طرح نگهداشت و افزایش تولید 27 مخزن

SPECIFICATION FOR INSTRUMENT AND CONTROL OF PACKAGE UNIT SYSTEM (PU)

نگهداشت و افزایش تولید میدان نفتی بینک

D01	MAY. 2022	IFA	P.Hajisadeghi	M.Fakharian	M.Mehrshad	
D00	AUG. 2021	IFC	M.Asgharnejad	M.Fakharian	Sh.Ghalikar	
Rev.	**Date**	**Purpose of Issue/Status**	**Prepared by:**	**Checked by:**	**Approved by:**	**CLIENT Approval**
Class: 2		**CLIENT Doc. Number: 'F9J-707182**				

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	X			
6	X	X			
7	X				
8	X				
9	X				
10	X				
11	X				
12	X				
13	X	X			
14	X	X			
15	X	X			
16	X	X			
17	X				
18	X				
19	X				
20	X				
21	X				
22	X				
23	X				
24	X				
25	X				
26	X				
27	X	X			
28	X				
29	X				
30	X	X			
31	X	X			
32	X				
33	X				
34	X				
35	X				
36	X				
37	X				
38	X	X			
39	X				
40	X				
41	X				
42	X				
43	X				
44	X				
45		X			
46		X			
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 D01

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 D01

This document covers minimum necessary requirements for the design, selection, manufacture, inspection, testing of "Instrument/Control part of the Package Unit System " for “Preservation and Production Increase of Binak oilfield” (Compressor station/ Extension of manifold and Gas-condensate Pipeline as project work packages). .

3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

· IPS-C-IN-100(1)	"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 Instruments"
· IPS-C-IN-120	"Construction (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(1)	"Construction and Installation Standard for Control Valves"
· IPS-C-IN-190	"Installation and Construction Standard for Transmission Systems"
· IPS-C-IN-240(1)	"Construction Standard for Measurement of Liquid Hydrocarbons Custody Transfer"
· IPS-E-IN-100(1)	"Engineering Standards for General Instrumentation"
· IPS-E-IN-105	"Engineering Standard for 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(1)	"Engineering Standard for Control Valves"
· IPS-E-IN-180	"Engineering Standard for Instrument Electrical Power Supply and Distribution Systems"
· IPS-E-IN-190	"Engineering Standard for Transmission Systems"
D01 · IPS-E-IN-240(1)	"Engineering Standard for Measurement of Liquid Hydrocarbons (Custody Transfer)"
· IPS-G-IN-160	"Petroleum industry, peripherals - Safety valves, control valves and Peripherals"
· IPS-G-IN-200(1)	"General Standard for Instrument Air System"
· IPS-G-IN-210	"General Standard for Instrument Protection"

- IPS-G-IN-220 "Engineering and Installation Standard for Control Centers"
- IPS-G-IN-230 "General Standard for Analyzers"
- IPS-G-IN-250 "Engineering & Construction Standard for Distributed Control System (DCS)"
- IPS-G-IN-260 "Engineering and Installation Standard for Indicating Lights, Alarms and Protective Systems"
- IPS-G-IN-270 "General Standard for Instruments of Fire-Fighting and Detection Equipment"
- IPS-G-IN-290 "Engineering and Construction Standard for Programmable Logic Controllers (PLC)"
- IPS-G-IN-300 "Tank Gauging Devices for Petroleum and Petroleum Products"
- IPS-I-IN-100(1) "Inspection Standard for General Instrument Systems"
- IPS-I-IN-115(1) "Periodical Inspection for Instrumentation"
- IPS-M-IN-100 "Material and Equipment Standard for General Instrumentation Factory Inspection and Testing of Instruments and 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-150 "Material and Equipment Standard for Receiving Instruments"
- IPS-M-IN-160(1) "Material Standard for Control Valves"
- IPS-M-IN-190 "Material and Equipment Standard for Transmission Systems"
- IPS-M-IN-220 "Material Standard for Control Panels and System Cabinets"
- IPS-M-IN-240 "Material Standard for Volumetric Liquid Measurement Methods (Custody Transfer)"
- IPS-M-IN-250(1) "Material and Equipment Standard for Distributed Control System (DCS)"
- IPS-M-IN-260 "Material and Equipment Standard for Alarm and

Protective Systems"

- IPS-M-IN-280 "Material Standards for Miscellaneous Items"
- IPS-M-IN-290 "Material and Equipment Standard for Programmable Logic Controllers (PLC)"
- IPS-M-EL-174(2) "Material and Equipment Standard for Battery and battery Charger (DC Power Supply)"
- IPS-E-TP-100 "Engineering Standard for Paints"

3.2 INTERNATIONAL CODES AND STANDARDS

ANSI (American National Standards Institute)

- B1.20.1 "Pipe threads, general purpose (Inch) "
- B16.5 "Pipe flanges and flanged fittings"
- B16.10 "Face-to-Face and End-to-End dimension of valves"
- B16.36 "Orifice flanges"
- B16.37 "Hydrostatic testing of control valves"
- B16.104 "Control valve seat leakage (FCI 70-2)"
- B31.3 "Process piping"
- B46.1 "Flange face and finishing"

API (American Petroleum Institute)

- API 500 "Recommended practice for classification of locations for electrical installation at petroleum facilities Classified as Class I, Division 1 and Division 2"
- API 505 "Recommended practice for classification of locations for electrical installation at petroleum facilities Classified as Class I, Zone 0, Zone 1 and Zone 2"
- API 520 "Design and installation of pressure relieving systems in refineries"
- API 521 "Guide for pressure relief and depressurizing systems"
- API 526 "Flanged steel safety relief valves"
- API 527 "Seat tightness of safety relief valves"
- API 551 "Process measurement Instrumentation"
- API 552 "Transmission systems"
- API 553 "Refinery control valves"

- API 554 "Process Instruments and control"
- API 555 "Process analyzer"
- API 556 "Instrumentation and control for field heater and steam generators"
- API std670 "Vibration, axial position and bearing temperature monitoring system"
- API std2000 "Venting atmosphere and low-pressure storage tank"
- API Manual "Petroleum Measurement Standards"

ASME (American Society of Mechanical Engineers)

- ASME "Boiler and pressure vessel codes section IX latest edition"
- ASME "Unfired pressure vessel code section VIII division I parts UG-125 through UG-136 and division 2, part AR."

BSI (British Standards Institution)

- BS 1042 "Measurement of fluid flow in closed conduits"
- BS 1780 "Specification for bourdon tube pressure and vacuum gauges"
- BS 2765 "Specification for dimensions of temperature detecting elements and corresponding pockets"
- BS 3463 "Specification for observation and gauge glasses for pressure vessels"
- BS 4683 "Electrical apparatus for explosive atmospheres"
- BS 5308 "Instrumentation cables"
- BS 5345 "Selection, Installation maintenance of electrical apparatus for use in potentially explosive atmospheres"
- BS 6121 "Mechanical cable glands – specification for metallic glands circuit Integrity under fire conditions"
- BS 6387 "Performance requirements for cables required to maintain"
- BS 6667 "Electromagnetic compatibility for industrial process measurement and control equipment"
- BS 7671 "Requirements of electrical installations, IEE wiring regulations"
- BS EN 837 "Pressure gauges: selection and Installation

Recommendations"

IEC (International Electrotechnical Commission)

- IEC 60079 "Electrical apparatus for explosive gas atmospheres"
- IEC 60092-375 "General Instrument, control and communication cables"
- IEC 60529 "Degrees of protection provided by enclosures (IP Code)"
- IEC 60534 "Industrial process control valves"
- IEC 60584 "Thermocouple reference tables"
- IEC 60751 "Industrial platinum resistance thermometer sensors"
- IEC 61000 "Electromagnetic compatibility for Industrial process measurement and control equipment"
- IEC 60332 "Tests on electric cables under fire condition"
- IEC 61131 "Programmable controllers"
- IEC 61158 "Fieldbus standard for use in industrial control systems"
- IEC 61508 "Functional safety of electrical/electronic/programmable electronic safety related systems"
- IEC 61511 "Safety Instrumented systems for the process Industry"
- IEC- 34-5 "Rotating electrical machines – Part 5"
- IEC- 337-1 "Switch contact rating"
- IEC- 534-8-3 "Control valve noise calculation"

ISA (International Society for Measurement and Control)

- ISA S5.1 "Instrumentation symbols and identification"
- ISA S5.2 "Binary logic diagrams for process operations"
- ISA S5.3 "Graphic symbols for distributed control/shared display Instrumentation, logic and computer system"
- ISA S5.4 "Instrument loop diagrams"
- ISA S5.5 "Graphic symbols for process displays"
- ISA RP16.1.2.3 "Terminology, dimensions and safety practices for Indicating variable area meters (rotameters), (glass

tube, metal tube, expansion glass tube)"

