

TECHNICAL PROCUREMENT SPECIFICATION

for

3.3kV, 50 Hz, 1600 Amps SWITCH BOARD

FACT-UC

TPS NO. : TPS-UC-SS-IIVSB-01

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1.0 INTRODUCTION

- 1.1. This specification gives minimum user requirements for a new 3.3kV, 50Hz, 1600A Indoor Switch Board intended to commission in the 110kV substation of FACT Udyogamandal, Cochin, Kerala for replacement in lieu of existing NGEF and TMG make panels.
- 1.2. Fertilisers And Chemicals Travancore (FACT) is a Government of India Enterprise engaged in manufacture of fertilizer, chemical & petrochemical products, engineering consultancy and engineering fabrication. FACT-Udyogamandal Complex (FACT-UC) is a division of FACT located at Udyogamandal, Kochi, Kerala that manufactures intermediates and products like sulphuric acid, oleum, ammonia, ammonium phosphate, ammonium sulphate, caprolactum etc.
- 1.3. Vendor's scope shall include design, selection, material, manufacture, assembly, painting, supply, assistance for testing & commissioning and operational/ maintenance training of the Indoor switch board.
- 1.4. The feeder details of proposed switch board is provided in the data sheet.
- 1.5. The electrics supplied shall be complete with all accessories for the safe, smooth and efficient operation of the system and shall comply with all required latest statutory requirements and standards.
- 1.6. Every component shall be brand new and shall be of proven design for safety, reliability and durability. Makes of components shall be as specified in Annexure-III.
- 1.7. The vendor shall provide warranty as specified in section 25 herein.
- 1.8. This is a two bid enquiry with Pre-Qualification Criteria. An unpriced copy of the price bid as specified in Annexure-V shall be attached with the technical bid for technical evaluation.
- 1.9. Only offers that comply with the requirements as specified in the bid documents and specification shall be considered for further evaluation. If the vendor however finds some deviation unavoidable, such deviations shall be clearly mentioned in the compliance statement in the specified format (Annexure-IV) with proper justification. The purchaser reserves the right to reject or accept the offer with such deviations.
- 1.10. Bidders are advised to visit the site before quoting for better understanding of the scope and prevailing site conditions before bidding.

2.0 PERIOD OF COMPLETION

- 2.1. The vendor shall complete the supply within a period of 28 weeks from date of final drawing review /approval. The drawings for review/ approval shall be submitted within 15 days from the date of Purchase order. Revised final drawings for final approval, after incorporating the all comments/ changes from Purchaser, if any, shall be submitted within 10 days from date of intimation of comments/ changes in drawing from Purchaser.
- 2.2. Vendor shall complete the testing & commissioning assistance within a period of 4 weeks from date of work- to -proceed notice.

2.3 Time is of the essence of this contract. The vendor shall complete the supply within the time specified above.

2.4 All drawings and documents as per Vendor Data Requirement shall be supplied as specified.

3.0 SCOPE

3.1 SCOPE OF VENDOR

3.1.1 Design, selection, material, manufacture, assembly, painting, supply, assistance for testing & commissioning and training of the Indoor switch board as specified herein.

3.1.2 Furnishing all drawings and documents as per section 21, 'Vendor Data Requirements'

3.1.3 Inspection and tests as per section 19.

3.1.4 Supply of critical spares as per Annexure-II.

3.1.5 Necessary foundation channels as per design requirement (if not integral) shall be supplied along with the equipment.

3.1.6 Any other item that may not be specifically mentioned in this specification but found required for the efficient working of the system and the successful completion of the job.

3.2 SCOPE OF PURCHASER

3.2.1 230V 50Hz AC auxiliary supply required for space heaters, panel illumination and socket outlets.

3.2.2 110V DC for control circuits.

3.2.3 Panels shall be supplied at FACT Udyogamandal Stores. Transportation of panels from FACT stores to site, erection and assembly etc. are under purchaser's scope.

4.0 GENERAL REQUIREMENTS

4.1 The panel covered in this specification is for replacing existing 3.3kV NGEF and TMG make panels at 110kV substation. Tentative schematic diagram incorporating all existing feeder panels is given in Annexure-VI

4.2 Metal clad switch board shall be complete with all the accessories for efficient and trouble free operation. The equipment offered shall be safe, reliable and compact to install. The circuit breaker, switches and protective device shall be of latest design so as to ensure rapid and efficient interruption of fault current, small arcing time and freedom from fire hazards.

4.3 The equipment shall operate satisfactorily at the rated load under the service conditions and power supply conditions specified in the data sheets.

4.4 Momentary paralleling of incomer/ bus section with other bus section/ incomer shall be possible with appropriate selector switch and check synchronizing relay.

4.5 The Switch board shall be designed, manufactured and tested in accordance with the best international

engineering practices under strict quality control to meet the requirement stipulated in the technical specification. Adequate safety margin with respect to thermal, mechanical, dielectric stress and insulation coordination etc. shall be maintained during design, selection of raw material, manufacturing process etc. so that the switch board provides long life with least maintenance.

- 4.6 The workmanship shall be of the highest quality and shall conform to the latest modern practices for the manufacture of high technology machinery and electrical switch board.
- 4.7 The Switch board panel shall be free standing, floor mounted, fully compartmentalized, metal enclosed construction complying latest IS and IEC standards. Each breaker panel shall be compartmentalized with separate metallic partition. Separate breaker draw out truck compartments, HV bus compartment, incomer cable compartments and control cubicles are required.
- 4.8 All operations of circuit breaker, disconnection, earthing, spring charging etc. shall be done from front side of the Switch board.
- 4.9 Each panel shall be provided with one earth bus of suitable size. The earth bus shall be of suitably rated tinned/nickel plated copper or aluminium.

5.0 STANDARDS

Requirements laid down in the equivalent/ latest revisions of the following Indian Standards and other relevant standards shall be strictly adhered to.

IS:13118	Circuit breakers
IS:3427	Metal enclosed switchgear and control gear for voltages above 1000 V
IS:5578	Guide for marking of insulated conductors
IS:10118	Code of practice for selection, installation and maintenance of switch gear and control gear
IS:10601	Dimensions of terminals of high voltage switchgear and control gear
IS:11353	Guide for uniform system of marking and identification of conductors and apparatus terminals
IS:722	AC electricity meters
IS:1248	Direct acting electrical indicating instruments
IS:1901	Visual indicator lamps
IS:2551	Danger Notice Plates
IS:2705	Current Transformers
IS:3043	Code of practice for earthing
IS:3156	Voltage Transformers



- IS:3231 Electrical relays for power systems protection
- IS:3842 Application guide for electrical relays for ac systems
- IS:4146 Application guide for Voltage Transformers
- IS:4201 Application guide for CTs
- IS:4483 Flush mounting IDMTL relays
- IS:6875 Push buttons and related control switches (for voltages upto and including 1000V ac and 1200 V dc)
- IEC 62271-102: High-voltage switchgear and controlgear- Alternating current disconnectors and earthing switches.
- IEC 62271-100: High-voltage switchgear and controlgear- Alternating-current circuit-breakers
- IEC 62271-201: High-voltage switchgear and controlgear- AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

All other included items shall conform to latest IEC/IS standards.

