



OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT (LOCAL), ISLAMABAD
SCHEDULE OF REQUIREMENT

Material : **TRANSFORMERS & ELECTRICAL MATERIAL FOR NASHPA PLANT**

Due Date: -

Tender Enquiry No: **PROC-LE/17608/19**

Bid Bond Value : **RS. 330,000/-**

Attachment(if any) : **YES**

EVALUATION WILL BE CARRIED OUT ON GROUP WISE

Group A

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST	Unit Price (PKR) Inclusive of GST	Total Price (PKR) Inclusive of GST	Delivery Period Offered	deviation from Tender Spec. If Any
1	DISTRIBUTION TRANSFORMER,STEP-UP,1250KVA,0.4KV/3.3KV, H.V= 3 PHASE 3.3 KV (DELTA), L.V= 3 PHASE(4-WIRE) 400 VOLTS (STAR),FREQ=50HZ, VECTOR GROUP= Dyn11, ONAN, WITH ALL ACCESSORIES,COMPLETE INSTALLATION & COMMISSIONING, DETAIL IS ATTACHED	1		Number					
2	DISTRIBUTION TRANSFORMER,STEP-DOWN,1250KVA,3.3KV/0.4KV, H.V= 3 PHASE 3.3 KV (DELTA), L.V= 3 PHASE(4-WIRE) 400 VOLTS (STAR),FREQ=50HZ, VECTOR GROUP= Dyn11,ONAN, WITH ALL ACCESSORIES,COMPLETE INSTALLATION & COMMISSIONING, DETAIL IS ATTACHED	1		Number					

Group B

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST	Unit Price (PKR) Inclusive of GST	Total Price (PKR) Inclusive of GST	Delivery Period Offered	deviation from Tender Spec. If Any
3	LV SWITCHGEAR PANEL ,(2350X800X1470) MM,COMPRISING OF: BUS BAR (VOLT= 415VOLTS, AMPERE =3000AMP, 3P+N+E ,65KA),MAIN ACB(2000 AMPS, TP 65KA DRAWABLE TYPE),TRANSFORMER PROTECTION RELAY,ALL NECESSARY COMPONENTS,DETAIL IS ATTACHED	1		Number					
4	LV SWITCHGEAR PANEL ,2100(800+2x600)800 MM,COMPRISING OF: BUS BAR (VOLT= 415VOLTS, AMPERE =3000AMP, 3P+N+E ,65KA),MAIN ACB(2000 AMPS, TP 65KA DRAWABLE TYPE),TRANSFORMER PROTECTION RELAY,ALL NECESSARY COMPONENTS,DETAIL IS ATTACHED	1		Number					

Group C

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST	Unit Price (PKR) Inclusive of GST	Total Price (PKR) Inclusive of GST	Delivery Period Offered	deviation from Tender Spec. If Any
5	HT CABLE JOINTING KIT FOR ARMORED MV POWER CABLE , 3 CORE 95 SQMM, CU /XLPE/ SWA ,3.6/6KV	2		Number					



OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT (LOCAL), ISLAMABAD
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Material : **TRANSFORMERS & ELECTRICAL-MATERIAL FOR NASHPA PLANT**

Due Date: -

Tender Enquiry No: **PROC-LE/17608/19**

EVALUATION WILL BE CARRIED OUT ON GROUP WISE

Group C

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST	Unit Price (PKR) Inclusive of GST	Total Price (PKR) Inclusive of GST	Delivery Period Offered	deviation from Tender Spec. If Any
6	HT CABLE TERMINATION KIT FOR ARMORED MV POWER CABLE , 3 CORE 95 SQMM, CU/ XLPE/ SWA, 3.6/6KV	2		Number					

Group D

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST	Unit Price (PKR) Inclusive of GST	Total Price (PKR) Inclusive of GST	Delivery Period Offered	deviation from Tender Spec. If Any
7	MV POWER CABLE, 3X95MM2, 6350/11000 V, INSULATED ARMOURED, Cu/ XLPE/ SWA (DETAIL IS ATTACHED).	1200		Meter					

Special Note: The prospective bidders also download the master set of Tender Document

- The prospective bidders may keep in touch with OGDCL web site for downloading the clarifications/amendments (if any) issued by OGDCL.
- I. MATERIAL TO BE DELIVERED AT NASHPA PLANT WITH IN 120 DAYS AFTER ISSUANCE OF LPO. II. PAYMENT AFTER DELIVERY/INSTALLATION/COMMISSIONING

Discount (if any) shall only be entertained on Schedule of Requirement of Bidding Document (Financial Proposal). If the discount is mentioned elsewhere in the bid, the same shall not be entertained.



OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT (LOCAL), ISLAMABAD
SCHEDULE OF REQUIREMENT

Mandatory Checklist

Please confirm the compliance of the following mandatory information along with the bid(s) (failing which bids(s) will not be accepted)

Documents	To be Attached with the Technical/Financial Bids	Compliance	
		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Original Bid Bond	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Copy of NTN Certificate	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Copy of GST Certificate	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Confirmation that the Firm is appearing on FBR's Active Taxpayer List	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly signed and stamped Annexure-A (Un-priced)	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-B	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-D	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-L on Company's Letterhead	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly signed and stamped Annexure-M on Company's Letterhead	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly signed and stamped Annexure-N on Non-Judicial Stamp Paper duly attested by Notary Public	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-A (Priced)	Financial Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-C	Financial Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-E	Financial Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>



OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT (LOCAL), ISLAMABAD
SCHEDULE OF REQUIREMENT

For the Vendors/Contractors who opt to submit Bank Draft/Call Deposit/Pay order against Bid Bond/Performance Bond, our Accounts Department has finalized an arrangement for online payment to such Vendors/Contractors, which will be processed through (IBFT & LFT) for which following information is required:

i.	IBAN No. (International Bank Account Number 24 Digits)	
ii.	Vendor Name as per Title of their Bank Account	
iii.	Contact No.of Company's CEO/ Owner (Mobile & Landline)	
iv.	Bank Name.	
v.	Bank Branch Name and Code	

Name, Sign and Stamp of the authorized official of the Bidder(s) _____



Oil & Gas Development Company Limited

Indent No.
NOF/ELECT/144/2018
TE #

Group-A

**ATTACHEMENT FOR (TE # PROC/LE/
PT/17608/19)**
GROUP-A

**DESIGN, FABRICATION, SUPPLY, INSTALLATION,
COMPLETE TESTING AND COMMISSIONING OF STEP-
UP& STEP-DOWN TRANSFORMER**

Prepared by:	Ahmed Zia (DCE-Elect-N)	Doc: BOQ AND SPECS
		Rev: 0

**DESIGN, FABRICATION, SUPPLY, INSTALLATION, COMPLETE TESTING AND
COMMISIONING OF STEP-UP & STEP-DOWN TRANSFORMER**

S. No.	Description	Reference Specs./ Drawing No.	Unit	Qty	Unit Rate	Amount (Rs.)
1	Supply of 1250 KVA, ONAN type, 0.4 kV/3.3 kV, Dyn11 step-up transformer as per Doc. No. Trafo-144-01 complete with Buchholz relay, moisture analyzer, gauge glass oil indicator and all the required indications & protections and weather/ water proof terminal box. Complete in all respects. Transformer shall be suitable for 4 core 240 mm ² PVC/Cu/PVC/SWA cable connection on primary side and 3 Core, 95 mm ² , Cu/ XLPE/ PVC/ SWA/ PVC medium voltage cable connection on secondary side.	Trafo-144-01 Traffo-specs-01 Single line-01	No.	1		
2	Supply of 1250 KVA, ONAN type, 3.3 kV/400V, Dyn11 step-down transformer as per Doc. No. Trafo-144-01 complete with Buchholz relay, moisture analyzer, gauge glass oil indicator and all the required indications & protections and weather/ water proof terminal box. Complete in all respects. Transformer shall be suitable for 3 Core, 95 mm ² , Cu/ XLPE/ PVC/ SWA/ PVC medium voltage cable connection on primary side and 4 core 240 mm ² PVC/Cu/PVC/SWA low voltage cable connection on secondary side.	Trafo-144-01 Traffo-specs-01 Single line-01	No.	1		
3	Installation, complete testing and commissioning of 1250KVA, ONAN type, 0.4 kV/3.3 kV, Dyn11 step-up and 1250KVA, ONAN type, 3.3 kV/400V, Dyn11 step-down transformer as stated in Sr. No. 1&2 with all accessories. Complete in all respects.		Job	2		
4	Supply of commissioning spares for step-up and step-down transformer with price of each item.		Set	1		
5	List of recommended operation and maintenance spares for two (02) years operation with price of each item for step-up and step-down transformers at Sr.No.1&2.		Set	2		
6	The Expense on Factory Acceptance Test (FAT) of complete Factory Acceptance Test of item No. 1. The objective of the FAT is to verify that the offered transformer meet the requirements as specified in Doc. No. Trafo-144-01. The FAT shall be a 100% complete system functional test and shall be witnessed by (02) numbers of OGDCL representative(s) at manufacturers' workshop. Expenses including fare, boarding & lodging shall be borne by the Supplier. Complete in all respects.	Trafo-144-01	Job	1		

Grand Total= Rs:

Notes:

- 1- The Supplier shall be responsible for the Factory Acceptance Test and Site Acceptance Test of supplied equipment.
- 2- The sizes as specified above for cable entry.
- 3- It is the responsibility of Supplier to transport the equipment safely at site.
- 4- The Supplier shall provide the civil foundation details for the offered transformer.
- 5- Civil works shall be done by OGDCL.
- 6- The Supplier shall provide the installation, operation and maintenance manuals for the offered transformers.
- 7- The Supplier shall provide certification as per DOC# traffo-144-01 (attached) and clearance from GOP if required.

 <p>Oil & Gas Development Company Limited</p>	<p>Indent No. NOF/ELECT/144/2018 Group-A</p>
	<p>Spec. No. Traffo-144-01</p>

SPECIFICATIONS FOR DISTRIBUTION TRANSFORMER

Prepared by:	Ahmed Zia (DCE-Elect-N)	Doc: Traffo-144-01
		Rev: 0

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1.0 **PURPOSE**

This specification supplements the General Specification for Electrical Installation and covers the minimum requirements for the design, construction, testing and performance of oil immersed distribution transformers.

