OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT, ISLAMABAD
FOREIGN SECTION B

6/c

(To be completed, filled in, signed and stamped by the principal)

ANNEXURE 'A'

Material PRODUCTION SEPARATORS FOR NASHPA OIL FIELD

Tender Enquiry No PROC–FB/CB/PROD–2065/2017

Due Date

Evaluation Criteria FULL

SCHEDULE OF REQUIREMENT

Sr No	Description	Unit	Quantity	Unit Price (FOB)	Total Price (FOB)	Unit Price C & F BY SEA	Total Price C & F BY SEA	Deviated From Tender Spec. If Any
1	High Pressure 3 Phase Horizontal Separator, Design Pressure/Temp :1415 psig/195~40 DegF, Operating Pressure/Temp :750~1200 psig/120~40 DegF, Fluid Flow; Gas:20 MMSCFD, Oil:10000 BPD, Water:1500 BPD, Specifications as per Annexure–A1	Number	1					
2	Medium Pressure 3 Phase Horizontal Separator, Design Pressure/Temp :900 psig/195~40 DegF, Operating Pressure/Temp :150~600 psig/120~40 DegF, Fluid Flow; Gas:5 MMSCFD, Oil:10000 BPD, Water:200 BPD, Specifications as per Annexure–A1	Number	1					
3	Low Pressure 3 Phase Horizontal Separator, Design Pressure/Temp :250 psig/195~40 DegF, Operating Pressure/Temp :15~90 psig/120~40 DegF, Fluid Flow; Gas:0.5 MMSCFD, Oil:10000 BPD, Water:50 BPD, Specifications as per Annexure–A1	Number	1					

Note:

1) PURSUANT TO TENDER CLAUSE # 2.2, 11.4, 13 & 35.3.2, BID BOND AMOUNTING TO USD 24,000/- OR EQUIVALENT TO PAK RUPEES MUST BE SUBMITTED WITH THE TECHNICAL BID AND VALID FOR 150 DAYS FROM THE DATE OF OPENING OF THE BID.
2) EVALUATION CRITERIA: FULL CONSIGNMENT WISE ON CFR KARACHI BASIS OR FOR BASIS OGDCL'S STORES/LOCATION FOR LOCAL MANUFACTURERS/BIDDERS.
3) **TERMS AND CONDITIONS:** BIDDERS ARE ADVISED TO CAREFULLY READ ALL THE TERMS AND CONDITIONS OF THE TENDER DOCUMENT AVAILABLE AT OGDCL WEBSITE IN THE MASTER TENDER DOCUMENT.
4) **SHIPMENT FROM ACU MEMBER COUNTRIES:** IN CASE OF SHIPMENT FROM ACU MEMBER COUNTRIES, THE LC BENEFICIARY SHOULD BE OF THAT PARTICULAR COUNTRY FROM WHERE THE CONSIGNMENT IS BEING SHIPPED.
5) **SUMMARY REJECTION CRITERIA:** THE SUMMARY REJECTION CRITERIA AT CLAUSE 35 OF THE TENDER DOCUMENT MAY ALSO BE EXAMINED CAREFULLY. ANY BID NOT MEETING THE CRITERIA SPELLED IN THE CLAUSE # 35 SHALL BE SUMMARILY REJECTED WITHOUT ANY RIGHT OF APPEAL.
6) **DELIVERY PERIOD:** THE LEAD TIME OF THE QUOTED PRODUCT SHOULD NOT BE MORE THAN SIX (06) MONTHS ON CFR BY SEA KARACHI BASIS OR FOR BASIS FOR LOCAL MANUFACTURERS/BIDDERS AFTER OPENING OF LETTER OF CREDIT (LC).

Vetted
29-5-2017
MUHAMMAD ARIF
SE (Mech) FD
Ext. 2810

ANNEXURE-A1

Job No. : **01**
Spec. No : **OGDCL-NSP-1**

SCOPE AND SPECIFICATION FOR THREE PHASE OIL-GAS-WATER SEPARATORS (SKID MOUNTED)

Project: **Nashpa Oil Field Separation System**

Client: **Oil & Gas Development Company Limited**

Prepared by:	**MA**
Checked by:	**AB**
Approved by:	**FA**
Revised by:	-

0	Issued For Bidding	[illegible] 2017	
Rev.	**Description of Revision**	**Date**	**Revised Page Nos.**

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1.0 INTRODUCTION

This specification covers the minimum requirements for the design, fabrication, inspection, testing, coating and supply of "U" stamped Class 900 skid mounted weir type Three Phase (Oil-Gas-Water) Separation Battery comprising upon One High Pressure (HP), One Medium Pressure (MP) and One Low Pressure (LP) Production Separators for OGDCL Nashpa Oil Field.

1.1 Definitions

- "Company" means "Oil and Gas Development Company Limited (OGDCL)"
- "Supplier" means Entity with whom the Company will execute a Contract for supply of equipment/material as per this document
- "Project" means "Nashpa Oil Field Separation System"
- "Separator" means "Three Phase Separators".

1.2 Error or Omission

1.2.1 The review and comments by Company on Supplier's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Supplier/manufacturer of its obligations to comply with the requirements of this specification and other referenced documents.

1.2.2 All deviations to this specification, other referred document or attachments shall be brought to the knowledge of the Company in the bid. Such deviations shall be shown in the bid.

1.3 Language and Units of Measurement

1.3.1 The governing language shall be English language.

1.3.2 Bid and all required documents should be submitted in English. Legal English translation letter should be provided for documents other than English.

1.3.3 All other referred quantities (temperature, pressure, flow rate, etc.) shall be expressed as per datasheet.

1.4 Conflicting Requirements and Order of Precedence

1.4.1 In case of conflict among this document, the referenced documents and the International Codes and Standards, the Supplier shall bring the matter to the Company/ Engineering Consultant attention for resolution and approval in writing.

1.4.2 The order of precedence shall be as follows:

1) Schedule of Requirement
2) This specification document and the referenced Documents
3) Referenced International Codes and Standards

1.4.3 In the event of any conflict of data or requirements in any of above documents, it is the Supplier's responsibility to resolve these conflicts and obtain Company's approval before proceeding with design, manufacture or purchase. In any case, the most stringent requirement shall prevail. However, Company's interpretation shall be the final.

1.5 Supplier's Responsibility

The supplier shall be responsible for supply of "U" stamped Class 900 skid mounted weir type Three Phase (Oil-Gas-Water) Separation Battery comprising upon One High Pressure (HP), One Medium Pressure (MP) and One Low Pressure (LP) Production Separators as per specifications provided in this document. In this regard, the Supplier shall do the detailed mechanical and process design, prepare detailed drawings, General Arrangement Drawings in 3D, get the same approved from Company, arrange materials, fabricate, prepare as build drawings and transport it to OGDCL Nashpa Oil Field situated on main Indus Highway District Karak, KPK after completion.

2.0 DELIVERY OF SEPARATORS

Supplier shall deliver all the Separators with maximum acceptable delivery time of 180 calendar days at OGDCL Nashpa Oil Field; district Karak, KPK starting from the date of establishment of letter of credit by OGDCL.

3.0 REFERENCES

Pressure vessels and all component parts shall be designed, fabricated and tested in accordance with the latest edition of the following codes and standards as applicable.

- ✓ ASME Boiler and Pressure Vessel Code, Section VIII, Division I.
- ✓ API 12-J (API specifications for the Oil and Gas Separators)
- ✓ American Society for Testing and Materials (ASTM).
- ✓ ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
- ✓ ASME Boiler and Pressure Vessel Code, Section V, Non-Destructive Testing/Examination.
- ✓ ASME II, Material Specifications.
- ✓ ASME B31.8 Natural Gas Piping.
- ✓ ASME B31.3 Liquid Piping.
- ✓ ASME B16.5 - Pipe Flanges and Flanged Fittings.
- ✓ ASME B16.20, Ring Joint Gaskets and Grooves for Steel Pipe Flanges.
- ✓ N.A.C.E. Standard MR-0175.
- ✓ ISO Standard 15156.
- ✓ AISC (American institute for Steel Construction)
- ✓ Any other applicable API/ANSI/ASME/ASTM Standards.

3.1 American Society of Mechanical Engineers (ASME)

ASME BPVC Section V	Boiler and Pressure Vessel Code, Section V, Nondestructive Testing
ASME BPVC Section VIII, Division 1	Boiler and Pressure Vessel Code, Pressure Vessels
ASME BPVC Section IX	Boiler and Pressure Vessel Code, Welding and Brazing Qualifications
ASME B31.3	Chemical Plant and Petroleum Refinery Piping
ASME B31.8	Gas Transmission and Distribution Piping Systems

3.2 American Society for Testing and Materials (ASTM)

ASTM A36	Structural Steel
ASTM A105	Forgings, Carbon Steel for Pipe Components
ASTM A106	Seamless Carbon Steel Pipe for High Temperature Service
ASTM A193	Alloy Steel and Stainless Steel Bolting Material for High Temperature Service

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ASTM A194	Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A234	Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher Temperature Service
ASTM A490	Specification for Structural Joints Using High Strength Bolts
ASTM A515	Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher Temperature Service
ASTM A516	Pressure Vessel Plates, Carbon Steel, for Moderate and Lower Temperature Service
ASTM A632	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing(Small Diameter) for General Service
ASTM E94	Guide for Radiographic Testing
ASTM E142	Controlling Quality of Radiographic Testing

3.3 American National Standards Institute (ANSI)

ANSI B16.5	Pipe Flanges and Flanged Fittings

3.4 NACE International

NACE MR0175-96	Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment

3.5 Steel Structures Painting Council Specifications (SSPC)

SSPC-SP6	Commercial Blast Cleaning
SSPC-SP10	Near White Metal Blast Cleaning

4.0 SCOPE OF SUPPLY

The Equipment Package is to be furnished as complete skid mounted module. All instruments, controls, control valves, Manual Flow/Temperature/Pressure recorder, instrument gas filter separator and pressure reducers (for skid instrumentations) with provision on the skid, connecting piping with valves and structural platform shall be included on the skid module. All inlet and outlet piping shall terminate at the skid edges with appropriately rated flanges (with connecting bolts/gaskets etc).

Supplier's scope of supply for Separators & Pressure Vessels, Spares and tools is as follows:

4.1 Supplier shall do the detailed mechanical and process design, arrange materials, fabricate, coat, inspect, test and supply the Separators to OGDCL.

4.2 Supplier shall submit General Arrangement drawings, detailed fabrication drawings, weld procedures, detailed calculations, quality plan and other required documents for approval to the Company. Shop work shall not start until the Supplier has received drawings and weld procedure approved by the Company/TPI firm. No subsequent revision may be issued unless it is approved by the Company/TPI firm. Weld procedures shall be accompanied by a weld procedure index and weld map for each Separator.

4.3 Demister Pad shall be provided.

4.4 Separators shall be provided with all their internals like inlet baffles, vortex breaker, and weir plate etc. along with complete internal support structures where required and as mentioned in the data sheets of Separators. Boot type design for pressure vessel is not acceptable.

4.5 Man-ways for all Separators shall be provided with davit arms, blind flanges, gaskets and bolting and should be in center of the separator body.

4.6 Separators shall be provided with necessary access/platforms with cage access Ladders for easy operation of valves/reading of gauges. This requirement shall be further finalized during detail engineering by supplier with respect to vessel sizes, orientation and connections.

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4.7 Separators shall be provided with necessary Spare Parts and Special Tools and details to be provided with the bid.

4.8 WRC Bulletin No. 107 "Local Stresses in Spherical and Cylindrical Shells due to External Loadings" shall be used in analysis methods of nozzles connecting to shells or heads.

4.9 Nozzles on shell for instrument connection shall be properly braced.

4.10 If supplier supplies any loose items, he shall provide all the required necessary equipments and hook-up material and drawings to mount the items at site.

4.11 The Supplier shall provide two M–12 earthing bosses complete with studs, nuts and washers etc., with each Separator in order to provide earth connection points. All the material (stud, nut and washers) shall be brass only except the welded lug.

4.12 Safety relief valve and rupture disc to be installed.

4.13 Gauge glass for water & condensate (complete with isolation valves).

4.14 Liquid level control valve with local control loop (Self actuated) for water & condensate for effective control. Sizing of valves should consider flashing.

4.15 Pressure and temperature indicators should be provided on gas inlet & outlet.

4.16 Electronic flow meter should be installed on water & condensate pipeline along with totalizer.

4.17 Gas flow should be through (Multi-variable) Indicator Transmitter

4.18 Liquid flow measurement shall be taken by electronic flow Meter. Pressure Indicator, Temperature Indicator & Differential Pressure system should be installed.

4.19 Senior orifice assembly (With Straightening vanes & Metering Tube) and Manual Gas Recorder (Flow, Pressure, and Temperature) should be installed on the skid.

4.20 Manual drain shall also be provided in addition to auto liquid drain. Water & Condensate drains should separately terminate at the end of the skid.

