of it.

D01

7.2 CABLING

Within the plant area, underground cabling shall be used generally, laid within dedicated cable trenches. However, cables shall be installed in duct banks for crossing of roads. Above-ground cabling, using cable trunking or cable trays shall be limited to connection of field instruments to field mounted junction boxes.

Above ground cables shall be armoured in accordance with IPS-M-EL-271. Underground cables shall be lead sheathed in accordance with IPS-M-EL-271 where soil contamination by hydrocarbon liquids aggressive to the cable insulation is anticipated.

Instrument signal cables shall be adequately separated from power cables and electrical power equipment to minimize noise interference. A minimum cable separation distance, segregation of trenches, terminal boxes and wiring notes shall be as per IPS-C-IN-190 guide lines.

Flame retardant cables according to IEC 60332.3 shall be used for instrument cables as a minimum requirement.

Fire resistant cables according to IEC 60331 shall be used for safety system as:

- Cables for fire-fighting equipment as:
  - Command and monitoring cables for remote operated firefighting, deluge and CO_2 systems (IF ANY).
  - Fire and gas detection circuits.
- Cables related to ESD system and F&G system equipment as:
  - Connection Cables between transmitter and ESD system
  - Connection Cables between Detectors and F&G system
  - Power supply cables to solenoid valves of all ESDV, and BDV.
  - Cables related to emergency electrical shutdown.
- Any other areas related to safety aspects.

Unless otherwise specified, equipment and cabinets/panels shall be designed for the bottom cables or cord sets, and shall be equipped with gland plates.

All wires shall be identified at both ends using plastic tie-on markers. Above-ground cables shall be marked at their termination points (outside the terminal box where applicable) with a suitable label, of engraved or embossed plastic.

Underground cables shall be marked at approx. 50 cm intervals by means of embossed strips of corrosion resistant material (e.g. stainless steel or nylon).

In addition, cables shall be marked either side of cable transits, building entry/exit points, etc. All wiring shall be identified by sleeve-type markers, e.g. Grafoplast or equivalent

Specialist cable types (eg, co-axial, cat. 5, fiber optic, composite etc.) required for DCS, ESD system, F&G system, vibration monitoring etc. are to be defined in conjunction with selected vendors.

Refer to ''Specification for Instrument/F&G Cables, Doc.No.BK-GNRAL-PEDCO-000-IN-SP-0010'' for more detail.

D01

For additional information please refer to ''Specification For Instrument/F&G Cables, Doc.No. BK-GNRAL-PEDCO-000-IN-SP-0010''

7.3 CABLE TRAYS & ACCESSORIES

Cable Trays and associated accessories including tray covers shall be pre-fabricated type galvanized steel sheets

The nominal width of cable trays selected is 50, 100, 150, 300, 450 and 600 mm. The cable trays shall be supplied in standard length of 2500 mm.

Types of trays used are Perforated type, Ladder Type & Solid type.

The Flange height shall be considered for Ladder Type as 50 mm & for perforated & solid type trays as 100 mm.

The thickness for cable trays shall be considered 2 mm and the thickness for cable tray cover shall be considered 1.6 mm.

The maximum spacing between the rungs of the ladder type cable tray shall be considered as 250 mm.

Cable tray covers shall be provided for Perforated & solid type trays as indicated in the project drawings.

Accessories: The cable tray accessories are Vertical Elbows, Horizontal Bends, Adjustable Bends, Crosses, Tees and Reducers, etc,. All accessories shall have minimum bending radius of 600 mm.

Galvanizing: All cable trays, tray accessories, tray covers & tray supports including washers, etc. shall be hot dip galvanized. Should the galvanizing of the samples be found defective the entire batch of steel shall be regalvanized at BIDDER's cost.

Grounding conductors for Cable Trays 25 x 6 GS flat conductor shall run along the trays & interconnecting the trays at every 2.5 m intervals. 95 Sq.mm stranded copper conductor shall be

used to grounding trays at minimum two points and in addition at 25 meters interval for longer length of trays

Manufacturer shall perform metrological / chemical composition and mechanical test on random samples of cable trays such as :

1. Visual inspection, dimensional checks and verification of bill of material as per approved drawings.
2. test for galvanizing to ensure that materials and workmanship to the relevant standards.
3. Zinc coating thickness test
4. Copper sulphate test (uniformity test).

8.0 ELECTRO-MAGNETIC COMPATABILITY

The design of the instrumentation systems shall be such as to: -

- Avoid susceptibility to electromagnetic interference from other systems
- Avoid causing electromagnetic interference to other systems (Including telecoms).

9.0 SPARE CAPACITY

D01

All systems shall be sized to have a minimum of 20% full wired spare and 20% installed spare I/O. CPU loading shall not exceed 50% of the maximum capacity. At least 20%, spare space shall be considered for cabinets for future extensions.

Multicore cables shall incorporate a minimum of 20% spare pairs. All unused cores in I.S. cables shall be connected to I.S. earth.

Instruments (including spares parts) shall be supplied with additional 20% of total quantity of each category (at least one item).

10.0 FACTORY ACCEPTANCE TESTING (FAT)

EPC CONTRACTOR shall be permitted to perform or witness (or both) completes testing of the system at VENDOR's premises.