6.0 CONSTRUCTION

6.1.0 GENERAL

- 6.1.1 The switchboard shall be of min. 2 mm. Thick folded sheet steel construction, fully enclosed, dust, damp and vermin proof, floor mounted and free standing type with service- test-draw out features. The degree of protection shall be as specified in the data sheet. Vertical units shall be assembled to form a continuous line up of uniform height and front lineup.
- 6.1.2 Front access with hinged doors shall be available to all components in the cubicle, which require adjustment, maintenance or replacement.
- 6.1.3. Rear access shall be available to cable box, cable glands, multi core terminal block etc. with bolted covers.
- 6.1.4 All doors shall be hinged at one end and shall be bolted (knob/equivalent type) on the other end.
- 6.1.5 All barriers used shall be manufactured from non-inflammable material. All hardware shall be corrosion resistant. Doors & openings shall be provided with neoprene gaskets.
- 6.1.6 Each CB shall be housed in a separate compartment and shall be enclosed on all sides.
- 6.1.7 Switchboard comprising of a number of CB panels, shall be of unit construction to enable the board to be broken down into sections for shipping to site and to be correctly reassembled and erected on prepared foundations. Inter panel and inter compartmental wiring shall preferably be protected by heavy gauge solid metal conduit or trunking.
- 6.1.8 The construction of switchboard shall be reliable, safe, self-contained, compact, interchangeable,

accessible, easily extensible at both ends and complete with all positive mechanical interlocks.

6.1.9 Adequate lifting facilities shall be provided on each section. Lifting eyes may be of removable/ foldable design. When removed, these shall not leave any openings on the boards.

6.2.0 MOVABLE SECTION

6.2.1 Movable truck of the draw out type circuit breaker, mounted on suitable rollers, fitted with truck earthing mechanism shall be complete with circuit breaker poles, operating mechanism, plug in connectors, etc.

6.2.2 For independent poles of the circuit breakers for housing CB contacts and the rupturing chamber, it shall be fixed to the rigid sheet steel chassis on the movable truck.

6.2.3 Closing and opening mechanism, interlocks, connecting links, coils for close and trip etc. shall be provided on the movable chassis.

6.2.4 An arrangement in which the panel door is integral with the circuit breaker truck is not acceptable. It shall be possible to close the panel door after the circuit breaker is fully drawn out of the panel. It shall also be possible to close the panel door, even when the circuit breaker truck remains inside the panel in the isolated position.

6.3.0 FRONT COMPARTMENT RECEIVING THE MOVABLE TRUCK

6.3.1 This compartment shall include automatically operated shutters for automatically screening the stationary plug in connections.

6.3.2 Proper guide rails for easy insertion and withdrawal of the circuit breaker shall be provided. Different positions of the C.B like 'service', 'test', and 'isolated' positions shall be clearly marked.

6.4.0 CABLE HEAD COMPARTMENT

6.4.1 Cable head compartment of the CB shall be so designed to receive, in addition to cable incoming/outgoings, wound or bar primary current transformers etc.

6.4.2 There shall be ample space for connecting power cables (sizes mentioned in data sheet). Sufficient clearance shall be maintained between phases and also with the panel frame as per IEC/IS.

6.4.3 Compartment for cable connection shall allow cable pulling, termination and connection work with switch board energized.

6.4.4 Suitable arc propagation barriers shall be provided between the panels. Independent pressure release flaps shall preferably be provided for different compartments.

6.5.0 BUS BAR COMPARTMENT

6.5.1 Bus bars shall be housed in a separate compartment. The triple pole bus bars inside compartment shall be preferably arranged on supports like araldite epoxy resin, to provide long air insulation distance and creepage path.

6.5.2 The bus bar compartment shall be provided with bolted covers. Necessary extra precaution like



additional covers, caution signs etc. shall be provided to prevent inadvertent contact with live busbars.

6.6.0 LOW VOLTAGE COMPARTMENT

6.6.1 This compartment shall be fitted with all protection relays, auxiliary relays, instruments etc. It shall preferably be mounted on top side of the front compartment receiving the movable section of the CB.

6.6.2 All relays and meters mounted on this compartment shall be flush type and different items shall be logically laid out on the front of this compartment. Relays which require adjustment, resetting shall be mounted at reasonable operating height from the floor level.

6.6.3 Mounting of relays & meters on the rear is not acceptable.

6.7.0 ACCESSIBILITY

6.7.1 Checking and removal of components shall be possible without disturbing adjacent equipment. All auxiliary equipment shall be easily accessible.

6.7.2 It shall be possible to set all 'measuring' relays 'in situ' without de-energizing the switchboard.

6.7.3 Access to busbar chamber, CTs, etc. shall be through rear bolted covers.

7.0 CIRCUIT BREAKER

7.1.0 The circuit breaker shall be vacuum circuit breaker and rating as mentioned in the data sheet and suitable for indoor use. The CB shall be of three pole, horizontal drawout type, low surge type, encapsulated unless otherwise specified in the data sheet. The ratings specified shall be for operating condition inside the panel, at site.

7.2.0 The operating duty shall be O – 0.3 Sec – CO – 3 min - CO

7.3.0 All parts of the CB shall be liberally dimensioned to have high factor of safety to withstand electrical and mechanical stresses during the normal operation of the breaker and during short circuits.

7.4.0 Breakers of same rating shall be interchangeable. Wiring and termination of plug in contacts shall be identical in all interchangeable breakers.

7.5.0 CIRCUIT BREAKER CONTACTS

7.5.1 The CB contacts shall be adjustable to allow for wear, be easily replaceable and shall have the minimum movable parts and adjustments, which accomplish these results.

7.5.2 The breaker isolating contacts shall be of self-aligning type and shall have ample area and contact pressure for carrying the rated current and short circuit currents such that there is no excessive temperature liable to bring about pitting or welding and it shall not show tendency to "blow off" when carrying rated short circuit currents.

7.5.3 A minimum of 3 sets of reversible and adjustable auxiliary contacts are to be provided on breaker operating mechanism as spare, exclusively for the use of purchaser. Multiplication shall be done only mechanically. All auxiliary contacts shall be wired to the terminal block. Auxiliary contacts and limit

switches shall be in dust tight enclosures.


7.6.0 OPERATING MECHANISM

- 7.6.1 The operating mechanism of the CB shall be quick make, quick break type and trip free as per relevant code of practice.
- 7.6.2 Circuit breaker shall be provided with electrically operated motor charged spring closing mechanism.
- 7.6.3 The closing coils and other auxiliary devices shall operate satisfactorily between 85 and 110% of the rated auxiliary supply voltage indicated in the data sheet.
- 7.6.4 In motor charged spring closing mechanism, the charging of the closing spring shall be automatically initiated after every closing operation. It shall be ensured that the closing operation shall be possible only when the springs are fully charged. Suitable protection circuit, limit switches, etc. shall be provided for protection of the spring charging motor and to cut out the motor when the springs are fully charged.
- 7.6.5 Irrespective of the mode of operation of the breaker, independent manual closing arrangements shall also be provided as a standard feature, for emergency and testing purposes. Necessary operating handles shall also be supplied.
- 7.6.6 Closing and tripping devices for both electrical and mechanical arrangements shall be provided & shall be located in the front of CB.
- 7.6.7 A mechanical interlock shall be provided for preventing any inadvertent, undesired operation. For instance, closing the breaker when the springs are being charged.
- 7.6.8 Anti pumping relay & circuitry / anti pumping feature shall be provided in the closing circuit of the CB to ensure that it does not reclose automatically after a tripping or in the case of failure to close, even if the closing impulse is maintained.
- 7.6.9 The control circuit shall be suitable for local as well as remote control. Each control circuit tapping shall be provided with fuses.
- 7.6.10 The control and other auxiliary connections from the CB to the cubicle shall be through plugs and sockets, as per manufacturer's standard rating, located at either ends and connected through flexible jumpers. The jumper shall have sufficient number of spare cores to utilise all the spare auxiliary contacts and it shall be long enough to maintain connection in the test position of the truck.
- #### 7.7.0 CB POSITIONS & INDICATION
- 7.7.1 There shall be three distinct positions for circuit breaker, viz. "service position", "test position" and "isolated position" and these positions shall be clearly marked and provided with mechanical stops at each position. Circuit breaker shall be electrically and mechanically trip free in all positions. The "test position" shall have locking device. Fully racked in, racked out, and isolated positions shall also be clearly marked.
- 7.7.2 It shall be possible to release the mechanical stop of the truck in the "test position" in order to drawout

the truck fully after severing the control connections. Cable and busbar isolating connections shall be automatically screened by the automatically operated shutters, before the CB reaches isolation position.