4.21 Level bridle bottom connections and vortex breaker for the produced water outlet to have an internal up stand to minimize danger of obstruction and minimize sand carry over.

4.22 All flanges should be RTJ.

4.23 All the piping shall terminate at the skid end, should be flanged along with supply of companion flanges, gaskets and Stud/Washers/ Bolts.

4.24 Pressure Control Valve should be installed on the Gas outlet line of the separator.

4.25 Acceptable piping size for all liquid drains should be minimum 2 inches. If the calculated size is more than 2", calculated size shall be considered otherwise 2" size shall be applicable.

4.26 Any instrument within the skid boundary requiring instrument gas supply, shall be supplied with a proper sized stainless steel tube connected in between the instrument header take off point & the instrument requiring the Instrument gas (I/G).

4.27 Block valves shall be full ported ball valves unless otherwise specified. All valves shall be flanged end of RTJ type. The bypass valves shall be globe valves.

4.28 The manufacturer shall provide all instrumentation and controls equipment necessary for providing protection and the safe operation of each vessel. The instrumentation philosophy shall be PLC based. The supplier will be responsible for its integration with OGDCL existing system.

4.29 Isolation Ball valves to be installed on all piping before Start / termination from Skid End.

4.30 Each outlet line like, gas, oil and water shall be terminated having NRV at each end with the same specs as of parent line.

4.31 Jacks should be provided to ensure separator integrity during testing.

4.32 Supplier shall carry the sole responsibility for the performance of Separator internals and mechanical correctness of Separators

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4.33 Separator and its piping shall be internally coated with ceramic coating. The coating should be compatible with product specifications. Bidder to submit details of coating along with bid for review.

4.34 U-Stamping

Separators and Pressure Vessels shall be design on ASME Sec. VIII Div. 1 latest edition and shall be provided with "U"stamp. ASME Inspector will visit the manufacturer facility during various stages from material receipt to completion of vessel. All the reports generated by ASME inspector will also be shared with OGDCL/TPI firm. Email contact of U Stamp inspector with inspection plan to be provided immediately after award of contract by OGDCL.

4.35 Civil Design

The Supplier shall be responsible for the provision of necessary foundation design data including but not limited to size and location of all anchor bolts, static and dynamic loading conditions for foundation design. Supplier shall also indicate on his drawings required elevation of foundations from ground level.

4.36 Cleaning

Prior to shipment and after hydro-testing, Separators shall be subject to thorough cleaning by the Supplier. Supplier shall ensure that the Separators & associated piping are free from any foreign material, dirt, etc. and hydro-test water is drained and Separators are cleaned internally.

4.37 Installation/ Erection Works

Installation/ Erection works are included in the Supplier's Scope. The Supplier will provide detailed description of the site activities including complete drawings related to the installation and erection/ assembly of all the loose items.

5.0 DESIGN REQUIREMENTS

5.1 Environmental Design Criteria

5.1.1 General

Separators will be installed in an open atmosphere area.

5.1.2 Area Classification

All instrumentation and electrical equipment shall be with "Ex d" flameproof enclosures suitable for use in Class I, Division I, Zone 0, Explosion Group IIA & IIB, with temperature classification T4.

5.1.3 Site, Environmental & Utility Design Data

Separators shall be designed for outdoor location with maximum atmospheric temperature as +50°C.

5.1.4 Noise

The noise level from each Separator shall not exceed 85 dBA at 1m.

5.2 Mechanical & Process

5.2.1 Three Phase Separators must be capable of separating flash gas from a liquid feed stream. Separator internals should be suitable for most effective separation so that 100% of all liquid particles up to 8 microns and larger and 99.5% of all liquid particles up to 0.5 to 8 microns are removed from the flash gas stream. Also the separators should be capable of separating water from hydrocarbon liquids with the maximum oil in water ratio of 1000 mg/liter. The minimum retention time should be 3 minutes.

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5.2.2 All the control valves shall be designed on worst scenario basis i.e. maximum flow at minimum operating pressure, max. Oil API, max. gas Specific Gravity etc.

5.2.3 Process design calculations should be submitted with the bid for review of Company/TPI firm.

5.2.4 Separators shall be designed, constructed and tested in accordance with the data sheet and the requirements of ASME Section VIII, Division 1 and API 12-J (API specifications for Oil and Gas Separators) latest editions.

5.2.5 The vessel shell be "U" stamped by the authorized ASME inspector and it must be designed/constructed for horizontal installation.

5.2.6 All piping and assemblies provided on the vessel shall be designed, fabricated and tested in accordance with the latest editions of ASME B31.8 for natural gas piping and ASME B31.3 for Process Piping.

5.2.7 Piping arrangement for Gas, Oil and Water outlets shall be furnished with flow measurement, sampling points, pressure & temperature indicators, regulating valves and bypass arrangement. The strainers shall be provided at the upstream of metering devices to avoid any malfunctioning.

5.2.8 The separator bypass line should be included in the design. The bypass across the separator and bypass across all oil/gas/water controllers are designed in away to enable repair during operation. Also block valve will be provided in addition to globe valve at separator by-pass line for complete isolation.

5.2.9 Senior orifice meter with straightening veins and metering tube along with gas recorder shall be provided on gas outlet.

5.2.10 Check valve shall be required at gas inlet and all the gas/oil/water outlets.

5.2.11 All piping must terminate at the skid edge and piping ends shall be flanged together with companion flange screwed on with studs, nuts and gaskets.

5.2.12 Block valves shall be full ported ball valves unless otherwise specified.

5.2.13 All valves shall be flanged end and all the valves shall be RTJ type. The by-pass valves shall be globe valves.

5.2.14 The safety valve and the rupture disk at vessel shall be part of design for primary and secondary safety and must have separate nozzles on vessel.

5.2.15 Vortex breaker shall be provided for drains and siphons.

5.2.16 The manhole minimum of 20" should be provided for inspection/cleaning purpose in centre of shell.

5.2.17 Thermo wells for 300#ANSI and above rating should be flange connected to piping and vessels rather than threaded.

5.2.18 All the separator vessel internals shall be of material SS316.

5.2.19 Oil and water flow meters, strainer etc shall be of min. 2" size. If the calculated size is more than 2", calculated size shall be considered otherwise 2" size shall be applicable.

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5.2.20 Separator vessel shall be horizontal vessel type having weir plate being the partitioning plate for liquid separation i.e. oil and water. Boot type design shall not be acceptable for liquid separation.

5.2.21 All the liquid (oil and water) flow meters shall be electronic flow meter instead of PD meters.

5.3 Instrumentation

5.3.1 The manufacturer shall provide all instrumentation and control equipments necessary for providing protection and the safe operation of each vessel. The instrumentation philosophy shall be PLC based.

5.4 *Skid*

5.4.1 The vessel must be mounted on skid with all piping and accessories. The construction of skid will be on 4-runner I-beam structure.

5.4.2 Vessels shall be designed to be self-supporting and for a wind load as specified in the design information. The wind load will be specified based on the projected area of the vessels including all external appurtenances such as insulation, ladders and platforms. The vessel supports shall be adequate for the specified wind load when the vessel is full of water.

5.4.3 If the data sheets specify that the manufacturer has to provide vessel trim, the vessel shall be completely trimmed, instrumented and piped. All sizing of skid, pipe and equipment shall be done by the manufacturer based on design and keeping in view transportation restrictions.

5.5 Design Loadings

5.5.1 Separators shall be self-supporting and designed to withstand a wind loading based on the projected area of curved surfaces. The area of ladders, platforms and pipework shall be assumed as equivalent to one and one-half times of the projected area.

5.5.2 Separators & Pressure Vessels components, their supports and anchorages, shall be designed to withstand the results of the following combinations of loads and forces within the limits of stress and deflections set by the code:

- Erection Condition (The empty weight plus the weight of any internals present during erection)
- Initial Site Test Condition (The empty weight plus weight of water to fill the vessel).
- Operating and Design Conditions (The empty weight plus the weight of all internals packing, insulation and operating liquid).
- Hot Shut down Condition (As for the Operating and Design Condition, but excluding the operating liquid).
- Transportation/Dynamic Loading Condition. Separator shall withstand acceleration forces of 0.5g applied at any time in any direction.
- Periodic Site Test Condition.
- Earthquake design.
- Any other condition which would affect the safety of the Separator e.g. cyclic loading.

5.5.3 Supplier shall submit detailed calculations of Nozzle Loading for all Separators & Pressure Vessels for establishing the compliance of design and all with the requirements of this specification, the certifying authority if applicable and all statutory regulations.

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6.0 SEPARATOR INSTRUMENTATION

Three-phase separators shall be provided with the following types of measurement / monitoring/ control equipments:

6.1 Gas

6.1.1 Flow (Multi-variable) Indicator Transmitter

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol

Supply Voltage	24 VDC
Differential Pressure range	0-400 IN H_2O
Static Pressure Range	3000 Psi
Temperature Range	0 to 250°F with 4-wire platinum RTD (calibrated to 100 Ohms at 0°C)
Calculations	Standard Volume Flow Rate as per AGA-3 calculations
Accuracy	4 to 20 mA Output: 0.075%
Output	Standard Volume Flow Rate, Static Pressure, Temperature
Local Display	Back-lit Digital LCD integral Display
Mounting Orientation	Horizontal
Communication	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Ex ia IIC T4
Protection Class	Minimum IP65
Accessories	HART TRI-LOOP for 03 analog output signals, Five Valve Manifold, RTD with thermowell, complete with DPU, mounting bracket sun-guard.

6.1.2 Thermowell

- Thermowell shall be tapered **316 stainless steel 1½"** flanged raised face with ANSI rating equal to piping rating. Thermo wells provided without instrument shall have a stainless steel plug and chain.
- Thermowell body shall be 316 stainless steel machined from one piece bar stock.
- Thermowell shall protrude into the pipe to at least one half the nominal pipe diameters and shall normally be installed in the vertical position (top of pipe).

6.1.3 Pressure Control Valve

Make: Emerson/ NEWAY/JFLow/Fluid Control/Samson,

Trim/Type	6.00/EP 112
Valve size	8.00 Inch
Rated Working Pressure (WP)	2500 Psig
Pneumatic Supply	55 Psi
Acting range	3 to 15 Psi
Accessories	Electro-pneumatic positioner
Compliance	Explosion proof Flame Proof

Note that specifications can be adjusted according to the capacity. PCV shall have bypass for maintenance purpose as per following dwg:-

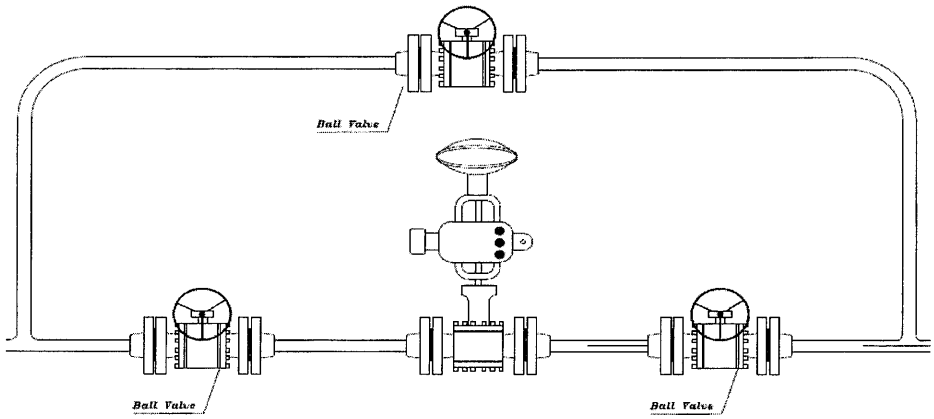

Fig-1

6.1.4 Dual Chamber Senior Orifice Meter

- Dual Chamber orifice fitting will incorporate double block & bleed (DBB) capabilities to meet or exceed ASME/ANSI specifications.
- Isolation using two separate chambers with separate equalization and venting for the upper and middle chambers is to be provided to enhance operator safety in event of lower valve failure. Senior Orifice Meter shall be welded flanged design.
- Pressure gauges complete with blowout preventers should be provided for upper and middle chambers to help operator access the equipment status including valve failure, vent blockages and other system malfunctions.
- Pressure class rating: Class 600, AGA-3 compliant
- Make: Canalta / Daniel / ABB / Precision

6.1.5 Orifice Plate

a. The primary flow element shall be concentric, square-edged orifice plates of a design to allow installation in a quick-change, dual-chambered double block bleed orifice fitting.

b. Orifice plate thickness shall be 1/4 inch.

c. The minimum diameter **Beta ratio** (β ratio) shall not be less than **0.3** and the maximum allowable shall not exceed **0.7**.

d. No vent or drain hole shall be allowed in the orifice plate.

e. Orifice plate shall have a maximum surface roughness of 50 micro-inch RMS using a comparator.

f. Orifice plate shall be manufactured of 316 stainless steel.

g. Orifice plate shall be sized with maximum flow considering the bore size & inches of

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water column values.

h. The flow measurement error caused by elastic deformation of the orifice plate shall not exceed 0.1%.

