

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک فعالیت های روزمینی در بسته های کاری تحت الارض عمومی و مشترک							
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طرح نگهداشت و افزایش تولید 27 مخزن

SPECIFICATION FOR WHCP/HPU

نگهداشت و افزایش تولید میدان نفتی بینک

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 IFC: Issued For Comment
 IFA: Issued For Approval
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 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



نگهداشت و افزایش تولید میدان نفتی بینک
فعالیت های روزمینی در بسته های کاری تحت الارض
عمومی و مشترک



شماره پیمان:

053 - 073 - 9184

SPECIFICATION FOR WHCP/HPU

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D04	0001	SP	IN	110	PEDCO	SSGRL	BK

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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.

As a part of the Project, construction of well location, access roads, wellhead facilities for 6 new wells (with electric power supply for 2 of them) and required modifications on 4 workover wells (with electric power supply) shall be done. In addition, construction of 6 new flowlines from new wells to Binak B/C unit (with extension of relevant manifold) are in the Project scope of work.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Construction of New Well Locations, Modifications on Workover Wells, Wellhead Facilities, Electrification Facilities, Flowlines and Extension of Binak B/C Manifold
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.

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک فعالیت های روزمینی در بسته های کاری تحت الارض عمومی و مشترک								
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2.0 SCOPE

This document covers minimum necessary requirements for the design, selection, manufacture, inspection, testing and delivery of Hydraulic Control Panel. Dedicated WHCP shall be provided for control of the SSV and SSSV installed on each Christmas tree.

As per project description each constructed well (W018S, W008N, W028, W035) has it's dedicated WHCP except Well nos.007S and 046S.

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

3.0 NORMATIVE REFERENCES

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-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-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 |
| • PS-M-IN-280 | Material Standards for Miscellaneous Items |
| • IPS-G-IN-210 | General standard for instrument protection |

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- IPS-E-GN-100 Engineering Standard for Units
- IPS-I-IN-100 Inspection Standard for General Instrument Systems

3.2 INTERNATIONAL CODES AND STANDARDS

American Petroleum Institute (API)

- API SP 6A Standard for Wellhead and Christmas tree Equipment
- API RP 14B Design, Installation and Operation of Subsurface Safety Valves System
- API RP 14C Recommended Practices for Analysis, Design, Installation and Testing of Basic Surface Safety Systems on Offshore Production Platforms
- API 14A Specification for Subsurface Safety Valve Equipment
- API RP 14F Recommended Practice for Design and Installation of Electrical Systems for Offshore Production Platforms
- API 674 Positive displacement pumps, reciprocating
- API 675 Positive displacement pumps, controlled volume
- API 676 Positive displacement pumps, rotary

International Electro technical Commission (IEC)

- IEC 60079 Electrical Apparatus for Explosive Atmosphere
- IEC 60529 Classification of Degrees of Protection provided by Enclosure

American Society for Testing and Materials (ASTM)

- ASTM A488 Steel Casting, Welding Qualification of Personnel and Procedures
- ASTM E 113 Standard Recommended Practice for Ultrasonic Testing by the Resonance Method
- ASTM E 142 Standard Method for Controlling Quality of Radiographic Testing
- ASTM E 165 Standard Recommended Practice for Liquid Inspection Method
- ASTM E 446 Standard References Radiographic for Steel Casting
- ASTM A435 Ultrasonic testing
- ASTM 1457 Specification for PTFE moulding and extrusion materials
- ASME B31.3 Process Piping-ASME Code for Pressure Piping

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National Association of Corrosion Engineers (NACE)

NACE MR-0175 Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment

Other Standards:

- GS EP SAF 226 General specification-Completed wells safety systems and safety rules

Vendor shall state the additional Codes and Standards if necessary. The latest published issue or amendment shall apply unless otherwise stated.

3.3 THE PROJECT DOCUMENTS

- | | |
|---------------------------------|---|
| • BK-GNRAL-PEDCO-000-PR-DC-0001 | Process Basis of Design |
| • BK-GNRAL-PEDCO-000-PR-DC-0001 | Piping & Pipeline Material Specification |
| • BK-GNRAL-PEDCO-000-IN-SP-0004 | Specification for Instr. And Control Of Pack. Unit System(Pu) |
| • BK-SSGRL-PEDCO-110-IN-DG-0002 | WHCP Hydraulic Diagram- Whellheads |
| • BK-SSGRL-PEDCO-110-IN-DC-0002 | Instrument & Control System Design Criteria |
| • BK-GNRAL-PEDCO-000-IN-SP-0001 | Specification for Instrumentation |

Note: This document shall be used in conjunction with P&IDs and PFDs of each 4 wells of the Project that shall have WHCP.