Equipment shall comply with the Reference Standards and Codes. Where the manufacturer's standards differ from other supplementary requirements of this Specification and its associated Data Sheet, details shall be submitted with the technical bid.

In case discrepancies are found among this specification and other documents, OGDCL shall be referred for correct interpretation.

2.1 **REFERENCE STANDARDS & CODES**

- 2.2 The equipment and material selection, design, manufacturing, testing and inspection shall conform to the latest editions of the following Codes and Standards. Any changes and alterations and necessary re-certification of the equipment for compliance with the applicable Codes and Standards shall be at the part of manufacturer.

IEC 60038	Standard Voltages
IEC 60050	International Electro technical Vocabulary. IEC
60071	Insulation coordination.
IEC 60076	Power Transformers.
IEC 60085	Recommendations for the classification of insulating material in relation to their stability in service.
IEC 60137	Bushings for Alternating Voltages above 1000 Volts.
IEC 60296	New insulating oil.
IEC 60354	Loading guide for oil immersed transformers.
IEC 60529	Classification of degrees of protection provided by enclosures. IEC
60551	Determination of transformer and reactor sound levels.
IEC 60606	Application guide for power transformers.
IEC 60616	Terminals and tapping markings for power transformers.

IEC 60722 Guide to the lightning impulse and switching impulse testing of power transformers and reactors.

BS 60729 Specification for hot-dip galvanized coatings.

In addition to the above, the following codes shall be considered;

- NFPA-70 / National Electric Code.
- Oil & Gas (Safety in Drilling and Production) Regulation Govt. of Pakistan)
- API Recommend Practice 500 A, B & C.
- Relevant British Standard Specification and Codes of Practice
- CENELEC Standards
- The Institute of Petroleum – Model Code of Sage Practice Electrical
- The Institute of Electrical Engineers, Regulations for Electrical Installation- Latest Edition.
- Institute of Electrical & Electronic Engineers (IEEE)
- Electricity Act. 1973 (Govt. of Pakistan)
- Oil & Gas (Safety in Drilling and Production) Regulation 1974, Govt. of Pakistan.

2.3 In the event of conflict between Standards, the most stringent shall prevail.

3.1 INSTALLATION AND SERVICE CONDITIONS

3.2 Site Conditions

Electrical design shall be based on the following:

Temperature:	Maximum	48 °C
	Minimum	0°C

Relative Humidity:	70%
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Site Elevation	2700Ft. above sea level
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3.3 Service Conditions

The transformers shall be suitable for continuous operation under the prevailing ambient conditions without any deleterious effect of any kind, with a minimum of supervision and maintenance. Due and liberal regard shall be paid to the climatic conditions with regard to temperature, humidity, dust, etc., as defined above. Minimum degree of ingress protection of the

Enclosures against contact with live or moving parts and against ingress of solid foreign bodies or liquids shall be IPW 55, in accordance with IEC 60529.

3.4 DESIGN CRITERIA

Refer to the equipment specification Sheet for design criteria. Complete the "Vendor Data" portion of the spec Sheet, Document Number Traffo-specs-01. Data and Information provided in the spec Sheet will be considered for design criteria.

3.4.1 Operating Philosophy

The equipment will operate on a continuous basis with scheduled maintenance. **3.3.2**

Performance Characteristics and design life.

Refer to the equipment Data Sheet for performance characteristics.

Design equipment for the design life, 25 Year, as specified on the equipment Data Sheet.

3.3.3 Preferred Equipment

Provide main and all auxiliary equipment/s as made by leading manufacturers in market.

3.3.4 Other

- Lifting Lugs
 - Provide adequate lifting points for safe handling, installation and servicing.
- Noise Levels
 - Restrict noise levels so as not to exceed 65 dB A at 0.3 meter from the source.
- Safety Guards
 - Provide safety guards around all exposed energized equipment parts to protect operating personnel from injury in compliance with IEC requirements.

4.1 MAIN ELECTRICAL CHARACTERISTICS

4.2 Power Supply System

a) Characteristics of power supply.

Step-up transformer shall be fed from the 400 Volt system to step up the voltage supply to 3.3 KV.

Step-down transformer shall be fed from the 3.3 KV to step down the voltage supply to 400 V.

Rating	1250 KVA @ site
Voltage	0.4 kV \pm 10% & 3.3 KV \pm 10%
Phase	3
Vector Group	Dyn11
Frequency	50 Hz \pm 2%
Neutral system	solidly earthed
Design symmetrical Fault Level	Vendor shall provide.

Characteristics of auxiliary supply systems:

- Control/command	24 V DC
-Space heater system	230 V AC

4.3 Rating and Performance

Transformers shall be designed and built for continuous service at full load with occasional overload capacity, in accordance with IEC 60076, under combined variation of both voltage and frequency as stated above, without exceeding the permitted temperature.

The temperature rise limits for top oil and for average temperature rise (by resistance measurement) shall not exceed the values given by IEC 60076 reduced by the amount by which the design ambient temperature exceeds 40° C. The design ambient temperature shall be based on 48°C.

For transformer accessories and their parts, the temperature rise when tested at the most severe operating ratings, shall not exceed the values given below. The values shall be determined by the resistance method.

Insulation Class	Maximum Temperature Rise °C
Y	40
A	55
E	70
B	80
F	105
H	130
C	No limit

The classification of insulating materials is according to IEC Publication 60085.

Impedance voltage shall be in accordance with IEC 60076-5 table-1 :-

The impedance voltage and short circuit impedance shall not differ by more than 10% of the specified values.

Voltage regulation, computed from the impedance volts and watts, shall not exceed the guaranteed values at unity and 0.8 lagging power factors by more than 10 percent.

4.4 Short Circuit Withstand Capability

The transformer shall be designed and constructed to withstand without damage, the dynamic and thermal effects of short circuit currents of the magnitude and for the time duration in accordance with IEC 60076.

The maximum permissible average winding temperature specified in the standards shall not be exceeded for the fault duration as specified above.

The transformer shall have been "Type" tested by a recognized testing authority for the short circuit thermal and dynamic withstand capability in accordance with the relevant standards.

5.1 MAIN DESIGN REQUIREMENTS

5.2 Construction

Transformers shall be of welded steel construction, fully tropicalized, three phase, step up, mineral oil immersed, self-cooled (ONAN), core type, double wound, skid mounted, with conservator, dehydrating breather and buchholz relay, and suitable for outdoor installation.

The transformer tank and tank covers shall be constructed of electrically welded or bolted mild steel sheets of sufficient strength to withstand full vacuum without developing any deformation, and a pressure at least 25% greater than the maximum operating pressure caused by the expansion of the oil/gas under service conditions, without rupture of the tank or fittings.

The transformer tanks shall be mechanically strong, leak-proof and suitable for proper heat dissipation. They shall be shot blasted and tested under pressure for detecting any leakage before assembly.

The tank covers made of steel plate shall be of sufficient strength to prevent distortion when lifted and shall be directly bolted to the top rim of transformer tank using gasket for perfect oil seal. These shall essentially be constructed in a manner that they can be separated from the transformer tanks without core and windings, when required. These shall be designed to ensure the

elimination of all air pockets during oil filling operation and shall be provided with pockets for oil temperature indicators.

The conservator shall be fabricated from welded steel sheets, complete with drain valves, filling plugs and having a suitable percentage of oil in the radiators and the main transformer tank. It shall be vacuum tested under pressure for detecting any leakage.

The connections between the cover and conservator shall be placed so as to ensure positive operation of the buchholz relay upon the formation of gas or sudden movement of oil. The inside of the cover shall present the minimum obstruction to the passage of gas bubbles to the buchholz relay. Water shall not accumulate on the outside surfaces.

The joints between tank and cover and the handholes/manhole joints shall be provided with suitable flanges, sufficient and properly placed bolts and gaskets. Gaskets between metal surfaces shall be set in grooves or held in position by retainers so arranged that all parts are bolted metal to metal. The gaskets shall be made of resilient material, which will not deteriorate under the action of hot oil and will remain oil tight. The manufacturer shall supply complete information about the material of the gasket and the method of installation and compression control.

The cooling system for ONAN shall consist of fixed radiators welded on the tank sides and shall be designed to withstand the same vacuum and pressure conditions as the transformer tank. These radiators shall be designed to sufficiently cool down the heat generated by the transformer due to its losses.

Transformers shall be supplied filled with adequate quality of insulating oil which shall be straight run mineral oil, obtained from fractional distillation of crude petroleum, refined specially for use as insulating and cooling medium in oil immersed transformers and circuit breakers. It shall be free from water, sediments, foreign materials, and petroleum fractions, which may be injurious to transformer or to any of its components, such as insulation, paint, varnish and metallic or other parts. It shall be free of synthetic additives of all types.

The oil shall be class I oil conforming to IEC 60296. The transformers shall be suitable for use with this oil and for satisfactory service shall require oil of dielectric strength above 60 kV when tested with BS Standard gap.

5.3 Core

Transformer core shall be made of high grade, non-aging, cold-rolled electrical silicon steel. Lamination shall have low losses and high permeability. After the laminations have been cut and sharp projection removed, they shall be annealed to relieve shearing stresses. All laminations shall be machine coated to ensure a thin uniform coating. The coating material shall be heat resistant, inert to the action of the hot oil and shall be baked on. The core shall be rigidly clamped with insulated clamping bolts or by other approved method, into a one piece steel structure which will retain its shape under the most severe stresses encountered during shipment and handling and under short-circuit conditions. Insulated packets of the core shall be connected so that potential difference does not exist between them. Flux distortion will be minimized to reduce noise level. Cooling ducts will be provided in ample number throughout the core to eliminate hot spots.

The design of the magnetic circuit shall be such as to avoid static discharges, development of short-circuit paths within itself or to the earthed clamping structure and the production of flux components at right angles to the plane of the laminations which may cause local heating.

5.4 Windings

Transformer windings shall be made of high conductivity electrolytic copper drawn without impurities, burr and cracking, insulated thoroughly and all insulation shall be thoroughly treated with insulating varnish or equivalent compound, as necessary, to withstand not only available short circuit forces but also impulse voltages and to minimize deterioration. All materials used shall be insoluble and chemically inactive in the hot transformer oil, and shall not soften or become brittle under operating conditions.