- ISA RP16.4 "Nomenclature and terminology for extension type variable area meters"
- ISA RP16.5 "Installation, operation, maintenance instructions for glass tube variable area meters (rotameters)"
- ISA RP16.6 "Methods and equipment for calibration of variable area meters (rotameters)"
- ISA S18.1 "Annunciators sequences and specification"
- ISA RP31.1 "Specification, Installation and calibration of turbine flowmeters"
- ISA RP 60.8 "Electrical guide for control centers"
- ISA S61.1 "Procedures for executive function for process input output and bit manipulation"
- ISA S61.2 "Procedures for file access and the control of file contention"
- ISA S75.01 "Flow equations for sizing control valves"
- ISA S75.02 "Control valve capacity test procedure"
- ISA S75.03 "Face to face dimensions for flanged globe type control valves"
- ISA S75.04 "Face to face dimensions for flangeless control valves"
- ISA S75.05 "Control valve terminology"
- ISA S75.08 "Installed face to face dimensions for flanged clamp or pinched valves"
- ISA S75.12 "Face to face dimensions for socket weld-end and screwed-end globe style control valves (ANSI Classes 150, 300, 600, 900, 1500 & 2500)"
- ISA S75.14 "Face to face dimensions for butt weld-end globe style control valves (ANSI class 4500)"
- ISA S75.15 "Face to face dimensions for butt weld-end globe style control valves (ANSI classes 150, 300, 600, 900, 1500 & 2500)"
- ISA S75.16 "Face to face dimensions for flanged globe style control valve (ANSI classes 900, 1500 & 2500)"
- ISA S75.19 "Hydrostatic testing of control valves"
- ISA S84.01 "Application of Safety Instrumented Systems for the Process Industries static"

ISO (International Organization for Standardization)

· ISO 68 ISO	"General Purpose Screw Threads - Basic Profile"
· ISO 261 ISO	"General Purpose Metric Screw Threads - General Plan"
· ISO 724 ISO	"General Purpose Metric Screw Threads - Basic Dimensions"
· ISO 2714	"Liquid hydrocarbons- volumetric measurement by displacement meter systems other than dispensing pumps"
· ISO 2715	"Liquid hydrocarbons- volumetric measurement by turbine meter systems"
· ISO 5167	"Measurement of fluid flow by means of orifice plates, nozzles, and venturi tubes inserted in circular cross-section, conduits running full."
· ISO/TR 5168	"Measurement of fluid flow, estimation of uncertainty"
· ISO 9001	"Quality Management System requirements"
· ISO 9002	"Quality Systems- Model for Quality assurance in Production, Installation and servicing"

NEMA (NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATIONS)

· NEMA IA 2.1-2002	“Programmable Controllers-General Information”
· NEMA IA 2.2-2002	“Programmable Controllers-Equipment Requirements and Tests”
· NEMA IA 2.3-2002	“Programmable Controllers-Programming Languages”
· NEMA ICS 6	“Industrial Control and System Enclosures”

NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

· NFPA 72: 2002	“National Fire Alarm and Signaling Code”

OTHER STANDARDS

· NACE MR 0175/ ISO 15156	"Petroleum and Natural Gas Industries – Materials for Use in H2S-Containing Environments in Oil and Gas Production"
· IEEE 472	"Surge Protection"
· EIA RS23214221423/485	"Communications Specifications"
· EN 61000-6-2	"Electromagnetic compatibility (EMC)-Part 6-2: Generic standards Immunity for industrial environment"
· NEC #70	“National Electrical Codes”

3.3 THE PROJECT DOCUMENTS

D01

· BK-GNRAL-PEDCO-000-PR-BD-0001	Process Basis of Design
· BK-GNRAL-PEDCO-000-IN-SP-0002	Specification For Control System
· BK-GNRAL-PEDCO-000-IN-SP-0002	Specification For ESD System
· BK-GNRAL-PEDCO-000-IN-SP-0001	Specification For Instrumentation
· BK-SSGRL-PEDCO-110-IN-DC-0002	Instrument and Control Design Criteria
· BK-GCS-PEDCO-120-IN-DC-0002	Instrument and Control Design Criteria
· BK-PPL-PEDCO-320-IN-DC-0001	Instrument and Control Design Criteria
· Symbol & Legend For PFD and P&ID	BK-SSGRL-PEDCO-110-PR-PI-0001
· P&ID - W018S	BK-W018S-PEDCO-110-PR-PI-0001
· P&ID - W028	BK-W028-PEDCO-110-PR-PI-0001
· P&ID - W0046S	BK-W046S-PEDCO-110-PR-PI-0001
· P&ID for Diesel Oil Drum- W0046S	BK-W046S-PEDCO-110-PR-PI-0002
· P&ID for Potable Water Tank - W0046S	BK-W046S-PEDCO-110-PR-PI-0003
· P&ID - W035	BK-W035-PEDCO-110-PR-PI-0001
· P&ID - W008N	BK-W008N-PEDCO-110-PR-PI-0001
· P&ID - Extension of Binak B/C Manifold	BK-W007S-PEDCO-110-PR-PI-0001
· P&ID - W007S	BK-W007S-PEDCO-110-PR-PI-0002
· P&ID for Diesel Oil Drum- W007S	BK-W007S-PEDCO-110-PR-PI-0003
· P&ID for Potable Water Tank - W007S	BK-W007S-PEDCO-110-PR-PI-0004
· P&ID for Diesel Oil Drum- BK14	BK-BK14-PEDCO-110-PR-PI-0001
· P&ID for Potable Water Tank - BK14	BK-BK14-PEDCO-110-PR-PI-0002
· P&ID for Diesel Oil Drum- BK12	BK-BK12-PEDCO-110-PR-PI-0001
· P&ID for Potable Water Tank - BK12	BK-BK12-PEDCO-110-PR-PI-0002
· P&ID for Diesel Oil Drum- BK15	BK-BK15-PEDCO-110-PR-PI-0001
· P&ID for Potable Water Tank - BK15	BK-BK15-PEDCO-110-PR-PI-0002
· P&ID for Diesel Oil Drum- BK05	BK-BK05-PEDCO-110-PR-PI-0001
· P&ID for Potable Water Tank - BK05	BK-BK05-PEDCO-110-PR-PI-0002
· Symbol & Legend For PFD and P&ID	BK-PPL-PEDCO-320-PR-PI-0003
· P&ID - Gas Pipeline (to Siahmakan G.I. Station)	BK-PPL-PEDCO-320-PR-PI-0001
· P&ID - Condensate Pipeline (to Binak PU)	BK-PPL-PEDCO-320-PR-PI-0002
· Symbol & Legend For PFD and P&ID	BK-GCS-PEDCO-120-PR-PI-0001
· P&ID- Gas Compression Inlet Gas Pipeline (Binak)	BK-GCS-PEDCO-120-PR-PI-0002

· P&ID- Gas Compression Inlet Gas Pipeline (Golkhari)	BK-GCS-PEDCO-120-PR-PI-0003
· P&ID - Slug Catcher System	BK-GCS-PEDCO-120-PR-PI-0004
· P&ID - Gas Compression Inlet Knock Out Drum	BK-GCS-PEDCO-120-PR-PI-0005
· P&ID - 1st Stage Gas Compression Suction Drums	BK-GCS-PEDCO-120-PR-PI-0006
· P&ID - 1st Stage Gas Compression Compressors	BK-GCS-PEDCO-120-PR-PI-0007
· P&ID - 1st Stage Gas Compression Air Coolers	BK-GCS-PEDCO-120-PR-PI-0008
· P&ID - 2nd Stage Gas Compression Suction Drums	BK-GCS-PEDCO-120-PR-PI-0009
· P&ID-2nd Stage Gas Compression Compressors	BK-GCS-PEDCO-120-PR-PI-0010
· P&ID - 2nd Stage Gas Compression Air Coolers	BK-GCS-PEDCO-120-PR-PI-0011
· P&ID - 2nd Stage Gas Compression Discharge Drum	BK-GCS-PEDCO-120-PR-PI-0012
· P&ID - Gas Compression Dehydration Package	BK-GCS-PEDCO-120-PR-PI-0013
· P&ID - Lean Glycol Storage Tank	BK-GCS-PEDCO-120-PR-PI-0014
· P&ID - Instrument & Plant Air System	BK-GCS-PEDCO-120-PR-PI-0015
· P&ID - Nitrogen Generation System	BK-GCS-PEDCO-120-PR-PI-0016
· P&ID - Close Drain System	BK-GCS-PEDCO-120-PR-PI-0017
· P&ID - Corrosion Inhibitor Package	BK-GCS-PEDCO-120-PR-PI-0018
· P&ID - Methanol Injection Package	BK-GCS-PEDCO-120-PR-PI-0019
· P&ID - LP Flare System	BK-GCS-PEDCO-120-PR-PI-0020
· P&ID - Oily Water Sewer	BK-GCS-PEDCO-120-PR-PI-0021
· P&ID - Fuel Gas System	BK-GCS-PEDCO-120-PR-PI-0022
· P&ID - Diesel Oil System	BK-GCS-PEDCO-120-PR-PI-0023
· P&ID - Potable Water System	BK-GCS-PEDCO-120-PR-PI-0024
· P&ID - Glycol Sump Drum	BK-GCS-PEDCO-120-PR-PI-0025
· Specification for Instrument/F&G Cables	BK-GNRAL-PEDCO-000-IN-SP-0010