- 7.7.3 An automatic visual indication shall be provided to indicate "spring charged" / "discharged" positions, in the case of circuit breaker with spring charging mechanism.
- 7.7.4 Red / Green / Amber / Clear indicating lamps shall be provided for ON /OFF / TRIPPED ON FAULT / BREAKER READY FOR ON indications respectively. Blue lamps shall be provided in the case of non trip alarms and DC failure alarms. A White lamp and test button shall also be provided for 'TRIP CIRCUIT HEALTHY' indication. Indication circuit shall be through separate contacts only.
- 7.8.0 POSITIVE INTERLOCKS OF THE CB
- 7.8.1 It shall not be possible to close the circuit breaker unless it is fully "plugged in" (truck in service position) or fully isolated (truck in the test position) or has been completely removed from the cubicle.
- 7.8.2 It shall not be possible to discharge the closing spring if the CB is in closed position already.
- 7.8.3 It shall not be possible to close the circuit breaker unless the closing spring is fully charged.
- 7.8.4 Interlock shall be provided to prevent pushing in/ drawing out of the breaker truck when the breaker is in the closed position.
- 7.8.5 Suitable interlocks shall be provided to prevent faulty operation as per manufacturer's standard design.
- 7.8.6 The above positive mechanical interlocks are the minimum requirements. Manufacturers can include any other safety interlocks which maybe necessitated by the particular design feature of the CB.

8.0 BUS BARS

- 8.1 The arrangement of bus bars shall be as per relevant standards. All phase bus bars shall be of uniform cross-section throughout the switchboard.
- 8.2 Bus bars shall be of high conductivity aluminium and shall be continuously rated for the rated current and service conditions specified. Busbars shall be provided with heat shrinkable PVC insulated sleeves and busbar joints shall be shrouded.
- 8.3 The horizontal and vertical bus bars shall be rated for the same fault level specified in the data sheet. 
- 8.4 Rigid insulating barriers / protection guards /wire meshes shall be provided between the group of line busbars and other parts, so as to eliminate danger to personnel due to accidental contact.
- 8.5 Thermal design of the bus bars shall be based on installation of the switch board in poorly ventilated conditions. The cooling air volume shall take into account only the bus enclosure.
- 8.6 The busbar supports shall be non-hygroscopic, epoxy resin material with anti-tracking features to prevent flashovers. These shall have high tracking index and be mechanically strong. Hylam is not acceptable.
- 8.7 The bus bars and busbar supports shall withstand the dynamic, thermal & magnetic stresses and strains

due to the maximum short circuit current corresponding to the fault level indicated in the data sheet, without any deformation, deterioration or damage.

- 8.8 Suitable provisions shall be made for the expansion and contraction of the bus caused by temperature variation and due consideration shall be given for reactance, proximity and skin effects also, while choosing the sizes and spacing of busbars.
- 8.9 It shall be possible to extend the busbars on either side without any further fabrication /modification on the existing busbars. Removable end covers with fixed nut & bolting arrangement shall be provided on either end and the ends of the bus bars shall be suitably drilled.
- 8.10 Appropriate identification marking / labels shall be provided on the busbars and tappings for distinguishing the various phases.
- 8.11 Due allowance shall be given in the sizing of the bus bars in case of insulated busbars.
- 8.12 Busbar sizing calculation to be submitted.

9.0 INSTRUMENT TRANSFORMERS

9.1.0 CURRENT TRANSFORMER

- 9.1.1 CTs shall conform to relevant IS/IEC and shall be cast resin insulated. They shall be mounted on switch board stationary part.
- 9.1.2 CTs for metering and protection shall be selected suitably to meet the individual requirements of meters and relays specified in the datasheet.
- 9.1.3 CTs for metering purposes shall have adequate capacity to cater for 130% of full load conditions. Instrument security factor for metering CTs shall not be more than 5 and shall have an accuracy class of 1, unless otherwise specified.
- 9.1.4 CTs for protection purposes shall have sufficient accuracy, burden and accuracy limit factor for necessary co-ordination/discrimination for clearing the faults. Accuracy limit factor for protection shall not be less than 20 and accuracy class shall be 5P.
- 9.1.5 CTs shall be provided with polarity markings, adjacent to terminals, both for primary and secondary. These shall be legible even after years of service.
- 9.1.6 Unused CT terminals must be short circuited.
- 9.1.7 The CT terminals which have been used shall be provided with links to facilitate shorting as and when required (when load / burden on CT is disconnected.)
- 9.1.8 All live terminals shall be shrouded to prevent accidental contact.

9.2.0 VOLTAGE TRANSFORMER

- 9.2.1 VTs shall conform to relevant Indian Standards/ IEC and shall be cast resin insulated.
- 9.2.2 VTs shall have suitable accuracy and capacity for the satisfactory operation of the protection, instrumentation and metering specified in the data sheet / drawings enclosed. The class of accuracy and

the burden of VTs selected shall be adequate for the destined different purposes.

9.2.3 Voltage transformer shall be of fully draw out type and shall be provided with HRC fuses on both HV & LV sides. The draw out mechanism shall disconnect the bus bars and shall earth the VT primary and secondary terminals. The primary connection shall be disconnected before the VT or its primary fuses become accessible.

9.2.4 The primary rated voltage shall be equal to the rated voltage of the system and unless other-wise specified, secondary voltage shall be 110V.

9.2.5 Line VT (on each incomer) as well as Bus VT required.

10.0 RELAYS, INDICATING INSTRUMENTS, LAMPS, ETC.

10.1.0 RELAYS

10.1.1 Relays shall conform to relevant IS/IEC.

10.1.2 Relays shall be flush mounted and of a type and make approved by the buyer. List of acceptable makes is indicated in Annexure III.

10.1.3 Relays shall have hand reset type flag indicators and initiating contacts. It shall be possible to reset the flag without opening the relay case.

10.1.4 When hand reset type flag indicators are not available in primary relays, additional auxiliary relays with flag indicators and initiating contacts shall be provided in conjunction with the primary relays.

10.1.5 Flag indicators shall be visible from the front side of the CB panel.

10.1.6 Window type annunciators with labeling shall be provided for visual identification of the faults.

10.1.7 Protection relays shall be suitable for the CT/ VT secondary currents/voltages and other auxiliary relays shall be rated for the auxiliary voltage available.

10.1.8 Protection relays shall be back connected, drawout / plug-in type suitable for flush mounting and fitted with dust tight covers.

10.1.9 Non-protective relays can be in fixed execution.

10.1.10 All the relays shall have minimum 2 nos. of potential free auxiliary contacts in required combination.

10.1.11 It shall be ensured, by checking with the relay manufacturer, that with the accuracy limit factor indicated / chosen, the thermal withstand capability of the relays will not be exceeded for the fault levels specified.