Vendor must supply flow calculation sheet from OEM.

6.1.6 3-pen chart recorder

General		
1	Service	NACE Compliant as per MR-01-75
2	Electrical Area Class	Class 1, Division 2, Group C & D (Exia) T4
3	Make	Cameron/ Barton or equivalent
Sensing Element - Differential Pressure		
4	Body Material	Forged Steel (C1018)
5	Bellow Material	316 SS
6	DP Range	vendor recommended
7	Process Connection	1/2" Top & 1/4" Bottom, NPT Female
Sensing Element - Static Pressure		
8	Pressure Range	0 - 3000 psi
9	Static Element	316 SS, Helical
10	Process Connection	1/4" NPT Female, Standard
Sensing Element - Temperature		
11	Temperature Range	32 to 212°F
12	Class	VB - Mercury Filled
13	Type	Case compensated
14	Capillary	1/8" T-316 SS Heavy Capillary
15	Capillary Length	Vendor recommended
16	Instrument Connection	1/2" NPT Male
17	Bendable Extension Neck	10"
18	Bulb O.D.	11/16"
19	Armor	Yes
20	Max Temperature	200°F
SS Solid Drilled Thermowell		
21	Type	Solid Drilled 1/2" NPT Female x 3/4" NPT Male
22	Immersion Length	As per vendor recommendation
23	Instrument Connection	1/2" NPT Female

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24	Bore Diameter	8mm (to match sensor)
25	Process Connection	3/4" NPT Male
Functional Specification		
26	Casing Material	Die Cast Aluminum
27	No. of Pens	03, Disposable
28	Chart Drive	24hrs/7 days, Mechanical
29	Chart Size	12 inch
30	Chart Paper	0 - 10 sqrt & 0 - 100 linear, 24 hrs
31	Mounting	2" Pipe Mount or As per vendor recommendation
Performance Specification		
32	Accuracy	(+/-) 0.5% FSD
33	Repeatability	(+/-) 0.1% D/P Scale
34	Response Time	Sensitivity 0.05% of Full Scale
35	Ambient Temperature	- 10 to + 50 Deg. C
Accessories		
36	2-Years Operational spares	Yes (Disposable pen, ink)
37	Valve Manifold	Yes
38	Chart Paper (24 hrs)	24hrs recording [10 box (each containing 100 charts)]

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6.2 *Water*

6.2.1 Flow Transmitter

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol

Supply Voltage	24 VDC
Range	0 to 2000 BBLs
Local Display	Back-lit Digital LCD integral Display
Communication / Output	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Eex ia IIC T4
Protection Class	Minimum IP65

Suitable for flow measurement of produced water and proposed model should be in operation for last 3-4 years.

6.2.2 Level Transmitter for Water

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol

Supply Voltage	24 VDC
Range	1055 mm
INHALT/Volume	LT 3 Inch
Local Display	Back-lit Digital LCD integral Display
Communication / Output	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Eex ia IIC T4
Protection Class	Minimum IP65
Accessories	Level glass with isolation valve, service & drain.
Maintenance	In-service maintenance and calibration provision

6.2.3 Level Control Valve

Make: Emerson/ NEWAY/JFLow/Fluid Control/Samson,

Trim/Type	1.00/MP 200
Valve size	2.00 Inch
Rated Working Pressure (WP)	2250 Psig
Pneumatic Supply	55 Psi
Acting range	3 to 15 Psi
Accessories	Electro-pneumatic positioner
Compliance	Explosion proof, Flame Proof

Note that specifications can be adjusted according to the capacity.

6.3 *Condensate/Crude*

6.3.1 Flow Transmitter

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol

Supply Voltage	24 VDC
Range	0 to 10000 BBLs
Local Display	Back-lit Digital LCD integral Display
Communication / Output	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Eex ia IIC T4
Protection Class	Minimum IP65

Suitable for flow measurement of produced condensate/crude and proposed model should be in operation for last 3-4 years.

6.3.2 Level Transmitter

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol

Supply Voltage	24 VDC
Range	1065 mm
INHALT/Volume	LT 3 Inch
Local Display	Back-lit Digital LCD integral Display
Communication / Output	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Eex ia IIC T4
Protection Class	Minimum IP65
Accessories	Level glass with isolation valve, service & drain.
Maintenance	In-service maintenance and calibration provision

6.3.3 Level Control Valve

Make: Emerson/ NEWAY/JFLow/Fluid Control/Samson

Trim/Type	2.00/MP 200
Valve size	6.00 Inch
Rated Working Pressure (WP)	2500 Psig
Pneumatic Supply	55 Psi
Acting range	3 to 15 Psi
Accessories	Electro-pneumatic positioner
Compliance	Explosion proof, Flame Proof

Note that specifications can be adjusted according to the capacity.

6.4 Vessel

One static Pressure transmitter & Temperature transmitter shall also be required at the top of each Separator for the monitoring of pressure & temperature of the vessel.

6.4.1 Static Pressure Transmitter

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol

Supply Voltage	24 VDC
Calibration range	0-2000 PSI
Max. Working Pressure	3000 Psi
Accuracy	0.075%
Local Display	Back-lit Digital LCD integral Display
Mounting Orientation	Horizontal
Communication	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Eex ia IIC T4
Protection Class	Min. IP65
Accessories	Three Valve Manifold, Mounting Kit

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6.4.2 Temperature Transmitter

Make: Emerson/E&H/Yokogawa/ABB/Siemens/Schneider/Foxboro/Autrol,

Supply Voltage	24 VDC
Temperature range	0 to 250 deg. F
Accuracy	0.075%
Local Display	Back-lit Digital LCD integral Display
Mounting Orientation	Horizontal
Communication	HART 4-20 mA
Electrical Certification	ATEX Group II 1/2G DT95 deg C, Eex ia IIC T4
Protection Class	Min. IP65
Sensor	4-wire platinum RTD, calibrated to 100 Ohms at 0°C
Accessories	Mounting Kit

Thermowell

- Thermowell shall be tapered **316 stainless steel 1½"** flanged raised face with ANSI rating equal to piping rating. Thermo wells provided without instrument shall have a stainless steel plug and chain.
- Thermowell body shall be 316 stainless steel machined from one piece bar stock.
- Thermowell shall protrude into the pipe to at least one half the nominal pipe diameters and shall normally be installed in the vertical position (top of pipe).

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SEPARATOR INSTRUMENTATION

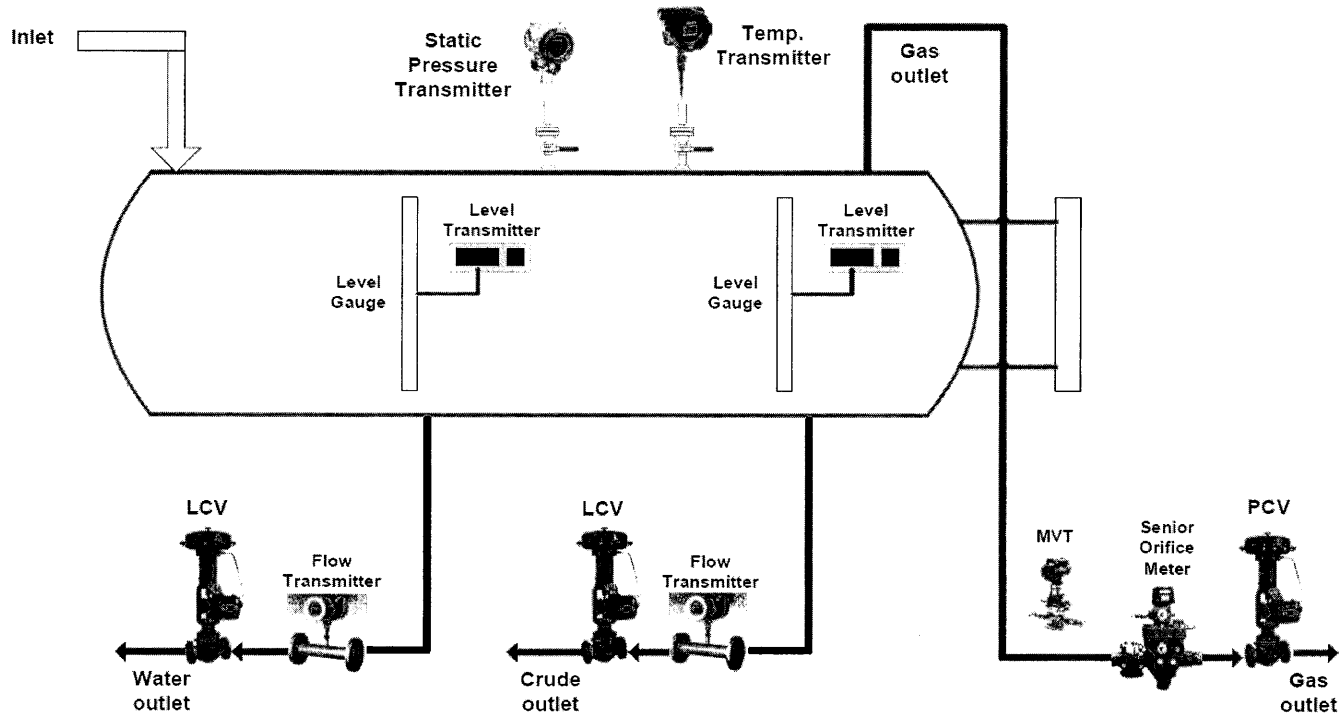
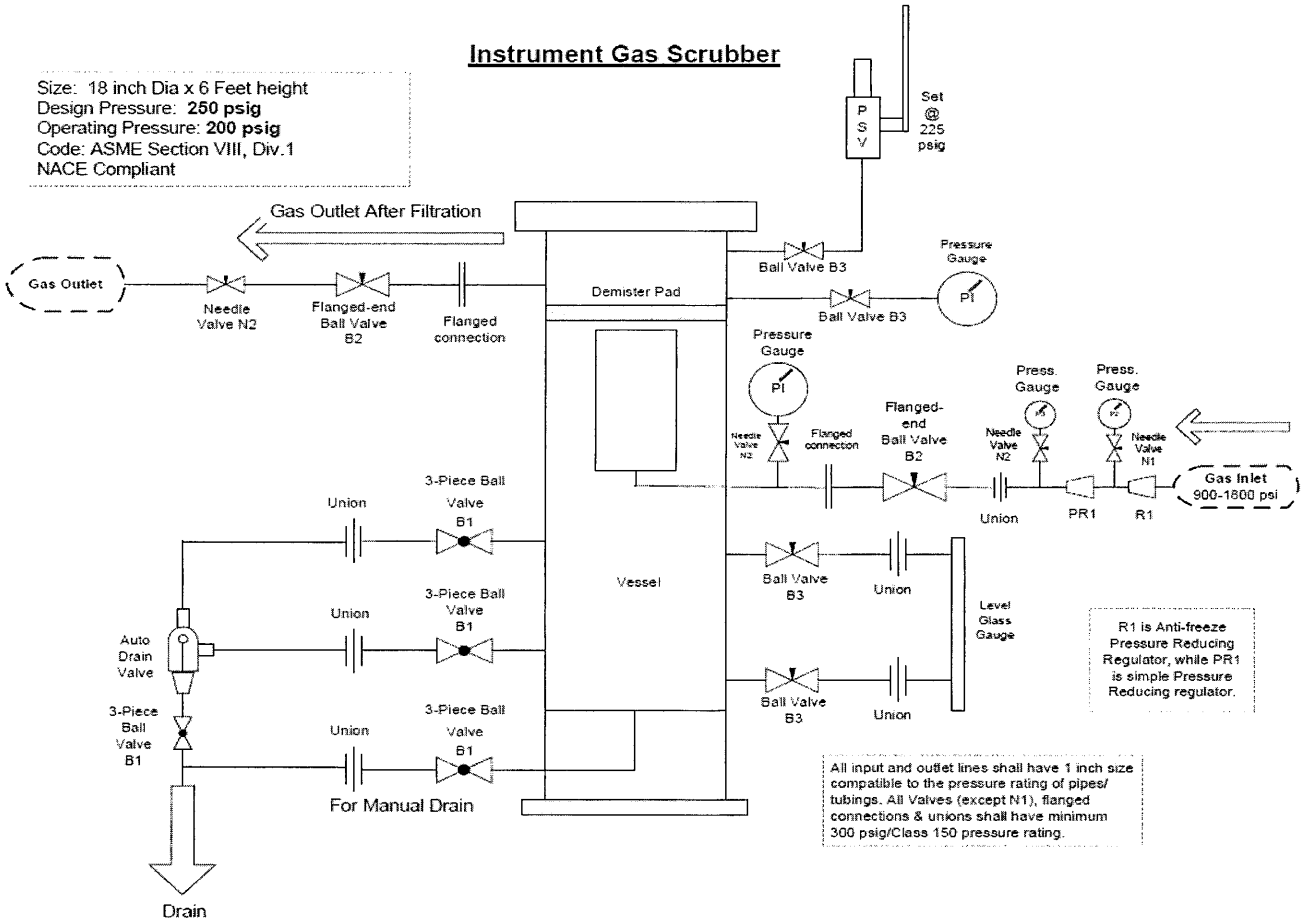


Fig-2

6.5 Gas Scrubber



Gas Scrubber comprises of Skid mounted Instrument Gas Dryer with associated filters & accessories for processing instrument gas. The outlet from Gas scrubber will go to Instrument Air Header for onward distribution to all instrument equipments. Design of Instrument Air Header will be vendor recommended. Gas Scrubber shall be provided with anti-freeze regulator, low-pressure regulator, filters & two pressure indicators (one on upstream and one on downstream). Detail & figure of the Gas Scrubber is attached. Gas scrubber shall consist of the following items:-

1) Complete vessel with filters & strainers, Qty: 01
2) Anti-freeze Pressure Reducing Regulators (R1 & R2), Qty: 02
3) Needle valves (Minimum 600 psig pressure rating), Qty: as per diagram
4) Ball valves (Minimum 600 psig pressure rating), Qty: as per diagram
5) Pressure gauges, Qty: 04 (02 on anti-freeze regulators, 01 on gas input before vessel, 01 on the vessel)
6) Union, Qty: 06 (01 on gas input line, 02 on level gauge glass, 03 on the downstream of drain valves)
7) Flanged connections as per diagram
8) Auto drain valve, Qty: 01
9) Level glass gauge, Qty: 01
10) Pressure safety valve, Qty: 01

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The above list represent requirement for one Gas Scrubber only. Please note that all the above-mentioned items shall conform to NACE compliant MR-0175.