3.4 ENVIRONMENTAL DATA

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

4.0 ABBREVIATIONS

NISOC	National Iranian South Oil Company

AFC	Approved for Construction
AFD	Approved for Design
AI	Analog Input
AO	Analog Output
CB	Control Building
CR	Control Room
CPU	Central processing Unit
DCS	Distributed Control System
DI	Digital Input
DO	Digital Output
EMC	Electro-magnetic Compliancy
ESD	Emergency Shut Down
EWS	Engineering Work Station
FAT	Factory Acceptance Test
F&G	Fire and Gas
FTA	Field Termination Assemblies
FTB	Field Terminal Block
I/O	Input Output
IS	Intrinsic Safety
JB	Junction box
LED	Light Emitting Diode
LM	Link Master
LV	Low Voltage

D01

MTBF	Mean Time between Failures
MTTR	Mean Time to Repair
OCD	Operator Control Desk (Console)
OWS	Operator Work Station
P&ID	Process & Instrumentation Diagram
PLC	Programmable Logic Controller
SAT	Sit Acceptance Test
UCP	Unit Control Panel
UPS	Uninterruptible Power Supply
UCP	Unit Control Panel
VDU	Visual Display Unit

5.0 ORDER OF PRECEDENCE

D01

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

6.0 TECHNICAL SPECIFICATION

6.1 ENVIRONMENTAL CONDITION

Instruments and equipment shall be designed to operate indoor/outdoor and at environmental conditions describe in document'' Process Basis of Design; Doc. No.BK-GNRAL-PEDCO-000-PR-BD-0001'.

6.2 HAZARDOUS AREA CLASSIFICATION

All instrumentation equipment, materials and installation methods shall comply and fully satisfy the statutory requirements for the area classification identified on the hazardous area classification layout. In general all analogue instruments in hazardous area installations shall be Intrinsically Safe, EExi type according to CENELEC, for area classification zone 2 according to Hazardous Area classification schedule, unless

otherwise specified in datasheet. Intrinsically Safe protection shall be obtained by means of galvanic separation barriers.

6.3 INGRESS PROTECTION

All field mounted instrumentation equipment, including junction boxes, shall have a minimum ingress protection of IP65 (protected against dust and jets of water) to IEC 60529.

Equipment located within Control and Equipment Rooms shall have a minimum ingress protection of IP54. Instruments not classified accordingly shall be subject to Contractor approval.

Sunshades or heated enclosures, as necessary, shall be provided for field mounted instruments.

6.4 ELECTROMAGNETIC COMPATIBILITY

In order to comply with the requirements of IEC 61000, all electrical equipment shall meet the current applicable levels of ‘emission’ and ‘immunity’. All applicable equipment shall be designed so that the electromagnetic disturbance it generates does not exceed a level allowing telecommunications equipment and other relevant apparatus to operate as intended.

The design of equipment should be of an adequate standard to maintain its performance during its operational life in its installed environment. For the purpose of EMC, the performance of apparatus that must comply is taken to be degraded if permanent or temporary loss of function occurs.

6.5 RADIO INTERFERENCE

The instrumentation equipment shall be immune to interference from hand-held radio transceivers in the immediate vicinity with signal strength of up to 30 V/m over the range 20 to 1000 MHz and shall not affect the operation of other equipment.

6.6 TRANSMITTED SIGNALS

Transmitted electronic signals shall operate in the 4-20mA signal range, using a nominal voltage level of 24 VDC on a two wire transmission circuit. Smart transmitters shall be used wherever possible, using HART protocol for configuration, performance monitoring and maintenance of the transmitter.

Analogue transmitters with signal level sensing in the Control System cabinets are preferred for trip and alarm duties. In general, field switch devices (i.e. pressure, level,

flow and temperature switches) shall not be used.

Dedicated transmitters shall be used for shutdown duty, separate from transmitters for control/indication purposes measuring the same process variable.

Pneumatic instrumentation, where used, shall operate in the range 0.2 to 1.0 barg.

ON/OFF signal for alarms, trip relays and logic shall be 24VDC.

6.7 UTILITIES

The following utilities can be made available, as required, at the Package boundary:

- 400VAC, 3 phase, 50Hz electrical power, typically for motorized valves and sample pumps (May be used just when UCP is not installed in Control Building).
- Two redundant 110VAC, 1 phase, 50Hz electrical power from an Uninterruptible Power Supply for Unit Control Panels (UCP).
- 230VAC, 1 phase, 50Hz electrical power from a normal supply for heating, lighting and socket outlets.
- For Instrument air at a Minimum, Normal operating and maximum pressure, refer to BK-GNRAL-PEDCO-000-PR-BD-0001.

Suppliers shall advise utility requirements for the equipment offered within their Proposal.

6.8 UNITS OF MEASUREMENT

Engineering units shall be generally based on the International System (SI). Specifically, the following units of measurement shall be used:

- Mass flow rate kg/h
- Volumetric flow rate m3/h
- Crude oil flow rate kg/h
- Density kg/m3
- Absolute Pressure bara
- Gauge Pressure brag
- Differential Pressure bar
- Length km, m, mm
- Volume m3
- Temperature ºC

- Viscosity cP
- Power kW

7.0 MATERIAL REQUIREMENTS

7.1 MATERIALS

Materials of construction shall be suitable for the environmental specified conditions and the process conditions identified in the relevant Package Specification and attachments.

Materials of construction of in-line equipment shall be equal to, or better than the relevant piping class.

In general, unless specifically identified otherwise in the Package Specification and attachments, process wetted materials shall comply with the requirements of NACE MR-01-75/ISO 15156.

Field mounted transmitter bodies shall generally be manufactured in stainless steel unless a higher grade material is required for the process duty. Electronics housings (typically manufacture form low copper aluminum alloy) shall be provided with a coating suitable for the environment or be manufactured in stainless steel.

Electrical cable entries shall generally be M20 x 1.5 ISO unless a larger size is required to accommodate the cable gland.

The Supplier shall be responsible for the selection of the equipment and materials of construction based on the information supplied in this specification and attachment.

7.2 RECOMMENDED SUPPLIERS

A list of preferred instrument component suppliers will be provided with the requisition. The objective of that is to provide a short list of suppliers, for the major instrument components who can provide the required components to an acceptable level of technical quality.

Where practicable, Suppliers shall provide equipment in accordance with this List. However, instrumentation from alternative suppliers may be offered where technical and/or commercial advantages can be demonstrated or where compliance would impact on the Supplier’s standard Package design.

7.3 INSTRUMENT LABELS AND NAMEPLATES

Each item of equipment and instrumentation shall be provided with a manufacture's nameplate detailing model and serial number, range, materials of construction, certification code and relevant Equipment details.

In addition, a securely attached engraved stainless steel label shall show the individual instrument tag number. All cables and junction boxes shall be clearly identified with permanent markers/labels as well.

Information on labels shall be in English.

Instrument, equipment and cable numbers shall be allocated based on Instrument numbering procedure.

7.4 PAINTING

Painting procedures, for all instruments, shall reflect the harsh environment in which the equipment shall be installed.

All metallic surfaces, other than stainless steel, shall be painted in accordance with the "Specification for painting''. Alternatively, the SUPPLIER may offer his standard painting specification with his proposal, for approval by the CONTRACTOR.

In addition, any damaged parts of ready painted instruments and components shall be prepared and painted, before assembly, in accordance with the above project specification for painting. Painting of flameproof components, other than that applied by the manufacturer, is prohibited. Repairs to paintwork on flameproof equipment shall be in accordance with the manufacturer's instructions and with IEC 60079.

All bracketry and steelwork used for the support of instruments, racking, tray, etc., shall be prepared and painted black before fixing and re-touched after installation, in accordance with the above project specification for painting.

8.0 PACKAGE DESIGN SPECIFICATION

8.1 GENERAL

Packages shall be pre-assembled on skids, complete with local piping and instrument systems, before delivery to site. The majority of packages will be installed outside, exposed to the harsh environmental conditions.. A few Packages will be installed inside a building or enclosure.

Vendor is responsible for the engineering, detailed design, fabrication and supply of the package unit(s).

