

TECHNICAL PROCUREMENT SPECIFICATION				CD-RPH-SB-TPS	
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TPS No.	CD-RPH-SB-TPS				
STATUS	<input checked="" type="checkbox"/>	ENQUIRY	<input type="checkbox"/>	COMMITMENT	
ORIGINATING DEPT.	ELECTRICAL				
P.O / W.O NO.					
PROJECT	SUPPLY OF 11KV, 630A, 7 PANEL SWITCHBOARD FOR RESERVOIR PUMP HOUSE SUBSTATION				
ITEM	11KV, 7 PANEL SWITCH BOARD				
LOCATION	RESERVOIR PUMP HOUSE SUBSTATION				
CLIENT	M/S. FACT COCHIN DIVISION				
PURCHASER	M/S. FACT COCHIN DIVISION				
VENDOR					
R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

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TPS NO: CD-RPH-SB-TPS			
ITEM: 11KV, 7 PANEL SWITCHBOARD			
The Scope of work includes the following			
<b>Sl. No.</b>	<b>Description</b>	<b>Required</b>	<b>Remarks</b>
1.0	Design, engineering, manufacturing, testing at works and supply of the following medium voltage switchboard fully conforming to the attached specifications and documents		
1.1	11kV, 630A, 26.3kA, SF6/ Vacuum circuit breaker, 7 panel switchboard for Reservoir Pump House substation.	Yes	
2.0	Arranging inspection and tests as per “Scope of Inspection & Tests” attached.	Yes	
3.0	Supply of spares as per “Spares List” attached.	Yes	

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<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>EQUIPMENT/ITEMS TO BE SUPPLIED</b>	<b>CD-RPH-SB-TPS-IS</b>	
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TPS NO: CD-RPH-SB-TPS			
Sl. No.	Description	Quantity	Remarks
1.0	Design, engineering, manufacturing, testing at works and supply of 11 kV, 630 A, 26.3 kA SF6/Vacuum circuit breaker, 7 panel switchboard for Reservoir Pump House substation, conforming to attached specifications/documents.	1 No.	
2.0	Supply of spares for items as per spare list	1 Set	

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### **1.0.0 SCOPE OF WORK**

1.1.0 This specification covers design, manufacture, shop testing, inspection, packing, delivery to site of 11 KV, 630 Amps, 26.3 KA, indoor, 7 panel switchboard with SF6/Vacuum circuit breaker for Reservoir Pump House substation to give reliable and continuous operation at the load rating specified in the data sheet/ single line diagram.

1.2.0 The equipment offered shall be complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

1.3.0 The design of the switchgear should be exclusive and specific responsibility of supplier and should be comply with current good engineering practice, the relevant codes and recommendation, the project specific requirements.

### **2.0.0 REFERENCES**

2.1.0 The following documents shall be read in conjunction with this specification.

2.1.1 Engineering specification of general requirements for electrics (Tag no. CD-RPH-SB-TPS-GRE).

2.1.2 Data sheet of 11 KV, 7 panel switchboard (Tag no. CD-RPH-SB-TPS-DS).

2.1.3 Technical particulars of 11 KV, 7 panel switchboard (Tag no. CD-RPH-SB-TPS-TP).

### **3.0.0 STANDARDS**

3.1.0 Requirements laid down in the 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

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IS:722	AC electricity meters
IS:1901	Visual indicator lamps
IEC 60255	Measuring relays and protection equipment
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 up to and including 1000Vac and 1200 V dc )
IS 12729	General Requirements for switchgear and control gear for voltages exceeding 1000 V
IS 12063	Degree of protection provided for enclosures for electrical equipment
IS 11353	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals

#### **4.0.0 SUPPLY CONDITIONS**

4.1.0 The equipment to be supplied shall be designed to operate satisfactorily at rated load under the supply conditions specified in the data sheet.

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## **5.0.0 CONSTRUCTION**

### **5.1.0 GENERAL**

- 5.1.1 The switchboard shall be of min. 2mm. thick folded sheet steel construction, fully enclosed, dust, damp and vermin proof, indoor cubicle type, floor mounted and free standing type, internal arc tested for designed fault current, fitted with floor rolled truck mounted SF6/Vacuum circuit breaker in fully horizontal draw out execution and horizontal isolation type. Vertical units shall be assembled to form a continuous line up of uniform height and front line-up. Entire panel length shall not be more than 5.25 meter.
- 5.1.2 SF6/Vacuum circuit breaker shall be truck mounted so that it directly rolls on to the floor when taken outside without usage of any external breaker handling truck. Cassette type breakers are not acceptable.
- 5.1.3 Rated short time withstand current of the switchboard shall not be less than the system short circuit level specified for 3 seconds. Rated peak withstand current of the switchboard shall not be less than 2.5 times the system short circuit level.
- 5.1.4 Degree of protection shall not be less than IP 4X.
- 5.1.5 The switchboard shall be assembled on suitable base channel of structural steel for proper erection.
- 5.1.6 Seal-off bushings should be provided wherever bus bars pass through metallic partitions.
- 5.1.7 Suitable arc propagation barriers shall be provided between the panels. Explosion vents of suitable design shall be provided on the roof sheet of the busbar /cable /CT's chambers so as to enable discharge of explosive gases from inside during a flashover. However the provision of explosion vent shall not affect the degree of protection/vermin proofing of the panel.
- 5.1.8 The panel board shall have adequate width to ensure ease of maintenance. Each cubicle shall be of compartmentalized construction and shall have following separate compartments.
- a) Main compartment for housing the draw out trucks.
  - b) HV bus bar compartment.
  - c) Compartment for CT and outgoing cable/bus terminations.
  - d) LV Compartment

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- 5.1.9 Front access with hinged doors shall be available to all components in the cubicle, which require adjustment, maintenance or replacement. Front doors shall be hinged at one end and shall be bolted (knob type) on the other end. All hinges shall be of concealed design for elegant appearance.
- 5.1.10 Rear access shall be available to cable box, cable glands etc. with bolted covers. The rear panel cover shall be of bolted split type construction (Preferably of two portions) for the ease of maintenance.
- 5.1.11 All barriers used shall be manufactured from non-inflammable material. All hardware shall be corrosion resistant. Door & openings shall be provided with neoprene gaskets.
- 5.1.12 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 without skilled supervision. Inter-panel and inter-compartmental wiring shall preferably be protected by heavy gauge solid metal conduit or trunk.
- 5.1.13 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. Adequate lifting facilities shall be provided on each section.
- 5.2.0 MOVABLE SECTION
- 5.2.1 Floor roll out, horizontal draw out horizontal isolation type movable truck of the circuit breaker shall be mounted on suitable rollers and it shall be complete with circuit breaker poles, operating mechanism, plug in connectors, etc.
- 5.2.2 If independent poles are envisaged for 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.
- 5.2.3 Closing and opening mechanism, interlocks, connecting links, coils for close and trip etc. shall be provided on the movable chassis.
- 5.2.4 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.

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5.3.0 FRONT COMPARTMENT RECEIVING THE MOVABLE TRUCK

- 5.3.1 This compartment shall include automatically operated shutters for automatically screening the stationary plug-in connections with facility for padlocking the shutters in closed position.
- 5.3.2 The switchgear cubicle shall be provided with a position changing gear arrangement in such a way that by engaging detachable device from outside the front door, it shall be possible to move the breaker truck and change position without opening the cubicle door.
- 5.3.3 Proper guide rails for easy insertion and withdrawal of the circuit breaker shall be provided. Different positions of the CB like service, test and isolated positions shall be clearly marked. Adequate barriers shall permit personnel to work safely within an empty breaker compartment, with the bus bars energized.

5.4.0 CABLE HEAD COMPARTMENT

- 5.4.1 Cable head compartment of the panel board so designed to receive wound or bar primary current transformers in addition to cable incoming/ outgoing.
- 5.4.2 Rear bottom plates of the cable compartment shall be fitted with removable gland plates of adequate size for fixing the cable glands. Clearances as per standard shall be provided for 11 kV cable termination.
- 5.4.4 The cable compartment shall be provided at the rear of the switchgear panels suitable for bottom entry of the cable and shall have sufficient space and support arrangement inside each panel to accommodate HT cable termination kits and sealing kits suitable for 1Rx3Cx 400 sq: mm Al XLPE cable.
- 5.4.5 Cable compartment shall be robust enough & self-supporting. The design shall be such that the weight of the power cable within the compartment shall not cause direct pressure on the C.T studs.

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5.5.0 BUS BAR COMPARTMENT

5.5.1 Bus bars shall be housed on a separate compartment and shall be accessible for inspection only with special tools. In the bus bar compartment of the CB, the triple pole bus bars shall be arranged on supports like araldite epoxy resin, to provide long air insulation distance and creepage path.