The windings shall be located in a manner which will ensure that they remain electrostatically balanced and that their magnetic centers remain coincident under all condition of operation.

The coils shall be wound and assembled so that the voltage between turns is kept as low as is consistent with good design and coordinated with voltage gradient distribution during voltage surge.

The winding and leads of all transformer shall be braced to withstand the shocks which may occur through rough handling and vibration during transport, switching and other transient services condition.

The windings shall be arranged concentrically around the core limbs providing vertical and horizontal cooling ducts to ensure that cooling oil is in intimate contact with every portion of the core and windings.

During manufacture, all coils shall be subjected to impregnation, and after completion, the transformer shall be vacuum dried.

5.5 Clamping Structure

A strong rigid clamping structure shall be used to clamp the interior assembly. This structure shall also be used to fasten the core and coils securely to the transformer tank and shall be provided with lifting lugs for unclamping. Ample allowance shall be provided between core and coils and the tank bottom for collection of sediment. Adequate provision shall be made to prevent movement of the transformer relative to the tank during transport and installation or while in service.

5.6 Guides

Suitable guides shall be provided to position the various parts during assembly or dismantling operations.

5.7 Base

The base of the transformer shall be a rigid welded steel frame fabricated from

structural shapes of adequate size to withstand moving, shipping, and handling the transformer and to support the weight of the transformer on a concrete foundation in service.

5.8 Terminal Boxes

The design shall provide for mechanically well protected and insulated enclosed terminals and bushings with adequate space for cable termination. Exposed bushings are not acceptable.

Terminals for secondary connections shall be located on the opposite end of the case from the primary terminals and shall be arranged so that cables can be isolated from transformer terminals without strain or damage to terminals or cables.

All incoming cables shall enter from below.

Entries for cables shall be provided with removable gland plates of non-magnetic material suitable for the reception of either multiple or single core sheathed cables with standard copper conductors and shall be compatible with the type, size, etc., of cable already specified in BOQ.

Where current transformers are required to be mounted on the transformers, they shall be mounted in the cable box.

All terminal bushings shall be wet process porcelain, homogenous, free from laminations, cavities or other physical flaws and shall be glazed, brown coloured, rigidly clamped with effective creepage distances. Fittings made of steel shall be galvanized.

Bushings shall be removable without the need of untanking of the transformer or removing/dismantling the tank cover.

The bushings shall be cover mounted and located to develop their full insulation and impulse strength between bushing terminals and earthed metal parts.

Cable boxes shall be finished with corrosion resistant paint and shall be fitted with externally removable drain plugs.

Earthing studs shall be provided within the terminals compartment to facilitate direct earthing of cable screens and outside for earthing cables.

5.9 Auxiliary Terminal Box

Auxiliary circuits for measurement, control and protection requiring external connection shall be wired up to an auxiliary terminal box mounted on the transformers.

The terminal box shall, in general, be fitted with Klippon or similar type terminal blocks with 20% spare terminals on each block and with the Manufacturer's standard wire numbers at both ends.

Cable glands shall be provided at the bottom of the terminal box.

The cabling between the terminal box and the auxiliary devices shall be performed using metal armoured cables or PVC insulated wires in metal conduits. The minimum

conductor size shall be 1.5 sq. mm.

5.10 Accessories

Transformers shall be fitted with the following accessories as a minimum:

- Pressure Relief Device

A pressure relief device shall be provided for rapid release of any dangerous pressure within the transformer. The device shall operate at a pressure less than the test pressure of the tank and the outlet shall be arranged to face away from the bushings. If a diaphragm is used, it shall be of approved material, permanently resistant to strong sunlight. The device shall be equipped with alarm contacts and a readily visible operation indicator.

- Oil Level Indicator

Oil level indicator shall be fitted on one end of the conservator. The indicator shall be provided with alarm contacts for low oil level.

The words "Oil Level" shall be marked on the dial or on a suitable nameplate.

- Dial Type Oil Temperature Indicator

A dial type indicator shall be mounted on the side of the tank to indicate the top oil temperature. It shall be of mercury type direct stem-mounted in a closed well. Adequate mechanical protection shall be provided for the capillary tube and sharp bends shall be avoided.

The words "Oil Temperature" shall be marked on the dial or on a suitable nameplate.

The instrument shall be provided with contacts for alarm and trip.

- Winding Temperature Gauge

A dial-type "hot-spot" thermometer / RTD or Thermistor with alarm contacts shall be furnished for windings. The winding temperature gauge shall be provided with three temperature monitoring levels of alarm, "Warning", "High", and "High-High".

- Buchholz Relay

The buchholz relay shall be designed and installed to operate rapidly for internal transformer faults and shall be equipped with contacts for alarm and trip. The alarm contact shall be set to operate from a low rate of gas evolution, whereas the trip contact shall operate on a high rate of gas evolution or oil movement such as experienced from internal transformer faults or internal flashover. Full provision shall be made for local test and reset of the relay.

- Conservator

Transformer shall be provided with a conservator complete with sump and drain valves and having a suitable percentage of the total cold oil volume in the transformer and radiators.

One end of the conservator shall be removable for cleaning purposes, and the drain valve shall be so situated that the conservator can be completely emptied when mounted as in service.

The pipe from the transformer to the conservator shall be of at least 75 mm inside diameter and shall rise at an angle of from three to seven degrees to the horizontal. A valve shall be provided at the conservator to cut off the oil supply to the transformer.

Each conservator vessel shall be fitted with a Silica Gel dehydrating breather of adequate size, the Silica Gel container being arranged so that the tinted crystals may be easily observed. The breather bottom shall be equipped with a glass bowl containing oil to prevent the moisture from penetrating Silica gel when the transformer is not "breathing" and to give a visual indication in the form of air bubbles during breathing process.

- Filter and Drain Valves

The transformers shall be fitted with the following valves:

- a) One drain valve of adequate size so situated that the tank can be drained of oil as far as practicable.
- b) Filter valve(s) for connection to the oil circulation system.
- c) Devices for sampling the oil at the bottom, middle or top of the tank but independent of the specified filter valves and situated so as to be readily accessible with the transformer live and in service.
- d) Flanged valves shall be provided on each side of the Buchholz relay.

All valves shall be of iron body with bronze or stainless steel trim and shall be of globe type. All valves opening to atmosphere shall be fitted with blank flanges. Means shall be provided for locking the valves. Each valve shall be provided with an indicator clearly showing its position.

- Lifting Facilities

Adequate facilities shall be provided for lifting the core and coil assembly from the tank and for lifting the complete transformer. Besides, lifting eyes shall be provided for lifting the cover only. Each lifting lug shall be provided with a hole having a minimum diameter of 20mm for guying purposes. The bearing surface of the lifting lugs shall be free from sharp edges.

- Moving Facilities

The base of the transformer shall have members forming a rectangle which will permit rolling in the directions of centerlines of the segments. The points of support of these members shall be so located that the center of gravity does not fall outside of these points for a tilt of the base of 15 degrees or less from the horizontal, with or without oil in the transformer or in the tap-changer compartment. Bi-directional flanged rollers shall be provided. Blocking devices for the rollers shall be provided. Provision shall be made on or adjacent to the base for pulling the transformer parallel to either side.

- Jacking Facilities

Jacking facilities shall be located near the outer ends of the base. The jacking pads or lugs shall be so designed that the lifting member of jacks of suitable capacity can be inserted when the transformer is completely assembled.

- Earth Terminals

Two earth terminals each capable of carrying for thirty seconds the full low voltage current shall be provided, with provision for fitting to any of the bottom four corners of the tank, to suit local earthing arrangements. They shall be suitable for 95-120 sq. mm stranded copper earth lead.

- Inspection Facilities

Adequate facilities shall be provided for inspection, testing and carrying out minor repairs in the interior of the transformers when assembled without draining the oil. Such facilities shall include two or more hand holes of suitable diameter or as approved to afford easy access to lower ends of bushings, terminals, and the upper portion of the coils etc., and permit replacement of auxiliaries without removing the tank cover or un-bundles to facilitate lifting.

The covers shall have adequate handles to facilitate lifting.

- Terminal Marking Plates
- Rating Plate

The alarm or trip contacts of transformer accessories shall be suitable for use in 10 A, 230 VAC or 24 VDC circuits.

Accessories with markings or dials shall be in such positions as to be easily

readable by a person standing on the ground. If necessary, dial faces shall be mounted at an inclined angle for easy visibility.

5.11 Nameplates

The transformers shall have a corrosion resistant stainless steel rating plate permanently engraved with the information listed in IEC 60076-1 and with the Owner's tag number and following minimum information.

- a. Kind of transformer
- b. Manufacturer's name
- c. Manufacturer's serial number
- d. Place and year of manufacture
- e. Vendor's installation and operating instructions reference
- f. Contractor order number
- g. Number of phases
- h. Rated power (kVA)
- i. Rated frequency
- j. Insulation levels (BIL values) for each winding and bushing
- k. Rated voltages, including details of tap voltages and operation above 1.05 p.u. tap or rated voltages as applicable. Detailed tap information shall be given, as required by IEC 60076-7.
- l. Rated currents
- m. Connection (phasor) symbols (e.g., Dyn11)
- n. Positive and zero-sequence impedance voltages (percent) at rated current (measured value) and, if necessary, the reference power, which shall always be given for multi winding and multi rated transformers.
- o. Type of cooling. If the transformer has several methods of cooling, the rated power for each shall be given.
- p. Temperature rise
- q. Maximum oil temperature
- r. Type of insulating liquid, manufacturer and trade name.
- s. Conductor material (of each winding)
- t. Total weight (including cooling oil or liquid)
- u. Liquid weight
- v. Component weight for transformers exceeding 5 kg total weight:
 - Core and coils
 - Tank and fittings
 - Untanking mass (heaviest piece)
 - Transportation mass, excluding oil if applicable
- w. Maximum duration of short-circuit
- x. Tank data for transformers:
 - Maximum operating pressures of liquid preservation system
 - Pressure setting of relief device
 - Vacuum withstand level
 - Liquid levels
- Volumes of insulating liquid for main tank and each liquid-filled compartment gravity.

6.0 FINISH

All interior and exterior surfaces of tank and other metal parts shall be thoroughly cleaned of rust and scale before applying rust inhibitor and/or paint.