6.5.1 Operating Requirements

Gas Flow Rate:	0.1 MMSCFD
Operation:	200 Psig and 120°F
Inlet size:	1" inlet pipe
Outlet size:	1" gas outlet

6.5.2 General

Type:	Vertical
Size:	18" Diameter x 6'-0" Height x 9.53mm thickness
Gas Flow Rate:	0.1 MMSCFD
Operating Pressure	200 PSIG
Operating Temperature:	120 ^{0}F
Design Pressure:	250 PSIG (150# flanged)
Design Temp.	150 ^{0}F

6.5.3 Vessel Feature

Design Code:	ASME SEC. VIII DIV.1 Latest Revision
Radiography:	As per code
Orientation:	Vertical
Joint Efficiency:	100%
Externals (Provided):	Lifting Lugs, Name Plates & Brackets
Painting (External):	One Coat after sandblast.
Standards:	(NACE compliant)
Support Type:	Legs

6.5.4 Demister Pad

Type:	Wire Mesh
Wire material:	Stainless Steel
Thickness:	75 – 100 mm
Design Pressure:	250 psi
Efficiency:	99.0% for 10 particle size & larger

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6.5.5 Pressure Safety Valve (PSV)

Type:	Proportional lift, spring loaded
Material	Stem, housing & spring : Stainless Steel (NACE)
Set Pressure:	225 psi

6.5.6 Pressure Indicator (P1)

Dial Size:	4 inch
Pressure range:	0-500 psig
Material	316 stainless steel wetted parts. 304 Stainless steel case and bayonet ring. (NACE compliant)
Liquid filled:	Yes
Accuracy:	1% of span
Process Connection	NPT threaded lower mount

6.5.7 Pressure Indicator (P2)

Dial Size:	2.5 inch
Pressure range:	0-1000 psig
Material	316 stainless steel wetted parts. 304 Stainless steel case and bayonet ring. (NACE compliant)
Liquid filled:	Yes
Accuracy:	1% of span
Process Connection	NPT threaded lower mount

6.5.8 Pressure Indicator (P3)

Dial Size:	2.5 inch
Pressure range:	0-500 psig
Material	316 stainless steel wetted parts. 304 Stainless steel case and bayonet ring. (NACE compliant)
Liquid filled:	Yes
Accuracy:	1% of span
Process Connection	NPT threaded lower mount

6.5.9 Auto Drain Valve

Function:	Allows automatic drain discharge without electric power
Proof pressure:	2.5 MPa
Max. operating pressure:	1.6 MPa
Operating pressure range:	0.5 to 1.6 MPa
Max. drain discharge:	2 Litre/min
Standards:	(NACE compliant)

6.5.10 Anti-Freeze Pressure Reducing Regulator R1

Type:	Direct-operated, pressure reducing regulator that resist hydrate formation and regulator freeze-up
Input pressure:	900 to 1800 psig
Material	Inlet adaptor: **316 Stainless steel** Lower Casing: **Brass** Spring Case: **Brass** Orifice: **316 Stainless steel** Valve Stem: **316 Stainless steel** Valve Disk: **Nylon (PA)** O-rings: **Nitrile (NBR)** Spring: **Zinc-plated steel** (NACE compliant)
Output pressure:	Adjustable 500-800 psi
Make:	Fisher or equivalent
Process Connection	Vendor recommended

6.5.11 Pressure Reducing Regulator PR1

Type:	Direct-operated, pressure reducing regulator.
Input pressure:	500 to 800 psig
Material	Body and Bottom Cap: **CF8M Stainless steel** Spring Case: **CF8M Stainless steel** Orifice: **316 Stainless steel** Valve Disks and Holder: **PTFE and 316 Stainless steel** Regulator Spring: **Zinc-plated steel** Adjusting Screw and Bolting: **Double Zinc-plated steel with zinc dichromate overlay** Upper Spring Seat: **Zinc-plated steel** Diaphragm: **K500 Monel** (NACE compliant)
Output pressure:	Adjustable 100-250 psi
Make:	Fisher or equivalent
Process Connection	Vendor recommended

6.5.12 3-Piece Ball Valve (B1)

Type:	Full Port, bubble-tight shut-off
Material:	Body: Stainless Steel 316, Ball & Stem: Stainless Steel
Pressure Rating:	Class 150 / 300 psi
Inlet Dia:	1 inch
Outlet Dia:	1 inch
Connection:	Threaded end connections
Standards:	API 6D, NACE

control locking Level Handle

6.5.13 Flanged End Ball Valve (B2)

Type:	Full Bore
Material:	Body: Stainless Steel 316 Ball & Stem: Stainless Steel
Pressure Rating:	Class 150 / 300 psi
Inlet Dia:	1 inch
Outlet Dia:	1 inch
Connection:	Flanged end connections
Standards:	API 6D, API-607 Fourth Edition Fire Safe, API-608 Anti-Static, NACE
Control	Locking handle or manual gear operator

6.5.14 Two-Piece Ball Valve (B3)

Type:	Full Port, bubble-tight shut-off
Material:	Body: Carbon Steel, Ball & Stem: Stainless Steel
Pressure Rating:	Class 150 / 300 psi
Inlet / Outlet Dia:	1 inch
Connection:	Threaded end connections
Standards:	API 6D, NACE
Control	Locking Lever handle

6.5.15 Needle Valve N1

Material:	Body, Stem & Packing ring: Stainless Steel 316 Packing: PTFE (NACE compliant)
Handle:	Standard, Round
Pressure Rating:	900 psi
Inlet & Outlet Dia:	Vendor recommended, threaded

6.5.16 Needle Valve N2

Material:	Body: Stainless Steel 316 Stem & Packing ring: SS 316 Packing: PTFE (NACE compliant)
Handle:	Standard, Round
Pressure Rating:	300 psi / Class 150
Inlet & Outlet Dia:	Vendor recommended, threaded

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6.6 PLC Controller

6.6.1

- Dual redundant PLC controllers with weather proof enclosures & sun shed stand shall be supplied for the monitoring & control of all parameters of Separators. All calculations shall be done in PLC in accordance with AGA.
- All instrumentation will be wired to PLC through a weather proof marshaling box. The PLC enclosure will be mounted in a non-hazardous area (outside 30 ft. radius of skid). The PLC enclosure will be polycarbonate NEMA 4 / IP-65, weather proof (i.e. protected against vertical-falling drops of water 'condensation' and protected against water from all directions). The PLC enclosure shall be lockable through specialised keys. At least three sets of all keys shall be provided.
- PLC will monitor the local analog and digital inputs and will perform local control operations. Control operations, set point changes and data may be downloaded to the PLC from the Control Room either by operator action or as required by the system software. PLC should not lose the record on failure of power supply.
- Transmitter signal, power and control signal cables will be wired though armored cable, running in conduit pipes, buried 3 ft. in the ground, to the PLC. Fuses on transmitter power lines will be provided at the PLC Panel.
- PLC shall also be responsible to communicate all parameters (indications, alarms, status, etc.) to SCADA Server for monitoring, recording and supervisory control at Scada Control Station.
- All cabling from transmitters to PLC (distance 50 feet) & from PLC to servers (distance 80 meter) at Control room will be supplied by vendor.

6.6.2 General:-

a	Processor	Dual Core 32-bit micro-controller, integrated watchdog timer
b	Memory	Minimum 16 Mb SDRAM, 8 Mb FLASH, 2 Mb CMOS RAM
c	Non Volatile RAM	CMOS RAM with lithium battery retains contents for 2 years with no power
d	External Storage	Option for extendable SD card option
E	I/O Terminations	5, 6, 8, 9 and 10 pole, removable terminal blocks, 12 to 22 AWG, 15A contacts
f	Power Input:	11 - 30 VDC,

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6.6.3 Input/Output:-

a	Analog Inputs	Minimum 56 Channels IF8 (07 Nos.) (HART Enabled), single-ended, software selectable 0-5V / 0-10 V or 0-20mA / 4-20mA (16 bit resolution), Suitable for 2 wire, 3 wire and 4 wire connections Crude:- Flow Transmitter/ Level Transmitter Water:- Flow Transmitter/ Level Transmitter Gas:- Flow Transmitter, Pressure Transmitter, Temperature Transmitter Vessel: Pressure Transmitter, Temperature Transmitter
b	Analog Outputs	Minimum 24 Channels OF8 (03 Nos.) (HART Enabled), output range 4-20mA (12 bit resolution) For LCV of Crude, LCV of Water, FCV of Gas
c	Digital Inputs	Minimum 16 channels (02 Nos. Cards)
d	Digital Outputs	Minimum 24 Channels (03 Nos. Cards) 12 for Sounder Alarm 12 for Beacon Light All DO should be short circuit protected

6.6.4 Certifications:-

a	Hazardous Locations	Suitable for use in Class I, Division 2, Groups A, B, C and D Hazardous Locations. Temperature Code T4

6.6.5 PLC Spares:

Vendor shall supply following spare cards with PLC:-

a	DC Power Supply	Qty: 02	f	Digital Input card	Qty: 01
b	AC Power Supply	Qty: 02	g	Digital Output card	Qty: 01
c	Analog Input Card	Qty: 02	h	Microprocessor card	Qty: 02
d	Analog Output card	Qty: 02			
e	Modbus Card	Qty: 01			

Modbus Card shall be used for communication with DCS.

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6.7 HMI

- Vendor shall supply & configure HMI (Human Machine Interface) for the graphical display of all parameters (like valve status, pressures, temperature, tank level, gas volume, crude volume etc) with control options for different loops, just like mentioned in Fig 6.1.
- All screens layout and system functionality shall be subject to OGDCL approval.
- Overall system security will be distributed on following levels:

Password Level	**Access**
Operator	View, Print
Supervisor / Engineer	Change set point, view, print
System Designer	Configuration, set points, menu / system edit, forced values
Remote Monitoring	Monitoring only. No change allowed.

- Incoming alarms shall be time stamped upon receipt and may be categorized as events, alarms (audible, visual, printed), critical and ESD.
- The HMI package should support OPC, ModBus, TCP/IP communication protocols.

6.8 *SERVERS*

- Control station shall consist of a redundant configuration, hot standby, industrial grade, high end, server computer system. Two server computers will be interlinked on a high speed Ethernet, using a network switch, with each machine database maintained synchronized. In the event of a failure, the standby machine will automatically assume control of all peripherals and the communication lines without initiating a re-boot of the standby computer.
- Each Server computer will have two hard disks connected through RAID controller. The mirror hard disks will automatically backup entire data of the master hard disk. Upon failure of the master hard disk, mirror hard disk will take over the operations, automatically or through operator assistance, without causing a re-boot of the computer.
- Each Server computer will have OPC application for maintaining data in OPC database.
- One peripheral high speed color LaserJet printer will be supplied, automatically accessed through TCP/IP bus or other mode of automatic addressing, by either Server machine or Operator stations. Printer will be primarily used for printing events, system alarms, status changes, system reports, screen prints, graphs and historical trends.