5.5.2 The bus bar compartment shall be provided with bolted covers. Necessary extra precaution like additional cover, caution signs etc. shall be provided to prevent inadvertent contact with live bus bars.

5.6.0 LOW VOLTAGE COMPARTMENT

5.6.1 LV compartments containing metering, protection, and control equipment shall be so designed and constructed, that these shall permit, accessibility for inspection or checking without the need of de-energizing the switchboard. It shall preferably be mounted on top of the front compartment receiving the movable section of the CB.

5.6.2 The mounting of the instruments shall be such that vibrations generated by switching operations do not affect them. Mounting of relays & meters on the rear is not acceptable.

5.6.3 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.

5.6.4 Relays that require adjustment, resetting etc. shall be mounted at reasonable operating height from the floor level. Maximum operating height shall be 1900 mm and minimum 500 mm from the floor level.

5.7.0 ACCESSIBILITY

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

5.7.2 Access to bus bar chamber, CTs, etc. shall be through rear bolted covers.

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**6.0.0 CIRCUIT BREAKER**

6.1.0 The circuit breaker shall be of suitable type and rating as mentioned the data sheet and suitable for indoor use. The CB shall be of three poles, horizontal draw out, horizontal isolation and floor rollout type unless otherwise specified in the data sheet. The breaker shall be E2, M2 and C2 class type tested. The ratings specified shall be for operating condition inside the panel, at site.

6.2.0 Rated operating duty shall normally be O-3sec-CO-3min-CO.

6.3.0 Total break time: Less than 75ms.

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

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

6.6.0 Non-reset type operation counter shall be provided

**6.7.0 CIRCUIT BREAKER CONTACTS**

6.7.1 The CB contacts shall be adjustable to allow for wear, be easily replaceable and shall have the minimum movable parts and adjustments.

6.7.2 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.

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- 6.7.3 A minimum of 4 sets of auxiliary contacts are to be provided on breaker operating mechanism as spare, exclusively for the use of purchaser.
- 6.7.4 Auxiliary contacts shall have continuous rating of 10A at 240V. 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.
- 6.8.0 OPERATING MECHANISM
- 6.8.1 The operating mechanism of the CB shall be quick make, quick break type and trip-free as per relevant code of protection.
- 6.8.2 Circuit breaker shall be provided with electrically operated motor charged spring closing mechanism with provision for manual charging through handle. Necessary operating handles shall also be supplied. The electrical circuit for spring charging motor shall cut off on initiation of manual charging.
- 6.8.3 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.
- 6.8.4 The closing solenoids / coils and auxiliary devices shall operate satisfactorily between 85 and 110% of the rated auxiliary supply voltage indicated in the data sheet. Trip coils shall operate satisfactorily at all voltages between 70% and 110% of the rated auxiliary voltage.
- 6.8.5 Irrespective of the mode of operation of the breaker, independent manual closing and tripping arrangements shall also be provided as a standard feature for emergency and testing purposed.
- 6.8.6 A mechanical interlock shall be provided for preventing any inadvertent / undesired operation. For instance, closing the breaker when the springs are being charged, draw out of breaker while breaker is in closed and service position etc.

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- 6.8.7 Anti-pumping relay & circuitry/anti pumping feature shall be provided in the closing circuit of the CB to ensure that it does not re-close automatically after a tripping or in the case of failure to close, even if the closing impulse is maintained.
- 6.8.8 The control circuit shall be suitable for local as well as remote control. Each control circuit tapping shall be provided with fuses.
- 6.8.9 The control and other auxiliary connections from the CB to the cubicle shall be through plugs and sockets, mechanically coded, rated for 10A (minimum) / 650V, located at either ends and connected through flexible jumpers. Provision for locking of control plug to avoid looseness during operation shall be considered.
- 6.8.10 The jumper shall have sufficient number of spare cores to utilize all the spare auxiliary contacts and it shall be long enough to maintain connection in the test position of the truck. The multi-pin plug provided shall have scraping earth terminals.
- 6.9.0 CB POSITIONS AND INDICATION
- 6.9.1 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.
- 6.9.2 It shall be possible to release the mechanical stop of the truck in the test position in order to draw-out the truck fully after severing the control connections.
- 6.9.3 Shutters shall automatically screen cable and bus bar isolating connections before the CB reaches isolation position.
- 6.9.4 An automatic visual indication shall be provided to indicate spring charged / discharged positions.

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- 6.9.5 All circuit breakers shall have mechanical ON/OFF indicator and spring charge indicator. These shall be visible from the front without opening the panel door. There shall be provision for mechanical (manual) tripping of breaker and manual charging of the springs with suitable handle.
- 6.10.0 POSITIVE INTERLOCKS OF THE CB
- 6.10.1 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.
- 6.10.2 It shall not be possible to discharge the closing spring if the CB is in closed position already.
- 6.10.3 It shall not be possible to close the circuit breaker unless the closing spring is fully charged.
- 6.10.4 Interlock shall be provided to prevent pushing in /drawing out of the breaker truck from any of the three positions to another when the breaker is in the closed position.
- 6.10.5 Truck cannot be racked into service position with door open and control connection disengaged. Insertion of breaker into `Service' position shall not be possible if safety shutters are not free. Door interlock shall have defeat feature.
- 6.10.6 Control connections cannot be disengaged with the truck in `Service'.
- 6.10.7 Remote closing of breaker not permitted with door open.
- 6.10.8 Padlocking facility in test & service position to be made available.
- 6.10.9 Safety shutters shall be spring loaded, positively operated by the travel of the draw out truck.
- 6.10.10 Mechanical and electrical interlocks shall be provided for Incomers and bus coupler Circuit Breakers for preventing parallel operation of the incomers. Three locks and two keys system shall be employed. Keys shall be trapped in circuit breaker “CLOSED” condition and free in circuit breaker “OPEN” condition.

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6.10.11 Safety shutters shall be of metallic having locking facility in the closed position. Independent operating mechanism for bus side and cable side shutters shall be provided. Busbar/ cable marking on safety shutters shall be provided.

6.10.12 The above positive mechanical interlocks are the minimum requirements. Manufacturers can include any other safety interlocks, which may be necessitated by the particular design feature of the CB.

### **7.0.0 BUSBARS**

7.1.0 The arrangement of bus bars shall be as per relevant standards. All phase bus bars shall be of uniform cross section throughout the switchboard.

7.2.0 Bus bars shall be of high conductivity aluminium / copper as specified in the data sheet. Bus bars shall be continuously rated for the rated current and service conditions specified.

7.3.0 Bus bars shall be provided with heat shrinkable, non-tracking, low absorption type PVC insulated sleeves with full voltage insulation of the switchboard.

7.4.0 Busbar joints and tap-offs shall be shrouded with removable shrouds of full voltage insulation.

7.5.0 Maximum allowable current density for bus bars shall be 1.25A/mm<sup>2</sup> for copper conductor and 0.78A/mm<sup>2</sup> for aluminium conductor.

7.6.0 The horizontal and vertical bus bars shall be rated for the same fault level specified in the data sheet.

7.7.0 Rigid insulating barriers/ protection guards, wire meshes shall be provided between the group of line bus bars and other parts, so as to eliminate danger to personnel due to accidental contact.

7.8.0 Thermal design of the bus bars shall be based on installation of the switchgear in poorly ventilated conditions. The cooling air volume shall take into account only the bus enclosure.

7.9.0 The busbar supports shall be non-hygroscopic glass reinforced plastic material with anti tracking features to prevent flashovers. These shall have high tracking index and be mechanically strong. Hylam is not acceptable.

7.10.0 These insulators shall be of solid core porcelain or epoxy resin cast, with suitable petticoat design.

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7.11.0 The bus bars and bus supports shall withstand the dynamic, thermal and 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.

7.12.0 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 bus bars.

7.13.0 It shall be possible to extend the bus bars on either side without any further fabrication / modification on the existing bus bars. Removable end covers with fixed nut and bolting arrangement shall be provided on either end and the ends of the bus bars shall be suitably drilled.

7.14.0 Appropriate identification marking / labels shall be provided on the bus bars and tapings for distinguishing the various phases.

7.15.0 Due allowance shall be given in the sizing of the bus bars in case of insulated bus bars.

## **8.0.0 INSTRUMENT TRANSFORMERS**

### **8.1.0 CURRENT TRANSFORMER**

8.1.1 CTs shall conform to relevant Indian / International Standards and shall be cast resin insulated. They shall be mounted on switchgear stationary part.

8.1.2 CTs shall withstand the maximum short circuit current for a minimum of one second and it shall be designed to withstand stresses resulting from the maximum short circuit currents.

8.1.3 CTs for metering and protection shall be selected suitably to meet the individual requirements of meters and relays specified in the data sheet. Low reactance CTs shall be used for protection.

8.1.4 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.

8.1.5 CTs for protection purposes shall have sufficient accuracy, burden and accuracy limit factor for necessary coordination / discrimination for clearing the faults. Accuracy limit factor for protection shall not be less than 10 and accuracy class shall be 5P.