After surface preparation and cleaning of all surfaces to be painted, the surfaces not in contact with oil shall be primed with two coats of any epoxy primer containing red lead, zinc or aluminum. The surfaces shall be finish coated with two coats of enamel applied to provide a uniform smooth surface free from blemishes.

After the tank and conservator have been shot blasted inside, the inner surfaces shall be painted with two coats of oil resistant paint.

The interior and exterior surfaces of the transformer structures and control cabinets shall be given manufacturer's standard finish before shipping. The exterior surfaces of the transformer structure and control cabinets shall be painted with Clifton sand color.

7.1 TESTS

I. Type Tests:

The following type tests shall be performed on one set of the transformers with the same when specified on datasheet.

- Temperature rise at maximum rating
- Short Circuit Test

II. Routine Tests

The testing procedure shall be submitted for approval prior to testing. All tests shall be conducted according to related Standard and Codes.

The Manufacturer shall give at least two-week notice prior to final tests at manufacturer's facility to be witnessed by OGDCL rep. Factory tests shall essentially include, but not limited to:

- Visual inspection of appearance, construction, dimensions and workmanship
- Measurement of normal primary and secondary voltages at all tap settings.
- Measurement of voltage ratio and check of phase displacement.
- Measurement of winding resistance.
- Measurement of zero sequence impedance.
- Measurement of efficiency at $\frac{3}{4}$ load and at full load and at 0.8 Power Factor.
- Measurement of impedance voltage.
- Measurement of insulation resistance.
- Heat Run tests.
- Insulation Di-electric test of insulators.
- Test of insulating oil Di-electric strength, viscosity, flash point and specific gravity.
- PI test for windings.
- Measurement of acoustic sound levels.

The following tests shall be made on assembled transformers at the Manufacturer's works as mentioned below:

a) Buchholz Relay

This test shall be carried out on any one transformer out of a group of transformers of same make, type, and rating and with same type of Buchholz relay installed. Tests shall be carried out to indicate proper installation and

functioning of relay for operation with slow and fast evolution of gas in the power transformer.

b) Temperature Indicator

Tests shall be made for proper calibration and functioning of oil temperature indicator.

8.1 DRAWINGS AND DATA

The Manufacturer shall furnish drawings and descriptive data as described below:

- i) General Arrangement showing masses, main dimensions, arrangement of auxiliary components and the minimum clearances required for ventilation and safety during operation and maintenance.
- ii) The technical description of the windings, core, tank, conservator and radiators, etc., shall be supplied to indicate the design and construction features of the transformer and its components. The materials, and their properties, used in the construction of the transformer shall be listed. The type, specific, losses and the design flux density for the core material shall be indicated.
- iii) Dimensional drawings for HV and LV bushings showing details of terminal size, diameter and size of holes.
- iv) Oil level indicators showing dial markings for the high and low oil levels and also markings for oil filling at temperatures of 25° C.
- v) Transformer bucholz relays indicating pressure and/or speed of oil flow for the operation of contacts and detail of float arrangement.
- vi) Oil temperature indicators showing details of sensing, measuring and indicating elements. The details of and operation of alarm and trip contacts be supplied.
- vii) Foundation plan, including foundation loading.
- viii) Pressure relief device.
- ix) All types of valves
- x) Rating plate and connection diagram
- xi) Instruction books for the installation, handling, storage and commissioning (including loading profile) of transformer and its accessories.
- xii) Instruction books for the commissioning, operation and maintenance of transformer and its accessories.
- xiii) Instructions for transformer dehydrating using all methods and recommended method for dehydration.

- xiv) Short circuit test reports carried on similar transformers shall be furnished.
- xv) A list of transformers showing the voltages and the transformer capacities, which have been made along with the year of manufacture, shall be supplied with the bid. It shall also indicate the country to which supply has been made.

9.1 COMMISSIONING SPARES

Commissioning spare parts required for installation and commissioning of the transformer stated at serial No. 1& 2 of BOQ shall be provided and delivered with transformer. The list of commissioning spares with prices of each & every component must be included in the bid.

9.2 Commissioning tools and testing equipment.

Commissioning tools and testing equipment required for commissioning and SAT shall be the responsibility of manufacturer.

9.3 List of recommended spare parts and Spare Parts Books

For each separate piece of equipment, the Manufacturer shall give a spare parts book. This spare parts books shall contain an assembly drawing of the equipment which shall show all parts of the equipment separately marked, designated and referenced. The book shall also contain sketches of each part with the part number and the designation of the part. The material of the part shall be indicated. These sketches and lists of parts shall be cross-indexed with the assembly drawings. The spare part books shall present information in a simple manner so that non-technical personnel may be able to indent these spare parts. The lists of spare parts required shall be made with reference to the spare parts books.

10.0 GUARANTEED VALUES

The Manufacturer shall list any exception this specification. The Manufacturer shall certify that the design shall be such that the nameplate rating of the transformer and accessories shall be maintained during the life of this equipment under the specified operations and maintenance conditions.

The Manufacturer shall supply guaranteed figures for impedance voltage, regulation, no-load current, losses and efficiencies, etc., in his bid as listed on the rating plate.

The Manufacturer shall guarantee that the equipment furnished is free from fault in design, workmanship, is of adequate size and capacity, and of proper material to satisfactorily fulfil the operating conditions specified. Should any defect in design, material, workmanship or operating characteristics develop during the first year of operation, the Manufacturer shall make all necessary alterations, repairs, and replacements of defective equipment / components, at his own cost including transportation, installation and testing.

11.0 SHIPPING

The transformers shall be properly conditioned for shipping against all possible damages in fully assembled condition completely filled with insulation oil. If a transformer is to be shipped without oil, the Manufacturer shall take all precautions necessary to prevent any accumulation of moisture during shipment and storage and shall provide complete instructions for filling the oil into the tank at site.

Manufacturer shall be responsible for shipment of transformers to site and for the adequacy of the preparations for shipment ensuring that materials and equipment arrive at their destination in undamaged condition. All components shall be shipped simultaneously.

Manufacturer shall provide the Purchaser with shipment details; dates of equipment departure and arrival at site and a list of weights and sizes of shipment packages prior to dispatch.



Oil & Gas Development Company Limited

Indent No.
NOF/ELECT/144/2018
Group-A

TE No.

Spec. No.
Traffo-specs-01

SPECIFICATIONS SHEET FOR DISTRIBUTION TRANSFORMER

Prepared by:	Ahmed Zia (DCE-Elect-N)	Doc: Traffo-SPECS-01
		Rev: 0

ITEM No.	DESCRIPTION	UNITS	REQUIRED	OFFERED
	GENERAL			
1	REQUIRED FOR		NASHPA OIL & GAS FIELD	
2	LOCATION		NASHPA	
3	EQUIPMENT DESCRIPTION		DISTRIBUTION TRANSFORMER	
4	EQUIPMENT TAG		TBA	
5	QUANTITY		01	
6	AREA CLASSIFICATION		SAFE AREA	
7	MANUFACTURER INFORMATION			
8	MANUFACTURER NAME		VTA	
9	PLACE OF MANUFACTURE		VTA	
10	APPLICABLE STANDARD		IEC-60076	
11	MODEL		VTA	
12	APPLICABLE DOCUMENTS			
13	SPECIFICATION FOR DISTRIBUTION TRANSFORMER		Trafo-144-01	
14	SINGLE LINE DIAGRAM		Single line-01	
15	SITE CONDITIONS:			
16	LOCATION OF DISTRIBUTION TRANSFORMER		OUTDOOR	
17	SITE ALTITUDE	ft.	2700	
18	MAXIMUM DRY BULB SHADE TEMPERATURE	°C	48	
19	MINIMUM DRY BULB SHADE TEMPERATURE	°C	0	
20	DESIGN TEMPERATURE FOR DISTRIBUTION TRANSFORMER (Max. / Min.)	°C	48/0	
21	SUPPLY SYSTEM DATA			
22	SUPPLY VOLTAGE	kV	400V ± 10%	
23	FREQUENCY	Hz	50 ± 2	
24	CONTROL SUPPLY	V	230VAC	
25	3.3 kV SYSTEM FAULT LEVEL MIN.	kA	TBA	
26	3.3 kV SYSTEM FAULT LEVEL MAX.	kA	TBA	
27	DISTRIBUTION TRANSFORMER GENERAL CHARACTERISTICS			
28	DUTY		Continuous	
29	RATED POWER	kVA	1250 @ SITE	
30	RATED PRIMARY VOLTAGE FOR STEP-UP & FOR STEP-DOWN	kV	0.4 & 3.3	
31	RATED SECONDARY VOLTAGE FOR STEP-UP & STEP-DOWN	kV	3.3 & 0.4	
32	RATED FREQUENCY	Hz	50	
33	NUMBER OF PHASE	Ø	3	
ITEM No.	DESCRIPTION	UNITS	REQUIRED	OFFERED
	GENERAL			

34	VECTOR GROUP		Dyn 11	
35	POWER FREQUENCY WITHSTAND VOLTAGE			
36	-PRIMARY SIDE	kV (rms)	VTA	
37	-SECONDARY SIDE	Kv (rms)	VTA	
38	LIGHTNING IMPULSE FREQUENCY WITHSTAND VOLTAGE			
39	-PRIMARY SIDE	kV (Peak)	VTA	
40	-SECONDARY SIDE	Kv	VTA	
41	SEPARATE WINDING(PRIMARY & SECONDARY)		Required	
42	INSULATION SYSTEM			
43	INSULATION CLASS		F	
44	BIL		As per IEC 60076-3	
45	TYPE OF INSULATION		Oil Immersed Conservator System	
46	OIL TYPE		class I oil confirming to IEC 60296.	
47	TRANSFORMER OIL DIELECTRIC STRENGTH		Min 45 KV and when de-hydrated >60 KV	
48	COOLING SYSTEM			
49	TYPE OF COOLING		ONAN	
50	INSULATING LIQUED		MINERAL OIL	
51	PRIMARY WINDING			
52	WINDING CONSTRUCTION MATERIAL		Copper	
53	MAXIMUM CURRENT DENSITY IN WINDING		VTA	
54	RATED PRIMARY CURRENT		VTA	