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ITEM	DESCRIPTION
Processor Type	Intel Xeon E5-2650v4 or latest,
Memory Type	16 GB DDR4-2400 R ECC, Expandable
HARD DISCS Type	2 x 1TB, Hot-Pluggable Hard Discs
Operating System	Windows Server 2012 or latest
DVD Drive	1 x DVD-RW Drive
Network Interfaces	4 x Gigabit Ethernet Ports
RAID Controller	SAS Array Controller with minimum 1GB Cache with support for RAID 0, 1, 5
Remote Management	Integrated remote management controller
Power Supply & FAN	Redundant fans & Hot-Plug redundant power supplies
System Peripherals Ports	VGA port, USB ports, management LAN and etc
Virtualization	Supported
Management & Monitoring	Pre failure indication, Centralize Management & Monitoring software from respective server manufacture must also support remote sites
Form Factor	Rack with required mounting kit to accommodate servers.
Rack Console	Min 17" Monitor with Touch with Mouse & Keyboard Console kit
Warranty & Support	3 Years on site by authorized service partner backed by manufacturer

This server will also act as WAN Data Application server and will form the gateway to the future DCS through Ethernet. This will be connected with OPC database for intranet connectivity.

OPERATOR STATION

Supplier shall provide 01 Operator Station interlinked with Server machines through HMI application on a high speed Ethernet.

Operator Station	
i	Intel Latest
ii	8 GB RAM
iii	1 TB Hard Disk
iv	20"+ color LED monitor
v	WINDOWS Latest version 64 bit

This Operator station obtain data from the main Servers databases through HMI application and display them on monitor screens for the operators to supervise and make adjustments to set points, to tweak processes and start or stop certain parts as and required operationally.

8-PORT NETWORK SWITCH

Supplier shall provide two 8 port network switches for interconnection of server stations, operator station & other peripheral devices.

6.9 OPC Database

- The system shall have an intuitive on-line database builder capability which shall allow the operator to define and revise the system database, with field areas for tag name, description, engineering units, engineering conversion factors and alarm levels fields and alarm action fields. The database construction procedure shall be simple fill-in-the-blank format with associated help "pop-up" dialogs.
- The constructed database shall be searchable by simple software query language statements. The system database may be constructed off-line by standard PC application programs and allow direct bi-directional database exchange with standard PC software. OPC DATABASE shall be used.
- Bi-directional Dynamic Data Exchange (DDE) capabilities will be provided between the system and PC application database and spreadsheet programs.
- The system shall have the capability to record at least two years of data in its archive.

6.10 BEACON LIGHT & SOUNDING ALARM

A warning beacon light with sounding, for all critical alarms described in section 6.15, will be installed on a separate pole structure on each separator.

6.11 *Configuration Machines*

Vendor will provide 02 portable configuration machines for the programming & configuration of PLC & transmitters with following specifications.

i	Intel Latest
ii	16 GB RAM
iii	1 TB Hard Disk
iv	17" color LED Display
v	WINDOWS latest version, 64 bit
vi	Anti-Virus Licensed

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6.12 KVA UPS

Vendor will supply one 1.5 KVA UPS for providing un-interrupted power supply to the PLC system for smooth operation. Battery bank shall be sufficient to provide backup time of 48 hours.

6.13 *REMOTE MONITORING*

Vendor shall supply Communication Terminal Block with associated software for establishing remote monitoring of Separators through WAN/LAN.

6.14 *BASIC INSTRUMENTATION*

Isolation and vent valves for maintenance shall be supplied on each skid instruments. Within the limits of design and construction all separators have the same basic instruments and controls as follows:-

(1) Pressure Indicator (PI)

- Monitors the pressure in the separator with 4" dial display. The gauge shall have an **accuracy of ±0.25%** or better of the calibrated span.
- Gauge shall be glycerin filled and shall be provided with a phenolic case and stainless steel movement and element and solid front with safety blow out plug at the rear.
- A multiport gauge and bleed manifold shall be provided to isolate the gauge for calibration. The manifold shall have a pressure rating equal to or greater than the process piping design pressure. A double block and bleed valve is required at the process line tapping point for gas service.

(2) Temperature Gauge

- Temperature gauge shall be bimetallic dial type with a nominal diameter of 5 inches. Gauges shall be hermetically sealed, with a stainless steel case. Every angle type is preferred, and be fitted with shatterproof glass.
- Accuracy of gauges shall be within ±2% of full scale

(3) Cables & Cable Tray:

- Skid mounted instrumentation shall be cabled to junction boxes at agreed locations at the skid edge. All cables shall be located in cable trays mounted on the skid. Electric cables shall be certified for use in hazardous areas classification.
- All cables will comply with BS 5308 or equal and the relevant national and international standards and guidelines for cabling on Onshore installations in the oil, gas and petrochemical industries. Earthing cables will be single core copper, sized to suit the duty. Please note that earthing bosses will be provided on the skid for connection to the main earthing systems.

(4) Explosion Proof Junction Boxes:

- Explosion proof Junction boxes shall be supplied with 20% spare terminals.
- All wiring associated with equipment installed shall be pre-terminated using suitably certified cable glands in skid mounted local junction boxes that shall meet the

protection type requirement. Separate Junction Boxes shall be provided for analog and digital signals.

- The Packager/ Manufacturer shall provide detailed termination diagrams for all local junction boxes installed.

(5) **Lightening arrestors**

Lightening arrestors and appropriate earthling system shall be provided on the skid.

(6) Low-powered explosion-proof lights

Low-powered explosion-proof lights shall be provided on Skid for providing illumination to the control valves & transmitters on the skid.

6.15 *SEPARATOR ALARMS*

All separators are fitted with the following protection alarms:

- Low level alarm
- High level alarm
- High pressure alarm
- High pressure relief valves

These alarms shall also be displayed on HMI with sounder.

7.0 MATERIAL REQUIREMENTS

7.1 All materials and parts included in the construction of the Separators shall be new, unused and of the highest grade being free from all defects or imperfections likely to affect their performance.

7.2 The material used for separators shall conform to those permitted in ASME Section VIII, Division 1, Sub section C. Materials of construction for Separators shall conform to ASME Section II, Part A Latest Edition. ASME Specification numbers are prefixed by SA.

7.3 Material for shells and heads shall be limited to those permitted in Part UCS of Subsection C, of ASME Section VIII, Division 1.

7.4 Proposed materials (BOM) should be shown on the drawings and submitted to purchaser for approval.

7.5 Refer to the provided hydrocarbon composition; bidder has to evaluate the material selection according to the gas composition.

7.6 All material of construction for Separators must be NACE compliance and N.A.C.E. Standard MR-0175/ ISO 15156 (Latest Rev.) should be strictly followed.

7.7 All flanges shall conform to ANSI B16.5.

7.8 All studs and nuts shall conform to ASTM A-193 and A-194 and cadmium plated.

7.9 All carbon steel pipes shall conform to ASTM A-106 for sour service.

7.10 The Skid Steel structure, support saddles, legs or skirts shall meet ASTM A36 material requirements.

7.11 All fittings shall be seamless forged steel. Malleable, cast iron or brass shall not be used.

7.12 All internal components shall be stainless steel.

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7.13 No threaded fittings are to be provided (excluding instrument tubing) for any pressure containing elements. Pressure gauge and thermo well connections are to be flanged (2" minimum). Flanged by threaded valves may be used to connect pressure gauges.

7.14 Vessel mounted instruments, equipments, enclosures and junction boxes, if any, shall be explosion proof and suitable for use in the H_2S environment. Purged and pressurized enclosures shall not be provided.

7.15 All tubing shall be high quality, fully annealed, seamless type 304 /316 stainless steel, ASTM A-632.

7.16 Maintainability

7.16.1 Separators shall be designed and fabricated to facilitate maintenance, repairs, and replacement of the internals and all valves/equipments installed on the skid.

7.16.2 Man ways, hand holes, and inspection openings shall be accessible from the ground or maintenance platforms and shall permit the maintenance and removal of all internal components.

7.17 Separator Internals

7.17.1 Supplier shall furnish and install all supporting rings, internal piping and all other internals where required and as mentioned in the data sheets and drawings of the Separators.

7.17.2 All internals (i.e inlet baffles, vortex breaker etc) shall be designed and fabricated so as to pass through the Separator man-ways.

7.17.3 Requirement of internals are mentioned in the data sheets of Separators.

7.18 Lifting

7.18.1 Supplier shall provide lifting lugs with full penetration welds on lifting attachments and it shall be subjected to 100% UT & 100% MPI/DPT as appropriate. All welds directly associated with lifting of Separators shall be subject to 100% MPI/DPT after load test.

7.18.2 Separators should be suitable for handling with mobile crane using a single point lift at the construction site, where it is necessary to use special lifting beams, spreader bars, slings, shackles, etc. these shall be provided by Supplier.

7.19 Corrosion Allowance

7.19.1 All separators and their internals shall have 3mm corrosion allowance applied to all pressure retaining parts and all surfaces of non-removable internals exposed to the process fluid. Removable internals shall also have the same corrosion allowance on all surfaces exposed to process fluid.

7.19.2 Those parts of separators which are subjected to erosion e.g. due to impingement by the process stream, shall be protected with weir plates, or impingement baffles.

7.20 Minimum Thickness

7.20.1 Minimum thickness of materials other than carbon steel shall be based on the structural stability of the separators in addition to the requirements of pressure and other mechanical loading.

7.20.2 Wall thicknesses of carbon steel nozzle necks for separators including corrosion allowance shall be in accordance with design. Supplier shall check thicknesses in accordance with ASME Code.

7.20.3 Minimum thickness of internal carbon steel attachments shall not be less than 6mm excluding corrosion allowance.

7.21 Support

Horizontal Separators shall be supported on two steel saddles only. Saddles shall be furnished by Supplier. Calculations shall be provided for the effect of support on the Separators & Vessels shell and heads.

7.22 Ladders and Platforms

7.22.1 All Separators shall be provided with necessary platforms with cage Access Ladders for the equipment having installed height above the 5 ft..

7.22.2 Supplier shall submit the strength calculation for cleats and attachments to the Separators.

8.0 MANUFACTURING AND FABRICATION REQUIREMENTS:

8.1 All welding shall be performed according to welding procedures which have been qualified to Section IX of the ASME Boiler and Pressure Vessel Code using low hydrogen electrodes or a low hydrogen process. Qualification of welding procedures shall include hardness testing to demonstrate compliance with NACE MR0175.

8.2 All welders must have a current code qualification certificate. Certificates shall be available for review by the purchaser/TPI firm.

8.3 Internals shall be attached to the shell using double-sided fillet welds or full penetration welds. Internals shall always be supported near the end with intermediate supports.

8.4 Each vessel skid shall be provided with lifting lugs and cable guides designed for a single point lift when lifting twice the dry weight of the fully assembled separator. Lifting lugs, piping and ladder support clips shall be welded to the attachment pads using full penetration welds and not directly to the vessel. The fabrication of skid and attachments shall comply the AISC (American Institute of steel construction).

8.5 Vessels shall be stress relieved as prescribed in paragraph UCS-56 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code.

8.6 All pressure piping shall be fabricated in accordance with the minimum requirements of the ASME B31.8 and ASME B31.3 for gas and liquid piping. The piping shall be 100% stress relieved in accordance with the methods provided in these codes.

8.7 Piping shall terminate with either a flange or a flanged valve. Tubing shall terminate with tubing fitting such as a tubing connector.

8.8 All piping shall be rigidly supported for service as well as for shipment. Relief valves shall be located such that they are accessible for testing and repair. Each relief valve shall have a full port ball valve, complete with locking device capable of locking the valve in the open position on the inlet and outlet sides of the relief valve. Either a bleed ring or a vent valve shall be provided between this upstream ball valve and the relief for each relief provided.

8.9 Valves, instrumentation and controls shall be installed completely and securely mounted on the vessel and ready for service.

8.10 All instrument tubing shall be installed so that fittings are accessible for tightening and removal. All instrument tubing and cables must be installed properly in trays/conduits. All tubing runs shall be installed to allow for thermal expansion and removal of instruments.

8.11 Isolation valves shall be installed, as required, for maintenance and removal of instruments.

8.12 The entire vessel including pipe supports and mounting bases shall be cleaned and abrasively blasted and prepared for painting. All piping shall be cleaned and abrasively blasted and prepared for painting. The external painting for the vessel and piping should be of good quality primer, undercoat and final coat with color specified by the purchaser.

8.13 Material and thickness of the internal coating of separators & piping shall be designed and approved by the Company prior to fabrication and should be in compliance to NACE MR 0175 and product specification. OEM recommendations letter with the bid to be submitted for acceptance.

8.14 Separator and its piping shall be internally coated with ceramic coating. The coating should be compatible with product specification. Internal coating will be done on all internal surfaces of the shell and head along with nozzle necks.

8.15 All calculation and specification for the selection of Material and thickness of the internal coating for the separators & Piping shall be furnished by the Supplier.