3.4 ENVIRONMENTAL DATA

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

4.0 ABBREVIATIONS

FAT	Factory Acceptance Test
HPU	Hydraulic Power Unit
HP	High pressure
MP	Medium pressure
WHCP	Wellhead Control Panel

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TRV	Temperature Relief Valve
SSV	Surface Safety Valve
SSSV	Sub Surface Safety Valve
QA	Quality Assurance
QC	Quality Control
SAT	Site Acceptance Test

5.0 ORDER OF PRECEDENCE

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 VENDOR RESPONSIBILITY

VENDOR shall be responsible for the correct design and operation of all the provided equipment, the quality of all materials and workmanship, and in compliance with these specifications. Approval of the test by CONTRACTOR SHALL not relieve the VENDOR of responsibility for conforming with the provisions of this specification when the equipment is installed.

6.1 VENDOR'S COMPLIANCE

Vendor shall submit his bid(s) in full compliance with the requirements of the MR and relevant attachments.

Any exceptions or deviations to/from the MR SHALL be clearly stated and quoted in an optional part of the bid, as an alternative.

If no exceptions are specified, CONTRACTOR will intend that the bid is completely in accordance with the MR and relevant documents.

Vendor shall quote separately and comparatively, the alternatives requested in MR by contractor.

VENDOR is requested to include in his proposal the enclosed form "VENDOR'S CERTIFICATE" duly filled in & signed.

Compliance with this requisition in any instance SHALL not relieve the VENDOR of his responsibility to meet the specified conditions.

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VENDOR SHALL include in the bid copies of technical forms that will allow, through the proposed model number, a check of technical characteristics of the instruments including the spare parts.

6.2 DATA SHEETS

It is mandatory that project required specification, specified by contractor on project documents, shall be confirmed /filled by the bidders and attached to the bids.

Bids without CONTRACTOR's required specifications, properly completed/ confirmed by vendor, will be considered technically incomplete and therefore, technically unacceptable.

7.0 GENERAL DESIGN REQUIREMENTS

The control and safety equipment located at well head area shall be self- sufficient. The area is un-manned so the WHCP and HPU shall be designed in order to protect the area automatically in absent of personnel and also provide enough data during the presence of operators for operation and maintenance purposes.

The Wellhead panel will be located outdoor. The panel shall be installed on concrete floor & under a sunshade. It shall be designed to operate continuously at mentioned site / environmental conditions.

There is no utility available in area so all the requirements shall be foreseen by the vendor.

The hydraulic safety control panel shall operate SSSV valve and SSV valve through reliable hydraulic Pressurized system supplied integrally with control panel.

The interface between piping & tubing shall be followed and done according to Project Hook-Up Diagram and vendor standard.

All loos items as per project material requisition (such as SSV/SSSV command line tubing, fusible plug...) shall be provided by WHCP vendor and the tube length shall be based on project documents.

8.0 SYSTEM DESCRIPTION FOR HYDRAULIC PANEL

8.1 HYDRAULIC POWER UNIT

The hydraulic pressure is needed for actuation of two type of valves (SSV and SSSV) and pneumatic pressure (N2) for related logics and fusible plug loop. The panel shall be designed for fail safe, action to trip, de-energized/depressurized/contacts open or close to trip shall be considered and mentioned for panel in operation time by Vendor in related documents.) and also it shall be designed to prevent damage to the actuator due to the high hydraulic pressure or entry of dirty oil to the actuator.