10.1.12 All Protective relays shall be numerical type and shall have ethernet connectivity with necessary software for PC interface and programming. They shall be IEC 61850 compliant.

10.1.13 Synchro check relay shall be capable of checking the synchronism between the two incomers. It shall facilitate the paralleling of the two incomers by giving close permission to bus coupler circuit breaker.

10.2.0 INDICATING INSTRUMENTS

- 10.2.1 Meters shall be flush mounted and of a type and make approved by the buyer. List of acceptable makes is indicated in Annexure III.
- 10.2.2 Voltmeter, if specified, shall be moving iron type complete with suitable selector switch and control fuses and it shall be of class 1 accuracy as per IS:1248. Voltmeter shall have initial suppressed scale for the lower values in the range.
- 10.2.3 Cushion stoppers and zero correction screws shall be provided for all analog meters.
- 10.2.4 All control / selector switches used shall be of rotary type, spring loaded and of robust construction. The operating handle of these switches shall be knob type and of black colour. The switches shall have 3 way with OFF position. Necessary facia plates shall be black anodised aluminium with white lettering.
- 10.2.5 Digital type meters shall be provided wherever specified in the data sheet.
- 10.2.6 All auxiliary equipment such as shunts, transducer, etc., as required, shall be included in the supply of switchboard
- 10.3.0 PUSH BUTTON
- 10.3.1 Colour of push button knobs shall be as per relevant Indian Standard.
- 10.3.2 All push buttons shall be provided with legend plates to identify the function or operation.
- 10.3.3 All push buttons shall have minimum 1 NO + 1NC contacts, unless otherwise specified in the data sheet.
- 10.4.0 INDICATING LAMPS
- 10.4.1 Indicating lamps shall be of LED type with appropriate colour.
- 10.4.2 All lamps shall be indigenously available.
- 10.4.3 All signaling lamps must have clarity of colour.
- 10.4.4 Necessary protective fuses shall be provided for the lamp circuit.
- 10.5.0 ANTICONDENSATION HEATER
- 10.5.1 Space heater shall be provided in the CB panel/ cable chamber. It shall be of adequate capacity and rated for the auxiliary supply specified in the data sheet.
- 10.5.2 Necessary ON / OFF isolator, HRC protection fuses & link and thermostat shall be provided for the heater.
- 10.5.3 Heater shall be provided inside the panel in easily accessible position for removal / replacement.
- 10.5.4 Wiring of space heater shall be isolated or separately bundled from other internal wiring.



11.0 ANNUNCIATION SCHEMES FOR TRIP, NON-TRIP & DC FAILURE ALARMS

- 11.1.0 Separate visual and audible annunciation scheme shall be available for;
- Automatic tripping on fault conditions
 - D.C. failure condition
 - Non-trip alarm conditions
- 11.2.0 Common facilities and accessories for the trip annunciation scheme & DC failure annunciation scheme like flasher relay, hooter, buzzer etc, shall be mounted on the bus coupler panel. Alarm operation and cancellation relays for trip annunciation scheme shall be mounted on the respective panels, wherever indicated in the data sheet. The trip annunciation schemes shall be rated for D.C. auxiliary supply indicated in the data sheet covering the switchboard.
- 11.3.0 TRIP ANNUNCIATION SCHEME
- 11.3.1 In the event of a fault in any one of the feeders, the relay sensing the fault initiate trip annunciation scheme in that panel in addition to initiating the tripping of the circuit breaker concerned. The amber lamp provided on the panel starts flashing on the flasher bus (derived from flasher relay) and the common hooter starts sounding. When the alarms accept PB is pressed the hooter shall stop and the amber lamp shall glow steady. After resetting the flags and contacts on the protective relay which initiated the alarm, the alarm scheme can be reset by pressing the reset. Now the amber lamp, which was glowing steady till then, shall go off.
- 11.3.2 The annunciation scheme shall be repetitive and shall be ready to receive and initiate systematically a second or third fault, irrespective of whether the alarm due to first or second fault in other panels is in 'initiated' or 'accepted' or 'relay reset' condition prior to fully resetting of the annunciation scheme.
- 11.3.3 It shall be possible to check the healthiness of all amber lamps by pressing the lamp test PB.
- 11.3.4 Necessary interlock shall be provided to prevent closing of the circuit breaker before resetting the alarm in that panel, by using suitable contact of the alarm operation and cancellation relay in the closing circuit of the circuit breaker. Contacts for this purpose shall also be available.
- 11.4.0 DC FAILURE ANNUNCIATION SCHEME
- 11.4.1 For DC failure annunciation scheme instantaneously operated DC under voltage relay shall sense the DC failure and shall initiate the flag indication and the DC failure annunciation scheme. The indicating lamp comes ON and the buzzer is initiated. On pressing the 'accept' PB, the audible alarm shall stop. When DC is restored, the scheme shall get automatically reset.
- 11.4.2 The DC failure sensing relay shall have hand reset flag indication.
- 11.5.0 NON-TRIP ANNUNCIATION SCHEME
- 11.5.1 Non- trip annunciation scheme shall be provided on transformer feeder, wherever indicated in the data sheet. Window type alarm facia shall be fitted. Accept, Reset, Test Buttons shall preferably on each



switchboard. Audio alarm shall be common bell.

12.0 CABLE TERMINATION & WIRING

12.1.0 CABLE TERMINATION

12.1.1 Termination of wiring for external connection shall be done using terminals of reputed make and of proven design for long trouble free life.

12.1.2 Terminals shall be compact and shall have very high dielectric strength so as to prevent flashover and have thermal strength to prevent deterioration.

12.1.3 Identification / numbering / lettering shall be provided for each terminal. Such marks shall be legible even after years of service.

12.1.4 Not more than one incoming / outgoing cable is to be connected per terminal.

12.1.5 Sufficient spare terminals shall be provided on each terminal block.

12.1.6 Facilities shall be available for temporary or permanent short-circuiting of terminals for earthing and testing.

12.1.7 Shorting links shall be provided for all CT terminals.

12.1.8 Conductors shall be terminated with adequately sized compression type tinned copper lugs for connection to equipment terminals and strips. Stranded conductors shall be soldered at the ends before connections are made to the terminals.

12.1.9 All auxiliary equipment terminals shall be made with pressure type terminals.

12.1.10 Terminal strips shall be preferably separated from power circuits by metal barriers or enclosures.

12.1.11 All terminals shall be shrouded with plastic covers to prevent accidental contact.

12.1.12 Sufficient clearance shall be available between terminals where terminal lugs are fitted to them.

12.1.13 Terminals shall be designed to avoid bimetallic corrosion and breaking of strands due to excess pressure.

12.1.14 Terminal strip for outgoing control cable connections shall be accessible to facilitate working and testing with breaker in test / service condition and while the switchboard is energized.

12.2.0 WIRING

12.2.1 Control and power wiring shall be kept separate.

12.2.2 All wiring for controls shall in general be carried out with copper conductor of size not less than 2.5sq mm.

12.2.3 The wiring shall be of suitable grade and shall have flame resisting insulation.

12.2.4 Wiring shall be terminated in easily accessible terminal blocks.

- 12.2.5 The wires shall be arranged neatly and the two ends of each wire and the terminal blocks shall bear the circuit number by using unbreakable ferrules for identification purposes.
- 12.2.6 Control wiring wherever terminated shall be in single layer formation.
- 12.2.7 All inter panel control wiring shall be taken through PVC sleeves and this shall be done by the switch board manufacturer with identification of wires and terminals for interconnection.
- 12.2.8 Whenever a VT is mounted on the breaker carriage, all auxiliary wiring shall be done in conduits.
- 12.2.9 All spare contacts of aux. relays, timers, etc. shall be wired up to the terminal block.