ITEM #	DESCRIPTION	UNITS	REQUIRED	OFFERED
	GENERAL			
55	CONFIGURATION (STEP-UP AND STEP-DOWN)		WYE AND DELTA	
56	SECONDARY WINDING			
57	WINDING CONSTRUCTION MATERIAL		Copper	
58	MAXIMUM CURRENT DENSITY IN WINDING		VTA	
59	RATED SECONDARY CURRENT		VTA	
60	CONFIGURATION (STEP-UP AND STEP-DOWN)		DELTA AND WYE	
61	TEMPERATURE RISE			
62	TOP OIL TEMPERATURE RISE	° C	51	
63	AVERAGE WINDING TEMPERATURE RISE	° C	56	
64	ELECTRICAL AND MECHANICAL CHARACTERISTICS			
65	METHOD OF SYSTEM EARTHING		Solidly Earth	
66	TANK EARTING EARTHING POINTS		Required	
67	SKID EARTHING POINTS		Required	
68	NO LOAD CURRENT (PRIMARY) AND POWER FACTOR		VTA	
69	IMPEDANCE VOLTAGE AT PRINCIPLE TAP AND RATED CURRENT AS PER IEC 60076-5 TABLE-1	%	VTA	

70	ZERO SEQUENCE IMPEDANCE		VTA	
71	POSITIVE SEQUENCE X/R RATIO		VTA	
72	NEGATIVE SEQUENCE X/R RATIO		VTA	
73	PERMISSIBLE NEGATIVE SEQUENCE CURRENT	A	VTA	
74	PRIMARY RATED CURRENT	A	VTA	
75	SECONDARY RATED CURRENT	A	VTA	
76	PEAK INRUSH CURRENT	A	VTA	
77	TIME TO HALF PEAK CURRENT	Sec	VTA	
78	CORE FLUX DENSITY	weber/ m2	VTA	
79	PRIMARY WINDING RESISTANCE PER PHASE (COLD)	ohm	VTA	
80	SECONDARY WINDING RESISTANCE PER PHASE (COLD)	ohm	VTA	
81	PRIMARY SYSTEM APPARENT SHORT CIRCUIT RATING		As per SLD	
82	SECONDARY SYSTEM APPARENT SHORT CIRCUIT RATING		As per SLD	
83	MAXIMUM SHORT CIRCUIT DURATION		1 sec	
84	NO-LOAD LOSSES	kW	VTA	
85	LOAD LOSSES	kW	VTA	
86	TOTAL LOSSES	kW	VTA	
87	GUARANTEED EFFICIENCY (AT 0.8 PF) AT 100%, 75% 50% OF CONTINUOUS MAXIMUM RATING EFFICIENCY AT UNITY POWER FACTOR & 100 % / 50 % RATED CURRENT		VTA ≤ 98.43 % / ≤ 99.03 %	
ITEM #	DESCRIPTION	UNITS	REQUIRED	OFFERED
88	MAXIMUM EFFICIENCY AT % OF CONTINUOUS MAXIMUM RATING		VTA	
89	MAXIMUM UNBALANCED LOAD CAPABILITY AND DURATION		VTA	
90	VOLTAGE REGULATION			
91	-AT PF 1.0 & rated current		> 1.59 % and exact value = VTA	
92	-AT PF 0.85		≥4 % and exact value = VTA	
93	CORE MATERIAL		VTA	
94	CORE TYPE		VTA	
95	ENCLOSURE OF TRANSFORMER			
96	ENCLOSURE TYPE		Tank	
97	MATERIAL OF TANK		Steel	
98	TANK CONSTRUCTION TYPE		As per doc .(Trafo-144-01)	
99	RADIATOR MATERIAL		VTA	
100	NUMBER OF RADIATORS		VTA	
101	DEGREE OF PROTECTION FOR ENCLOSURE		IP 65	
102	TANK COVER TYPE		Welded or Bolted	
103	BREATHING TYPE		Required, Dehydrating Type	
104	TAP CHANGERS			

105	TAP CHANGER TYPE		OFF LOAD	
106	TAP CHANGER RANGE		±5% in steps of 2.5%	
107	NUMBER OF TAP POSITIONS		5	
108	CAPACITY		Full Power Rating	
109	OPERATING HANDLE WITH PADLOCK FACILITY		Required	
110	NOISE LEVEL			
111	NOISE LEVEL	dB A	Not more than 65dB A at 0.3 Meter	
112	PRIMARY/SECONDARY CABLE CONNECTION			
113	CABLE TERMINATIONS		0.4 KV Y (4 core cable) / 3.3 KV Δ (3 core cable)	
114	CABLE TYPE		Specified at S# 132	
115	TYPE OF BUSHING		IEC-60137	
116	BUSHINGS (DIMENSION, IMPULSE, LOW-FREQUENCY INSULATION LEVELS AND OTHER CHARACTERISTICS)		VTA	
117	PROTECTIVE ENCLOSURE		Complete With Cable Glands Air Insulated Type	
118	IP RATING		IP 65	
119	MINIMUM CLEARANCE BETWEEN LIVE METAL AND DIFFERENT PHASES	mm	As Per IEC 60076-3	
120	MINIMUM CLEARANCE BETWEEN LIVE METAL AND EARTH	mm	As Per IEC 60076-3	
ITEM #	DESCRIPTION	UNITS	REQUIRED	OFFERED
121	MINIMUM CREEPAGE DISTANCE OVER INSULATOR	mm	As Per IEC 60076-3	
122	ACCESSORIES AND AUXILIARIES			
123	WINDING TEMPERATURE MONITOR DEVICE WITH CONTACTS		Required RTD / Thermistor	
124	OIL TEMPERATURE (DIAL TYPE) MONITOR DEVICE WITH CONTACTS		Required	
125	OIL LEVEL GAUGE WITH CONTACTS		Required	
126	PRESSURE RELIEF VALVE WITH ALARM CONTACTS		Required	
127	PRESSURE / VACUUM GAUGE		Required	
128	THERMAL PROTECTION RELAY (49)		Required	
129	BUCHOLZ RELAY (Gas & Liquid Actuated)		Required	
130	BOTTOM DRAIN VALVE		Required	
131	TOP VENT VALVE		Required	
132	FILTER CONNECTION VALVE NEAR THE TOP OF THE TANK		Required	
133	RATING PLATE		Required	
134	JACKING PADS AND PULLING EYES		Required	
135	HOOKS FOR HORIZONTAL TRACTION		Required	
136	BI-DIRECTIONAL ROLLERS (WHEELS)		Required	
137	CABLES			
138	MV CABLE TYPE		XLPE/SWA/PVC/CU	
139	MV CABLE SIZE		3 core 95 sq mm	

140	LV CABLE SIZE		XLPE/SWA/PVC/CU or PVC/SWA/PVC/CU, 4 core 240 sqmm	
141	CONTROL CABLE		VTA	
142	MISCELLANEOUS			
143	GROUNDING TERMINAL & SIZE		VTA	
144	-NEUTRAL GROUNDING		Required	
145	-TANK GROUNDING		Required,	
146	-MV and LV cable box		Required	
147	PAINT		VTA	
148	REQUESTED SIGNALS (ALARMS)			
149	WINDING TEMPERATURE ALARM & TRIP		Required	
150	OIL TEMPERATURE ALARM & TRIP		Required	
151	OIL RAPID PRESSURE RISE - TRIP		Required	
152	PRESSURE RELIEF DEVICE - ALARM		Required	
153	BUCHOLZ RELAY ALARM & TRIP		Required	
154	LIQUID LEVEL INDICATOR ALARM & TRIP		Required	
ITEM #	DESCRIPTION	UNITS	REQUIRED	OFFERED
	GENERAL			
155	WEIGHT & DIMENSION			
156	OVERALL HEIGHT	mm	VTA	
157	OVERALL WIDTH	mm	VTA	
158	OVERALL DEPTH	mm	VTA	
159	DISTANCE BETWEEN ROLLER AXIS	mm	VTA	
160	CORE AND WINDING WEIGHT	kg	VTA	
161	TANK AND FITTING WEIGHT	kg	VTA	
162	OIL WEIGHT	kg	VTA	

ITEM #	DESCRIPTION	UNITS	REQUIRED	OFFERED
	GENERAL			
163	OIL VOLUME	Liters	VTA	
164	TOTAL WEIGHT	kg	VTA	
165	TOTAL TRANSPORTATION WEIGHT	kg	VTA	
166	ROUTINE TESTS			
167	ALL ROUTINE TESTS AS PER SPECIFICATION & IEC REQUIREMENT		Yes	
168	TYPE/ROUTINE TEST CERTIFICATES		Yes	
169	WITNESS / NOT WITNESSED		Witnessed	
170	SPECIFIC SITE TEST REQUIREMENT		Yes	
171	DOCUMENTATION			
172	COMPLETE DATA SHEET		With bid and after award	
173	GENERAL ARRANGEMENT DRAWINGS		With bid and after award	
174	WIRING DIAGRAMS		With bid and after award	
175	TEST REPORTS CERTIFICATES		After award	
176	FAT PROCEDURE		After award	
177	INSPECTION AND TEST PLAN		After award	
178	OPERATION & MAINTENANCE MANUAL		After award	
179	INSPECTION AND TEST PLAN		After award	

NOTES:

- 1 VTA = Vendor To advise
TBA = To be advised

DESIGN, FABRICATION, TESTING AND SUPPLY OF LV SWITCHGEAR PANELS

S. No.	Description	Ref. Specs./ Drawing No.	Unit	Qty.	Unit Rate
1	<p>Design, fabrication and supply of LV Switchgear panel to be installed at MCC with complete testing , 415 V ac, 3 phase, 4 wire, 2000A , 65 kA, 50 Hz with one (01) no. of incoming ACB rated at 2000A in single draw-out type panels, ELCBs, circuit breakers, contactors, CTs, PTs, relays, internal wiring, lugs, connectors, power & control terminals, ferrules, nuts, bolts, lugs etc. The panels constructed of sheet steel, free standing, indoor floor mounting type IP42 with all the indications and metering as indicated below:</p> <p>Panel Size Heightxwidthxdepth=(2350x800x1470) mm</p> <p>Bus bar Ratings Volt= 415Volts, Ampere =3000Amp, 3P+N+E ,65KA</p> <p>Main ACB 2000 Amps, TP 65KA draw type with MCH, UVT, shunt trip, closing coil earth leakage relay etc.</p> <p>Transformer protection relay Digital microprocessor based static transformer protection relay according to specification Doc# Relay-144-01</p> <p>Panel accessories following accessories will also be needed in the pannel U/O voltage and phase sequence, timer, H-O-A S/switch TP, auxiliary contactor (02 Nos), push button (ON/OFF:02 Nos), terminal block 4mm (10 Nos), control MCB 6A SP 6KA (03 Nos) and indication lights: Indication lights (Red-closing) Indication lights (Green-opening) Indication lights (White-charging) Indication lights (Yellow-ACB fault) Indication lights (Yellow-earth fault) Indication lights (Red-bucket fault) Indication lights (Red-volt abnormal)</p> <p>Mounting of panel Floor mounted</p>	Relay-144-01 Switchgear-144-01	No	1	
2	<p>Design, fabrication and supply of LV Switchgear panel to be installed with transformer to feed residential staff houses with complete testing , 415 V ac, 3 phase, 4 wire, 2000A , 65 kA, 50 Hz with one (01) no. of incoming ACB rated at 2000A in single draw-out type panels, ELCBs, circuit breakers, contactors, CTs, PTs, relays, internal wiring, lugs, connectors, power & control terminals, ferrules, nuts, bolts, lugs etc. The panels constructed of sheet steel, free standing, indoor floor mounting type IP42 with all the indications and metering as indicated below:</p>	Relay-144-01 Switchgear-144-01	No	1	

S. No.	Description	Ref. Specs./ Drawing No.	Unit	Qty.	Unit Rate
	<p>Panel Size Heightxwidthxdepth=2100(800+2x600)800) mm The above panel is actually comprised of below mentioned three panels connected together as per following dimensions Panel#1- Heightxwidthxdepth= (2100x800x800) mm Panel#2- Heightxwidthxdepth= (2100x600x800) mm Panel#3- Heightxwidthxdepth= (2100x600x800) mm</p> <p>Bus bar Ratings Volt= 415Volts, Ampere =3000Amp, 3P+N+E ,65KA</p> <p>Main ACB(fitted in panel#1) 2000 Amps, TP 65KA draw type with MCH, UVT, shunt trip, closing coil earth leakage relay etc.</p> <p>Transformer protection relay Digital microprocessor based static transformer protection relay according to specification Doc# Relay-144-01</p> <p>Panel# 1 accessories following accessories will also be needed in the pannel U/O voltage and phase sequence, timer, H-O-A S/switch TP, auxiliary contactor (02 Nos), push button (ON/OFF:02 Nos), terminal block 4mm (10 Nos), control MCB 6A SP 6KA (03 Nos) and indication lights: Indication lights (Red-closing) Indication lights (Green-opening) Indication lights (White-charging) Indication lights (Yellow-ACB fault) Indication lights (Yellow-earth fault) Indication lights (Red-bucket fault) Indication lights (Red-volt abnormal)</p> <p>Outgoing/distribution breakers MCCB 630A TP 50KA (03 Nos) (fitted in panel # 2) MCCB 320A TP 36KA (03 Nos) (fitted in panel # 3)</p> <p>Mounting of panel Floor mounted</p>				
FACTORY ACCEPTANCE TESTING					
3	Factory Acceptance Test of Switchgear Panel. The objective of the FAT is to verify that the offered LV Switchgear meet the requirements as specified in Doc. Switchgear-144-01. The FAT shall be a 100% complete system functional test and shall be witnessed by GDCL representative at manufacturer’s workshop. Expenses for FAT shall be borne by the Supplier.	Switchgear-144-01	Lump sum	1	

NOTES:

1. The Scope of Supplier shall also include design, selection of components of the offered electrical system.
2. The Manufacturer shall provide all the drawings & documents for approval to OGDCL. The Manufacturer shall provide equipment arrangement layout for switchgear panel and interconnection with existing MCC, power and control schematics, single line drawings, component list etc.
3. The Manufacturer/vendor shall provide termination arrangement through busbar for hookup/coupling with existing LV busbar.
4. The Supplier / Vendor shall be responsible for the Factory Acceptance Test and Site Acceptance Test of supplied equipment.
5. The Supplier shall specify the delivery period in its proposal.
6. It is the responsibility of Supplier to transport the equipment safely at site.
7. The Supplier shall provide the civil foundation details for the offered Panels.
8. Civil works shall be done by OGDCL.
9. The Supplier shall provide the installation and maintenance manuals of the offered system.
10. All wiring shall be properly dressed.
11. Supplier to provide complete schematic and wiring diagram and architectural layout with full dimension details of the offered electrical system panels/cubicle.
12. The Switchgear panel control supply shall be 230V AC.
13. ACB shall be suitable for both, manual as well as motorized operation.
14. The charging motors of ACBs shall be at single phase 230 Vac,50 HZ.

**MICROPROCESSOR BASED MULTIFUNCTION STATIC RELAYS FOR
PROTECTION OF TRANSFORMER**

Parameters	Specified	Offered (To be filled by Vendor)
Transformer Protection Relay: Quantity Required (02 Nos)	VTs (Vendor to specify)	
Make	VTs	
Model	VTs	
IDMT Overcurrent and Earth fault Protection	Required	
Measurement Functionality (Voltage, Current)	Required	
Communication protocol	Required	
AC Current Inputs	Required	
Power Supply	Control Supply= 220V AC ; Aux. Supply= 220/230VAC	
Contacts	Required	
Frequency	50 Hz	
Operating Temperature	Ambient 47 deg C	
Auxiliary tripping for Buckhols relay.	Required	

BOQ & Specification

Doc. No: Relay-144-0

TOR Notes:

1. The relays shall be from reputable brands preferably American & European origin.
2. The bidder shall completely fill the response against each item mentioned in BOQ.
3. The Relay configuration/parameterization files shall be prepared and uploaded in the Relay by the vendor.
4. The Supplier shall provide the installation, operation and maintenance manuals of the offered relay.
5. Existing System: Control Supply= 220VAC ; Aux. Supply= 220/230VAC
6. The Supplier shall specify the delivery period in its proposal.
7. Licensed Software of digital protection relays will also be provided to OGDCL site team on the suitable device for future use.
8. The supplier shall guarantee that equipment is free from fault and fulfill required / specified operating conditions. Should any defect in relay developed during guarantee period in operation, the supplier shall provide new relay in replacement.

SPECIFICATION OF LV SWITCHGEAR PANEL

 Oil & Gas Development Company Limited	Indent No. NOF/ELECT/144/2018 TE # GROUP-B
	Spec. No. Switchgear-144-01

SPECIFICATIONS FOR LV SWITCHGEAR PANEL

Prepared by:	Ahmed Zia (DCE-Elect-N)	Doc: switchgear- 1 4 4 - 0 1
		Rev: 0

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INTRODUCTION

This specification covers the minimum requirements for the design, construction, supply, testing of factory built low Voltage Switchgear panel for the Nashpa Plant to feed 1250 KVA transformer going to be installed for transmitting electric power from power house to residential camp.

1.1 REFERENCE STANDARDS & CODES

1.2 The equipment and material selection, design, manufacturing, testing and inspection shall conform to the latest editions of the following codes and Standards. Any changes and alterations and necessary re-certification of the equipment for compliance with the applicable Standards and Codes requirements shall be at the expense of the Supplier.

IEC 38	Standard Voltages
IEC 50	International Electrotechnical Vocabulary
IEC 51	Direct Acting Indicating Electrical Measuring Instruments and their accessories
IEC 59	Standard Current Ratings
IEC 79	Electrical Apparatus for Explosive Gas Atmospheres
IEC 88	Standard Rated Current (2 to 63A) of Fuse Links for Low Voltage fuses
IEC 112	Methods of determining the comparative and the proof tracking indices of solid insulating material under moist conditions.
IEC 144	Degree of Protection for L.V. Switchgear and Control Gear
IEC 157	Low Voltage Switchgear and Control Gear

IEC 158	Low Voltage Control Gear
IEC 185	Current Transformers
IEC 186	Voltage Transformers
IEC 255	Electrical Relays
IEC 269-1	Low Voltage Fuses
IEC 277	Definitions for Switchgear and Control Gear
IEC 364	Electrical Installations for Buildings
IEC 439	Factory Built Assemblies for Low Voltage Switchgear and Control Gear.
IEC 445	Identification of Apparatus Terminals and General Rules for a uniform system of terminal marking, using alphanumeric notation
IEC 664	Insulation co-ordination with low voltage systems including clearances and creepage distances for equipment.
IEC 947	Low voltage Switchgear and control gear
-	National Standards requirements

Any other Standards referred to in above Standards.

1.3 In the event of conflict between Standards, the most stringent shall prevail.

2.1 INSTALLATION AND SERVICE CONDITIONS

2.2 Site Conditions

Electrical design shall be based on the following:

Temperature:	Maximum	48°C
	Minimum	0°C

Relative Humidity:	70 %
Atmosphere	Dusty, Tropical
Climate	Dry and Cold Environment
Altitude:	2700 ft. above mean sea level.

2.3 **Service Conditions**

Equipment shall be installed inside an air-conditioned electrical room, but the provision shall be given to install it in a non-air-conditioned room. The equipment shall be suitable for indoor installation and operation under the prevailing ambient conditions without any deleterious effect of any kind.

Equipment shall be designed and built for continuous service at full load under combined variation of both voltage and frequency as stated below, without exceeding the permitted temperature, with a minimum of supervision and maintenance.

Transient voltage depression down to 80% of rated voltage shall not affect the performance of the equipment.

The rated characteristics of the power supply and auxiliary supply systems applicable to Low Voltage switchgear panel is:

Voltage	400 V \pm 10%
Phase	3
Frequency	50 Hz. \pm 2 Hz
Short Circuit Rating	65 kA
Neutral System	Solidly Earthed
Control Voltage	230 VAC
Space Heater	230 VAC

The current ratings of all components must be guaranteed at the specified design temperature.

The Supplier shall define on curves the setting of the protection relay and guarantee the

selectivity of all protections with respect to the main upstream source.

Equipment shall be fully rated and constructed for withstanding, making and breaking the specified short circuit duty.