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- SSSV actuator swept volume: 250 CC (for wells W008N, W018S)
- SSSV actuator swept volume: 19 CC (for well W028, W035)
- SSV actuator swept volume: 6000 CC
- SSSV opening / closure time: 5-10 / 2-5 Second
- SSV opening / closing time: 270 / 14-38 Second
- SSSV Crack open hydraulic pressure: 5000 PSI
- SSV Crack open hydraulic pressure: 2500 PSI
- SSSV Actuator Hydraulic Design Pressure: 5000 PSI
- SSV Actuator Hydraulic Design Pressure: 5000 PSI
- SSSV Maximum Working Pressure: 3500 PSI (for wells W008N, W018S)
- SSSV Maximum Working Pressure: 4950 PSI (for well W028, W035)
- SSV Maximum Working Pressure: 2500 PSI
- SSV Minimum Working Pressure: 600 PSI



Two hydraulic pressure levels are required for this panel. High hydraulic pressure for actuation of SSSV (5000, to be finalized as per process data), medium pressure for actuation of SSV (2500 PSI, to be finalized as per process data). Suitable dedicated regulator to be considered by vendor to Supply medium-pressure hydraulic level from high pressure line.

For panel logics and fusible plug the nitrogen pressure is required.

Vendor shall supply the accumulators for HP, MP supplies headers with suitable volume to avoid fluctuation in supplied pressure and prevent the damage the SSV and SSSV.

Vendor is responsible for define suitable pressure levels according to above information. Vendor shall send queries in case any further details are needed.

Open /close status indicator (green/red colored) for SSV and SSSV, pressure gauges for hydraulic line to SSV/SSSV and pressure gauges/low alarm indicators for nitrogen headers and high/low alarm indicators for flow line pressure before/after choke shall be considered in panel drawers face dedicated for each well, (Note: all the indicators in panel face shall be finalized by CLIENT requirement and vendor recommendation).

Independent commands headers for SSSV and SSV (after hydraulic pump) to be considered by Vendor.

The Nitrogen bottles and pumps will be used as back-up for generating required high and medium pressure levels. Low pressure N2 bottle shall also supply for logics and fusible plugs.

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8.2 PUMPS

Two types of pumps are required to be installed in the panel for recovering the pressure of hydraulic lines due to leakage of system in long term or start-up.

- For manual applications, hand pump shall be used. This pump will be installed inside the panel to pressurize the hydraulic system to the highest pressure level in the panel.
- To keep the pressure of hydraulic line in normal operation, a N2 driven pump is needed to generate the highest pressure level in the panel.

In addition to above mentioned pumps, required connection and valves to be considered in panel battery limit ,as a feasibility for extra portable hand pump connection, to be used in emergency condition (while automate/manual pumps inside panel are out of service).

The N2 driven pump shall operate automatically for start-up at normal operation (pressurized by nitrogen bottles) except it hand pump shall operate.

Both hand pump and a N2 driven pump shall be able to produce hydraulic pressure up to 5000PSI separately.

Vendor is responsible to consider any more intensifier sets to achieve best panel performance guarantee if required.

8.3 NITROGEN BOTTLES (2 SEPARATED BANKS)

The Nitrogen bottles and pumps will be used as back-up for generating required high and medium pressure levels. Low pressure N2 bottle shall also supply for logics and fusible plugs.

Two set of Nitrogen bottles shall be supplied Nitrogen gas for N2 driven pump, logics and fusible plugs. The WHCP Vender is responsible for design of suitable pressure, volume and number of Nitrogen bottles for each HP, MP supplies headers .for calculation of pressure, volume and numbers of Nitrogen bottles both of below notes to be considered together (As minimum, bottles with capacity of 50 liter with quantity: 4 main bottles and 4 reserved bottles shall be considered),

Requirement Nitrogen Gas for N2 Driven Pump Supply At Least for Two Times Actuation of Each Valves (SSV and SSSV) is required

Requirement Nitrogen gas for N2 driven pump supply at least six months operation of WHCP without refill is needed at worst scenario (for each of Nitrogen banks)

Necessary requirements shall be provided by vendor for changeover between sets of nitrogen bottles so reserved one could be in service without any interrupt so low pressure bottles could be recharged or replaced.

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Two nitrogen headers shall be provided for main and reserved bottles. Each nitrogen header shall be supplied with a pressure gauge.

9.0 CONSTRUCTION REQUIREMENTS

9.1 CABINET ENCLOSURE

The cabinet shall be free standing, requiring no external bracing or support. All corners being fully welded and reinforced with additional members as required to prevent buckling or distortion of the frame or the panel face. At least, 20% free space shall be considered at panel.

Components shall be arranged in a manner to facilitate accessibility and maintenance.