13.0 INSULATION

- 13.1 The insulation between phases and between phases & ground for power or control conductors shall be made of suitable insulating material resistant to heat, dust and dampness. It shall be non-hygroscopic, mould proof and treated with suitable varnishes.
- 13.2 Minimum clearance between phases, or between connections of same phases separated electrically from each other, or between phases and ground, shall be as per relevant standards.

14.0 EARTHING

- 14.1 Earthing arrangement shall conform to IS 3043.
- 14.2 Continuous earthing strips of material and size specified in the data sheet shall be provided for the complete length of the switch board. Strips shall be connected to the body of the switchboard by means of integral bolts, spring washers and nuts.
- 14.3 Earthing terminals shall be provided on the trucks to earth the body of the truck when pushed into the cubicle.
- 14.4 A minimum of 2 terminals shall be provided on the strip for external connections to earth grid.
- 14.5 All doors and movable parts shall be connected to earth bus with flexible copper connection.
- 14.6 All non-current carrying metallic parts of the equipment shall be earthed.
- 14.7 Earth bus shall be extended upto each cable compartment and earthing bolts shall be provided to ground cable armours.

15.0.0 PAINTING AND LABELLING

- 15.1 The sheet steel housing and all the metal surfaces shall be properly cleaned and coated with two coats of anticorrosive paint (RAL 7032) over two coats of suitable primer. A final coat in gloss finish with the colour indicated shall also be given to the switchboard.
- 15.2 All panels shall have, on the front and the rear sides, nameplates in large sized letters, giving feeder details.
- 15.3 Painted MIMIC DIAGRAM shall be provided on all the panels of the switchboard, unless otherwise

specified in the data sheet.

- 15.4 Special warning plates shall be provided on all removable covers or doors giving access to high voltage cables / bus bars and inside the switchboard also wherever considered necessary.
- 15.5 Nameplates shall be fastened by "screws" and not by adhesives.
- 15.6 A nameplate with the switch board designation shall be fixed at the top of the central panel
- 15.7 Name plates shall be provided for each equipment, such as lamps, PBs, switches, relays, aux. contactors etc., mounted on the switchboard, indicating the operation / function
- 15.8 The size of the letters giving switchboard designation shall be as per standard practice.
- 15.9 Necessary DANGER nameplates to be provided as per standards

16.0 EARTHING TRUCK

- 16.1 One number Earthing Truck shall be supplied, unless otherwise specified in data sheet. The Earthing truck shall be fully draw out pattern, complete with necessary earthing links to facilitate earthing on the cable side. Locking facility shall be available. Earthing links shall be of size to withstand the fault current specified in the single line diagram/data sheet.
- 16.2 As an alternative to the above, vendor may offer integral earthing switch in each outgoing feeder of the switchboard. Such earthing switches shall be fitted with interlocks such that circuit breakers cannot be made "ON" while earthing switch is in the 'earth position'.
- 16.3 Earthing Truck shall be provided with Audio -Visual Annunciation, if specified in the datasheet, to prevent earthing of live cable.

17.0 SPARES AND SPECIAL TOOLS

- 17.1 Spare parts and special tools recommended for keeping in stock for trouble free operation of CB panel shall be supplied. List and catalogue numbers of these spare parts shall also be furnished. Critical spares required are mentioned in the Annexure II.

18.0 DRAWINGS

- 18.1 All drawings and documents as per Vendor data requirement shall be furnished. The control circuits shall be prepared by the manufacturer and the drawings shall be neat, legible and incorporating all requirements. The rating of all components such as voltage, ampere and wattage/VA shall be clearly indicated in component list.

19.0 INSPECTION AND TESTS

- 19.1 Comprehensive Inspection and Testing Plan in the form of Quality Assurance Manual for switch board shall be submitted by the bidder including testing, inspection & witnessing required by the Purchaser. The Comprehensive Inspection and Testing Plan shall be approved by the Purchaser.
- 19.2 Bidder's quality assurance manual shall include all details of type tests & routine tests as per IS/IEC.

- 19.2.1 Bidder shall submit type test certificates of Power Switchgear and Control gear assemblies as per IS/IEC.
- 19.2.2 Bidder shall bear the cost of all tests. The purchaser will witness inspection & testing at mutually agreed date. The cost of the purchaser's visit to the factory for inspection and testing will be borne by the Purchaser.
- 19.2.3 Bidder shall give 15 days advance intimation to Purchaser for inspection and witnessing of routine tests on completely assembled switch board.

20.0 DATA SHEET

1.0	SERVICE CONDITIONS	
	Location	Udyogamandal, Cochin
	Humidity Min.	64 %
	Humidity Max.	95 %
	Humidity Design	100 % at 40 Degree Celsius
	Ambient Temperature °C - Min.	19.2
	Ambient Temperature °C - Max.	40
	Ambient Temperature °C - Design	40
	Environment	Tropical atmosphere
2.0	POWER SYSTEM DETAILS	
	Voltage	3.3kV ± 10%
	Frequency	50 Hz ± 5%
	No. of Phases/wires	3 phase 3 wire
	Fault level (sym.)	175 MVA
	Neutral earthing	Solidly Earthed
	Continuous rated current	Power bus 1600A
	Short time current (kA/s)	Power bus : 31.5 kA / 1sec. CT : 31.5 kA/1 sec. Ground bus: 31.5 KA for 3sec.

3.0	DIMENSION OF ROOM				
	Length (mm)	22510			
	Width (mm)	7260			
	Height (mm)	5000			
	Door Width (mm)	1950			
	Door Height (mm)	2750			
	Dimensions of existing panel (L x W x H) in mm	20110 x 2570 x 2350			
4.0	GENERAL DATA				
4.1	Location	Indoor			
4.2	Degree of protection	IP 4X			
4.3	Electrically exposed / non exposed	Non Exposed			
4.4	Cable entry	Bottom			
4.5	Type of Circuit breaker	Vacuum CB			
4.6	Breaker closing	Motor charged spring closing			
4.7	DC control supply voltage	110V DC for shunt trip coil, closing coil, indication lamps, etc.			
4.8	AC auxiliary supply voltage	240V AC for spring charging motor supply, panel anticondensation heater, panel illumination and socket outlets.			
4.9	VT secondary voltage (Phase to phase)	110V			
4.10	Bus bars-material	Insulated aluminium (Bus bars shall be insulated with heat shrinkable sleeves rated for phase voltage and joints shall be shrouded.			
4.11	Earth bus – size & material	As per manufacturers design			
4.12	Mimic diagram	Required			
4.13	Current transformers		Accuracy Class	Burden (VA)	Insulation Class
		Metering core	1	As per manufacturers standard design	As per manufacturers standard design
		Protection core	5 P 20		
4.14	Voltage transformers		Accuracy	Burden (VA)	Insulation Class

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		Class		As per manufacturers standard design	As per manufacturers standard design	
		Metering core	1			
		Protection core	3 P			
4.15	Ammeter – accuracy class	1.0				
4.16	Multifunction Meter (Digital)	Measuring Current, Voltage, kW, KWh, kVA, kVA _r , Frequency, PF etc . RS 485 serial port for modbus comm.				
4.17	Painting	Anticorrosive epoxy based powder coating				
4.18	Interlocks	Required				
4.19	Earthing truck	Required (1 No)				
5.0	COMPONENT DETAILS					
	TYPE OF PANEL	INCOMER	BUS COUPLER	FEEDERS		
				POWER	TRANSFORMER	CAPACITOR BANK
	Nos	2 Nos	1 No	0 Nos	1 No	2 Nos
5.1	Current Transformer (3 Nos for each panel)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
5.2	Voltage Transformer					
	a) On cable side	Reqd.	-	-	-	-
	b) On busbar side	Required for each bus section and incomer				
5.3	INDICATION LAMPS					
	Breaker ON	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Breaker OFF	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Breaker Auto trip	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Trip Circuit healthy	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Spring charged	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Breaker ready to close	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Test position	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Service position	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Panel space heater ON	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.