It is the responsibility of the Vendor to ensure that the package unit(s) supplied to meet all the requirement of this specification together with the referred documents and codes.

All correction or modification requested by the CONTRACTOR and agreed by the Vendor will be under Vendor responsibility. Vendor shall ensure that request is operable and safe regarding process and safety.

When CONTRACTOR specifies typical schemes in the call for bid documents, it is the Vendor's responsibility to examine them and condense or modify them in that his proposed design will insure a safe and operable unit.

The Vendor shall provide literal descriptions and functional logic diagrams for start up, sequence control, safeguarding and emergency shutdown procedures, for Contractor approval. All interfaces between package battery limits and Control System shall be fully detailed by the Vendor during the detail engineering of package and submitted for approval to Contractor.

8.2 INSTRUMENTATION

The Vendor shall provide all instruments and their accessories in accordance with the referred project documents and with the relevant codes and standards listed..

Instrumentation shall be electronic type as a general rule, but might be pneumatic type in case of local control loop as long as associated status, alarms and controls are not required by the Control System.

Instrument shall be selected according with the relevant reference document mentioned in section 3.1.

8.3 INSTALLATION

Each instrument shall be calibrated by the Vendor. Before delivery, a copy of the calibration sheet shall be delivered to the Contractor; these shall be included within the technical documentation requested in the requisition.

8.4 CONTROL SYSTEM

Basically, three types of packages shall be considered:

8.4.1 Package type A

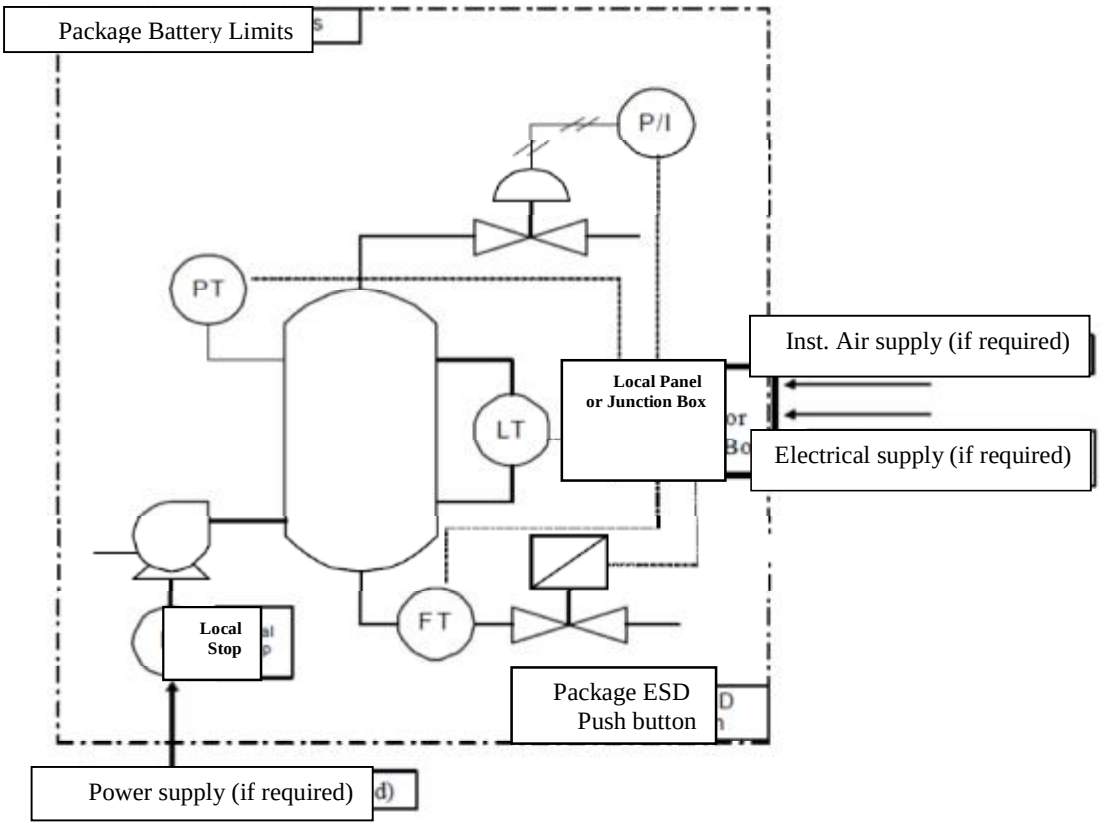
Standalone packaged unit with no (or very limited) interface with DCS, ESD and F&G systems.

The package is equipped with its instruments and controlled by its attached local panel. This package type is restricted to a unit with only few instruments or alarms connected to the DCS.

This type of Packages shall contain all required instruments as required for the safe operation of the Package. All instrumentation equipment shall be fully installed in accordance with this Specification, referenced documents and all relevant codes, standards and regulations.

Note1: Junction Boxes segregation shall be according to Specification for Instrument Installation.

Package “Type A” Diagram



8.4.1.1 Package Vendor/Supplier Scope of Work

- Detailed engineering studies
- Equipment list and instrument list,
- Data sheets,
- I/O lists and configuration data,
- Cables list,
- Wiring Connection Diagram,
- Detailed functional description to the Contractor,
- Validation of part of Functional analysis done by the Contractor
- Instruments Junction Boxes wiring connection diagram,
- Programming and I/O configuration of local panel

FAT of package control system to be performed by Package VENDOR

8.4.1.2 Package Vendor/Supplier Scope of Supply

- All instruments (fully installed, piped & wired on skid),

- All other instrument equipment (Local Panel when required...),
- Accessories (impulse lines, fittings, cables glands),
- Junction Boxes (cable glands, terminals, plugs...),
- Cables, inside the skid battery limits and special instrument cables , all wiring and cabling inside panels.
- Cable trays and their accessories inside the skid battery limit (labels, supports...),
- Utility distribution inside the skid battery limits,
- Documentation.
- All computing hardware and software

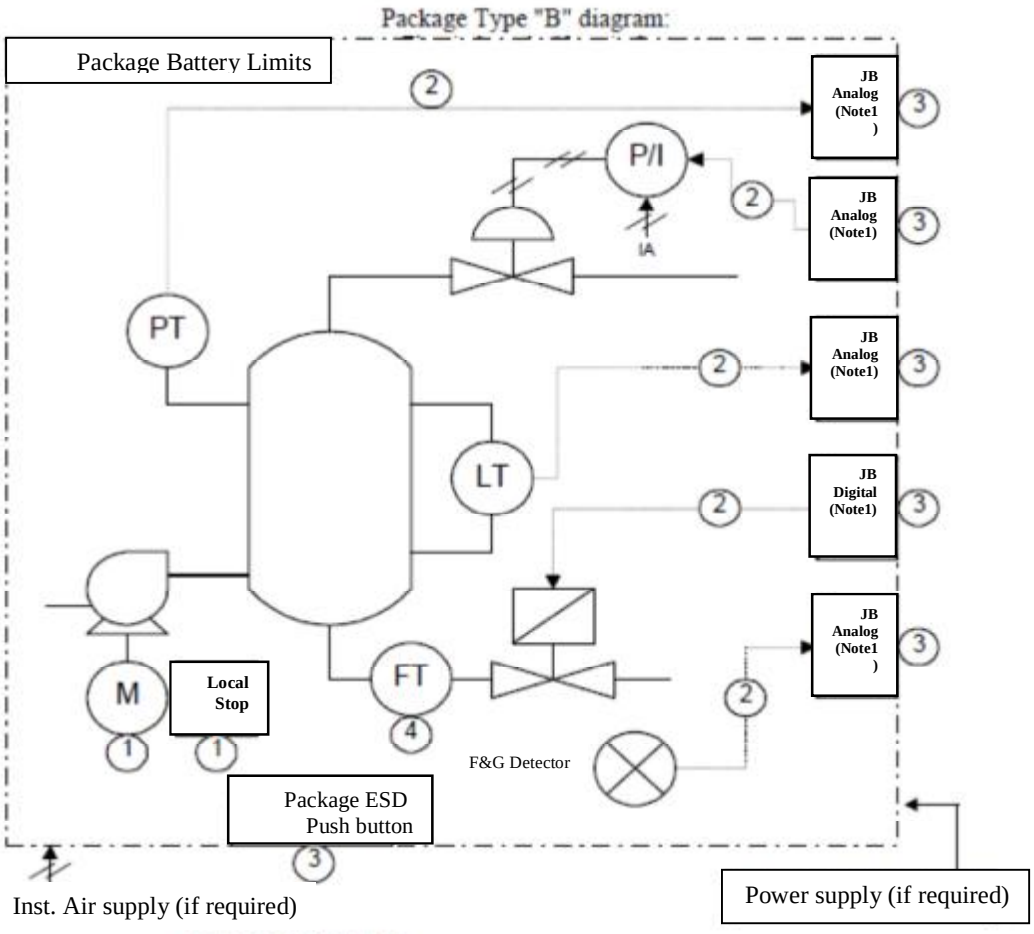
Note: All cables outside battery limit are out of the Vendor scope of supply.