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- 8.1.6 The burden of the CTs shall meet the requirements of relays, instruments and leads associated with the particular CT including 20% spare capacity.
- 8.1.7 Separate CTs / cores shall be used for metering and protection. Dual purposes CTs are not acceptable.
- 8.1.8 CTs shall be of class E insulation unless otherwise specified.
- 8.1.9 CTs shall be provided with polarity markings adjacent to terminals, both for primary and secondary. These shall be legible even after years of service.
- 8.1.10 Unused CT terminals must be short-circuited.
- 8.1.11 CTs shall have solidly earthed system.
- 8.1.12 The CT terminals that have been used shall be provided with links to facilitate shorting as and when required (when load / burden on CT is disconnected).
- 8.1.13 All live terminals shall be shrouded to prevent accidental contact.
- 8.2.0 POTENTIAL TRANSFORMER
- 8.2.1 PTs shall conform to relevant Indian / International Standards and shall be cast resin insulated.
- 8.2.2 PTs 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 on PTs selected shall be adequate for the destined different purposes.
- 8.2.3 Potential transformer shall be of ‘fully drew out’ type and shall be provided with HRC fuses on both HV and LV sides. The draw out mechanism shall disconnect the bus bars and shall earth the PT primary and secondary terminals. The primary connection shall be disconnected before the PT or its primary fuses become accessible.
- 8.2.4 Withdrawable type, line potential transformer shall be mounted on top of cable chamber. PT mounted inside cable chamber is not acceptable.
- 8.2.5 The primary rated voltage shall be equal to the rated voltage of the system and unless otherwise specified, secondary voltage shall be 110V.

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8.2.6 PTs shall have solidly earthed system.

8.2.7 PT shall be of class E insulation unless otherwise specified.

### **9.0.0 PT SELECTION SCHEME**

9.1.0 PT selection scheme shall be provided in the bus coupler panel. PT voltage supply to the bus sections shall be fed from the respective incomer's PT secondary in normal conditions.

9.2.0 When entire panel is charged using only one incomer through bus coupler, PT supply to the entire panel shall be from PT secondary of incomer in charged condition.

9.3.0 It shall be possible to parallel the incomer-1 PT secondary and incomer-2 PT secondary when both incomers are in parallel condition.

### **10.0.0 PROTECTION RELAYS**

#### **10.1.0 GENERAL**

10.1.1 Relays shall conform to relevant Indian / International standards.

10.1.2 Numerical relay shall have control, measurement and supervision.

10.1.3 It shall be back connected, draw out / plug-in type, flush mounted and fitted with dust tight covers.

10.1.4 Relays shall have a type and make approved by the buyer. List of acceptable makes is indicated in the data sheet.

**10.1.5** Relay shall be compatible with protection CT secondary current of 1A / 5A.

10.1.6 Relays shall be suitable for auxiliary (control) power supply of 110V DC with 70-110% variation.

10.1.7 Relays voltage input (PT input) shall be 110 volt A.C. supply, obtained from PT selection scheme.

10.1.8 Relays shall conform to the latest edition of IS: 3231/IEC 60255.

10.1.9 Relays shall not operate at a current equal to or less than the setting. The minimum operating current shall not exceed 110% of the setting.

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- 10.1.10 The IDMT characteristic of the relay shall be in complying with IEC curves.
- 10.1.11 It shall be ensured, by checking with the relay manufacturer, that with the accuracy limit factor indicate/ chosen, the thermal withstand capability of the relays will not be exceeded for the fault levels specified.
- 10.1.12 Relays shall have self monitoring facility and it shall have relay healthy/relay in operation indication on fascia.
- 10.1.13 Trip circuits shall automatically break and CT circuit shorted when a relay is withdrawn.
- 10.1.14 Relay shall have minimum of 8 numbers of programmable binary inputs and programmable binary outputs.
- 10.1.15 Relay shall support both the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol together with the DNP3, IEC 60870-5-103, Ethernet IEC-61850 and Modbus protocols.
- 10.1.16 Relay shall have RS 485 serial communication port and RJ 45 Ethernet communication port.
- 10.1.17 Relay shall have LCD/LED display unit, keypads, LED indicators and communication port for parameter setting, monitoring and controlling the protection relay. Adequate push buttons shall be provided on the fascia to display and edit the relay settings, to display and activate the control segment of the relay, to display the relays instrumentation and fault data and to reset the output relays and LED's.
- 10.1.18 The IEC 61850 communication implementation shall support all monitoring and control functions. Additionally, parameter settings, Programmable LEDs and event lists, Measurement display, Disturbance records, Fault records, Importing/Exporting parameters, Report summary etc. can be accessed using the IEC 61850 protocol.
- 10.1.19 Relay shall have minimum of 8 numbers of programmable LED indications on the front side.
- 10.1.20 The vendor shall supply relay software compatible with MS Windows (Win7- 32bit or Win10-64bit) and provide configuration support during the erection and commissioning of the switchboard. Relay technical catalogue, operation manuals, brochures etc. shall be supplied in both hard and soft copies.
- 10.1.21 All relay terminals shall bring together and wired to separate terminal block.

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10.1.22 Labeling of relay terminals such as Control supply to relay, Voltage input, Relay input terminals, Relay output terminals etc. shall be done.

10.2.0 FEEDER PROTECTION RELAY

10.2.1 Incomers and township feeders shall have dedicated numerical feeder protection and control relay designed for the protection, control, measurement and supervision of utility substations and industrial power systems.

10.2.2 The relay shall provide main protection for underground cable feeders in distribution networks. Relay shall be compatible for solidly grounded networks.

10.2.3 The protective relay shall be multifunction type with protection features such as Phase overcurrents, Neutral overcurrents, Ground overcurrents, Negative sequence overcurrents, Thermal overload, Phase discontinuity, Circuit breaker failure, Trip circuit supervision, Self-monitoring / relay healthy, Disturbance record, Fault record, Event record , Three-phase current measurement, THD measurement, master trip etc.

10.3.0 TRANSFORMER PROTECTION RELAY

10.3.1 Transformer feeders shall have dedicated numerical transformer protection and control relay for power transformer.

10.3.2 Relay shall have Transformer protection and measurements, and low-impedance restricted earth-fault protection on secondary side.

10.3.3 Potential free contact of inter tripping relay shall wired to digital relay for Secondary to Primary inter trip. Provision for wiring Secondary side breaker status to the relay shall be provided.

10.3.4 The protective relay shall be multifunction type with protection features such as Phase overcurrents, Neutral overcurrents, Negative sequence overcurrents, Three-phase thermal overload protection, Circuit breaker failure, low-impedance restricted earth-fault protection, Trip circuit supervision, Self-monitoring/relay healthy, Disturbance record, Fault record, Event record , Three-phase current measurement, THD measurement, master trip etc.

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10.4.0 AUXILIARY RELAYS

10.4.1 Auxiliary relay for buchholz trip, buchholz alarm, oil temperature trip, oil temperature alarm, Secondary to primary inter trip etc. shall be connected in transformer feeders. Potential free contacts of auxiliary relays shall be wired to the protection relay and alarm scheme.

10.4.2 All auxiliary relays shall have minimum 2 potential free contacts as spare.

**11.0.0 MULTI FUNCTION METER**

11.1.0 Meters shall be flush mounted and of a type and make approved by the buyer.

11.2.0 Meters shall be of reputed make and shall conform to relevant Indian standards.

11.3.0 Microprocessor based Electronic Multi-Function Meter (MFM) with load survey facility and RS 485 communication port with necessary software / hardware for connectivity to PLC/DCS/SCADA through the use of Modbus RTU communications (Parameters A, V, KW, KWH, KVA, KVAR, PF, %THD of voltage & current) shall be supplied as specified in data sheet.

11.4.0 The front panel shall have 3 rows of 4 digits / characters each LED display. MFM meters shall have Three-Phase Electrical Instrumentation and load management facilities in a compact and rugged construction. The displayed readings shall be updated in every second.

11.5.0 Meter shall be configurable for 5 A or 1 A secondary CTs.

11.6.0 The meter shall have accuracy class 1.

11.7.0 MFM meters shall be configurable & programmable through the front panel.

11.8.0 All meters shall be square type of size 96 mm x96 mm. unless otherwise specified.

11.9.0 All meters shall be magnetically screened and temperature compensated.

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## 12.0.0 ANNUNCIATION SCHEMES

12.1.0 Separate visual and audible annunciation scheme shall be available for

- a) Automatic tripping on fault and Non-trip alarm conditions
- b) D.C. failure condition

12.2.0 DC failure relay, Alarm accept/reset relay, flasher relay, hooter, buzzer, push buttons, etc for the alarm scheme shall be mounted on the bus coupler panel.