Circuit breakers and contactors shall not be used beyond 80% of their rated category.

Pins of auxiliary circuits shall be sized for a rated current of 10 Amp minimum.

3.1 SCOPE

- 3.2** The manufacturer/ vendor shall Supply complete low voltage switchgear panel 400 V ac, 3 phase, comprising of ACB, protection relays, MCCBs, meters ,switches and other accessories as per Specification Sheet Doc# LV panel-144-01.
- 3.3** This specification covers minimum requirements for the design, supply and testing of low voltage switchgear panel. The manufacture/vendor shall design and select the components, their ratings for the offered new Low voltage switchgear panel as per specification given in Doc# LV panel-144-01.
- 3.4** LV Switchgear panel will be coupled with existing MCC through Bus bars therefore Busbars connection at incoming of panel shall be suitable for its hookup with existing MCC.

4.1 GENERAL DESIGN REQUIREMENTS

4.2 LOW VOLTAGE SWITCHGEAR PANEL

The Switchgears Panel shall be minimum of 2.5mm Thickness with, power coated glazed finish gauge, Standard, prefabricated, factory assembled, metal clad, self supporting, floor mounting, totally enclosed, dust, water and vermin proof, self ventilating, multi-tier vertical cubicles comprising draw-out type modular units assigned to a specific service, incoming feeder, outgoing motor, distribution feeders etc., gathering together all devices for one function, pre wired, designed for continuous operation at full rating under the specified conditions of installation.

Enclosure degree of protection shall be minimum IP42. Equipment will be located in air-conditioned switch-room (s) with normal ambient temperature of 30°C. However, equipment should be rated for continuous operation at the maximum shade ambient

temperature.

The Switchgear Panel shall be complete in all respects with material and accessories for control, protection, measurement, indication, communication, etc., required for the safe and intended operation as specified herein.

The Switchgear panel shall be of an industrial type enclosure, ready for installation after manufacturing tests.

The Switchgear panel supplier shall provide an arrangement of the bus bars and power/ control cable for installation and coupling of new panel with existing panel.

The Supplier shall ensure that the switchgear design provides adequate internal space for the glanding and termination of cables, particularly where cable sizes are determined on the basis of maximum voltage drop requirements. Cable entries shall be provided at the bottom while busbars entry shall be at top side. Cable supports shall be provided to avoid undue strain on the cable termination. Positioning of cable termination shall avoid obstruction to other cable termination and shall provide easy access for cable termination. Easy accessible locations shall be reserved in the compartment for measuring transformers installation.

The Switchgear panel with all component and accessories shall be suitable for front operation only and shall:

- Be provided with adequate clearance from live parts so that switching, vermin, pests, etc cannot cause flashover.
- Have locking provision for the front doors.
- Be provided with black colored metallic mimic diagram on the front face.
- Be designed for flush mounting of all instruments on the front side.
- Have all low voltage components rated for insulation class of 1000-volt minimum.
- Have the components mounted so as to facilitate ease of maintenance from the front.
- Have provision for lamp test and reset facility.
- Have all edges of passages, cut outs, holes between different compartments / cells of Panel / cubicle, rubber coverings.
- Be provided with steel nameplate on the front side and easily accessible document Case containing drawings and notices on the inside of the door.
- Provide door keys.
- In addition to those given in specifications it shall also be provided with all

necessary mechanical and electrical interlocking systems to ensure safe operation of the equipment and to protect the equipment from damaging mal-operation.

- Protection for earth leakage shall be provided.
- Auxiliary contacts shall be provided which will be used to monitor status remotely.
- Dust filters shall be provided on top and lower side of the front door.
- All major components shall be manufacturer make.
- Control power supplies for main circuit breaker closing and tripping duties etc. shall be at 240V AC
- Circuit breakers for incoming supplies shall be withdrawable type with drawable air-break type for 400V system, dependent on rating. Motor operated closing and shunt trip mechanisms shall be provided as well as facilities for manual operation. Indicator lamps for circuit breaker “open”, “closed” and “trip” circuit healthy” shall be provided.
- The short circuit protection device shall be a molded case circuit breaker (MCCB) with backup protection of HRC cartridge fuse link.
- Bus bar compartment.
- Cable connection compartment.

Incoming power supply shall be supplied by Busbars. Incoming supply metering shall include but not be limited to:

- a) Voltmeter and selector switch
- b) Ammeter and selector switch
- c) Kilowatt meter
- d) Kilowatt hour counter to Pakistan Fiscal Standards

Switchgear Panel shall be provided with all necessary adequate equipment and component to provide following minimum functions:

- Metering
- Protection
- Interlocking
- Control / command,
- Normal / abnormal operating conditions indication.

Indication on motor starters shall include but not be limited to:

- a) Indication lights (Red-closing)

- b) Indication lights (Green-opening)
- c) Indication lights (White-charging)
- d) Indication lights (Yellow-ACB fault)
- e) Indication lights (Yellow-earth fault)
- f) Indication lights (Red-bucket fault)
- g) Indication lights (Red-volt abnormal)

The Air Circuit Breaker rack within the compartments shall be provided with following three positions:

- Service position; power and auxiliary circuits being plugged in,
- Test position; auxiliary circuits only being plugged in,
- Off position; power and auxiliary circuits being isolated.

4.1.1 Mechanical

4.1.1.1 General

The Panel / cubicle unit shall be of robust steel, fabricated, welded and grinded, so as to form rigid, freestanding, flush fronted assembly.

Switchgear Panel shall be provided with lifting lugs and supplied with mounting channels with foundation bolts, standard accessories etc.

All exterior hardware (handles, locks, hinges, nuts, bolts etc.) shall be of stainless steel.

4.1.1.2 Safety Interlocking

Safety and interlocking system shall be provided to prevent:

- Drawing out from the service position, the movable rack, when the main power switching device is “ON”.
- Plugging-in into the service position, the movable rack, when the main power switching device is “ON”.
- Switching-in of the main power switching device unless the movable rack is fully in service position.

Each of these positions shall be clearly demarcated using a system of safety catches, located, for instance, on the tracks.

Movement from “test” to the “off” position shall be performed after disconnection of the LV plug and socket system.

Movement from “service” to “test” shall:

- Electrically or mechanically induce automatic tripping of the disconnecting devices,
- Mechanically induce the locking up of covering shutters of the power circuit plug-in openings.

Mechanical by pass switch shall be provided to open the door in powered condition.

4.1.1.3 Bus Bar Compartment

Bus bar shutters and their relative mechanism shall be provided to prevent access to live parts, placed outside the bus bar compartment. Movable ACB rack shall automatically and mechanically operate these shutters. Bus bars shall be of the single bus bar arrangement in a separately enclosed chamber and shall not be accessible under normal operating conditions. The phase sequence shall be L1, L2, L3 or R, Y, B with phase L2 or Y in the center and phase L1 or R on the left, front or top while facing the equipment from the operating side.

Removable partitions / covers secured by means of captive screws, shall be used to allow periodic checking of bus bar mechanical fasteners. Removable insulating screens with suitably sized warning labels at regular intervals shall be provided to adequately protect and ensure protection of workers and to avoid accidental contact with the bus bars. These shall be maintained by means of flame retardant moulded insulators able to resist electrodynamic effects of the short circuit currents.

The bus bars shall be made of hard drawn high conductivity tinned copper, mechanically braced to safely withstand the stresses due to short time momentary currents under the fault conditions. The phase identification of bus bars shall be provided by the application of heat shrinkable material and these shall be red (L1), yellow (L2), blue (L3), black (Neutral) and green/yellow (Earth).

Flexible joints shall be provided, wherever necessary, to avoid displacements due to expansion or transmission of shocks and vibrations from the equipment to the connecting bus bars.

Utmost care shall be taken in the positioning of bus bar supports and the layout of connections taking into consideration, the following:

- Electrodynamic stress under disturbed conditions,
- Resonance phenomena,
- Isolating distances,
- Temperature rise of conductors under these conditions.

The clearances shall not be reduced on account of the bus bar insulation or phase barriers. The bus bar supports and clamps shall be of the non-hygroscopic material. There should be proper gap among the bus bars from maintenance point of view.

A copper earth bar of suitable section for the specified fault level shall be provided.

4.1.1.4 Earthing

Earthing facilities shall be provided so as to receive bonding straps from the incoming and outgoing busbars and cables respectively.

The main framework and all metal parts of the equipment shall be adequately bonded to the earth bar.

The earth bus bar shall be provided with two compression type lugs at each end, which are suitable for terminating 2 x 70 sq. mm copper conductors. The ground bus bar shall preferably be located, at the rear or near the bottom edge of the Low Voltage Switchgear panel, and shall have equidistant holes for ground connections.

4.1.1.5 Cable Connection Compartment

These compartments shall be fully closed by covers or plates on rear and sides with front-hinged door with a locking device. The removable covers shall be assembled by means of retainable screws.

All incoming busbars shall be at top while incoming and outgoing cable entries shall be provided at the bottom, then be vertically brought up to the compartments. Cable supports shall be provided to avoid undue strain on the cable termination by fixing all cables over the full height of the equipment. Positioning of cable termination shall avoid obstruction to other cable termination and shall provide easy access for cable termination.

Easy accessible locations shall be reserved in the compartment for measuring transformer installation.

All wiring for external connection shall be brought out to individual terminals on a readily accessible terminal block. All such terminals shall be fitted with shrouds with suitably sized warning labels.

The outgoing cables shall be made with cable glands with protruding discs, installed on removable base plates, suitable for installation for CU/XLPE/PVC/SWA/PVC cables. A minimum of one spare entry shall be provided by quantity of five and one of each size, with the corresponding cable glands. Cable lugs shall be eyelet type.

4.1.2 Electrical

4.1.2.1 Main Incoming Circuit Breaker

Circuit breaker shall be air break drawn-out three pole type.

Operating Mechanism.