8.4.2 Package type B

Packaged unit fully remotely controlled (monitoring and control functions) by the DCS and ESD and F&G systems. There is no VENDOR supplied control cabinet for these packages.

The package is equipped with its instruments, wired by means of appropriate cables and cable routing. The cables are connected to the junction boxes located at the skid edge battery limits or at edge of base plate. All controls are incorporated into the IPCS by the IPCS Integrator.

Package “Type B” Diagram



Package Battery Limits

1. Electrical Cable from / to Package equipments up to MCC (out of Package Vendor's scope of supply)
2. Instrumentation Cable from / to instrument up to JB
3. Instrumentation Cable from / to JB up to Systems (out of Package Vendor's scope of supply)
4. Special Instrumentation Cable from / to instrument up to Systems, except where it is possible to transmit the signal throught the 4-20 mA junction box

Note 1: Junction Boxes segregation shall be according to Instrument Installation Specification

8.4.2.1 PACKAGE VENDOR/SUPPLIER SCOPE OF WORK

- Equipment list,
- Instrument List,
- Data sheets,
- Cables list,
- Instruments Junction Boxes wiring connection diagram,
- Detailed engineering studies),
- Detailed functional description to the Contractor.
- I/O lists and configuration data,
- Validation of part of Functional analysis done by the CONTRACTOR
- Participation to the IPCS FAT (Integration Test) to prove the implementation of the application.
- FAT of package

8.4.2.2 PACKAGE VENDOR/SUPPLIER SCOPE OF SUPPLY

- Accessories (impulse lines , fittings ,labels, local routings , cables glands , …)
- Utility distribution inside the battery limit,
- Documentation.
- All computing hardware and software, (if required).
- All instruments (including but not limited to: analogue transmitters, on/off valves and equipment, control valves, ESD valves, Blow down valves, Motor Operated Valves, relief valves), fully installed, piped & wired on skid,
- All other instrument equipment, including but not limited to panels, (Local Panel when required),
- All Junction Boxes, (Terminals, plugs, etc.),
- Cables, inside the skid battery limit and special cables,
- Cable trays and their accessories (labels, supports, etc.),
- All piping and tubing

Note: All cables outside battery limit are out of the Vendor scope of supply.

8.4.3 Package type C

Packaged unit fully controlled by a Package UCP located either on the skid package itself or remotely in the cabinet room.

Type "C" package UCP shall be connected to the DCS, ESD and F&G systems, for monitoring, control functions and emergency shutdowns.

A package type C is delivered with its own autonomous control and safety cabinets being PLC based and includes all relevant control equipment as well as process safety and fire & gas systems equipment as applicable.

Control and safety systems used for sequences and/or automatic shutdown shall be supplied and programmed by the Vendor. If this system needs to be connected to the DCS, all information related to DCS configuration shall be provided by the Vendor to the Contractor and Control System Vendor.

The package Process Safety Systems can be combined with the package DCS.

All safeguarding I/O's between safety systems package type C and the plant safety systems shall be hardwired. Package safety systems are only for protection of the package.

Each Package Unit shall be controlled from its own UCP located locally or in Control Building. Full access to package parameters, shall only be possible from the UCP.

To configure, control and maintain the Package Unit (this included hardware and software for PLC maintenance), Vendor shall provide the minimum special tools required for correct operation and for maintenance.

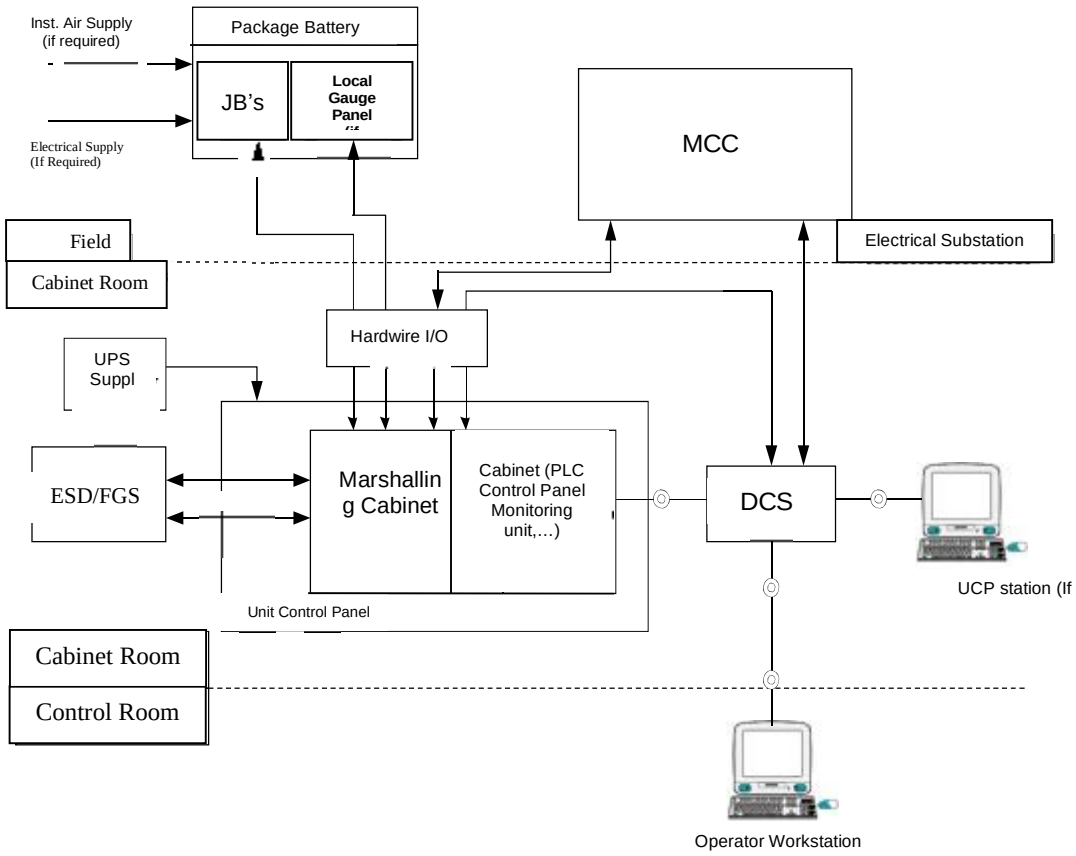
The control and monitoring of the package shall be from the Control System.

D01

An Engineering workstation for this type of package shall be considered.

Serial Link for Interface Between UCP and DCS shall be MODBUS RTU

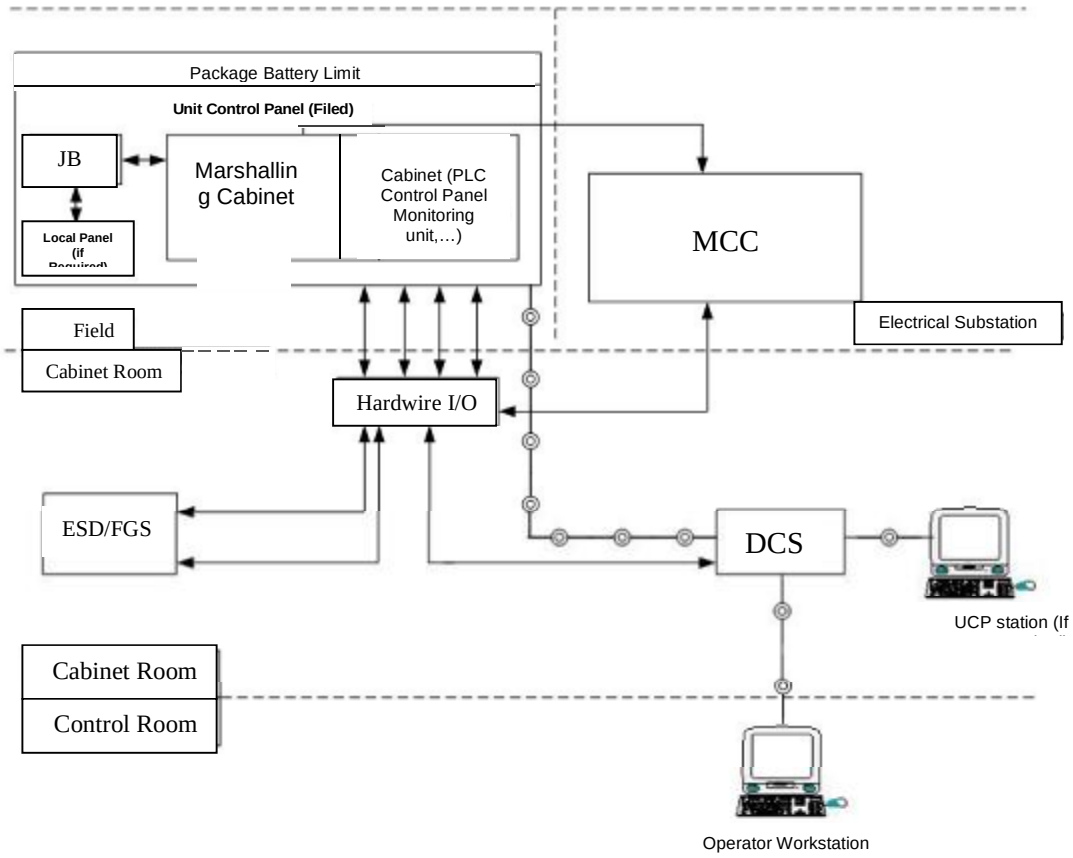
Package “Type C” Diagram



8.4.3.1 FIELD UCP

However, the Unit Control panel will only be located in the field (Type “C-L”) subject to contractor approval and when:

- Package controls are limited to few instructions, with not many I/Os,
- Packages are dedicated only to F&G equipment as Fire water pumps... Packages with Unit Control Panel field mounted (field UCP) shall follow the following architecture:



8.4.3.2 PACKAGE VENDOR/SUPPLIER SCOPE OF SUPPLY

- All instruments,
- F&G Detectors when F&G logic is implemented in UCP,
- All equipment (Local Panel when required...),
- Accessories (impulse lines, labels, fittings, cables glands), necessary for package,
- All Junction Boxes, (Terminals, plugs...),
- Cables, inside the skid battery limit and special cable,
- Cable trays and their accessories (labels, supports...),
- Utility distribution within skid,
- UCP and UCP programming devices in accordance with PLC requirements Documentation.

General Notes for all Type of Packages (Type A, B & C)

- Package vendor is responsible for ensuring proper communication between package control system/ field instruments and DCS, ESD and F&G.

- All cables outside the battery limit are out of the Vendor scope of supply.
- As a rule all transmitters shall be HART Smart 4-20 mA indicating type. Local indicators shall be provided where specifically indicated on the P&ID's
- The number of manufacturers and types of instruments shall be minimized in accordance with the CONTRACTOR vendor list. The manufacturers shall be agreed with the CONTRACTOR.
- Auto restart of a package shall not occur unless specifically agreed with CONTRACTOR.

Exception:

In case of a small quantity of I/Os, the marshalling cabinet may not be required. The Control Cabinet may contain all marshalling functions, if agreed by Contractor.

When specific monitoring system (as vibration...) is required, it shall be considered as part of the UCP.

8.5 EARTHING

All field instrument cases, cabinets and JBs earthing shall be based on "relevant IPS standards which are mentioned bellow:

D01

ENGINEERING STANDARD FOR ELECTRICAL SYSTEM DESIGN IPS-E-EL100

REFERENCE DRAWING GROUNDING INSTALLATION DETAIL IPS-D-EL400 To 417

8.6 INSTRUMENT AIR SUPPLY

Only one instrument air supply shall be provided per Package unit.

The Vendor shall furnish within the package the instrument air sub-header and distribution network to all users on the package.

8.7 JUNCTION BOX

Junction boxes shall be:

- Weather-proofed to IP 65, as a minimum,
- Grouped together on the skid edge to allow easy hook-up to Contractor's multi-cables
- (final location and arrangement of terminals shall be approved by Contractor),
- Made of stainless steel and be as a minimum of safety EExe type,
- Cable glands shall be metallic, nickel plated brass. Glands shall be EExd certified.

At least 20% spare terminal shall be considered in junction boxes. All spare cores within cables shall be terminated on spare terminals within JB. Spare cores shall not be cut back or taped to the cable.

Instrumentation signals shall be segregated according to their nature and system they belong to.

Vendor shall also consider enough space in junction boxes for package instruments that shall be furnished by the contractor.

8.8 CABLE

Cables required for Packages type A, B and C shall be provided by the Vendor based on the requirements mentioned in project document “Specification for Instrument/F&G Cable Doc No.: BK-GNRAL-PEDCO-000-IN-SP-0010”.

Vendor shall provide a cable schedule in his documents (with electronic file in Excel or Access) including all required cables for his package and package’s communication with other systems (like DCS, ESD, etc.). The list shall provide at least following information for each cable:

- Tag number
- Source (From)
- Destination (To)
- Size (number of cores/pairs/triads + core cross section)
- Type (Armour, Screen, Insulation, Voltage grade, Fire test)
- Outer sheet color
- Overall diameter
- Length (meter)
- Supplier (Vendor / Contractor)
- Manufacturer

Size and other specifications of cables which are not in Vendor’s scope of supply may be commented by Contractor in order to reduce the variety of instrument cables. In this case, Vendor shall use 12 Pair cables for multi cables which shall be supplied by the contractor.

20% spare capacity shall be considered in each cable.

9.0 UCP REQUIREMENTS

9.1 GENERAL

The package control system shall be PLC based and shall perform the following functions:

- Process control,
- Parameters monitoring and associated process shutdown actions,
- Package fire and gas monitoring (if required) and associated shutdown actions,
- Supervision and data archiving functions,
- Printing facilities (if required).

The UCP shall include marshalling and PLC cabinets.

When UCP installed outside in a process zone, the UCP shall be certified for the relevant hazardous area. Each electrical instrument or system to be installed in hazardous area shall be designed, constructed and installed according to ATEX requirements.

9.2 PROGRAMMABLE LOGIC CONTROLLERS (PLC)

9.2.1 General

The type (manufacturer and model) of PLC shall be uniform with the other PLC's provided for the project and must be submitted to Contractor for approval by the Vendor.

The PLC shall be supplied with all tools, hardware and software (including original licenses) necessary for control, configuration, development and maintenance.

9.2.2 Reliability and availability

Special attention shall be paid to the PLC availability in close relationship with the criticality of the package. A commonly admitted figure for PLC availability of critical packages is 99.97%, based on an MTTR of 24 hours and will use adequate diagnostic features to enable efficient fault detection and repair.

The power supplies shall be considered for the calculation of the UCP availability.

9.3 PLC HARDWARE

9.3.1 General

The PLC shall be supplied in a cabinet fully wired and tested. This includes:

- Power generation and/or distribution with all protecting devices,
- PLC chassis and modules,
- System interconnecting cables,
- Input/ Output mirror termination boards,
- Cross-wiring to marshalling terminals,
- Cabinet utilities, e.g. lighting, fans, temperature monitoring, heating/drying system when necessary, sockets, etc.

At least 10% spare space shall be considered in PLC rack.

9.3.2 Power supply modules

They shall be redundant and shall generate the PLC internal voltage rates from the 110V AC UPS power source provided by Contractor. Associated power distribution shall also be based on redundant feeders from UPS.

Each module shall not be loaded at more than 80% of total power consumption at in-rush conditions.

9.3.3 Central Processor Units

Memory modules shall be of the non-volatile type.

When RAM is used, they shall be battery saved. A battery low voltage indicator shall be available on the CPU front face.

The PLC shall be able to issue self-diagnostic alarms like:

- PLC watchdog,
- Power supply failure,
- I/O channel failure,
- I/O card failure,
- Communication failure,

A common alarm shall be sent to the Control System.

PLC based control system shall be fault tolerant.

When redundant CPU’s are used, switching from “master” to “slave” shall be with no interruption to control and loss of data. (Hot Standby)

9.3.4 Input/Output modules

Dual redundant input and outputs shall only be provided if the system integrity demands or if specifically requested by the Purchaser/Contractor.

9.3.4.1 Digital Input and Output cards:

- The cards shall have integrated LED's showing card and channels status.
- Inputs shall be powered from the cards. Galvanic isolation shall be provided for channels.
- Outputs shall be volt free contacts; power distribution shall be done at marshalling terminal strips.
- All safety signals which are not fail-safe shall be fully line monitored. Typically this covers signals from/to fire detection and protection devices.

9.3.4.2 Analogue Input and Output cards:

- The cards shall have integrated LED's showing card status.
- Inputs and outputs shall be powered from the cards.
- Input cards shall support 4-20 mA isolated signals. The minimum converter resolution shall be 16 bit.
- Output signals shall be 4-20 mA with 750 ohm maximum load.
- Analogue cards shall be so designed that a short circuit or high voltage on one channel shall not induce any fault on the other ones.

At least 10% spare capacity shall be considered for each type of I/O card.

9.3.4.3 Communication cards

The cards shall have integrated LED's showing card and communication port status. Redundant communication links with the Control System are required; and consequently redundant communication cards shall be installed.

Wiring and communication details shall be given by the package Vendor to the Control System vendor.