12.3.0 Accept, Reset and Test Push Buttons for both annunciation schemes shall be provided at bus coupler panel and labeled clearly.

### 12.4.0 AUTOMATIC TRIPPING ON FAULT AND NON-TRIP ALARM CONDITIONS

12.4.1 Each protection relays trip and alarm contacts shall be wired to the scheme.

12.4.2 A 15 window annunciation panel shall be provided on the bus coupler panel. Following details shall be displayed in the windows

- a) Incomer-1 Trip
- b) Incomer-2 Trip
- c) RPH TR-1 Auto Trip
- d) RPH TR-2 Auto Trip
- e) RPH TR-1 Inter Trip
- f) RPH TR-2 Inter Trip
- g) Lakeview-RPH S/S link feeder Trip
- h) Type III S/S feeder Trip
- i) RPH TR-1 Oil/winding temp high alarm
- j) RPH TR-2 Oil/winding temp high alarm
- k) 5 Windows- Spare

12.4.3 In the event of a fault/alarm, respective protection relay shall initiate Trip and Non-Trip alarm annunciation scheme in bus coupler panel. The respective window in the 15 point / channel alarm fascia shall start flashing on the flasher bus (derived from flasher relay) and the hooter start sounding. When the alarms accept PB is pressed the hooter shall stop and the fascia window 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 window, which was glowing steady till then, shall go off.

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12.4.4 The Trip and Non-Trip alarm annunciation scheme shall be rated for 110 V D.C. auxiliary supply.

12.4.5 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.

12.4.6 It shall be possible to check the healthiness of fascia windows by pressing the lamp test PB.

12.5.0 D.C. FAILURE CONDITION

12.5.1 Instantaneously operated DC under voltage relay shall be connected to the DC input to the panel. In case of DC failure, the relay shall initiate D.C. failure annunciation scheme. The indicating lamp comes ON and the buzzer is initiated. On pressing the 'accept' PB, the buzzer shall stop. When DC is restored, the relay and annunciation scheme shall get automatically reset.

12.5.2 The D.C. failure annunciation scheme shall be rated for 230 V A.C. auxiliary supply obtained from PT selection scheme.

12.5.3 The DC failure sensing relay shall have hand reset flag indication

12.5.4 It shall be possible to test the whole DC failure scheme. A push button shall be provided in the sensing relay circuit to simulate DC failure and test the scheme.

**13.0.0 PUSH BUTTON**

13.1.0 Colour of push button knobs shall be as per relevant Indian Standard.

13.2.0 All push buttons shall be provided with legend plates to identify the function or operation.

13.3.0 Push button shall have contacts rating of 6A

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#### **14.0.0 INDICATING LAMPS**

14.1.0 Indication circuit shall be through separate contacts only.

14.2.0 Indicating lamps shall be of cluster LED type.

14.3.0 All lamps shall be indigenously available and rated for 7 watts maximum. All signaling lamps must have clarity of colour.

14.4.0 Lens for signaling lamps shall be so designed to prevent glare from the bulb and it shall be of dome shape to permit visibility from all directions. The material of lens should be such that it neither gets destroyed nor changes the colour due to heat from the bulb.

14.5.0 Necessary protective fuses shall be provided for the lamp circuit.

#### **15.0.0 ANTICONDENSATION HEATER**

15.1.0 Three nos. of space heaters with thermostat control shall be provided. One each for the breaker chamber, bus bar chamber and the CT/cable chamber along with a common MCB mounted inside LT control wiring.

15.2.0 Heater shall be provided inside the panel in easily accessible position for removal / replacement.

15.3.0 Wiring of space heater shall be isolated or separately bundled from other internal wiring.

#### **16.0.0 CABLE TERMINATION & WIRING**

##### **16.1.0 CONTROL CABLE TERMINATION**

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

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

16.1.3 The moulding material of the terminal body shall preferably be melamine formaldehyde having high anti-tracking properties.

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- 16.1.4 Identification/ numbering/ lettering shall be provided for each terminal. Such marks shall be legible even after years of service.
- 16.1.5 Minimum 20% spare terminals shall be provided on each terminal block.
- 16.1.6 Facilities shall be available for temporary or permanent short-circuiting of terminals for earthing and testing.
- 16.1.7 Shorting links shall be provided for all CT terminals.
- 16.1.8 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 connection are made to the terminals.
- 16.1.9 All auxiliary equipment terminals shall be made with pressure type terminals.
- 16.1.10 Terminal strips shall be preferably separated from power circuits by metal barriers or enclosures.
- 16.1.11 All terminals shall be shrouded with plastic covers to prevent accidental contact.
- 16.1.12 Sufficient clearance shall be available between terminals where terminal lugs are fitted to them.
- 16.1.13 Terminals shall be designed to avoid bimetallic corrosion and breaking of strands due to excess pressure.
- 16.1.14 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.
- 16.1.15 Control terminals for external termination shall be located in the relay compartment only. All terminals going out of the switchboard shall be brought to a separate terminal board marked "External Termination". These will be easily accessible.
- 16.1.16 Complete control wiring shall be done with round lugs only.

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16.2.0 WIRING

16.2.1 Control and power wiring shall be kept separate.

16.2.2 All CT wiring shall be carried out with copper conductor of size not less than 2.5mm<sup>2</sup>.

16.2.3 Wiring shall be terminated in easily accessible terminal blocks.

16.2.4 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.

16.2.5 Control wiring wherever terminated shall be in single layer formation.

16.2.6 All inter panel control wiring shall be taken through PVC sleeves and this shall be done by the switchgear manufacturer with proper identification of wires and terminals for interconnection.

16.2.7 Whenever a PT is mounted in the breaker carriage, all auxiliary wiring shall be done in conduits.

16.2.8 All spare contacts of aux. relays, timers, etc. shall be wired up to the terminal block.

**17.0.0 INSULATION**

17.1.0 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.

17.2.0 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.

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### **18.0.0 EARTHING**

- 18.1.0 Earthing arrangement shall be in accordance with relevant Indian standards.
- 18.2.0 Continuous earthing strips of material and size specified in the data sheet, designed to carry the peak short circuit and short time fault current as specified shall be provided for the complete length of the switchboard. Strips shall be connected to the body of the switchboard by means of integral bolts, spring washers and nuts.
- 18.3.0 Earthing terminals shall be provided on the CB trucks to earth the body of the truck; when pushed into the cubicle.
- 18.4.0 A minimum of 2 terminals shall be provided on the strip for external connections to earth grid.
- 18.5.0 One of the secondary terminals of the CTs shall be earthed.
- 18.6.0 All doors and movable parts shall be connected to earth bus with flexible copper connection.
- 18.7.0 All non-current carrying metal work (including metallic cases of instruments and other panel mounted components) of the equipment shall be earthed.
- 18.8.0 Earth bus shall be extended up to each cable compartment and earthing bolts shall be provided to ground cable armours.
- 18.9.0 Looping of earth connection resulting in loss of earth connection to other devices when the loop is broken not permitted.
- 18.10.0 Withdrawable units provided with self-aligning, spring loaded, silver plated copper scrapping earth contacts of make before/break after type ensuring earth continuity from service to the test position.

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### **19.0.0 PAINTING AND LABELING**

19.1.0 All metal parts of the panel to undergo surface treatment that includes derusting, cleaning chemically, degreasing, pickling in acid, cold rinsing, phosphating and passivating followed by spraying with two coats of zinc oxide primer and baking in oven or sheet shall be Aluzinc.

19.2.0 The sheet steel housing and all the metal surfaces shall be properly cleaned and coated with two coats of anticorrosive paint over two coats of suitable primer. A final coat in gloss finish with a colour indicated shall also be given to the switchboard.

19.3.0 All panels shall have, on the front and the rear sides, nameplates in large sized letters, giving feeder details.

19.4.0 Painted mimic diagram shall be provided on all the panels of the switchboard, unless otherwise specified in the data sheet.

19.5.0 Nameplates shall be fastened by screws and not by adhesives.

19.6.0 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.

19.7.0 Nameplates shall be of white Perspex acrylic sheet with letters engraved in black.

19.8.0 A nameplate with the switchgear designation shall be fixed at the top of the central panel.

19.9.0 Bus side and cable side shutters shall be labeled for identification.

19.10.0 Nameplates shall be provided for all Door/front mounted devices such as lamps, PBs, switches, relays, aux. contactors etc., directly below them, giving the nomenclature and purpose of the device.

19.11.0 Labels shall be made of non-rusting metal with engraved inscriptions of white letters on black background.

19.12.0 The size of the letters giving switchboards designation shall be 25 mm that for feeder details 20mm and for components 6mm, unless otherwise specified in the data sheet.

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19.13.0 Label designation and size of lettering subject to approval.