The cabinet shall be fully enclosed providing equipment protection IP65 as a minimum side doors shall be used for maintenance. An IP65 test certificate shall be supplied.

Cabinet shall be 3 mm minimum thickness sheet AISI 304 stainless steel. The sheet shall be cold rolled; stretcher levelled as selected as being free of surface flows.

The frame work and all interior steel work shall be AISI 304 stainless steel.

Bolting through the cabinet face shall be kept to a minimum. Any studs required for attached minor panel components shall be supported from the framing members.

No sign of these supporting studs shall be visible on the panel face.

Removable eye bolts for lifting the complete cubicle shall be provided with local stiffening to allow lifting of fully assembled and wired cubicle with any distortion. Suitable plugs /seals shall also be provided for the eye bolt holes.

Access doors and frames shall be 3 mm type AISI304 stainless steel with lift-off type hinges and lockable handle (90° turn), handle shall have spare keys .all other accessories shall be type AISI 304 stainless steel.

An unbreakable window shall be set into the door for operator control.

Sufficient space for maintenance purposes and free accessibility to all items inside the panel shall be provided.

Suitable cut outs shall be provided on face of panel for installation of gauges to indicate the major parameters for operator actions.

The panel shall be designed with slop and a drain at lowest point so; the wastes could be drained after cleaning the panel internals.

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In addition to pressure gauges, indicators shall be supplied on face of panel to show the open/close status of SSSV and SSV.

9.2 INTERNAL TUBING

All valve, instruments and fitting used in the panel construction shall be AISI stainless steel.

Tubing and fitting shall be 316LSS imperial size (not metric). All tube fitting shall be from the same manufacturer and suitable for the pressure rating .they shall be compression fitting double ferrules imperial size type. All tubing shall be neatly laid out and adequately supported to prevent kink and facilitate trouble-shooting. Tubing shall not be left with any stress imposed.

Each section of tubing shall be blown clean prior to assembly, to ensure that no foreign matter can enter control components. Valves shall have packing and gland material suitable to withstand hydraulic operating pressure and temperature all tubing shall be routed to provide maximum accessibility to all equipment. No tubing shall pass a control component in such a way that would prevent convenient calibration or adjustment or easy removal of the control components.

9.3 PIPING / TUBING INTERFACE

All pressurized tubes shall be supplied with a temperature relief valve (TRV) to be protected against high pressure because of trapped oil expansion.

A drain tube shall be supplied between panel and well fences to drain the panel after cleaning. (Drain line and fitting accessories will be supplied by EPC CONTRACTOR and the tube length will be based on project documents.)

Tubes and fitting accessories for pressure switches before /after choke flange shall be supplied by EPC CONTRACTOR and the tube length will be based on project documents.

All wetted parts in sour services (as Specified in document: “piping material Specification”) shall be suitable for NACE MR0175.

Bulkhead union shall be included in WHCP vendor scope. Interface bulkhead union sizes shall be as follows:

- Oil line to SSV: ½ “
- Oil line to SSSV: ¼”
- Drain line for panel cleaning : ½”
- Crude oil line to PSHH, PSL, (before and after choke flange): ½”
- Nitrogen Line for Fusible Plugs (3No for each panel): ¼”

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Design pressure and burst pressure of the inlet/ outlet lines of WHCP shall be considered in accordance to the ASME B31.3.

9.4 OIL TANK

Stainless steel oil tanks shall be supplied with filter at entry of the tank and at suction line of the pumps. The tanks shall be sized by vendor according to the information provided in this document. Vendor is responsible to ask for any further details to size the oil tank. A separate oil tank or a compartment in main oil tanks should be supplied for SSSV return line.

The minimum volume of oil tank (50 liter) shall be considered in accordance to the capacity of SSV/SSSV and the hydraulic oil line.

10.0 GENERAL INSTRUMENT REQUIREMENTS

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 temperature range of -3.5~53°C (in sun shade), +85 °C (in sun light) and humidity range of 11~93% RH. Internally mounted instruments shall be rated to a minimum of IP 54.

The minimum material for instruments and fittings is 316/316L stainless steel.

Stainless steel subjected to temperatures higher than 60°C 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.

All instruments shall be provided with a stainless steel tag plate attached to the instrument by stainless steel wire.