The necessary coordination activities shall be in the scope of both the Control System vendor and the package Vendor. The package Vendor shall be fully responsible for ensuring the interface works.

3.2.1 PLC APPLICATION SOFTWARE

PLC programming shall be carried out using a standard software tool installed on the

programmer supplied with the UCP.

The configuration software shall authorize the studying, key-in, modifications, simulation of the application software from the programming PC without connection to the CPU.

It shall also allow on-line monitoring of all PLC inputs, outputs and internal variables.

The programming languages shall be in accordance with IEC 61131-3, preferably by function blocks, and shall be able to support literal comments or descriptions.

Special care shall be taken for initialization (software, parameters, etc), upon a black start. Programs will be developed based on standard functions. Programming will respect, as far as possible, the principles of the Project design method for system configuration and associated standard functions specifications. This is mandatory when the package control application software is not a Vendor's standard.

9.4 SUPERVISORY SYSTEM

Packages are normally supervised from the Control System operator stations in the Central Control Room. Nevertheless, as not all data and parameters are transmitted to the Control System, required supervision functions shall be available at a display unit located on the UCP itself.

This may include:

- Operating parameters display,
- Trending functions,
- Equipment statuses display,
- Detail alarm processing,
- Package safety displays,
- Inhibition facilities,
- Tuning,
- System maintenance overview,
- Local data archiving,
- etc.

Failure of the UCP supervisory system shall not affect the package operation. Special attention shall be paid to the self-adjustment of the parameters when restarting the HMI computers.

9.4.1 Hardware

The package supervisory unit shall be installed in the UCP.

It shall include one or more color VDU, with associated computer, keyboard, storage means, printer, if requested by project specifications, and as many hardwired signal lights and push buttons as necessary. VDU will generally be integrated in the PLC cabinet front door.

A local control panel, with command and display devices hardwired to the UCP, can be installed on the package for local operation, maintenance and emergency.

9.4.2 Software

Faults diagnosis displays shall be available.

The display refreshment rate shall be 1 second at the maximum.

The display configuration software shall be installed on the PLC programmer (e.g. laptop).

9.4.3 Data archiving

The package supervisory unit shall be able to keep track of main events and package parameters (if required) for a period of at least one week.

It shall be delivered with a software tool allowing data retrieval, sorting and trends drawing functions, and if requested, connected to a printer for screen hardcopies and event list print- outs.

9.5 COMMUNICATION WITH THE CONTROL SYSTEM

Interfaces between packages and Control System may be via redundant communication links or hard wired. The selection will be determined by the quantity of data to be transmitted.

The package Vendor shall provide at bid stage a list of recommended data to be reported to the Control System.

The final communication interfaces between package and Control System, including input/output list will be issued by the Contractor modifying the provided list by the Vendor based on project control and monitoring philosophy.

Status/alarm signal from package shall be contact rated 10A at 110VAC. Digital signal status to package shall be contact rated 10A at 110VAC.

Motor control circuit shall be 110VAC, 50Hz contactor controlled motor.

9.5.1 Process information

PLC package will communicate with the DCS via digital links using industrial standard protocols like Modbus Plus (for computer link to DCS RS485, isolated) or OPC (for computer link to DCS).

The communication master is always the DCS.

When only a smaller number of data points are involved (less than 20), hardwired links shall be envisaged.

9.5.2 Safety information

All executive action signals with the safety systems (ESD and F&G) shall be through hardwired Inputs/Outputs (4-20mA isolated).

Status information may be sent through the software link with the DCS.

Except for line monitored signals, hardwired signals shall always be treated as fail-safe. Trip actions shall be initiated in case of signal loss.

9.5.3 Local / Remote management

Packages are normally supervised or operated in “Remote” mode from the Control System workstations; but may be run in “Local” mode from the UCP.

In case of digital link communication failure between the Control System and the PLC package, the package shall automatically switch over to “Local” and be kept in operation under the control of its own control system. The management of Local/Remote mode will be as per the operating philosophy. Special care shall be taken for adjusting the internal logic values and settings after a loss of communication.

Safety functions shall remain active whatever the selected mode.

9.6 CYBER SECURITY

When the supervisory and/or the engineering workstation are based on a industrial fan less type PC computer using standard operating systems and standard network protocol (TCP/IP), the following rules shall apply:

Engineer / Maintenance modes shall not be accessible to operators. Limitation by key, badges, passwords or any combination is mandatory.

External mass storage devices (DVD-ROM, Hard, USB memory, etc) shall not be accessible in normal operation (could be removed from the setup).

Remote maintenance through a standalone modem shall not be permitted. When remote access for maintenance is necessary, a formal request shall be made to Contractor. Specific procedures shall be set up with Contractor. The connection shall be made through the Contractor local network using secured procedures with strong authentication (e.g. secure ID). In any case a preliminary

Evaluation of possible impact on the package's operation resulting of errors or failure of this remote operation shall be made.

All software original licenses, software disks (including operating system) and tools shall be provided with a detailed procedure including all system parameters for a full re-installation from scratch.

A full “ghost” version of the operating and application software shall be provided. Before start-up the Vendor shall verify and ensure that the UCP including all associated computers and associated configuration and maintenance tools are virus free.

The Vendor shall verify and ensure any electronic documentation supplied is virus free.

9.7 CABINETS

9.7.1 Local control panel

When a local control panel is required, the details will be defined in the Package particular datasheet and specification.

Panels’ ingress protection shall be at least IP 65 for outdoor and IP 54 for indoor; and those which are located in hazardous areas shall be certified EExd or EExe.

At least 20% spare space shall be considered inside panels.

9.7.2 Unit Control Panel (UCP)

D01

Unit Control Panel shall be installed inside the Local Equipment Room. Color shall be painted in accordance with the "Specification for Painting- BK-GNRAL-PEDCO-000-PI-SP-0006".

The UCP shall include marshalling, PLC cabinets and if required display units located on cabinets’ doors.

The minimum requirements for the Unit Control Panels are the following:

- Cabinets shall be front or dual access with door(s).
- Cabinets shall have bottom cable entries with supporting bar and sealing plate.

Entries in cabinet sides or top are subject of Contractor approval.

- Cabinets shall be shipped as single or dual cabinet but never more than 1200 mm length.
- Panels’ ingress protection shall be at least IP 65 for outdoor and IP 54 for indoor; and those which are located in hazardous areas shall be certified EExd or EExe.

- Panels mounted on skids containing rotating or reciprocating machines shall be provided with anti-vibration isolating mountings at all attachment points to skid structure, floor or wall.
- Cabinets shall be epoxy coated.
- Each cabinet shall be equipped with internal lighting with door activating switch.
- Main circuit breakers for all electrical distribution with fault to show trip.

Ventilation requirements are as the following:

- Ventilation shall be arranged in order to avoid any hot surfaces in the cabinets. Natural ventilation shall be preferred but forced ventilation shall be fitted in the cabinet if necessary. The entire ventilation air intake shall be filtered.
- When a forced ventilation system is fitted, maximum noise level at 100% duty shall be less than 55 dBA at 1 meter.

The minimum requirements for the marshalling side are the following:

- Special attention shall be paid to the signal segregation. Terminals for signals of different types/systems shall be installed in different sections.
- Field multi-cable shall be terminated in the UCP marshalling cabinet. Marshalling terminal strips shall be the mirror of the field junction boxes and all cores including spare ones shall be connected to a terminal block.
- Marshalling side shall be equipped with Field Terminal Blocks (FTB, mirroring the field junction box) and Field Termination Assemblies (FTA, mirroring the I/O boards).
- Marshalling side shall be used to cross-wire signals between FTB and FTA.
- Inter-connection between UCP System and marshalling side shall be via pre-wired and pre-tested system cables with multi-way connectors.
- Field terminal blocks in marshalling side shall be knife type or equivalent terminals, with the necessary polarity distribution, switching and protection, test points (for using HHC and earthing systems).
- IS barriers shall be of galvanic isolating type and using Zener barriers is prohibited.
- Routing for all IS circuits shall be segregated from all other circuits and separately identified.
- Routing of all signal circuits shall be segregated from all power circuits. General organization and dimensions of the cabinets shall be approved by Contractor before manufacturing.

At least 20% spare space shall be considered inside cabinets.

9.8 CABLING AND WIRING

All cables installed on the package shall be in accordance with the Project specification "Specification for Instrument/F&G cable Doc No.: BK-GNRAL-PEDCO-000-IN-SP-0010".

Intrinsically safe cables, junction boxes and terminals shall be light blue and completely segregated of other type of cabling.

Power supply wiring shall be segregated from signal wiring.

Packages type A, B and C shall be fully wired and connected up to junction boxes and/or local control cabinet at the edge of Package unit.