**20.0.0 FOUNDATION BOLTS**

20.1.0 Necessary foundation channels (if not integral), bolts and nuts shall be supplied along with the equipment.

**21.0.0 TEST CORDS AND TESTING PLUGS**

21.1.0 Flexible test cord 2m long with plug and socket for testing the breakers in the withdrawn position shall be supplied in a separate case. Alternatively flexible cord used for test position shall have sufficient extra length to test the breaker in the withdrawn position also.

21.2.0 Earthing and testing plugs for cables and busbars shall be supplied in a separate box.

**22.0.0 SPARES AND SPECIAL TOOLS**

22.1.0 Spare parts and special tools recommended for keeping stock for trouble free operation of CB panel for a minimum period of 2 years shall be supplied. List and catalogue numbers of these spare parts shall also be furnished.

**23.0.0 DRAWINGS**

23.1.0 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.

**24.0.0 DEVIATION FROM SPECIFICATION**

24.1.0 Should the tender wish to deviate from the provisions of the specifications, either on account of manufacturing practice or any other reasons, he shall draw attention to the proposed point of deviation in the tender and submit such full information, drawing and specification so that merits of his proposal may be fully understood. The specification shall be held binding unless the deviations have been fully accepted as requested.

<b>DATA SHEET</b>	<b>RESERVOIR PUMP HOUSE SUBSTATION</b>	<b>CD-RPH-SB-TPS-DS</b>	
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Project : Supply of 11KV, 630A, 7 panel switchboard for Reservoir Pump House substation. Owner : FACT-CD Location : Ambalamedu, Kochi			

<b>1.0 11KV, 7 PANEL SWITCHBOARD</b>		
1.1	Service conditions	
	a) Altitude	< 1000m above mean sea level
	b) Humidity	Min 64%
	c) Humidity	Max. 93%
	d) Humidity design	100% at 40 degree C
	e) Ambient temperature 0 C-Min.	19.2
	f) Ambient temperature 0 C-Max.	35
	g) Ambient temperature 0 C-Design	50
	h) Rain fall – Max . Record in an hour	40mm
	i) Rain –fall Max record in 24 Hours	169.5mm
	j) Environment	Highly corrosive industrial area, Presence of SO2 and other corrosive gases and chemical dusts, which can form conductive tracks.
	k) Wind velocity for structural design	124 km/h
	l) Seismic factor for design	Within seismic Zone 3 as per IS 1893
1.2	Rating details	
	a) Voltage	11KV +/- 10%
	b) No. of phases/wires	3 phase, 3 wire
	c) Frequency	50 Hz +/-5%
	d) Fault level (sym.)	500 MVA at 11KV
	e) Neutral earthing	Solid
	f) Continuous rated current	630A

					PROJECT	SUPPLY OF 11KV, 630A, SWITCHBOARD FOR RESERVOIR PUMP HOUSE SUBSTATION
					P.O. NO.	
R1	13.01.2021	JJM	KPN	BKN	VENDOR	
REV	DATE	PRPD.	CHKD.	APPRD.		

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	g) Short time current, KA/sec	
	Power bus	26.3 KA/1sec
	Ground bus	26.3 KA for 3 sec
	CT	26.3 KA/1sec
	h) Electrically exposed / Non exposed	Non exposed
1.3	Control supply	
	a) DC auxiliary supply voltage (For shunt trip coil, closing coil, indication lamps, Trip and Non-Trip alarm annunciation scheme, etc.)	110 V DC
	b) AC auxiliary supply voltage for panel anti-condensation heater, spring charging motor and DC failure annunciation scheme.	230 V AC
1.4	Panel board	
	a) Location (Indoor or Outdoor) Indoor	Indoor
	b) Enclosure	IP 4X
	c) Bus bars- material(Insulated aluminium/Insulated copper)	Insulated aluminium
	d) Earth bus size & material	As per IS: 3043, Bare aluminium
	e) Mimic diagram	Required
	f) Cable entry	bottom
1.5	Circuit breaker	
	a) Nominal System Voltage	11 KV
	b) Highest System Voltage	12 KV
	c) One minute power frequency withstand test voltage	28 KV (rms)
	d) Impulse withstand test voltage	75 KV (peak)
	e) Type of breaker	SF6/Vacuum
	f) No of poles	3
	g) Type of movable truck (Floor roll out/cassette type)	Floor roll out
	h) Application	Utility distribution network

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	i) Breaker closing (Motor charged spring closing/solenoid closing)	Motor charged spring closing
	j) DC auxiliary supply voltage (For shunt trip coil, closing coil, etc.)	110V DC
	k) AC auxiliary supply voltage (For spring charging motor )	230V AC
	l) Anti pumping relay	Required
	m) Positive inter locks	Required
	n) Capacitance current switching class	Class C2
	o) Mechanical and electrical endurance	M2-E2
	p) Total break time	Less than 75ms
	q) Test & Service position limit switches	Required
1.6	Instrument transformers	
	a) PT secondary voltage	110V AC
	b) PT insulation class	Class E
	c) PT accuracy class	Class 1
	d) Current Transformers	
	Metering CT	
	Accuracy	Class 1
	Instrument Security Factor	5
	Protection CT	
	Accuracy	5P
	Accuracy Limit Factor	10
	e) CT Insulation Class	E
1.7	Meters	
	a) Make of MFM meter	As per sub vendor list
	b) MFM meter - accuracy class	Class 1

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1.8	Push Button	
	a) No of contacts	1 NO/INC
	b) Current rating	10A
1.9	Protection Relay	
	a) Make of relay	As per sub vendor list
	b) Type	Flush mounted Numerical relay
	c) Application	For feeder and transformer protection
	d) IDMT characteristic	Following IEC curves
	e) Relay operation and fault indications	Required
1.10	Painting	Anticorrosive epoxy based powder coating As per Engineering Specification
	a) Final colour	Dark admiralty grey
	b) Mimic diagram	Required

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2.0 COMPONENT DETAILS – FEEDER WISE						
	Type of feeder	Incomer / Tie	Bus coupler	Type III S/S feeder	TR feeder	Spare
2.1	Number of feeders	2	1	1	2	1
2.2	Current Transformers					
	a) For metering - 3 nos.	400/1	-	200/1	150/1	200/1
	b) For O/C and E/F protection - 3 nos.	400/1	-	200/1	150/1	200/1
2.3	Potential Transformers					
	a) On cable side (Draw out dry cast Line PT) (11000/√3) / (110/√3)	Reqd.	-	-	-	-
2.4	Lamps					
	a) Breaker ON (red), OFF (green)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	b) Breaker auto trip (Amber)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	c) Low gas (SF6) pressure (yellow)( If SF6 breaker supplied)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	d) Breaker ready for ON	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	e) 15 Window annunciation panel		Reqd.			
	f) DC failure		Reqd.			
2.5	Meters					
	a) MFM meter	Reqd.	-	Reqd.	Reqd.	Reqd.
2.6	Primary protection relays					
	a) Numerical feeder protection and control relay as per Engg. specification	Reqd.	-	Reqd.	-	Reqd.
	b) Numerical transformer protection and control relay as per Engg. specification	-	-	-	Reqd.	-
2.7	Auxiliary relay					
	a) Anti pumping relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	b) Gas pressure low relay(If SF6 breaker supplied)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	c) Inter trip (HV/LV)	-	-	-	Reqd.	
	d) DC failure relay		Reqd.			
	e) Trip and Non-Trip alarm Annunciation scheme		Reqd.			
	f) DC failure Annunciation scheme		Reqd.			

FACT - COCHIN DIVISION

<b>DATA SHEET</b>	<b>RESERVOIR PUMP HOUSE SUBSTATION</b>	<b>CD-RPH-SB-TPS-DS</b>	
		<b>PAGE 6 OF 6</b>	<b>R1</b>

	<b>Type of feeder</b>	<b>Incomer / Tie</b>	<b>Bus coupler</b>	<b>T/S feeder</b>	<b>RPH TR feeder</b>	<b>Spare</b>
2.8	Control Switches and Push Buttons					
	a) Breaker Trip-Neutral-Close switch "ODC"	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	b) Control switch fuse / MCB for AC aux. supply	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	c) Control switch fuse / MCB for DC aux. supply	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	d) Control switch fuse / MCB & Thermostat for panel anti-condensation heaters	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	e) Control switch fuse / MCB for Spring Charging Motor	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	f) Accept, Reset and Test Push Buttons for Trip and Non-Trip alarm Annunciation scheme		Reqd.			
	g) Accept, Reset and Test Push Buttons for DC failure Annunciation scheme		Reqd.			
	h) PB for simulate DC failure scheme		Reqd.			
2.9	Other Items					
	a) Breaker operation counter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	b) Panel anti-condensation heater (strip type)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	c) Low Voltage compartment panel light and 3 pin socket with switch	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	d) Low gas (SF6) pressure switch and protection circuit ( If SF6 breaker supplied)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	e) Test and service position limit switches	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.