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	DC fail	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	R-Phase	Reqd.	-	-	-	-	
	Y-Phase	Reqd.	-	-	-	-	
	B-Phase	Reqd.	-	-	-	-	
	Trip alarm	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Non trip alarm	Reqd.	-	-	Reqd.	-	
5.4	ANNUNCIATION FACIA						
	Trip Relay operated	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Trip circuit unhealthy	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	O/C & E/F operated	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Standby E/F operated	Reqd.	-	Reqd.	Reqd.	Reqd.	
	Check Synchronising relay operated	-	Reqd.	-	-	-	
	Transformer Differential protection operated	Reqd.	-	-	Reqd.	-	
	Oil Temperature Alarm	-	-	-	Reqd.	-	
	Winding Temperature Alarm	-	-	-	Reqd.	-	
	Buchholz Alarm	-	-	-	Reqd.	-	
	Oil Temperature Trip	-	-	-	Reqd.	-	
	Winding Temperature Trip	-	-	-	Reqd.	-	
	Buchholz Trip	-	-	-	Reqd.	-	
	Spare	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
5.5	CONTROL SWITCHES						
	Trip-Neutral-Close Switch	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Ammeter Select Switch	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Voltmeter Select Switch	Reqd.	Reqd.	-	Reqd.	-	
	Momentary Paralleling Switch	-	Reqd.	-	-	-	

	Trip Selector Switch	-	Reqd.	-	-	-	
5.6	PUSH BUTTON						
	Lamp Test	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	DC Fail Test	-	Reqd.	-	-	-	
5.7	METERS						
	Voltmeter (analog type)	Reqd.	Reqd.	-	Reqd.	-	
	Ammeter (analog type)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Multifunction Meter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Hour Run Meter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
5.8	RELAYS						
	Numerical O/C & E/F Relay with serial, Ethernet, USB ports and multiple protocols for SCADA connectivity.	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Standby E/F relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Master trip relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Trip circuit supervision relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Breaker contact multiplication relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Transformer Differential Protection Relay	-	-	-	Reqd.	-	
	Transformer protection Aux. relay for BUCHZ, OT, WT ALARM	-	-	-	Reqd.	-	
	Transformer protection Aux. relay for BUCHZ, OT, WT Trip	-	-	-	Reqd.	-	
	DC fail relay	-	Reqd.	-	-	-	
	Check Synchronising relay	-	Reqd.	-	-	-	
	Relay for PT selection	As per manufacturers standard design					
	Flasher relay	As per manufacturers standard design					

HB

	Under Voltage Relay	As per manufacturers standard design					
5.9	ADDITIONAL TERMINALS						
	Remote Trip provision	-	-	-	Reqd.	Reqd.	
5.10	OTHER ITEMS						
	Breaker operation counter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Panel anti condensation heater (strip type)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Test & Service position limit switches	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.	
	Hooter for trip alarm	Common to entire panel					
	Buzzer for DC failure alarm	Common to entire panel					
	Bell for non-trip alarm	Common to entire panel					
	Note:- Three Spare feeders are mentioned in Annexure VI, out of which two shall be designed as power feeder and one as transformer feeder.						
6.0	OTHER REQUIREMENTS						
6.1	The breakers shall be fully withdrawable truck type. Cassette type breakers are not acceptable.						
6.2	The cable compartment shall have ample space for termination kits suitable for XLPE cables of sizes specified in the data sheet.						
6.3	Wiring terminations inside the panels shall be by crimping type lugs only.						
6.4	The connection to breaker from main busbars shall be rated for breaker rating of irrespective of CT rating of outgoing feeders.						
6.5	Indicating lamps shall be of LED type						
6.6	The vendor shall provide all software and hardware required programming of numerical relays.						
7.0	Feeder Details						
	Name	Breaker Rating(A)	CT ratio Metering	CT ratio Protection	Numerical Protection Relay	Power cable	
1	300 TPD AMMO.PHOS NO.1	1250	500/5	500/5	Reqd.	2X3X400 sq. mm XLPE AL	
2	FILTER BED No.1	1250	250/5	250/5	Reqd.	2X3X400 sq. mm XLPE AL & 1X3X400 PVC AL sq. mm	
3	LINK FEEDER TO SCHNEIDER PANEL	1250	500/5	500/5	Reqd.	2X3X400 sq. mm XLPE AL	

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4	CAPACITOR BANK NO.1	1250	500/5	500/5	Reqd.	1X3X400 sq. mm XLPE AL
5	INCOMER NO.1	1600	1000/5	1000/5	Reqd.	3X3X400 sq. mm XLPE AL
6	SPARE (Transformer fdr)	1250	300/5	300/5	Reqd.	--
7	SPARE (Power fdr)	1250	500/5	500/5	Reqd.	-
8	150 TPD AMMO.PHOS NO.1	1250	500/5	500/5	Reqd.	1X3X400 sq. mm XLPE AL
9	BUS COUPLER	1600	1000/5	1000/5	Reqd.	-
10	INCOMER NO.2	1600	1000/5	1000/5	Reqd.	3X3X400 sq. mm XLPE AL
11	CAPACITOR BANK NO.2	1250	500/5	500/5	Reqd.	2X3X400 sq. mm XLPE AL
12	FILTER BED NO.2	1250	250/5	250/5	Reqd.	2X3X400 sq. mm XLPE AL
13	SPARE (Power fdr)	1250	500/5	500/5	Reqd.	-
14	STATION TRANSFORMER	1250	300/5	300/5	Reqd.	1X3X300 sq. mm XLPE AL
15	150 TPD AMMO.PHOS NO.2	1250	300/5	300/5	Reqd.	1X3X400 sq. mm XLPE AL

Note:-

- 1 All the breaker trucks except incomer and bus coupler shall be rated for 1250A, identical and interchangeable.
- 2 Necessary technical parameters to be considered for capacitor feeder / breakers for catering to switching characteristics

21.0 VENDOR DATA REQUIREMENTS

Sl. No.	Description	With offer		After LOI/PO		Final	
		No.of copies	Date	No.of copies	Date	No.of copies	- Date
1	Duly filled in Technical Particulars of High voltage switchboard, as per Annexure-I	S	With tech bid				
2	Signed copy of Technical Procurement Specification with tentative SLD	S	With tech bid				
3	Dimensioned general arrangement drawing-internal & external, including busbar disposition.			S	10 days from PO	S/1P	As per Clause 2.1
4	Foundation plan, showing cutouts/floor openings, foundation pockets etc. along with outline dimensions			S	10 days from PO	S/1P	As per Clause 2.1
5	Single line diagram control schematic, wiring diagrams, terminal and bus wiring diagrams.			S	10 days from PO	S/4P	As per Clause 2.1
6	Schedule of materials / components, with quantity, rating, type, make, etc.			S	10 days from PO	S/1P	As per Clause 2.1
8	Type test certificates of the switchgear assembly, vaccum bottle and internal arc test for VCB, busbar and cable compartments	S	With tech bid				
9	Inspection and Testing Plan			S	10 days from PO	S	As per Clause 2.1
10	Routine test certificates.					S/1P	Along with Panel
12	Test certificates of bought out items like protective relays, CTs, energy meters etc.					S/1P	Along with Panel
13	Relay co ordination details, with recommended settings, calculations, etc. *					S/1P	Along with Panel
15	Technical literature, Pamphlets and brochures relating to the various equipment used.	S	With tech bid				
16	Operation and maintenance manuals					S/2P	Along with Panel
17	Spare parts list	S	With tech bid	S	With tech bid	S	With tech bid
18	Duly filled and signed Compliance statement as per format attached.	S	With tech bid				
19	Unpriced copy of price bid.	S	With tech bid				

Notes:

- S : Soft copy, P: Printout
- Vendor shall fill in proposed lead time if different from the required lead time.
- * : vendor to reproduce existing protection relay settings from old relays to new relays during commissioning.