8.16 Material and thickness of the internal coating of separators & Piping shall be provided in technical bid.

8.17 Codes & Standards used for the internal coating and cladding shall be mentioned and provided by the supplier.

9.0 GUARANTEE

9.1 Performance Guarantee

Supplier shall guarantee the workmanship and design performance of supplied Separators with all internals and externals for a period of one year starting from date of successful commissioning at site.

9.2 Mechanical Guarantee

The Supplier shall guarantee that supplied Separators with all internals and externals are free from any manufacturing defect and if any part of the Separator internal and external and associated piping/material is found defective in any manner during installation or after installation but within performance guarantee period shall be replaced by the Supplier with no cost to the Company. In this regard the company shall promptly notify the packager/contractor in writing of any claims arising under this warranty. Upon receipt of such notice, the contractor shall, with all reasonable speed, repair or replace the defective goods of parts thereof without any cost to the purchaser.

10.0 QA/QC & CERTIFICATION

10.1 Quality Management System

10.1.1 The Supplier shall show that an effective system of Quality Assurance is in operation for both products and services which generally complies with ISO 9001 or equivalent. The Supplier and his Sub-Suppliers shall be ISO 9001 certified.

10.1.2 The Supplier shall submit, with his Proposal, a copy of his Quality Manual for review by Company/TPI firm. The Quality Manual should contain but not be limited to the following:

i. A signed policy statement on commitment to quality by the head of the Supplier's company.
ii. An organization matrix of the Supplier's company indicating reporting responsibilities.
iii. An index of the Supplier quality procedures.
iv. A brief outline of each procedure indicating individual responsibilities for maintaining quality.

10.2 Quality Certificates

The supplier and the manufacturer shall submit their quality certificates along with the bid.

10.3 Quality Control

10.3.1 It is the intention of Company /TPI firm to determine its involvement in the inspection of materials and activities at the Supplier's work dependant on the equipment complexity/criticality and the effectiveness of the Supplier's QA/QC procedures. The Supplier shall provide their standard format Quality Control Plan, relating to the scope of work for review with the bid. This should include those activities, which have been sub-contracted and provision made for Company /TPI firm design review/inspection.

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10.3.2 Regular visits by Company for the purposes of surveillance and documentation review will be carried out. However, should it become apparent that the Supplier's agreed Manufacturing Quality Control Plan is either inadequate or not being implemented, Company reserves the right to ask the supplier to increase the level or frequency of his Quality Control activities or request the Supplier to revise his working practices, as necessary.

10.3.3 To assist the Supplier in evaluating the expected level of Company involvement applicable to this document, the following activities in Quality Control Level by Company /TPI firm have been identified:

i. QC Plan review/markup
ii. Surveillance of major Sub-Suppliers
iii. Certification and manufacturing data review
iv. Hold Points for inspection by Company.

10.4 Material Traceability & Certification

The Supplier shall advice their proposed material traceability system by which material will be assured to be fit-for-purpose and identified throughout the manufacturing process, as part of the bid submission. The Supplier should note that material certification is to be provided for all pressure containing and load bearing components.

10.5 Inspection and Certification Records

The Supplier shall ensure that all inspection, test and certification records for equipment and materials, procured by the Company, and test and inspection records for the Supplier's assemblies and fabrications, required by legislation, codes, standards and specifications, or otherwise required are provided, safely stored and available on request.

10.6 Certification and Manufacturing Data Requirements

10.6.1 Certification and manufacturing data requirements consist of a collection of original and type test certification, inspection and test records and final release documentation generated during the approval, manufacture and testing of the equipment or material.

10.6.2 All as build drawings, Certification and Manufacturing Data, two (02) sets in hard format two (02) sets in soft format for each separator are to be issued to Company as dossiers at the time of delivery of equipment.

10.7 QUALITY PLAN

Activity	Purchaser Inspection
Pre-production/Design Review Meeting	H
Material Procurement	R
Heat Treatment Certificates	R
Mill Test Reports	R
Welding Procedure Qualification	H
Welder Qualifications	R
Fabrication	H, on-site
Radiographic Testing	H, on-site
Hydrostatic Testing	H, on-site
Welding Repairs	M
Painting and Coating	M
Prepare for Shipment and Final inspection	H, on site

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Note: These inspections/tests are considered to hold points at the beginning of production and may be changed to monitor points based on production performance, if notified in writing by the purchaser.

H - Hold point, inspection or testing shall not proceed without the presence of the purchaser's representative.

M - Monitor point, notification to the purchaser's representative of impending inspection or test activity is required.

R - Review documentation, presentation of the specified.

11.0 INSPECTION & TESTING

11.1 General

Inspection and testing shall generally comply with the requirements as detailed in this document and in the Specification for Unfired Pressure Vessels (4985-VA-3000). Following is to be considered as a minimum:

11.2 Inspection

11.2.1 The Supplier shall provide free access to his works and that of Sub-suppliers for the authorized representative of the Company / TPI firm. All necessary certification on materials, shop test data etc., shall be made available to verify that the requirements of the purchase order are being met. No surface shall be painted until all inspection is completed.

11.2.2 The monitoring and witnessing of inspections and tests by the purchaser shall be in accordance with the quality plan included in this specification. The purchaser reserves the right to increase or decrease the level of inspection based on performance during production.

11.2.3 The Supplier shall submit WPS, PQR and WQT for approval by Company/ TPI firm. The approval shall be sought in a manner not disturbing the overall delivery schedule of the package. The Supplier shall notify Company/ TPI firm at least fifteen (15) working days prior to the start of fabrication and scheduled time of testing, etc.

11.2.4 All pressure bearing welds of vessel and piping shall be 100% radio graphed in accordance with the ASME BPVC, Section V, Article 2, which incorporates ASTM E-94 and ASTM E-142. The essential hole size for penetrameter readings shall be in accordance with the ASME BPVC, Section V. Manufacturer shall furnish an x-ray report. The x-ray film shall be kept on file and be available for review on request. Rejected film shall also be kept for purchaser's review.

11.2.5 Radiographic examination shall be performed in accordance with a qualified written procedure. The procedure shall comply with the applicable requirements of Section V of the ASME BPVC. A copy of the radiographic procedure shall be furnished to the purchaser upon request.

11.2.6 The magnetic Particle examination for detection of surface cracks must be performed in accordance with ASME BPVC, Section-V.

11.2.7 Bidder to confirm the compliance of Third Party Inspection as per SCOPE WORK attached in the Technical Proposal which includes the above inspection criteria.

11.2.8 The scope of third party inspection (TPI) firm will be 100% from start till end of the project.

11.2.9 Third party inspection will be arranged by OGDCL at its own cost. Bidder has to provide full support to TPI firm during manufacturing process.

11.2.10 The bidder must comply Third Party Inspection (TPI) in his technical proposal.

11.2.11 If there is any delay in TPI scope / increase in number of days of TPI firm due to supplier/manufacturer, the additional amount to TPI firm will be paid by bidder.

11.2.12 Two OGDCL engineers and one SCM officer would attend Design Review Meeting/Final Inspection at manufacturing site for 05 days each, excluding travelling time.

11.2.13 The total related cost of visit (05 days each plus travelling time) would be borne by the bidder including visa charges, air tickets, boarding & lodging costs, transportation and TA/DA for these meeting and inspection.

11.3 Inspection Methods and Acceptance Criteria

11.3.1 All examination methods shall be as per ASME Code, Section VIII, Division I latest edition, as relevant to the equipment.

11.3.2 Supplier's Quality Plan shall be reviewed by Company/ TPI firm.

11.4 Test Requirements

11.4.1 All vessels, valves and attachments shall be hydrostatically tested in accordance with the appropriate code requirements at 1.3 times the design pressure specified on the data sheets. All the piping shall be hydrostatically tested at 1.5 times of design pressure as per ASME B31.3 and B31.8. Test pressure shall be maintained within -0 psi and +100 psi tolerance.

11.4.2 The water for hydro testing shall be of suitable quality and should not to harm any component of the Separator & Pressure Vessel in any manner.

11.4.3 Pressure testing shall be maintained long enough to permit complete inspection but shall not be less than 60 minutes.

11.4.4 A shop hydrostatic test for Separators shall be applied as per Paragraph UG -99C, ASME Code, Section VIII, Division I latest edition.

11.4.5 Calibration of all testing apparatus shall be maintained. Deadweight, recorders and gauges shall be calibrated within the last 3 months or as per manufacturer's quality plan that shall be available for review on request.

11.4.6 All service piping, such as control piping or tubing, shall be pressure tested and inspected for leaks with a soap test. All nozzle reinforcing pads shall be pneumatically tested for leaks with soap solution as specified by ASME BPVC, Section V. A Certificate should be provided indicating the tests were performed.

11.4.7 Test pressure recording chart or log shall include date, time of test, name of job, work order number, purchase order number and signature of the manufacturer's authorized representative. All information shall be in ink on the surface of the test chart and/or log.

11.4.8 If machining, welding or cutting is performed after the hydrostatic test, an additional hydrostatic test will be required after such work is completed.

11.4.9 Visual inspection of the welding and fabrication shall be done following fabrication.

11.4.10 The vendor shall bench calibrate and function test all instruments prior to installation on the skid and the test report to be provided.

11.4.11 Upon mechanical completion of the vessel (and prior to the performance test) a complete instrument and control function test shall be performed.

11.4.12 The vendor shall provide all test & test equipment records along with the shipping documents.

11.4.13 A performance test shall be performed by the vendor on the completed package prior to preparation for shipment. This performance testing will include testing of the equipment, piping, electrical and instrumentation. All deficiencies will be corrected and the test rerun. Deficiency correction and test rerun shall continue until all deficiencies have been removed.

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11.5 Impact Test Requirements

11.5.1 Charpy V-notch impact testing shall be required for the Separators in accordance with the code, if it is applicable by the Codes & Standards.

11.5.2 Impact Test shall be performed in accordance with the requirements of ASME Section II Part A, SA20 and Clause UG-84 of ASME VIII, Division1.

12.0 PAINTING AND PROTECTIVE COATING

12.1 Painting, protective coatings and the procedures used for the preparation of surfaces shall be as specified in the Specification for Painting.

12.2 Where painting is specified, the entire Separator & Piping shall be painted. Nozzles shall be painted to the flange edges, inside bolt holes and up to the gasket surface.

12.3 Fire proofed or insulated surfaces shall be shot blasted and given one coat of primer only.

13.0 SHIPPING AND HANDLING

13.1 After the final test, Separators shall be dried and cleaned thoroughly of all grease, loose scale, rust, flux and weld spatter, both internally and externally.

13.2 All machined surfaces and threaded connections shall be protected by coating them with rust preventative.

13.3 Flanged openings shall be protected with steel plate covers attached by proper bolting or strapping and sealed with a plastic compound.

13.4 Screwed connections shall be protected with threaded, forged steel plugs.

13.5 The Supplier shall be responsible for loading and anchoring the Separators & Pressure Vessels to prevent any damage during shipment. Vendor shall notify purchaser one week in advance of the completion for each vessel.

13.6 All vessels including equipment, materials and documentation supplied shall be prepared and packaged in a manner so as to provide both mechanical and weather protection while in transit. All equipment shall utilize temporary bracing for shipment in addition to permanent mounting.

13.7 The manufacturer shall accept liability for loss or damage of the vessel and equipment during loading, transit and unloading.

14.0 SPARES

14.1 General

14.1.1 The Supplier shall provide commissioning spares of the Separators. These are the spares parts and other materials needed to adequately cover the requirement of installation, day to day maintenance for the Separators during the Construction phase and Commissioning stages, including start up and testing.

14.1.2 Any delay due to wrong or insufficient supply of commissioning spares will be at Supplier part for the immediate replacement/provision within two (02) working days.

14.2 Special Tools

Special tools (if any) that are required for the installation, adjustment commissioning, operation and maintenance of the equipment shall be provided by the Supplier.

15.0 DOCUMENTATION REQUIREMENT FOR BIDDER & MANUFACTURER:

15.1 Documents to be submitted with the Bid For Technical Evaluation

A fully detailed written bid is required together with all data requirements listed below:

A. Technical Documents:

1) Table of compliance / exception and deviations, if any

i) Name of bidder, manufacturer and country of origin

3) Name Plate of manufacturer / Country of Origin.
4) Guarantee statement.
5) P&ID of the separator.
6) Skid Structure details and drawings.
7) Material of Construction of Separator (including Internals etc).
8) A preliminary production schedule of the Separators including design, engineering, fabrication, factory testing etc. Also indicate delivery dates for all Sub-Supplier's items.
9) Document submission schedule.
10) Information requested (Ref Annexures)
11) Details of Sub-Suppliers with quality certificates
12) Detail scope of supply including the detailed material list.
13) Preliminary design calculations of Separators.
14) Process Design calculations.
15) Surface treatment and painting/coating procedure.
16) General Arrangement drawing for all Separators including, parts list, materials and equipment description, weights, space required for operation/maintenance.
17) Spare parts (Commissioning etc) and Special tool.
18) Quality Manual and Quality Control Plan.
19) Typical Inspection and Test Plan.
20) Packaging and shipment procedures
21) Valid U Stamp Certificate.
22) U Stamp certificates for last consecutive five years of manufacturer.
23) Quality Certificate of manufacturer.
24) Environmental Certifications
25) Performance certificates of manufacturer (at least three) from International Oil & gas companies for separators.
26) Separators supply record of manufacturer to International E&P companies during last three years.