### **3.0 OTHER REQUIREMENTS**

	The breakers shall be fully withdrawable truck type. Cassette type breakers are not acceptable.
	The cable compartment shall have ample space for termination kits suitable for XLPE cables of sizes specified in the engineering specification and shall have facilities for support of the cables.
	Wiring terminations inside the panels shall be by crimping type lugs only.
	The connection to breaker from main busbars shall be rated for breaker/main busbar rating irrespective of CT rating of outgoing feeders.
	Indicating lamps shall be of Clustered LED type
	The vendor shall provide all software and hardware required for programming numerical relays.

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>VENDOR DATA SUBMISSION PROCEDURE</b>	<b>CD-RPH-SB-TPS-VDSP</b>	
		<b>PAGE 1 OF 3</b>	<b>R1</b>

### **1.0.0 SCOPE**

- 1.1.0 This document together with “VENDOR DATA REQUIREMENTS (VDR)” defines FACT’s requirements for vendor drawing and data for any enquiry, work order or purchase order.
- 1.2.0 Bidders unable to comply with these requirements must detail all exceptions in their proposal. The timely delivery of quality drawings and data is as crucial as delivery of the equipment itself and hence the same shall be strictly adhered to after commitment.
- 1.3.0 Failure to provide adequate preliminary data / drawing may render a proposal non-responsive and hence may be rejected. After commitment failure to provide documents as per purchase order may delay progressive payments and adversely affect future invitation to bids.

### **2.0.0 VENDOR DATA REQUIREMENTS (VDR)**

- 2.1.0 FACT will provide a partially completed VDR form along with each enquiry. This form explains group code of the document, quantity of each document required and leads time for submission. Columns are available for the vendor to fill in his deviations, if any, from FACT’s requirements.
- 2.2.0 The vendor shall forward a filled-in VDR form along with his offer, if he has got any deviation from FACT’s requirements. In the absence of a filled-in VDR form along with the offer, it will be presumed that the vendor is accepting FACT’s requirements specified in the VDR.

### **3.0.0 CLASSIFICATION OF DOUCMENTS**

- 3.1.0 Documents are classified based on their status and nature of content.
- 3.1.1 Status of documents
1. Preliminary documents required along with the offer.
  2. Documents to be submitted after commitment.
  3. Final documents.
- 3.2.0 The documents are further classified into Groups A,B and C, depending on the nature of the documents as explained below.
- 3.2.1 Group A requirements
- These documents are urgent in nature and contain information that are required for proceeding with the detailed engineering of surrounding/down stream equipments in the plant and hence are to be submitted on priority basis.
- 3.2.2 Group B requirements
- These documents are to be reviewed by FACT for compliance with the purchase order / work order specifications but are not essential for other engineering activities of FACT.
- 3.2.3 Group C requirements
- Documents in this group contains data / information / records which are final in nature and that are required for the equipment user and need not be reviewed by FACT.

### **FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>VENDOR DATA SUBMISSION PROCEDURE</b>	<b>CD-RPH-SB-TPS-VDSP</b>	
		<b>PAGE 2 OF 3</b>	<b>R1</b>

**4.0.0 VENDOR DATA INDEX (VDI)**

3.1.0 Vendor shall forward a filled up and updated VDI along with each vendor data transmittal. VDI shall list out all documents that are being prepared for the particular order, their current revision status and indicate the documents included in the present transmittal. A blank VDI is attached along with this document which shall be used for this purpose.

**5.0.0 QUALITY OF VENDOR DRAWINGS**

5.1.0 Vendor drawing and data shall be supplied in full size drawings, reproducibles as specified in the VDR.

5.2.0 All drawings / documents shall be clear, legible, right reading and made out of originals prepared in black ink. English language and metric units shall be used for the preparation of all documents.

5.3.0 The documents shall be prepared in any of the following standard sizes.

- a) A1: 594 mm x 840 mm
- b) A2: 420 mm x 594 mm
- c) A3: 297 mm x 420 mm
- d) A4: 210 mm x 297 mm

5.4.0 All documents submitted to FACT shall be folded into A4 size (210 x 297 mm) except originals/ reproducibles which may be rolled. All reproducibles shall be in high quality polyester films. Soft copies shall be furnished in CD for final drawings/documents.

5.5.0 Each drawing / document shall have a title block at the right hand bottom corner with the following information.

- a) Name of Vendor.
- b) Name of Project, Owner and location
- c) FACT Purchase Order Number.
- d) Equipment name and number.
- e) Drawing title.
- f) Drawing number, revision and page number.

5.6.0 All drawings shall be drawn to some standard scales only and the same shall be indicated in the drawing.

5.7.0 The status of the document like “PRELIMINARY, FINAL, FOR REVIEW” etc. shall be stamped on all copies forwarded to FACT.

5.8.0 All documents shall have a block of 100 mm x 100 mm space left vacant for FACT to put their stamp after review.

5.9.0 All drawing/document shall have a revision block explaining revision number, revision description, data of revision, revision authorization etc. When the revised drawings are submitted all currently revised area shall be clearly demarcated by clouding. Any revisions made on other parts of the documenting will not be reviewed by FACT.

5.10.0 When drawings are received back from FACT with comments, vendor shall incorporate all the comments and resubmit the same. If the vendor is not in a position to incorporate certain comment made by FACT, then the reason for such deviation shall be highlighted in the forwarding letter to FACT.

**FACT - COCHIN DIVISION**

5.11.0 The respective engineering specification and other purchase order spec. will explain the minimum data / details required in various drawings. In the absence of any such information in the purchase order documents, vendor shall follow the standard good engineering practices in detailing the drawing.

**6.0.0 CONDITIONS OF FACT REVIEW**

6.1.0 FACT reserves the right to review the vendor documents. FACT’s REVIEW WITH OR WITHOUT COMMENTS OF THE VENDOR DOCUMENTS SHALL NOT RELIEVE THE VENDOR OF RESPONSIBILITY TO COMPLY WITH ALL PURCHASE ORDER TERMS AND CONDITIONS, including all implied requirements relating to fitness for service and good engineering practices. Approval or acceptance does not imply or infer any determination relating to compliance by the vendor with its full responsibilities under the purchase order.

6.2.0 FACT’s comments are limited to identifying requirements within the scope of the purchase order or failure by the vendor to comply with the requirements of purchase order, as revealed by the limited review. Oversights in the above limited review cannot be taken as approval for the vendor to deviate from the purchase order conditions. FACT reserves the right to point out any such deviations at any stage of the order execution. The vendor shall comply with all such requirements without any price / delivery implications.

6.3.0 FACT review will be authorized by an official stamp as given below, properly filled and signed by the concerned. Comments if any will be indicated in red ink or clouded in the case of copies of commented drawings.

6.4.0 Appropriate comment in the ‘comments’ column and ‘status of review’ column will be marked.

6.5.0 Comment Status of Review

<u>Comment</u>	<u>Status of Review</u>
As noted	revise and resubmit for review
No comments	Proceed as noted and submit revised docs. For records
Not reviewed	No further review required
Forward final docs. as per P.O.	Final docs. as per P.O.

6.6.0 All documents received in FACT shall be dispatched after review within 15 days from the date of receipt. Vendor shall notify FACT of non receipt of reviewed documents in time immediately, to take corrective actions.

6.7.0 The delivery of the equipment shall in no case be linked with the review of the vendor drawings and data by FACT. It is the sole responsibility of the vendor to execute the job as per the purchase order conditions. If required the vendor shall depute his technical personnel to FACT after submission of documents for timely finalisation of documents.

**FACT - COCHIN DIVISION**

TECHNICAL PROCUREMENT SPECIFICATION	VENDOR DATA REQUIREMENTS	CD-RPH-SB-TPS-VDR	
		PAGE 1 OF 2	R1

<b>PROJECT: SUPPLY OF 11KV, 630A, 7 PANEL SWITCHBOARD FOR RESERVOIR PUMP HOUSE SUBSTATION</b>	<b>ITEM: 11KV, 7 PANEL SWITCHBOARD</b>
<b>STATUS: ENQUIRY <input checked="" type="checkbox"/></b>	<b>COMMITMENT <input type="checkbox"/></b>
	<b>TPS. NO: CD-RPH-SB-TPS</b>
	<b>P.O. NO.:</b>

Sl. No.	Grp. code	Description	Offer	After commitment			@ @ Final	
			Qty.	Qty.	Lead time in weeks			Qty.
					Reqd	@ Propd	Agd	
1.0	B	Duly filled in Technical particulars of 11 KV,7 PANEL SWITCHBOARD as per Pro forma enclosed	1S	2P	4		4P	
2.0	A	Dimensioned general arrangement drawings – internal & external, including busbar disposition	1S	2P	4		4P	
3.0	A	Sectional views showing the general constructional features of the circuit breaker including operating mechanism, arcing chambers, contacts with lifting dimensions for maintenance.	1S	2P	4		4P	
4.0	A	Foundation plan showing cut-outs / floor openings and foundation pockets. Loading data and foundation design	1S	2P	4		4P	
5.0	A	Bill of material for complete switchgear	1S	2P	4		4P	
6.0	B	Single line diagram, control schematic, wiring diagrams, inters panel wiring, terminal and bus wiring diagrams.	1S	2P	4		4P	
7.0	B	Schedule of materials / components.	1S	2P	4		4P	
8.0	B	Characteristic curves of relays and their range of adjustments.		2P	4		2P	
9.0	B	Type test certificates of breakers.	1S		4		2P	
10.0	C	Routine test certificates.		2P	4		2P	

Legend: @	Group code: A-For review and detailed Engineering, B-For review, C- For information and record
@ @	Document type: S-Soft Copy, P-Print.
Notes:	Vendor shall fill in proposed lead-time if different from the required lead-time. Each set of final documents shall be submitted in a folder. Two such folders shall be packed and despatched with the equipment.