VENDOR shall prepare a detailed set of procedures for the Factory Acceptance Test (FAT) for EPC CONTRACTOR review and approval at least 60 days in advance of the test date. FAT procedure shall be submitted to the Client for review and approval 30 days before the test. The FAT must demonstrate to EPC CONTRACTOR that the system meets the functional and integrity design basis. A sample FAT procedure shall be submitted as a part of the bid.

EPC CONTRACTOR shall have the prerogative to modify the System FAT test procedures to ensure specified performance and quality is being met.

VENDOR shall ensure that all systems components are available for an integrated test at the factory. This shall include his proprietary equipment, together with bought out items such as trip amplifiers, push buttons, lamps, annunciators, power supplies, etc.

Where practicable the actual communication cables shall be used, but test cables may be substituted when specifically agreed with EPC CONTRACTOR. This substitution shall not absolve VENDOR from the need to test communication devices, when part of VENDOR's scope of work.

FAT shall be carried out for 100% of I/O, connected devices and control hardware and software. VENDOR shall ensure that adequate power supplies and acceptable I/O simulation are provided for the 100% test, and that spares are available to ensure proper continuation of testing if failures occur.

System equipment shall be heat soak tested as a part of the FAT. Heat soak test shall be for 48 hours at 48°C. VENDOR shall have completed in-house testing of the system prior to commencement of the FAT.

Evidence of the equipment passing such tests shall be made available to EPC CONTRACTOR prior to FAT commencement. Performance deficiencies noted during the FAT shall be documented and a rectification strategy agreed. All deficiencies shall be rectified by the Control and Safety System VENDOR. A complete retest of the systems shall be performed if, in EPC CONTRACTOR’s judgement, fundamental problems are discovered.

In addition to functional and integrity tests, systems shall be subjected to the following EMI immunity tests: System equipment shall operate correctly in the presence of a portable cellular telephone in the frequency band of 450MHz, keyed at a distance from the equipment to yield a field strength of at least 10 volts/metre at the equipment (This field strength typically occurs at a distance of 6 inches (15cm) for a 1 watt transmitter).

This interference shall be imposed in accordance with IEC 801-3 and at all propagation angles. Such interference shall not affect span or reading by more than 0.1% nor cause spurious systems operation or systems malfunction.

VENDOR shall provide training for CONTRACTOR's employees at initial stage of design for five (5) personnel to familiarize with the system and final training for ten (10) operations and maintenance personnel at VENDOR's works.

COMPANIE’s representative shall be participated in all the FAT progress.

11.0 SITE ACCEPTANCE TEST

EPC CONTRACTOR will require VENDOR's full Site Acceptance Test (SAT) procedure to be available for review at least 60 days in advance of the test. SAT procedure shall be submitted to

the Client for review and approval 30 days before the test.

11.1 INTERFACE TESTING

All interfaces between sections of VENDOR's equipment shall be fully tested as part of the SAT.

Where VENDOR's equipment interfaces with systems from other VENDORS then the two systems shall be tested together in one location or the interface may be simulated. Generally simulation will be acceptable for hard wired interfaces. Where the system interface is via data link the use of simulators will depend on the extent and importance of the interface, and on past experience of the two VENDORs. The use of unproven hardware, software, or protocols will not be acceptable.

Where simulation of the interface is agreed, the two VENDORS, in conjunction with EPC CONTRACTOR, shall agree test procedures and acceptance criteria for the FAT, and shall provide all necessary test equipment.

11.2 PRE-COMMISSIONING AND COMMISSIONING SUPPORT

System VENDOR specialist services will be required during pre-commissioning and commissioning of the plant. A comprehensive proposal to provide the required specialists for commissioning support shall form part of EPC CONTRACTOR’s scope. Proposal shall include details of the skill and the hourly rates offered.

12.0 SPARE PARTS AND SPECIAL TOOLS

12.1 SPARE PARTS

The VENDOR shall provide lists of recommended spare parts, which shall include the original part numbers with prices for commissioning, start-up and two years operation. All spare parts shall be identified individually.

Spare parts for commissioning and start-up; a qualified and complete list based on PROJECT SPARE PART SUPPLY PROCEDURE (Doc. No. E&D-QC-SP-1).

Spare parts for two years operation; a qualified and complete list based on PROJECT SPARE PART SUPPLY PROCEDURE (Doc. No. E&D-QC-SP-1).

The VENDOR shall be able to provide spares back up and support for the plant life of at least 20 years.

SPIR form shall be approved by OWNER prior to procurement.

12.1 SPECIAL TOOLS

The VENDOR shall provide any special tools required for the satisfactory operation and maintenance of his equipment. A complete list of special tools shall be provided by the VENDOR at enquiry stage.

13.0 TRANING

Training shall be prepared to provide suitable personnel as required for the following:

- Design configuration assistance to CONTRACTOR
- Operator training courses
- Maintenance training courses
- Site installation and commissioning support.

VENDOR shall provide detailed information of factory and onsite training courses in his proposal.

VENDOR shall furnish UNIT RATES for providing training in English for three groups of employees:

- Engineering
- Operators
- Maintenance

Training shall be for Control System, especially on Ethernet TCP/IP data highway communication protocol.

As an additional option, VENDOR shall provide an instructor to conduct operator training before the start-up of plant operations. The training will be specific to the specific facility systems, graphics, control, etc. The instructor shall be required to provide a training manual based on compilation of all configuration work done on the facility systems.