10.0 INSTRUMENT NUMBERING AND TAGGING

Instrument tag numbers will be assigned by the Vendor according with the Project rules and be shown in all drawings and schedules provided. Identification of junction boxes, cabinets and panels provided by the Vendor will be assigned by the Contractor as well.

Field instruments shall have a stainless-steel tag plate bearing the assigned tag number.

Panel nameplates shall be of the laminated plastic type and screwed, including tag number and the duty identification in English language.

Cables from junction boxes to instruments shall be identified with instrument tag number close to the junction boxes and at the instrument.

All the cables, wiring & terminals inside package will be fully numbered and marked according to wiring and tagging rules as defined by the Project rules. Labels shall also be provided for any other instruments and components within panels.

11.0 DOCUMENTATION

The Vendor shall provide all documentation related to engineering, detail study, installation, operation, and maintenance for instrumentation and control equipment supplied with the package as per the minimum specified in the Package Requisition.

All documents shall be in English language.

Following Vendor documents shall be submitted to Contractor as minimum for approval:

- Document list for Package System
- Package System Architecture
- Material List including Hardware and Software
- FAT procedure

Vendor documents to be issued for review by Contractor.

The documentation shall be submitted strictly in accordance with the timings indicated on the SDRS.

Review of Supplier drawings, calculations and other documents by the Purchaser does not relieve the Supplier of the responsibility for correctness under the terms of the order. Compliance by the seller with the requirement of this specification does not relieve the seller of responsibility to supply equipment which is of proper design and construction, fully suited for all specified conditions.

Contractor/Vendor/Supplier shall present their compliance/deviation to the specification /data

sheet, as part of bid documents, for owner consideration/evaluation.

Deviation from this specification or any document referenced in the requisition must be agreed in writing by the owner prior to any implementation.

Compliance by the vendor/contractor with the requirements of this specification and documents referenced in the requisition does not relieve the seller of the responsibility to supply equipment which is of proper design and construction, fully suited for all the specified conditions.

Approval of documents by the owner does not relieve the contractor/vendor from their contractual obligations or reduce their responsibility to perform proper design/construction as per contractual requirements.

11.1 DOCUMENTATION REQUIREMENT

All references to any instruments on any documents shall be by the tag number.

Besides hardcopy documents, an electronic copy of all documents shall be provided on CD ROM.

All drawing files shall be supplied on AutoCAD format.

Files of lists and indexes shall be provided in MS Excel or MS Access.

11.2 PRE-ORDER DOCUMENTATION

The Supplier shall provide, with his Proposal, adequate documentation to demonstrate that the proposed design satisfies the requirements of this Specification and other documentation referred to herein.

11.3 POST-ORDER DOCUMENTATION

Following Order placement, the Supplier shall provide documentation in accordance with the requirements identified in the Package Requisition. This shall typically include Project Quality Plan, Instrument Index, P&IDs, Hook-Ups, Loop Diagrams, Wiring Diagrams, Schedules, Data Sheets, Calculations, Specifications, Procedures, Certification, Installation, Operating & Maintenance Manuals, Document List, Package System Architecture, Material List Including Hardware & Software, FAT Procedure, etc.

Updated, Project specific, versions of all documents provided with the Proposal shall be re-issued and additional documents issued, as identified in the Requisition, in accordance with an agreed program.

11.4 SOFTWARE REQUIREMENT

For package type C, the Vendor shall provide a complete print-out of the program used in PLC completed with program reference list and a back-up copy (last version after FAT) on CD- ROM.

Vendor shall provide to the Contractor all the software licenses including full “ghost” version of the operating and application software.

The package software operating system shall be Microsoft windows (latest proven).

11.5 DOCUMENTS PRESENTATION

The form of the documents (specification, datasheet, drawing, etc) used by the Vendor for instrumentation shall be agreed for the project by the Contractor.

12.0 INSPECTION AND TESTING

The Owner/Contractor shall reserve the right to perform inspection of the equipment during manufacture at any time. Owner/ Contractor shall be notified ten three weeks prior to any testing.

Material certifications and record dispatching shall be made available to the Contractor during or at completion of fabrication. It is expected that assistance will be available for inspection of parts, during or after completion of fabrication, during a shop inspection.

Package shall be 100 % checked and tested, including all input/output and all logic and sequences at the Vendor premises.

All serial link communications between the package (UCP) and the DCS (package type C only) shall be fully tested.

Following operations shall be performed by Vendor before Factory Acceptance Tests:

- Issue of factory acceptance procedures,
- Issue of all built drawings and documents,
- Issue of all required documentation on instruments and control systems,
- Complete wiring diagram of control panels and interconnection wiring diagrams
- Complete labeling checking,
- Detailed and complete checking in two steps:

  - Step 1: control loop wiring checks,
  - Step 2: control loop functional checks.

Each one of the here above test operations shall be subject to a test report issued be Vendor and submitted to Contractor.

Factory Acceptance Tests witnessed by Owner/Contractor shall be performed only after receipt of all required technical documents and tests/calibration reports.

A sample FAT procedure shall be submitted with the bid.

A Factory Acceptance Test planning and full procedure shall be submitted to Owner/Contractor for approval 8 weeks before beginning of the tests.

The procedure for the acceptance of the package in the factory shall mainly include:

- A comprehensive review of drawings and documents, at their latest issue(as built),
- A comprehensive inspection,
- Functions, locations and installation checking, of all instruments,
- Accessibility of main elements,
- Energy consumption checking,
- All instruments calibration,
- Wiring checking (continuity, earth, etc.)
- Loop checking (all lines and connection shall be fully tested),
- Tagging checking,
- Checking of mechanical features, doors, hinges, latches, etc.,
- Noise level checking,
- 100% functional checking including sequence, data exchanges, control and monitoring,
- Performance checking,

- Earth segregation checking,
- Interface checking.

The Vendor will provide all necessary materials in order to test and check the performances of all instruments and/or control system supplied with the package unit.

For package type A and B, Vendor shall assist the Contractor during FAT of the Control System in order to check the software development made for this package.

The Vendor shall allocate adequate time, facilities and assistance to permit inspection and testing to the Specifications of the inspector.

The Vendor shall provide technicians and materials as required to make measurements and connections to the inspector deems necessary to assure that all functions and accuracy's are in accordance with the specifications.

Test instruments and equipment, test leads, temporary wiring tools, etc. shall be made, by the Vendor, as required to permit 100% inspection and testing.

During FAT functional test, the inspector shall develop a punch list of items to be completed before the package are accepted and shipped.

The Vendor shall perform all other tests as required to place the package in good operating condition.

Completion of these tests shall be submitted to the Contractor. After acceptance, a comprehensive test report shall be written and issued by the vendor.

Compliance by the seller with the requirement of this specification does not relieve the seller of responsibility to supply equipment which is of proper design and construction, fully suited for all specified conditions.

13.0 SPARE PARTS AND SPECIAL TOOLS

13.1 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.

13.2 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.

14.0 PACKING AND SHIPMENT

14.1 GENERAL

Shipment authorization will be given by inspection release certificate after all pending points raised during acceptance tests have been resolved.

Refer to the relevant Package Specification for general requirements for preservation, storage and shipment of Package equipment. The following section provides additional detail specifically relevant to instrumentation systems associated with the Package.

14.2 PACKING AND PRESERVATION

Instrumentation items installed on the Package shall be adequately protected, suitable for shipment and storage at site, prior to dispatch from the Supplier's Works. Typically, it is suggested that instruments be protected with bubble wrap securely taped over delicate components and then enclosed by a fabricated wooden cover securely fastened but easily removable for site commissioning and operation. Any fragile items that cannot be adequately protected in their installed location shall be removed from the Package and packed separately. Any such items, and their location on the Package, shall be carefully identified to facilitate re-installation at site.

Any panels or instrument items that are removed from the Package for shipment shall be wrapped in waterproof material and be placed in crates having an internal waterproofed lining and padding.

All instrument items shall be protected from vibrations and shocks normally expected during handling, loading/unloading and shipment.

In particular the following considerations and action shall be taken.

- All tap mounted instruments shall also be dismantled and packed separately.
- All opening taps, etc. shall be closed for the time of shipment and site storage.
- All main moving part shall be locked.
- All glasses shall be protected against shock.

Suppliers shall identify any fragile equipment (e.g. control panels), that needs to be stored in a temperature and/or humidity controlled environment prior to installation and/or during shipment.

The packing shall also be suitable for storage of the Package equipment for up to 18 months in the harsh outdoor environment described. The packing shall be adequate to resist the humidity, temperature extremes and corrosion conditions to be expected in the various site locations.

~~15.0 GUARANTEE~~ D01

~~The Vendor shall guarantee the satisfactory performance of the system in accordance with project material requisition. This guarantee shall be performed through a letter of acceptance. In addition, The Vendor shall guarantee the availability of all spare parts and replacement parts that are required by any equipment item supplied for 10 years of operational period.~~