R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

TECHNICAL PROCUREMENT SPECIFICATION	VENDOR DATA REQUIREMENTS	CD-RPH-SB-TPS-VDR	
		PAGE 2 OF 2	R1

<b>PROJECT: SUPPLY OF 11KV, 630A, 7 PANEL SWITCHBOARD FOR RESERVOIR PUMP HOUSE SUBSTATION</b>			<b>ITEM: 11KV, 7 PANEL SWITCHBOARD</b>					
<b>STATUS: ENQUIRY <input checked="" type="checkbox"/></b>			<b>COMMITMENT <input type="checkbox"/></b>		<b>P.O. NO.:</b>			
Sl. No.	Grp. code	Description	Offer	After commitment			@@ Final	
			Qty.	Qty.	Lead time in weeks			Qty.
					Reqd	@ Propd	Agrd	
11.0	B	Certificate of short circuit rating of breakers.	1S		4			2P
12.0	B	Test certificates of bought out items like protective relays, Circuit Breakers, PTs, CTs, energy meters etc.		2P	4			2P
13.0	B	Technical literatures, pamphlets and brochures relating to the various equipments used.	1S	1S				2P+ 1S
14.0	C	Operation and Maintenance manuals.		3P+ 1S				3P+ 1S
15.0	B	Spare parts list	1S					2P
16.0	B	Duly filled and signed Compliance Statement as per pro forma enclosed.	1S		-			2P
17.0	B	Duly filled and signed Vendor's Experience statement as per pro forma enclosed.						
18.0	B	Un-priced copy of price data sheet	1S		-			2P
19.0	B	Relay coordination details, with recommended settings, calculations etc.		2P	1P			2P
20.0	B	Dimensioned drawings of bus trunking flange showing bus bar arrangement, bolt hole etc.		2P	4			2P
Legend: @		Group code: A-For review and detailed Engineering, B-For review, C- For information and record						
@@		Document type: S-Soft Copy, P-Print.						
Notes:		Vendor shall fill in proposed lead-time if different from the required lead-time. Each set of final documents shall be submitted in a folder. Two such folders shall be packed and despatched with the equipment.						

R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

FACT - COCHIN DIVISION



<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>VENDOR DATA INDEX</b>	<b>CD-RPH-SB-TPS-VDI</b>	
		<b>PAGE 1 OF 1</b>	<b>R1</b>

PROJECT: Supply of 11KV, 630A, 7 panel switchboard for Reservoir Pump House substation.	TPS NO: CD-RPH-SB-TPS	VENDOR:
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ITEM: 11KV, 7 PANEL SWITCHBOARD	P.O NO.:	DATE:
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Sl. No.	Doc. / Drawing No.	Description	Rev. 0	Rev. 1	Rev. 2	Rev. 3	Rev. 4	Rev. 5	Relevant to This issue
			Date	Date	Date	Date	Date	Date	
ISSUE No.									
DATE									
SIGNATURE									

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 1 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.0	11 KV, 630 Amps, 26.3 KA, indoor, 7 panel switchboard with SF6/Vacuum circuit breaker as per following details	1 No.		Complied/ Not Complied	
1.1	7 panel switchboards meet all standards specified in the engineering specification (Tag No. CD-RPH-SB-TPS-ES)			Complied/ Not Complied	
1.2	Internal arc test for panel board at designed fault current - required			Complied/ Not Complied	
1.3	Degree of protection - not less than IP 4X			Complied/ Not Complied	
1.4	Seal-off bushings, arc propagation barriers , Explosion vents - required			Complied/ Not Complied	
1.5	Minimum size of sheet steel - 2mm			Complied/ Not Complied	
1.6	Panel board minimum width - 600mm. Entire panel width is < /= 5 meter			Complied/ Not Complied	
1.7	Removable gland plates required in rear bottom plate of cable compartment. Minimum 600 mm clear height required for cable termination.			Complied/ Not Complied	
1.8	Switchgear shall be suitable for bottom entry of the cable.			Complied/ Not Complied	
1.9	Relays are placed at reasonable operating height from the floor level. Maximum operating height shall be 1900 mm and minimum 500 mm from the floor level			Complied/ Not Complied	
1.10	CB truck can be moved and change position without opening the cubicle door			Complied/ Not Complied	

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 2 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.11	Type of breaker- SF6/Vacuum circuit breaker, three pole, horizontal draw out, horizontal isolation and floor rollout type			Complied/ Not Complied	
1.12	The breakers shall be E2, M2 and C2 class type tested.			Complied/ Not Complied	
1.13	Rated operating duty shall normally be O-0.3s-CO-3min-CO			Complied/ Not Complied	
1.14	Total break time: Less than 75ms			Complied/ Not Complied	
1.15	Breakers of same ratings shall be interchangeable. Wiring and termination of plug-in contacts shall be identical in all interchangeable breakers.			Complied/ Not Complied	
1.16	Breaker isolating contacts shall be self-aligning type			Complied/ Not Complied	
1.17	A minimum of 4 sets of auxiliary contacts shall be provided on breaker operating mechanism as spare. Auxiliary contacts continuous rating - 10A at 240V			Complied/ Not Complied	
1.18	The breaker operating mechanism - quick make, quick break type and trip-free as per relevant code of protection			Complied/ Not Complied	
1.19	Electrically operated motor charged spring closing mechanism shall be used in the breaker with provision for manual charging through handle. Necessary operating handles offered.			Complied/ Not Complied	
1.20	The closing solenoids / coils and auxiliary devices - operate satisfactorily between 85 and 110% of the rated auxiliary supply voltage indicated in the data sheet			Complied/ Not Complied	
1.21	Trip coils operate satisfactorily at all voltages between 70% and 110% of the rated auxiliary voltage			Complied/ Not Complied	

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 3 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.22	Manual closing and tripping arrangements provided as a standard feature for emergency and testing purposes.			Complied/ Not Complied	
1.23	Anti-pumping relay & circuitry/anti pumping feature provided in the closing circuit of the CB			Complied/ Not Complied	
1.24	Circuit breakers have mechanical ON/OFF indicator and spring charge indicator which is visible from the front without opening the panel door			Complied/ Not Complied	
1.25	Provision for mechanical (manual) tripping of breaker and manual charging of the springs provided.			Complied/ Not Complied	
1.26	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			Complied/ Not Complied	
1.27	It shall not be possible to discharge the closing spring if the CB is in closed position already			Complied/ Not Complied	
1.28	It shall not be possible to close the circuit breaker unless the closing spring is fully charged			Complied/ Not Complied	
1.29	Interlock shall be provided to prevent pushing in /drawing out of the breaker truck from any of the three positions to another when the breaker is in the closed position			Complied/ Not Complied	
1.30	Truck cannot be racked into service position with door open and control connection disengaged. Insertion of breaker into 'Service' position shall not be possible if safety shutters are not free. Door interlock shall have defeat feature			Complied/ Not Complied	
1.31	Padlocking facility in test & service position to be made available			Complied/ Not Complied	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 4 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.32	Mechanical (Castell key interlock) and electrical interlocks - provided for Incomers and bus coupler Circuit Breakers for preventing parallel operation of the incomers			Complied/ Not Complied	
1.33	Three locks and two keys system employed. Keys are trapped in circuit breaker "CLOSED" condition and free in circuit breaker "OPEN" condition			Complied/ Not Complied	
1.34	Safety Shutters having locking facility in the closed position shall be provided in CB receiving compartment for automatically screen cable and bus bar isolating connections before the CB reaches isolation position. Busbar/ cable marking on safety shutters shall be provided			Complied/ Not Complied	
1.35	Bus bars material - high conductivity aluminum / copper			Complied/ Not Complied	
1.36	Bus bars shall be provided with heat shrinkable, non-tracking, low absorption type PVC insulated sleeves with full voltage insulation of the switchboard			Complied/ Not Complied	
1.37	Busbar joints and tap-offs shall be shrouded with removable shrouds of full voltage insulation.			Complied/ Not Complied	
1.38	Maximum allowable current density - 1.25A/mm <sup>2</sup> for copper conductor and 0.78A/mm <sup>2</sup> for aluminum conductor.			Complied/ Not Complied	
1.39	The horizontal and vertical bus bars shall be rated for the same fault level specified in the data sheet			Complied/ Not Complied	
1.40	The busbar supports - non-hygroscopic glass reinforced plastic material with anti-tracking features to prevent flashovers. These insulators shall be of solid core porcelain or epoxy resin cast, with suitable petticoat design			Complied/ Not Complied	
1.41	The busbar design - extendable on either side without any further fabrication / modification on the existing bus bars.			Complied/ Not Complied	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 5 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.42	CTs shall withstand the maximum short circuit current for a minimum of one second and it shall be designed to withstand stresses resulting from the maximum short circuit currents.			Complied/ Not Complied	
1.43	Low reactance CTs shall be used for protection			Complied/ Not Complied	
1.44	CTs for metering shall have adequate capacity to cater for 130% of full load conditions.			Complied/ Not Complied	
1.45	Metering CT Accuracy - Class 1, Instrument Security Factor - 5			Complied/ Not Complied	
1.46	Protection CT Accuracy - 5P, Accuracy Limit Factor - 10			Complied/ Not Complied	
1.47	CT Insulation Class - E			Complied/ Not Complied	
1.48	The actual burden of the CTs shall meet the requirements of relays, instruments and leads associated with the particular CT including 20% spare capacity			Complied/ Not Complied	
1.49	Separate CTs / cores used for metering and protection. Dual purposes CTs shall not be used.			Complied/ Not Complied	
1.50	CTs provided with polarity markings adjacent to terminals, both for primary and secondary			Complied/ Not Complied	
1.51	CTs shall have solidly earthed system			Complied/ Not Complied	