- Circuit breaker shall be provided with a manual operating mechanism and a power operated mechanism.
- Manually operated mechanism shall be of the spring charging stored energy type.
- Power operated mechanism shall be of the motor wound spring charging stored energy type.
- The closing action of the circuit breaker shall charge the tripping spring ready for tripping.
- Speed of closing of contacts shall be independent of the speed with which the handle is operated.
- All stored energy mechanism shall be provided with mechanical indicators to show the “Charged” and “Discharged” conditions of the spring.
- Circuit breakers provided with stored energy operating mechanisms shall be provided with the following interlocks.
 - The circuit breaker shall not close unless the spring is fully charged.
 - Shocks, vibrations, or failure of springs shall not operate the breaker or prevent intended tripping.
- Power operated mechanism shall be
 - Provided with a spring charging motor suitable for operation on A.C. control supplies specified in equipment parameter with voltage variation from 85% to 110% rated voltage.
 - Designed to enable a continuous sequence of closing and opening

operation as long as power is available and at least one opening operation on power supply failure.

- Provided with emergency manual charging facilities.
- Provided with facilities for remote panel closing and opening operations whenever specified.
- Spring charging time for power-operated mechanism shall not exceed 15 seconds.

Circuit breaker positions shall be indicated electrically with following indicating colors:

Breaker “Close”	:	Red
Breaker “Open”	:	Green
Breaker “Auto Trip”	:	Amber

Circuit breaker positions (Open & Close) location (Service, test and drawout) and spring charged condition should also be indicated mechanically.

4.1.2.2 Specific Component Requirements

Contron supply-distribution Circuit Breaker

Control supply-distribution shall be controlled by Moulded Case Circuit Breaker mounted on standard movable racks.

The MCCBs shall have appropriate voltage and current ratings. as shown on the drawings. These shall have both over current and instantaneous short circuit protection.

The MCCBs shall have suitable short circuit rupturing capacity.

The breaker shall have quick make, quick break mechanism with positive ON, OFF and Tripped positions.

Trip mechanism shall be trip free on over load or short circuit, ensuring that the breaker will not remain close even when the operating handle is manually held closed or with circuit breaker handle locked in the ON position during short circuit or continuous over load.

Current Transformers

Current transformers shall comply with the requirements of IEC 185.

Current transformers shall be provided with accuracy Class in accordance with IEC 185.

The secondary output current shall normally be 5 amperes. For remote metering shall be 1 amperes.

Three single phase units with burden suitable for protection and / or metering circuits shall be used.

Current transformers shall be designed to mechanically and thermally withstand the specified switchboard short circuit capacity.

Current transformers secondary circuits shall be furnished with short circuiting link type terminals.

Voltage Transformers

Voltage transformers shall comply with the requirements of IEC 186 and shall be of the same accuracy class as current transformers.

Three single phase units with burden suitable for metering and / or protection circuits shall be used.

Voltage transformers shall be equipped with primary fuses with suitable interrupting capacity. Terminal blocks shall be provided for each voltage transformer system.

Protective Relay

Digital microprocessor based multifunction static protection relay for transformer according to specification at Doc# Relay-144-01.

Indicating Instruments

All instruments shall be of the industrial type, enclosed in dust and damp-proof casings, semi-flush switchboard type, with standard scale having white background and black graduations and markings, similar throughout in size and type and of suitable standard size. Indicating instruments shall be in accordance with IEC 51.

Instruments shall be provided with zero adjustments such that adjustment can be made without dismantling the instrument.

Voltmeters shall be scaled according to voltage and shall be connected to the system through HRC fuses.

Indicating Lights

Indicating lamps shall be transformer type, suitable for flush mounting, complete with base and lamp and shall have rosettes of following colours:

On (Closed)	Red
Off (Open)	Green
Fault	Yellow
Space Heater	Blue
Others	White

All lamps shall be able to be replaced from the front of the panel. All bulbs shall be similar, standard and easily obtainable from renowned lamp manufacturers.

Failure of an indicating light shall not cause circuit breaker misoperation.

Push Buttons

The push buttons shall be momentary make / break contact type (normally open / normally close) having similar contact blocks and suitable for flush mounting. The push button for ON and OFF switching shall be red and green respectively. The contact blocks shall have at least one set of normally open and normally close contacts easily wired for dismantling.

Selector Switches

Ammeter selector switch shall be R-Y-B-OFF and Voltmeter selector switch shall be RY-YB-BR-RN-YN-BN-OFF. These selector switches shall be spring loaded, switch position clearly and indelibly marked, complete with front plates and operating lever and circuits properly interlocked to avoid any mal-operations.

All switches shall have facilities for locking in any position.

Line up Terminals

The line-up terminals for control shall be suitable for channel mounting. All necessary accessories such as end-plates, fixing clips, transparent label holder caps and label sheets with marking shall be provided. Spare terminal blocks (approx. 20%) shall be provided with each group of terminals.

Auxiliary Circuits

Control circuit shall be provided for each movable rack and shall include circuits for control, signaling and heating, individually protected.

Auxiliary wiring shall be strand conductor copper conductor, thermoplastic insulated, flexibility class 2, 1000 V rated insulation, neatly arranged, clipped in groups, harnessed by means of straps and cords and shall be securely held in position (either loomed or run in conduits), with the following minimum cross sections:

- Current transformer circuit 2.5 sq. mm
- Control / signaling circuit 1.5 sq. mm

Flexible multi strand conductors shall be used for connection on equipment mounted on door. Wiring to door mounted components shall be in flexible PVC conduit. When wiring is inserted in PVC gutters, these shall be maintained by plastic bolting and shall not be ran with main bus bars or droppers. The terminals of meters, switches and other devices mounted on the hinged door shall be protected to prevent accidental contact when the panel door is opened for inspection / maintenance.

All internal wiring shall be coloured as per Supplier's standard except earth wiring, which shall be Green / Yellow.

Anti-Condensation Heater

Anti-condensation heater controlled automatically through adjustable humidistats for maintaining required safe operating condition inside the cubicle. The heater shall be wired to an accessible terminal block providing for a single connection of the external power source and shall be manually operable and provided with protective miniature circuit breaker and ON indication lamp, and alarm.

4.1.3 Labels

A master nameplate shall be provided which shows the following:

- Manufacturer's name or trade mark
- Type designation or equipment identification number
- Rated voltage
- Rated current
- Frequency
- Interrupting capacities
- Year of manufacture
- Governing IEC Recommendation

Circuit Breaker rating plate shall show the year of manufacture.

Danger signs shall be provided in accordance with electric rules, regulations and normal practice.

4.1.4 Finish

All metal work of the Switchgear panel shall be degreased and cleaned down to bare shining metal, phosphated and the surfaces chemically prepared for powder coating. Then it shall be powder coated with RAL 7032 colour and baked in oven.

5.0 DRAWINGS AND DATA

The Manufacturer/Supplier shall describe in his proposal the characteristics of all components of Low Voltage Switchgear with overall arrangement sketches.

Preliminary drawings shall be submitted with bid. Which shall include:

- Overall and assembly drawings.
- Front face arrangement.
- Power and control diagrams of Switchgear panel / cubicle.
- Installation procedures, installation specifications and installation drawings.
- Supplier drawings and test certificates
- Protection device settings in coordination with upstream protective devices.
- Protection Relay curves.
- Applicable catalogs, brochures and Repair/service manuals.
- Outline and cross-section drawings giving dimensions and weight.
- Certified test reports of the equipment.
- Installation and operation manuals.

All documentation will be subject to acceptance to the satisfaction level of OGDCL's Engineer.

The supplier shall develop a list of two years operating spares.

Three sets of As-built drawings shall be provided with the equipment in the document case.

6.0 FACTORY TESTS

The testing procedure shall be submitted to the OGDCL for approval prior to testing. The Owner reserves right to witness all tests and to conduct additional non-destructive and other tests at the Supplier's expenses in as much as these tests are not covered by this specification and/or applicable standards mentioned herein. All tests shall be conducted in accordance with the international standards and elementary diagrams.

The Manufacturer/vendor shall give at least one week notice prior to final tests. OGDCL may witness the tests at the Manufacturer's facility. Factory tests shall essentially include, but not limited to:

- Visual inspection of appearance, construction, dimensions and workmanship
- Mechanical operating test
- Insulation Di-electric test
- Short Circuit Test
- Interlocking, Logic and Wiring checks
- Functional Testing.

Final acceptance shall be given at site after commissioning of the system.

All protection relays shall also be tested at site.

All necessary software, hardware & equipment shall be provided for the earliest operation and maintenance of the system.

7.0 SHIPPING

The material shall be properly conditioned for shipping against all possible damages. Supplier shall be responsible for shipment of equipment to site and for the adequacy of the preparations for shipment ensuring that materials and equipment arrive at their destination in undamaged condition. All components shall be shipped simultaneously.

Supplier shall provide the OGDCL shipment details; dates of equipment departure and arrival at site and a list of weights and sizes of shipment packages prior to dispatch.

8.0 QUALITY ASSURANCE

The supplier shall operate a quality assurance scheme covering his design practices, documentation and workmanship.

9.0 GUARANTEE

The Supplier shall guarantee that the equipment furnished is free from fault in design, workmanship, is of adequate size and capacity, and of proper material to satisfactorily fulfill the operating conditions specified. Should any defect in design, material, workmanship or operating characteristics develop during testing and commissioning, the supplier shall make all necessary alterations, repairs, and replacements of defective equipment/components, at his own cost including transportation.

Supply of MV Power Cable, Jointing and Termination Kit

GROUP-C:

S. No.	Description	Unit	Qty.	Unit Rate	Amount (PKR)
1	Supply of HT cable jointing kit suitable for MV cable at S#1	No	2		
2	Supply of HT cable termination kit suitable for MV cable at S#1	No	2		

GROUP-D:

S. No.	Description	Unit	Qty.	Unit Rate	Amount (PKR)
1	Supply of MV Power cable 3-core 95 mm ² , 6350/ 11000 V stranded copper conductor, extruded semi-conducting conductor screen, cross linking polyethylene insulated, extruded semi-conducting core dielectric screen, copper tape screen, non-hygroscopic fibre filler, binding tape, PVC extruded bedding, galvanized steel wire armoured and PVC over sheath.	Meter	1200		

TOR NOTES:

1. The bidder shall be original manufacturer of the cables.
2. The manufacturer should be ISO certified at least ISO 9001 & 14001.
3. The bidder shall provide all factory test certificate including but not limited to insulation test, temperature with stand of conductor (70 to 90 °C) at full loading & short circuit current test, voltage drop curves etc.
4. Test shall be performed under KEMA certified facility according to IEC 60502-2 specified standards.