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22.0 **WARRANTY**

- 22.2 The vendor shall provide warranty for the entire switch board and accessories, for a period of 12 months from the date of commissioning or 18 months from date of dispatch, whichever is earlier.
- 22.3 Vendor shall be fully responsible for proper design, manufacture, testing, packing, dispatch and supply of complete system including all accessories.
- 22.4 Equipment and its components shall be covered under warranty against faulty design, defective / improper materials poor workmanship or failure from normal use during the warranty period. The warranty shall also cover all bought-out items by the vendor, for the same period mentioned.
- 22.5 Vendor shall have full defect liability during the warranty period. It shall be obligatory on the part of vendor to modify and/ or replace any hardware completely at vendor's cost, in case any malfunction is revealed during the warranty period.
- 22.6 Other warranty terms shall be as stated in the Terms and Conditions governing the Purchase Order.

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ANNEXURE I
TECHNICAL PARTICULARS (TO BE FILLED BY VENDOR)

1.0	VACCUM CIRCUIT BREAKER	
1.1	Make	
1.2	Country of manufacture	
1.3	Type of reference	
1.4	Conformity to standards	
1.5	Rated voltage	
1.6	Maximum permissible operating voltage	
1.7	Rated current	
1.8	Rated frequency	
1.9	Number of poles	
1.10	Rated insulation level (Indoor)	
1.11	Rated cable charging breaking current	
1.12	Rated capacitor breaking current	
1.13	Rated small inductive breaking current	
1.14	Rated symmetrical short circuit breaking capacityKA /MVA
1.15	Rated asymmetrical short circuit	
1.16	Rated transient recovery voltage	
1.17	Rated making current (KA peak)	
1.18	Rated short time current - (a) 1 Sec. (b) 3 Sec.	
1.19	Rated duty cycle	
1.20	Opening time	
1.21	Arc duration	
1.22	Total break time at rated S.C capacity	
1.23	Closing time	
1.24	No. of breaks per phase	
1.25	Total length of break per phase	
1.26	Type of main contact	
1.27	Type of arc control employed	
1.28	Minimum clearance in vacuum	
	(a) Between phases	
	(b) Live parts to earth	
1.29	Minimum clearance in air	
	(a) Between phases	
	(b) Live parts to earth	
1.30	No. of aux. Contacts (NO+NC) (Without multiplying contactor)	

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1.31	Whether manual closing & tripping facility is available, in addition to the power closing & tripping	
1.32	Whether this extra manual closing be used for switching	
1.33	Whether the circuit breaker is fitted with fixed trip or trip free mechanism	
1.34	Normal voltage of the spring charging motor	
1.35	Power at normal voltage required for spring charging motor	
1.36	Time taken to charge the spring completely by the motor	
1.37	Normal and minimum operating voltage of closing mechanism	
1.38	Power at normal voltage required for closing coil	
1.39	Normal and minimum voltage required for trip coil	
1.40	Power at normal voltage required for trip coil	
1.41	Normal & minimum voltage required for operation of solenoid closing mechanism	
1.42	Current at normal voltage, required for solenoid operation	
1.43	Whether antipumping relays and circuitry provided along with solenoid operating mechanism	
1.44	Short circuit type test certificate or report enclosed	
1.45	Make of Vacuum Bottle	
2.0	BUS BARS	
2.1	Conformity to standards	
2.2	Material & grade of bus bars	
2.3	Bus bars PVC covered or not	
2.4	Type of covering	
2.5	Continuous current rating	
2.6	Whether the size of bus bars is same throughout switchboard	
2.7	Size of bus bars – Horizontal Vertical	
2.8	Colour coding	

HSS

2.9	Type of insulation	
2.10	Type of insulation at joints / tap-offs	
2.11	Peak dynamic withstand capacity	
2.12	Details of bus bar supports	
2.13	Rated short time current and time	
2.14	Guaranteed temp. rise at rated current for bare bus bars	
2.15	Guaranteed temp. rise at rated current for PVC bus bars	
2.16	Whether type test certificates attached or not	
2.17	Provision for future extension	
2.18	Clearance of bus bars in air	
	a) Phase to phase	
	b) Phase to neutral	
	c) Phase to earth	
3.0	CURRENT TRANSFORMERS	
3.1	Conformity to standards	
3.2	Make	
3.3	Type	
3.4	Whether bar primary / wound	
3.5	VA capacity	
3.6	Insulation class	
3.7	Epoxy resin cast or other type with details	
3.8	Whether dual purpose CTs proposed contrary to the specification requirement	
3.9	Class accuracy for O/C & E/F protection	
3.10	Class accuracy for metering	
3.11	Class accuracy for special protection	
3.12	Short time current rating	
3.13	Duration of rated short time current	
3.14	Short circuit type test certificate attached or not	
3.15	Instrument security factor for metering CTs	
3.16	Guaranteed temp. rise at rated current	
4.0	VOLTAGE TRANSFORMERS	
4.1	Conformity to standards	
4.2	Make	
4.3	Type	
4.4	VA capacity	
4.5	Insulation class	
4.6	Withdrawable or not	

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4.7	Connection	
4.8	Class of accuracy	
4.9	Quantity of oil required	
4.10	Current limiting resistor provided or not?	
4.11	VTs connected to cable side or bus bar side	
4.12	Mounted on top of switchboard or in separate PT panel	
5.0	RELAYS	
5.1	Conformity to standards	
5.2	Make	
5.3	Withdrawal features provided or not	
5.4	Contact - Hand reset / self reset?	
5.5	Whether hand reset flags available?	
5.6	Type of protection relays	
5.7	Mounting	
5.8	Attach catalogues of different types of relays with details of VA consumption, operating data, Contact arrangement etc.	
6.0	METERS	
6.1	Conformity to standards	
6.2	Make	
6.3	Type	
6.4	Mounting: flush / projection	
6.5	Size of meters	
6.6	Scale size	
6.7	Class of accuracy	
6.8	VA consumption of different meters	
7.0	INDICATION LAMPS	
7.1	Conformity to standards	
7.2	Make	
7.3	Type	
7.4	Watts rating at specified auxiliary voltage	
7.5	Protective resistors provided or not	
8.0	PARTICULARS OF THE EQUIPMENT	
8.1	Size & material of earth bus bar	
8.2	Thickness of panel doors (mm)	
8.3	Thickness of load bearing members (mm)	
8.4	Thickness of base frame (mm)	
8.5	Weight of switch board complete with CB (Kg)	
8.6	Weight of each S/B (kg) (Dynamic loading, if any, shall be furnished)	