All instruments as appropriate shall have a stainless steel data plate showing the serial number and model number as a minimum.

All instrument wetted parts in sour services (as Specified in document: "piping material Specification") shall be suitable for NACE MR0175.

10.1 PRESSURE SWITCHES

Hydraulic pressure switches to activate logics depends on the flow-line pressure at specific set point. The actuation side (sensing) of the valve are wetted part which is in contact with the flow-

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line fluid. The wetted parts shall be suitable for NACE MR0175/ISO15156-1 requirements. Design pressure for pressure switches shall be considered 5000psi.

The acceptable reliability of set point is less than 2% of full scale. The narrow dead band should be less than 10% of full scale.

Two High-High and two Low-Low Pressure switches for flow line shall be mounted in the WHCP so a pressure sensing line from flow-line shall be installed between WHCP and each sensing point (one before choke flange and one after choke flange)

The accuracy of pressure switches shall be 1% of full scale.

10.2 LEVEL GAUGE

Local indication of oil tank level shall be achieved by means of gauge glass type. The level gauge shall be isolated from oil tank by means of isolating valve so the gauge could be replaced without losing the oil in the tank.

10.3 PRESSURE GAUGE

Dials shall have diameter of 60 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 316 alloy shall be used for pressure elements, sockets, Movement and tips material. Min SS 316L, 2 valve block manifold shall be provided.

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

The gauges shall be oil-filled and back connection type to be installed on face of panel.

The accuracy of pressure gauges shall be minimum than 1% of full scale.

10.3.1. Range Selection

Ranges of pressure shall normally be in accordance with ANSI/ASME B40.1. Pressure elements measuring a steady normal operating pressure shall not exceed 75% of their maximum range and 25% of their minimum range. Pressure elements measuring a fluctuating pressure shall not normally be operated beyond 60% of their maximum range. Pressure range shall be specified for each gauge such that the normal operating pressure is approximately at mid-range.

For the measurement of slurries, viscous or highly corrosive fluids for which a Bourdon tube or a bellows element is unsuitable, a Shaffer diaphragm or liquid filled diaphragm sealed element shall be used.

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Considering the pressure variation of the pressure gauge range shall be standardized as per below table.

Ranges	
-1Bar(-14.5Psi)	To 0 Bar(0Psi)
0Bar(0Psi)	To 1Bar(14.5Psi),
0Bar(0Psi)	To 1.6Bar(23.2Psi)
0Bar(0Psi)	To 2.5Bar(36.2Psi)
0Bar(0Psi)	To 4Bar(58.01Psi)
0Bar(0Psi)	To 6Bar(87.02Psi)
0Bar(0Psi)	To 10Bar(145Psi)
0Bar(0Psi)	To 16Bar(232Psi)
0Bar(0Psi)	To 25Bar(362.5Psi)
0Bar(0Psi)	To 40Bar(580Psi)
0Bar(0Psi)	To 60Bar(870Psi)
0Bar(0Psi)	To 100Bar(1450.3Psi)

Those ranges shall be used to obtain greater accuracy through a narrow span.

10.4 FUSIBLE PLUGS

A pressurized hydraulic loop shall be considered for fusible plugs, required hydraulic shall be supplied from WHCP. Fusible plug set point shall be considered as 100°C. Three No. fusible plugs are required.

Tube length for fusible plugs shall be supplied in accordance to the related project documents by vendor.

The minimum material for fusible plugs and fittings is 316/316L stainless steel.

11.0 SAFETY PANEL INSTRUMENT LIST

Each section of tubing shall be blown clean prior to assembly, to ensure that no foreign matter can enter control components. Valves shall have packing and gland material suitable to withstand hydraulic operating pressure and temperature all tubing shall be routed to provide maximum accessibility to all equipment. No tubing shall pass a control component in such a way that would prevent convenient calibration or adjustment or easy removal of the control components.