B. <u>Financial Documents:</u>

1) Price breakup of all the items in financial bid and without price in technical bid.
2) Performance Bank Guarantee(s)
3) Schedule of Deliveries
4) Comments or exceptions/contractual deviations to ITB.
5) Audited financial statements for last three years of bidder.
6) Audited financial statements for last three years of manufacturer.

15.2 <u>Documents to be submitted after Purchase Order (for Approval)</u>

1) Finalized Production Schedule.
2) Data required for civil foundation design.
3) Mechanical and process design calculations.
4) Finalized General Arrangement Drawings with Nozzle details (elevation, Ratings, Projection etc.).
5) Detail fabrication drawings (prior to execution of fabrication works).
6) Internals details/drawings.
7) Welding procedure specifications and Weld Maps.
8) Details of ASME inspector and his visits plan.

9) Procedure Qualification Records.
10) Welding qualification Test Procedure.
11) Hydro-testing Procedures.
12) NDT / Painting inspection Procedures.
13) Complete detail of Sub-suppliers.
14) Material Test Certificates etc.
15) Installation Drawings and Procedures.
16) Any other requirement.

15.3 Final Documentation

15.3.1 A fabrication dossier shall be compiled concurrently with fabrication such that a full record of the fabrication, materials, inspection and testing is available.

15.3.2 All items in the dossier shall be numbered and bound in an A4 four post binder; contents shall include but not be limited to the following (as applicable)

1) Front cover sheet detailing
   a. P.O. No.
   b. Project Title.
   c. Equipment Title
   d. Equipment Item No.
2) Index
3) Company Release Note
4) Purchase Order or extract thereof
5) A list of all applicable codes, standards and specifications
6) All "As-built" drawings to be folded to A4 size and inserted into pre-punched plastic wallets.
7) Approved weld procedures and NDT procedures.
8) Summary of approved welders and NDT technician's qualifications.
9) All NDT/PWHT/ Hydrostatic/ Performance test reports.
10) All reports checked and approved by ASME Inspector.
11) Photocopy of Nameplate.
12) Material chemical analysis and mechanical test certification.
13) Final signed quality plan.
14) Operating manuals shall also be assembled into bound volumes and shall contain following:
   a. Operating and maintenance procedures.
   b. Commissioning instructions.
   c. All "As-built" drawings.
   d. Detail of commissioning and operating spare parts for two years service.
   e. Any other documents not specified above, but essential to make the Separators operational and maintainable.

15.3.3 All above documents, Two (02) sets in hard and Two (02) in soft for each separator shall be submitted in 4 ring white hard cover binders. All documents smaller and larger than A4 shall be inserted into A4 pre-punched, top-opening plastic wallets with the project document number/title block clearly visible to the front.

15.4 Transmittals

All documents submitted to the Company after the award of Contract shall be accompanied by a transmittal completed by the Supplier. All transmittals will be

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15.5 Drawing Sizes

Sizes A1, A2, A3, and A4 shall be used.

NB. A0 size drawings are NOT acceptable.

15.6 Scale Ratios

Except where stated, all drawings will be supplied in metric units using one of the following scales 1:1, 1:2, 1:5, 1:10, 1:20, 1:25, 1:50, 1:100, 1:250, 1:500, 1:1000.

15.7 Electronic Data

15.7.1 Supplier shall also submit electronic/soft copies of all design data, documents, drawing, etc. This also includes design details by Supplier's and Sub-Suppliers.

15.7.2 All drawings shall be provided in AutoCAD 2004 format. All documentation shall be prepared in MS Office 2007.

16.0 NAME PLATE

16.1 Each Separator and Vessels shall be provided with a type 316 stainless steel nameplate securely attached to the Separator & Vessel shell and located so that it is clearly visible after installation. Nameplates shall be riveted to a bracket welded onto the Separator.

16.2 The following information shall be stamped on the nameplate:

1) Manufacturer's Name.
2) Manufacturer's Serial No.
3) Equipment Tag No.
4) Equipment Title.
5) Purchase Order No.
6) Year of Manufacture
7) Maximum allowable working pressure (psig) at (°F)
8) Minimum design metal temperature (°F) at (psig)
9) Size I.D./O.D. x T to T in mm.
10) Shell Thickness mm
11) Corrosion Allowance in mm.
12) Design Code.
13) Test Pressure (psig)
14) Weight empty/operating/hydrotest in kg.
15) Inspection authority and date of inspection.
16) Code 'U' stamp.
17) Plus appropriate symbols for:
    a. Type of construction
    b. Non-destructive testing
    c. Heat treatment

16.3 Letters and figures shall be minimum 5mm high and clearly stamped.

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17.0 PREFERRED VENDOR LIST

17.1

Instrumentation	Approved Vendor
Flow Transmitters Force Balance D/P cell	Rosemount, Honeywell, Foxboro
Flow Indicator Field Mounted Bellows Type Rota meters	Taylor, Barton, Fisher, Porter & Brooks
Liquid Electronic Flow Meter (Oil & Water)	Yokogawa ,Emerson , Rockwell, Krohne , Invensys (Schnieder Electric)
Level Controllers, Transmitters Displacement, with tore tube	Emerson, Fisher, Honeywell, Foxboro, Norriseal
Level Switches External, Displacement, with Torque tube or magnetic follower	Magnetrol, Mercoid, Yamatake.
Level Gauges Steel armored, Reflex or Transparent with illuminator	Jerfuson, Penberthy, Greenwood, Sparton Controls, Cesare Bonetti SPA - ITALY, Samil Industry Co. Ltd. Korea , Simco Engineers Ltd. U.K. , Vaihinger GMBH Germany
Pressure Transmitter Indicating, motion, or force balance	Rosemount, Honeywell, Foxboro
Pressure Switches- Electrical Process- 3.6 SS Bourdon tube Air 3-15 PSI	ASCO, Dresser (Ashcroft)
Pressure Switches- Pneumatic	
Pressure Gauges 4 ½" –316 SS Bourdon Tube Seals	Ashcroft, Wika, Nuova Fima
Temperature – Remote Indication or Recording Resistance bulbs (RTD) with Thermowellss-100 OHM Platinum	Conax, Taylor, Honeywell
Temperature Switches – Electrical (Blind, Gas Filled)	United Electric, Ashcroft
Temperature Gauges (Dial Type)	Ashcroft, Wika
Temperature Switches – Pneumatic (Blind)	Masoneilan
Control Valves (Steel globe body, Flanged 300# min. SS Trim	Fisher, Masoneilan, Norriseal, Yamatake-Honeywell (Azbil Corporation), Welker, ABB Control Valves, CCI AG Switzerland, Dresser Italia S.P.A. Italy, Metso Automation, Nuovo Pignone S.P.A Italy, Samson Ag Mess – Und Regeltechnik Germany, The Leeds Valve Co. Ltd. U.K, Xomox International Gmbh & Co. Germany.

Temperature Transmitter (Blind or indicating , Force or Motion balance with SS well)	Emerson, Honeywell, Foxboro, Rochester Instruments System Ltd. U.K., Yokogawa, ABB
Relief Valves (General Steel Bodies, Flanged 150# Inlet and Outlet min., Full nozzle type)	Farris, Crosby, Dresser Industrial Valve Operations U.S.A, Fukui Seisakusho Co. Japan, Keystone Anderson Greenwood - U.S.A, Leser Gmbh & Co. Kg Germany, Nuovo Pignone, Smart Valve Co. Korea
Field Mounted Recorders/ Indicating Controllers	Taylor, Foxboro, Honeywell, ITT Barton (Cameron), ABB
Panel Mounted Recorder/Indicating Controllers	Taylor, Foxboro, Honeywell, ITT Barton (Cameron), ABB
Tubing/Fittings (Instrument Air)	SS/Hokes
Gas Regulators	Fisher, ITT Conoflow , Fukui Seisakusho Japan ,Hartmann & Braun Germany , Hirata Japan, Valvitalia
Pneumatic Relays	Moore, Honeywell, Foxboro
Solenoid Valves (Class B Coil Min)	ASCO, Maxseal UK (Thompson Valves), Konan Electric Japan, Herion.
Draft Gauges	Hays-Cleveland, Baileys
Rupture Discs	Black Sivalls Bryson (BS&B)-Insert Type
Annunciators	Ronan, RIS, AMETEK
Switch Timers	Automatic Timing & Controls (ATC)
Panel Mounted Indicators	Taylor, Ashcroft, Foxboro, Honeywell
Pressure Switch-Differential	United Electric, ASCO, Ashcroft, Baumer Bourdon Haenni Sas – France, Delta Controls Ltd. - U.K, Dresser Europe S.A. – GERMANY, Nuova Fima, Wise Control INC - KOREA
Turbine Meter (PD Type)	Halliburton, Floco, Smith
Ball / Plug Valve	Valvitalia, Grove, PetrolValves, Newco, Kobold, KF, KVC, Orbit, Bel Valves, Flowserve, GWC Valves USA, KITZ Euorpe, Ringo Euorpe, Dafram Italy,Velan Canada/USA/Euorpe, MSA Italy
Senior Orifice Assembly	Daniel, FMC, Precision
External Coating	Heat and Corrosion resistant (Material data sheets to be provided)
Internal Coating	Carboline, Ameron, Tuboscope, Wisconsin

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17.2 If the bidder opts to offer any equivalent vendor other than the preferred vendor list at para 17.0 and para 6.0 Separator Instrumentation then it should meet following criteria for acceptance:

17.2.1 Supply record to Pakistani E&P companies (Copies of minimum five purchases Order).

17.2.2 Manufacturing facility should have at least five years continuous experience after obtaining relevant international certifications like API 6D for valves, API 5L for Pipes etc. Valid and last consecutive 5 years API 6D/other certificates of offered valves/other items manufacturer to be submitted.

17.2.3 Supply record of last five years of specific item of manufacturer.

17.2.4 Quality & HSE Certifications of manufacturer.

17.2.5 Financial Information (Audited Statements for last three years of offered manufacturer).

17.2.6 The vendors proposed by bidder in its technical bid will be final and will not be allowed to be changed afterwards.

18.0 DATA SHEET

18.1 GENERAL INFORMATION

Project	:	Nashpa Oil Field Separation System
Site	:	OGDCL Nashpa Oil Field
Service	:	Crude Oil/Condensatel/Water/Gas Separator
Model No.	:	_____
Equipment Tag No.	:	_____
No. Required	:	One Unit HP Separator + One Unit MP Separator + One Unit LP Separator
Vendor	:	_____
Project No.	:	_____
Delivery Period	:	_____
X-Ray	:	Full
P.W.H.T	:	Yes

18.2 OPERATING DATA

Parameter	Design	Operating
Fluid Handled	Crude Oil/Condensate, Gas and Water	
Class	900	
HP Separator		
Pressure	1415 psig	750~1200 psig
Temperature		
Maximum	195 °F	120 °F
Minimum	40 °F	40 °F
Gas Flow Rate	20 MMSCFD	
Oil Flow Rate	10000 BPD	
Water Flow Rate	1500 BPD	

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Parameter	Design	Operating
MP Separator		
Pressure	900 psig	150~600 psig
Temperature		
Maximum	195 °F	120 °F
Minimum	40 °F	40 °F
Gas Flow Rate	5 MMSCFD	
Oil Flow Rate	10000 BPD	
Water Flow Rate	200 BPD	
LP Separator		
Pressure	250 psig	15~90 psig
Temperature		
Maximum	195 °F	120 °F
Minimum	40 °F	40 °F
Gas Flow Rate	0.5 MMSCFD	
Oil Flow Rate	10000 BPD	
Water Flow Rate	50 BPD	
Specific Gravity (Gas)	0.67	
Specific Gravity (Oil)	40 API Gravity	
Specific Gravity (Water)	1.01	
Service	Sour	
CO_2	4 mole %	3.58 mole %
Chlorides	15000 PPM	700-15000 PPM
PH of water	5.5-6	
Retention Time (Minimum 3 minutes)	To be quoted for the separation based upon maximum oil in water as below.	
Max Oil in Water	1000 mg/liter	
Corrosion Allowance	minimum 3 mm	
H_2S	1000 ppm	
NACE MR 01 75	Yes (Applicable for all material / Coatings)	

19.0 REPORTS

Gas, Water & Condensate Analysis report is added for vessel sizing, instrumentation & controls selection and other design related issues. Data should be considered for design and sizing of separator.