DB

8.7	Shipping weight of the largest consignment and size	
8.8	Size of each panel / W x D x H	
8.9	Minimum distance required on the front side for withdrawal of circuit breaker	
8.10	Whether the equipment dust, damp and vermin proof	
8.11	Details of steps taken to render equipment dust, damp and vermin proof	
8.12	Details of anti-corrosive treatment to make eqpt. suitable for the environment	
8.13	Technical particulars of surge arrester if any	
8.14	Details of earthing truck	
8.15	Rating details & technical particulars of vacuum contactor (if any)	
9.0	Other details	
9.1	Signed and sealed TPS (Yes/No)	
9.2	Signed and sealed Compliance Statement (Yes/No)	
9.3	Type test certificates attached (Yes/No)	

ANNEXURE II
CRITICAL SPARES

1.0	HV SWITCHBOARD SPARES	
1.1	VCB Breaker truck 1250 A complete	1 No.
1.2	Disconnecting cluster contacts – Breaker side	12 Nos.
1.3	Disconnecting contacts– Panel side, with Insulating Shroud	12 Nos.
1.4	Current Transformer 1000/5	3 No.
1.5	Current Transformer 500/5	3 No.
1.6	Current Transformer 300/5	3 No.
1.7	Current Transformer 250/5	3 No.
1.8	Voltage Transformer 3.3kV/ $\sqrt{3}$ / 110V/ $\sqrt{3}$	1 set
1.9	Trip-Neutral-Close breaker control switch (as used in panel)	2 Nos.
1.10	Limit switch for breaker test / service position	4 Nos.
1.11	Spring charging limit Switch (as used in CB)	4 Nos.
1.12	Closing coil	3 Nos.
1.13	Tripping coil	3 Nos.
1.14	Check Synchronising relay	1 Nos.
1.15	Master Trip relay	2 Nos.
1.16	Spring charging motor	2 No.
1.17	Bus support insulator (3.3kV)	30 Nos. of each type.
1.18	3.3kV side PT fuse	3 Nos.
1.19	LED Indication lamps	6 Nos. of each type
1.20	Numerical protection relays (each type)	1 No each
1.21	110V DC Aux. relays with base used for contact multiplication (as used in panel wiring)	4 Nos.

ANNEXURE III

ACCEPTABLE MAKES FOR COMPONENTS

VACCUM CIRCUIT BREAKERS

SIEMENS, L&T, ABB, SCHNEIDER,
EATON,ALIND,CROMPTON

INSRUMENT TRANSFORMERS

AUTOMATIC ELECTRIC

PRAGATHI

SILKANS

SIEMENS

ALSTOM /AREVA

ABB

ECS

INTRANS

KAPPA

SCHNEIDER ELECTRIC

PROTECTIVE RELAYS (NUMERICAL)

ALSTOM/AREVA

ABB

SIEMENS

SCHNEIDER ELECTRIC

L&T

CONTROL & SELECTOR SWITCHES

KAYCEE

ALSTOM

SULZER

SIEMENS

EASUN REYROLLE

KHAITAN

JYOTI

ABB

L&T

SCHNEIDER ELECTRIC

INDICATING INSTRUMENTS

AUOTMATIC ELECTRIC

MECO

IMP

RISHAB

SILKAANA

SCHNEIDER ELECTRIC

HRC FUSES

SIEMENS

L&T

HAVELLS

ALSTOM

BUSSMAN

ALARM ANNUNCIATORS

APLAB LTD.

DIGICONT

ELECTRONIC CORPORATATION INDIA

INDUSTRIAL INST & CONTROLS

INSTALARM CONTROL PRODUCTS

INSTRUMENTATION LTD

ELECTRONIC CORPORATATION INDIA

MICRO PROCESSOR BASED METERING

SYSTEM

ENERCON

SEMS

ALACRITY

ABB

SIEMENS

SCHNEIDER ELECTRIC

L&T

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**ANNEXURE IV
COMPLIANCE STATEMENT**

ENQUIRY No: _____

We state that our Quotation No.....is in full compliance with the documents issued against the Enquiry No: -----except for the deviations listed below.

LIST OF DEVIATIONS

Sl. No	Description	Reason for deviation

Name of Vendor:

We have read, understood and accepted the terms and conditions of the enquiry as given in the Technical procurement Specification, Annexures, Terms and Conditions for Purchase attached with the tender documents, except for the deviations distinctively listed above.

Date:

Name & Designation

Seal & Signature



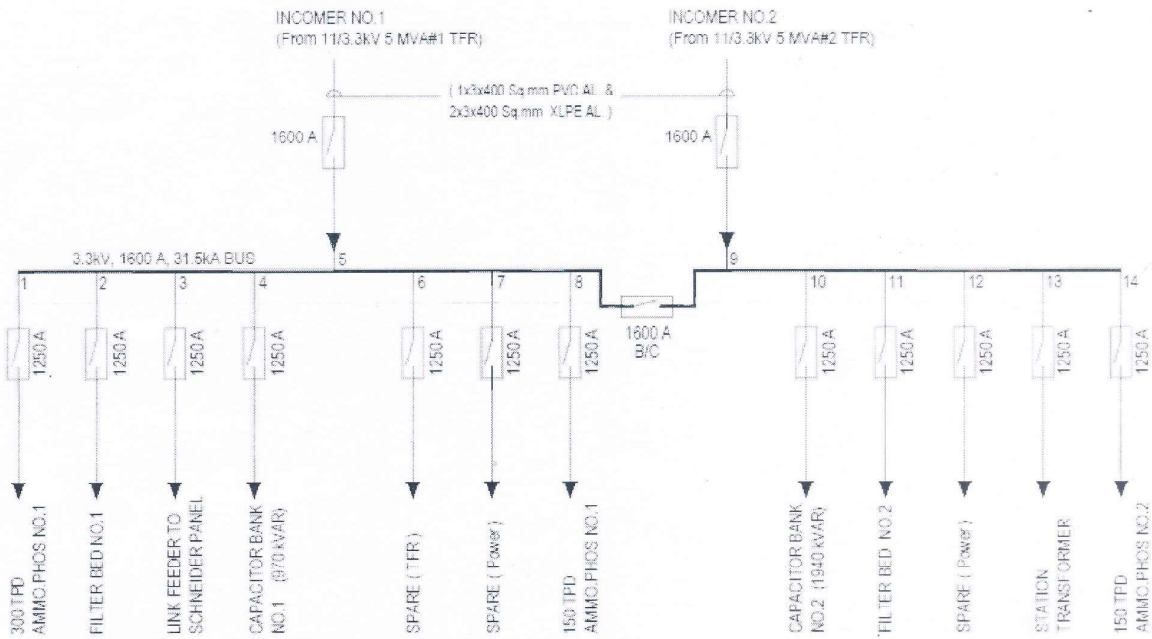
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ANNEXURE V
PRICE BID FORMAT

Sl.No	Code	Item	Quantity	Unit Price (Rs)	Total Price (Rs)
1	New code	Design, Manufacture, and Supply of 3.3kV, 50Hz, 1600A, 31.5kA Indoor Vacuum Circuit Breaker switch board complete with all other accessories as per the detailed specifications attached.(TPS NO. :TPS-UC-SS-HVSB-01).	1No	*	*
2	New code	Critical spares	LS	*	*
3	New activity code	Supervision for testing and commissioning of 3.3kV Indoor Vacuum Circuit Breaker switchboard as per TPS NO. :TPS-UC-SS-HVSB-01	LS	*	*

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**ANNEXURE VI
SCHEMATIC DIAGRAM**



Note: - The diagram shown is indicative only for tendering purpose. Vendor shall incorporate entire requirements as per standard manufacturing practices.

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