- Filter with indicator
- Relief valves (for SSSV/SSV/Logic lines)
- Pilot valves (for SSSV/SSV) with suitable bypass line for manual startup and quick opening option (for SSSV due to actuator swept volume, quick exhaust valve option shall be confirmed by Vendor.)
- Check valves
- Gas and hydraulic regulator

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- Hydraulic oil reservoir equipped minimally with filter / breather, level gauge, drain valve
- Minimum volume of reservoir shall be 50 liters.
- An override system for start-up in case of lack of pressure to bypass low pressure switch in flow line for limited time.
- Fusible Plugs at Least 3 No. for each panel
- Pressure switches (L, LL, H, HH), 4 No. each panel with two pressure sensing lines
- N2 driven and hand pumps
- Reset Push Button
- Nitrogen bottles (2 Separated banks) for N2 driven pump supply with pressure gauges
- Automatic drain valve for nitrogen supply line
- Oil accumulators for MP/HP line with pressure gauges
- ESD push button at WHCP
- Open/ Close indicators for SSV and SSSV
- Pressure Gauge for SSV and SSSV hydraulic command line

12.0 SEQUENCE OF OPERATION

12.1 OPEN SEQUENCE

SSV can be opened after an adjustable time delay after SSSV opening

12.2 CLOSE SEQUENCE

SSSV shall be closed after an adjustable time delay after SSV closing.

12.3 SHUTDOWN

The panel shall be able to shut-down SSV according to closing sequence in the following modes:

- Low-low pressure in fusible plug line (Fusible plugs activation in fire case)
- Low-low pressure in hydraulic line to S.S.S.V
- Low-low pressure in flow-line
- ESD Push button on panel

And for shut-down SSSV:

- Low-low pressure in fusible plug line (Fusible plugs activation in fire case)
- Low-low pressure in hydraulic line to S.S.S.V
- ESD Push button on panel

In case of flow line PSHH activation only SSV shall be closed and the SSSV will keep open.

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The panel shall be supplied with “FIRST OUT” feature so the panel logic shall be designed in a manner that first cause of panel shutdown be distinguishable for maintenance purposes.

13.0 MARKING

All the equipment of the panel front face shall be carefully tagged with trifoliate labels screwed to the panel.

These labels shall be white color with black engraved letters for the operation equipment such as indicator- push button-etc. and red color with white engraved letters for the safety equipment.

All labels shall bear the equipment tag and the service in short block letters.

14.0 INSPECTION AND TESTING

The WHCP shall be transferred to a complete operational shop test prior to shipment. Vendor shall notify the contractor ten working days in advance of panel completion, in order that EPC/EPD Contractor inspector may attend the factory acceptance test. The CLIENT representative shall attend in the factory acceptance test.

The tests shall be performed according to the vendor testing procedure, which shall have been approved by EPC/EPD Contractor not less than one month before the test. The tests shall include but shall not be limited to the following:

- Conformity with approved drawing and equipment specification.
- Inspection and fabrication method and erection method (including instrument). Dimension checking, calibration of each instrument, component. Clean lines procedure checking.
- Leak test under pressure
- Witness of hydro test, for hydraulic system.
- Complete operational test of all loops (conformity with shutdown sequence) with simulate of all external cabinet devices (pilots, valves, etc) Run test shall be made at rated pressure.
- Cleanness control
- Test certificates for ingress protection and hazardous area classification shall be provided for each panel.
- QCP, ITP and CERTIFICATION related to all components must be provided.
- All components exposed to SSSV shall be tested to the 1.5 times of max operating pressure.
- Instrument shall be calibrated by vendor and calibration report shall be available for final

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inspection.

Vendor shall attend at site after pre-commissioning for supervisory on panel installation and perform the site acceptance test.

The procedure for all tests like performance test, hydro test,...in FAT and SAT shall be approved by the CLIENT.

15.0 SPARE PARTS

Following items shall be considered (supplied) and included in the bid documentation:

- The VENDOR shall provide list 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)(shall be supplied with additional 20% of total quantity of each category (at least one item)).
- The VENDOR shall be able to provide spares back up and support for the plant life of at least 20 years.
- Capital spare parts (as option / if any)

16.0 SPECIAL TOOLS

Vendor shall propose the list of special tools needed for installation, operation and maintenance of this panel during the bid. The list shall be approved by the CLIENT.

As a minimum one charging kit shall be provided for each WHCP.

For opening SSV/SSSV, one portable hydraulic hand pump for WHCP shall be considered to use on emergency situation.

17.0 TRAINING

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

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- 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.

18.0 SITE ACCEPTANCE TESTING (SAT)

SAT procedure shall be provided by Vendor of package after the CLIENT approval.