19.1 Gas Analysis Report

Gas Analysis of Nashpa Oil & Gas Field

Components	Well # 01 Mole %	Well # 02 Mole %	Well # 03 Mole %	Well # 04 Mole %	Sale Gas Mole %
Methane C1	85.6203	84.8053	83.4701	84.6720	85.6377
Ethane C2	6.8925	7.0991	8.2885	7.1197	7.0393
Propane C3	3.1779	3.4783	3.0724	3.3592	3.2710
Iso-butane IC4	0.5083	0.5858	0.5050	0.5624	0.5594
N-Butane NC4	0.7896	0.9715	0.8103	0.9067	0.9130
Iso-Pentane IC5	0.2005	0.2866	0.2407	0.2496	0.2645
N-Pentane NC5	0.1627	0.2509	0.2110	0.2150	0.2286
Hexane + C6+	0.0267	0.0532	0.0530	0.2133	0.2017
Carbon Dioxide Co2	1.7732	0.5893	2.5185	1.8175	1.0668
Nitrogen N_2	0.8483	0.8800	0.8305	0.8846	0.8150
Hydrogen Sulphide H_2S	Nil	Nil	Nil	Nil	Nil
Specific Gravity	0.6670	0.6675	0.6826	0.6799	0.6714
BTU/ft^3	1128.10	1158.14	1134.02	1146.42	1153.25

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19.2 Condensate Analysis Report

Description	**Sample # 1**
Choke Size	**56/64**
Analysis Date	27-01-2017
Sampling Point	Downstream Well # 1
Sampling Date	26-01-2017
Testing Parameters	**Results**
Specific Gravity Observed	0.814
Specific Gravity @ 60/60 °F	0.818
Temperature °F	110
API gravity @ 60/60 °F	41.48
BS & W (% Vol)	0.30
Salt (PTB)	2.5
RVP (psi)	4.0

20.0 DATA TO BE PROVIDED

20.1 Vessel Data

Design Code ASME Section VIII, Division 1
U Stamp _____(Yes/No)
Vessel Design Capacity (MMscfd) _____
Pressure Drop @ Design Capacity _____
Outside Diameter (Vessel)_____Inches S/S Length_____ Inches
Inside Diameter (Vessel). _____ Weight _____ full of water
Shell Thickness _____ Head Thickness _____
Design Pressure _____PSIG Design Temperature _____ °F
Radiography 100% (Yes/No) Post Weld Heat Treatment_____
Hydrostatic Test Pressure _____ PSIG Min Design Metal Temp: _____
Inlet Block Valve: _____ Separator Bypass: _____
Safety Valve: _____ Rupture Disc: _____
MDMT: _____

20.2 Detailed Design Calculation

for VESSEL SIZING for all separators ***(PROVIDED / NOT PROVIDED)***

20.2.1 Material Specifications

NACE Materials _____ (Yes/No)
Metal Cladding:
Required_____ Type _____
Shell _____Heads _____
Flanges Nozzles

Weir Plate _____ Saddle _____
Internal Bolting (316/304 SS) _____ Studs _____
Support steel_____ Nuts _____
Gas Piping: _____ Oil Piping _____
Water Piping_____ Instrument Tubing _____

20.2.2 VESSEL INTRERNALS:

Mist Extractor:
Manufacturer _____ Type _____
Thickness _____ Material _____
Area of Cross Section _____
Demister Pad: _____
Vortex Breaker: _____
Deflecting Plate : _____
Weir Plate: _____
Float Shield: _____

20.2.3 NOZZLES AND CONNECTIONS

Total No. of Nozzles: _____

MK	No	SIZE	RATING	FACE	TYPE	SERVICE
N1						
N2						
N3						
N4						
N5						
N6						
N7						
N8						
N9						
N10						

Main Stream Inlet Connection: _____
Gas Outlet Connection: _____
Oil Outlet Connection: _____
Water Outlet Connection: _____
Drain Connections: _____
Sampling Points (Gas, Oil and Water): _____
All piping terminated at skid edge and ends are RTJ flanged with companion flange screwed with studs, nuts and gaskets. (Yes/No)

20.2.4 VESSEL TRIM

Trim Furnished by Vendor Yes (Yes/No)
Trim Furnished by Company No (Yes/No)

20.3 Material Detail

ITEM	ITEM NO.	BRAND	TYPE / DESCRIPTION
Pressure Relief Valve			
Pressure Control Valve			
Level Gauge Water			
Level Gauge Oil			
Level Controller Water			
Level Controller Oil			
Level Control Valve Water			
Level Control Valve Oil			
Level Transmitter			
Pressure Transmitter			
Ball Valves			
Needle Valves			
Pressure Gauge			
Temperature indicator			
Thermowell			
Pressure Indicator			
Meter Run for orifice			
Senior Orifice Meter			
Differential Pressure/Flow Recorder			
Flow Computers			
Oil Flow meter (Indicator & Totalizer)			
Water Flow meter(Indicator & Totalizer)			
Automatic Dump Valve			
High/Low Liquid Level Switch (oil/water)			
Rupture Disc			
Any Other			
Shell / Head Material			
Piping Material			
Fittings			
External Coating			
Internal Coating			
Any other items			

20.4 Coating & Painting:

20.4.1 External Coating:

i- Primer coat: _____ & ____ mils DFT
ii- Under coat: _____ & ____ mils DFT
iii- Top coat: _____ & ____ mils DFT
iv- Colour: Dark Blue.

20.4.2 Internal Coating:

NACE Complied internal coating required: & mils DFT

S/C

MAKE: (Provide one for Internal Coating brand)

20.5 SKID FRAME

20.5.1 Skid construction: 4 runner I-Beams (suitable for oil field condition) Yes/No

20.5.2 Material ASTM A-36 Yes/No

20.5.3 Detailed drawing for skid Yes/No

20.5.4 Approximate Weights in Pounds/Kgs of separator with skid:

Shipping _____ Hydro test _____

Erected _____ Operating _____

20.6 TESTS & RECORDS

- Hydrostatic test of vessel, piping and valves Report. (Yes/No)
- Leak Test of package (Yes/No)
- 100% Radiography (vessel) inspection Reports/Films (Yes/No)
- 100% Radiography (Piping)) inspection Reports/Films (Yes/No)
- Dimensional Inspection Record (Yes/No)
- Weld Map (Yes/No)
- Magnetic Particle Examination (Yes/No)
- Ultrasonic Test (Yes/No)
- Calibration of all Instruments before installation. (Yes/No)
- Function Test of all instruments after installation. (Yes/No)

20.7 QA/QC and INSPECTION:

Compliance of Quality Plan in section 10.0 of this specifications (Yes/No)

Compliance of Inspection Plan in section 11.0 of this specifications (Yes/No)

20.8 COMMISIONING & OPERATING PROCEDURE MANUALS

To be provided separately in 2 CDs and 2 Hard Copy Set. (Yes/No)

20.9 VENDOR REQUIREMENT

1) The successful vendor to provide three sets of basic and detailed engineering drawings for Approval.	(Yes/No)
2) Vessel drawings and ASME code calculations	(Yes/No)
3)01 CD and 01 hard copy of complete and final approved design.	(Yes/No)
4) 02 CD of final approved drawings in Autocad format.	(Yes/No)
5) 02 CD of as build drawings in Autocad format.	(Yes/No)
3) 02 CD set of complete job package including as built + 02 set of hard bound	(Yes/No)

NOTE: Manufacturer to complete applicable vessel data sheet with proposal, as a mandatory requirement of this tender's technical details.

TOR FOR THIRD PARTY INSPECTION & EXPEDITING OF SEPARATOR

1. Introduction:

Scope of this third party inspection (TPI) is to cover the project plan review, progress review as per delivery plan, inspections / check / tests review and facilitating the daily progress reports for the actual work done at the manufacturing site in a mutually agreed time bar and descriptive review note. Identification and improvements in the earliest (or before the contracted period) to expedite the unit's fabrication would be most valued role of TPI with meaningful insight to this project.

The TPI Company is to depute its certified testing and inspections Engineers during the entire project at the manufacturer's site at the total costs whatsoever to be paid to the TPI in lump sum payment till completion of the project. The entire vendor supplied items and QC/QA plans review are under this TPI plan as per contract / agreement. The TPI inspection dossier / report to enlist the following, but not limited to:

- Design / drawing / specifications / bid proposal and engineering package review and verification
- Material Identification through mill test certificates or through laboratory testing (if required)
- Review of Inspection Test Plan & Quality Manual.
- Review of data sheets of all material to be procured and to ensure that it is in line with specifications.
- To ensure that material procurement process is timely initiated in order to avoid delay.
- Review of complete project schedule and identify critical path items.
- Review / Witnessing of Procedure's qualification record and welder's qualification tests
- Inspection Regarding Construction of vessel and piping plan as per code.
- Inspection of plates materials as per specification given in agreement/code
- Inspection of welding consumables and to check the quality and suitability.
- Inspection of Steel Structure assembly and welding.
- Inspection of vessel as per code.
- Inspection of Nozzle Orientation.
- Witnessing of DPT and Pneumatic Leak Test where necessary.

3/c

- Inspection of quality of E&I and valves as per code and site's 25 years functioning life.
- Witnessing of testing of all weld joints
- Review results of radiography of all welds of the vessel and piping spools.
- Stage inspections / hold points to be decided according to the Quality Inspection plan to be submitted by manufacturer in accordance with specifications.
- Witnessing of Hydrostatic Testing
- Report of findings
- Overall responsibility for the excellent workmanship guaranteed through the above inspections and continuous site supervision by the certified ASME Inspector at site during the entire phase of separator's design (its review), sizing, fabrication, testing and inspection as defined in this document.

The scope for Open Box Pre-shipment inspection of Material to be carried out by third party inspector is outlined below:

- Ensure complete compliance with documents.
- Vendor items dimensions and identification marking (on body and/or nameplate) for conformance to purchase order and specifications.
- Check for any indications of damage.
- Check preparation for shipment and packaging as per specification.
- If gear or hand wheel operated, check that the clockwise operation of the operator closed the valve.
- Check the operas ability of Valves and Instrumentation.
- Review the detailed listing (will be provided by Manufacturer) of the equipment, materials, tools, accessories, spare parts, and all other relevant parts being shipped, Material Test Certificates, Purchase Order and other relevant documents.

- Each package shall contain following information with un washable paint.

b) Oil & Gas Development Company Ltd, Islamabad Pakistan.
c) Contract No._____
d) L/C No._____
e) Equipment No._____

f) Case No._____
g) Storing and handling instructions for fragile and perishable items.
h) Gross Weight (in metric tons)
i) Dimensions (length*width*height in metric system)
j) Place of Origin

- Verify the completeness of Material based on the final Packing List provided by Manufacturer.

- Compliance check for safety standards of transportation/ shipment for Material.

- Physical check for any damages of Material.

- Marking as per the packing list.

- Instructions necessary for the storage of Material to maintain its integrity at site and before startup.

- Integrity of coating/exterior paint must be checked and ensured. Make sure that paint does not contain Lead or chromates.

- All exterior surfaces except for corrosion resistant material shall be coated with rust preventive material.

- All interior surfaces shall be physically checked to ensure that no dust, oily particles, welding spatters and other damaging particles reside there and those surfaces shall be coated for rust prevention.

- All the material must be closed with some standard procedure.

- All the threaded openings must be secured with steel plugs and openings beveled for welding shall be secured to prevent entrance of any moisture contents or dust.

- Centre of Gravity and lifting points must be marked clearly on the equipment.

- All the connections whether piping, component or electrical shall be thoroughly inspected for their integrity.

- All the components being shipped separately shall be tagged with item and serial number of the equipment for which it is intended.

- All the equipment and components to be shipped shall comply with Occupational Health and Safety Standards.

- Any connections dismantled for shipment purpose shall be match marked for ease of assembly.

- Copy of installation / Maintenance manual must be shipped along with the material.
- Copy of As Built drawings must be shipped along with material.

- Preparation of report in light of above inspection, applicable codes/ standards and clearly identify the acceptance criteria.

3.0 Reporting Structure:

- Verification of Progress / Quality reports of all activities prepared by manufacturer.
- Submit a Non Conformance report to OGDCL signifying the quality concern & remedy.
- Daily inspection report.
- Detailed report at the end of complete inspection (Soft and hard copy).

Notes:

- 3rd Party inspector shall be present at the factory during all stages and for any increase in inspection time OGDCL will not be responsible.

- CV of third Party inspector from the aforementioned company should be immediately submitted to OGDCL for review and approval and should comply to following minimum requirements:
    - 10 Years of Minimum experience.
    - Carried Out third Party inspection of similar 5 Nos of Jobs (Proof to be attached).
- 3rd Party inspector will inform to company immediately for any delays in the manufacturing process and shall expedite the whole manufacturing process.
- Reference numbers of all documents reviewed / approved to be mentioned in daily and final report.
- Review and approval of documents related to project is included in scope of work of third party.
- Kindly appoint focal person of the project.