19.0 FACTORY ACCEPTANCE TESTING (FAT)

EPC CONTRACTOR shall be permitted to perform or witness (or both) completes testing of the WHCP 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 WHCP 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 WHCP FAT test procedures to ensure specified performance and quality is being met.

VENDOR shall ensure that all WHCP components are available for an integrated test at the factory.

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. A complete retest of the WHCP shall be performed if, in EPC CONTRACTOR's judgement, fundamental problems are discovered.

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

CLIENT's representative shall be participated in all the FAT progress.

GUARANTEE, WARRANTY AND MAINTENANCE

Vendor shall have the final and total responsibility for the design and performance of all instrument supplied under this specification. Vendor shall warrant the instrument furnished by him and the performance of said instrument in accordance with this specification.

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The guarantee shall cover both, the supply of material and manpower to make good any defective components or equipment.

The guarantee period shall be eighteen (18) months from the date of delivery or twelve (12) months from the installation date of each equipment/packages at site.

Manufacturers shall also guarantee all equipment furnished against defects in design, materials, and workmanship and will bear the entire cost of correcting such defects which would develop during the specified warranty period.

VENDOR shall supply the Equipment/Devices/Items with all the components necessary to provide the owner/operator of the facility with a finished, fully functional product; such product is in accordance with the contract documents, and operate within the performance guidelines set out in this document and the other relevant documents.

VENDOR shall guarantee that the Equipment/Device/Item is suitable for the operating conditions herein specified, and that all materials and components are free from any defects; verifications of all calculations are in VENDOR's responsibility.

VENDOR shall unconditionally guarantee the materials and workmanship of all material and/or services. If, within the guarantee period (which is noted in REFERENCE/ATTACHED DOCUMENTS, any defects occur which are due to faulty material and/or services included in his scope (design, manufacturing, inspection, testing, supply & etc.), VENDOR shall, at his own expense, repair or adjust the condition, or replace the material and/or services to the complete satisfaction of CLIENT's representative. These repairs, replacement or adjustments shall be made only at such time as will be least detrimental to the operation of the CLIENT's business.

VENDOR warrants promptly repairing or replacing the defective parts in the warranty period.

Vendor shall ensure a correct and safe operation of the unit, providing all safety protection Devices.

Vendor shall be responsible for the safe, reliable, continuous functioning of the Equipment/Devices/Items.

VENDOR is fully responsible for the design of package for correct and safe operation based on project requirement during package life time; therefore, VENDOR shall specify any documents/specifications which may be required for design, manufacture and finalizing of Equipment/Devices/Items to avoid any problems during the package operation at site before P.O; otherwise, VENDOR shall be hold responsible for any corresponding deviation from expectations from the Equipment/Devices/Items.

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19.1 MAINTENANCE AFTER GUARANTEE

The Supplier's proposal shall include details of all standard maintenance agreements available from the vendor that are suitable for the package. The CLIENT shall be under no obligation to select all or some of the agreements detailed and shall be free to negotiate a unique maintenance agreement with the Supplier.

20.0 PACKING AND SHIPPING

Supplier shall be responsible for packing and protection of all the instrumentation adequately for shipment to the job site in accordance with the Purchase Order Specification. All crating and boxes shall be clearly labelled on three sides with description and equipment numbers. Supplier shall prepare detailed packing list by box and crate number.

Instrument shall be properly protected from damage during sea freight. Each item shall be clearly identified with Purchaser's Name, Purchaser's Order Number and Equipment Tag Number prior to shipment. Supplier shall be responsible for the proper protection and the timely and correct delivery of all equipment to the location specified in the purchase order.

During preparation for shipment, the following factors shall be considered:

No equipment or materials shall be released for shipment without approval of the Purchaser and/or his inspection representative.

All slot mounted or plug-in instruments (e.g. computers) shall be removed and packed in their original protective packing and shipped separately from the cabinets.

All relays, connectors and interconnecting wires shall be secured by cable ties or tapes to prevent loosening due to vibration during shipment and transportation.

All equipment and materials shall be properly crated to prevent damage during transportation, handling and shipment. The preparation for shipment shall be subjected to the approval of the Inspector.

Supplier shall wrap and tag all small items being shipped loose. All items shall be properly tagged with the tag containing the Item Tag Number, Purchaser Order Number, service and other relevant details.