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<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 6 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.52	PTs shall have suitable accuracy and capacity for the satisfactory operation of the instrumentation and metering specified in the data sheet / drawings enclosed			Complied/ Not Complied	
1.53	Potential transformer shall be 'fully drew out' type with HRC fuses on both HV and LV sides			Complied/ Not Complied	
1.54	Potential transformer – draw out type			Complied/ Not Complied	
1.55	PT secondary voltage - 110V AC			Complied/ Not Complied	
1.56	PT accuracy class - Class 1			Complied/ Not Complied	
1.57	PT insulation class - Class E			Complied/ Not Complied	
1.58	PTs shall have solidly earthed system			Complied/ Not Complied	
1.59	PT selection scheme - required			Complied/ Not Complied	
1.60	Protection relay shall have control, measurement and supervision facility.			Complied/ Not Complied	
1.61	Protection relay type - back connected, draw out / plug-in type, flush mounted and fitted with dust tight covers.			Complied/ Not Complied	
1.62	Protection relay shall be compatible with protection CT secondary current of 1A or 5A.			Complied/ Not Complied	

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<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 7 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.63	Protection relay shall be suitable for auxiliary (control) power supply of 110V DC with 70-110% variation			Complied/ Not Complied	
1.64	Protection relays voltage input (PT input) - 110 volt A.C. supply, obtained from PT selection scheme			Complied/ Not Complied	
1.65	Protection relay - conformed to the latest edition of IS: 3231/IEC 60255.			Complied/ Not Complied	
1.66	Protection relays IDMT characteristic - complying with IEC curves.			Complied/ Not Complied	
1.67	Protection relays have healthy/relay in operation indication on fascia			Complied/ Not Complied	
1.68	Protection relays shall have minimum of 8 numbers of programmable binary inputs and programmable binary outputs.			Complied/ Not Complied	
1.69	Protection relay shall be compatible for solidly grounded networks			Complied/ Not Complied	
1.70	Protection relay shall support both the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol together with the DNP3, IEC 60870-5-103, Ethernet IEC-61850 and Modbus protocols			Complied/ Not Complied	
1.71	Protection relay shall have RS 485 serial communication port and RJ 45 Ethernet communication port.			Complied/ Not Complied	
1.72	Protection relay shall have LCD/LED display unit, keypads, LED indicators and communication port for parameter setting, monitoring and controlling the protection relay			Complied/ Not Complied	

**FACT - COCHIN DIVISION**



<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 8 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.73	Adequate push buttons required on the fascia to display and edit the relay settings, to display and activate the control segment of the relay, to display the relays instrumentation and fault data and to reset the output relays and LED's.			Complied/ Not Complied	
1.74	Parameter settings, Programmable LEDs and event lists, Measurement display, Disturbance records, Fault records, Importing/Exporting parameters, Report summary etc. can be accessed using the IEC 61850 protocol			Complied/ Not Complied	
1.75	The vendor shall supply relay software compatible with MS Windows ( Win7-32bit or Win10-64bit) and provide configuration support during the erection and commissioning of the switchboard. Relay technical catalogue, operation manuals, brochures etc. shall be supplied in both hard and soft copies			Complied/ Not Complied	
1.76	Incomers and township feeders - required dedicated numerical feeder protection and control relay designed for the protection, control, measurement and supervision of utility substations and industrial power systems.			Complied/ Not Complied	
1.77	The feeder protection relay shall provide main protection for underground cable feeders in distribution networks.			Complied/ Not Complied	
1.78	Feeder protection relay shall have all protections specified in Engineering Specification (Tag No. CD-RPH-SB-TPS-ES), Clause 10.2.3			Complied/ Not Complied	
1.79	Transformer feeders - required dedicated numerical transformer protection and control relay for power transformers used in utility and industry power distribution systems.			Complied/ Not Complied	
1.80	Transformer protection relay shall have Transformer voltage measurements, and low-impedance restricted earth-fault protection on secondary side			Complied/ Not Complied	
1.81	Potential free contact of inter tripping relay shall be wired to digital relay for Secondary to Primary inter trip.			Complied/ Not Complied	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 9 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.82	Transformer protection relay shall have all Protections specified in Engineering Specification (Tag No. CD-RPH-SB-TPS-ES), Clause 10.3.4			Complied/ Not Complied	
1.83	All auxiliary relays have minimum 2 reversible potential free contacts as spare			Complied/ Not Complied	
1.84	Microprocessor based Electronic Multi Function Meter (MFM) with load survey facility and RS 485 communication port with necessary software / hardware for connectivity to PLC/DCS/SCADA through the use of Modbus RTU communications (Parameters A, V, KW, KWH, KVA, KVAR, PF, %THD of voltage & current) supplied as specified in data sheet.			Complied/ Not Complied	
1.85	MFM meter front panel shall have 3 rows of 4 digits / characters each LED display.			Complied/ Not Complied	
1.86	The displayed readings shall be updated in every second.			Complied/ Not Complied	
1.87	Meter shall be configurable for 5 A or 1 A secondary CTs			Complied/ Not Complied	
1.88	The meter shall have accuracy class 1			Complied/ Not Complied	
1.89	MFM meters shall be configurable & programmable through the front panel.			Complied/ Not Complied	
1.90	Separate visual and audible annunciation scheme shall be available for Trip and Non-Trip alarm annunciation scheme & D.C. failure annunciation scheme			Complied/ Not Complied	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 10 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1.91	It shall be possible to check the healthiness of fascia windows and DC failure indication lamp by pressing the respective lamp test PB			Complied/ Not Complied	
1.92	All protection relays trip and alarm contacts shall be wired to the Trip and Non-Trip alarm annunciation scheme			Complied/ Not Complied	
1.93	A 15 window annunciation panel shall be provided on the bus coupler panel			Complied/ Not Complied	
1.94	The Trip and Non-Trip alarm annunciation scheme shall be rated for 110 V D.C. auxiliary supply			Complied/ Not Complied	
1.95	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.			Complied/ Not Complied	
1.96	Instantaneously operated DC under voltage relay provided in bus coupler panel			Complied/ Not Complied	
1.97	The D.C. failure annunciation scheme shall be rated for 110 V A.C. auxiliary supply obtained from PT selection scheme.			Complied/ Not Complied	
1.98	All push buttons have minimum 1 NO / 1 NC contacts and rated for 10A			Complied/ Not Complied	
1.99	Indicating lamps shall be of cluster LED type with 7 watts maximum rating			Complied/ Not Complied	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 11 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
2.0	Three nos. of space heaters with thermostat control provided in each panel			Complied/ Not Complied	
2.1	Identification/ numbering/ lettering provided for each terminal.			Complied/ Not Complied	
2.2	All terminals shall be shrouded with plastic covers to prevent accidental contact			Complied/ Not Complied	
2.3	CT wiring for controls shall in general be carried out with copper conductor of size not less than 2.5mm <sup>2</sup>			Complied/ Not Complied	
2.4	Ferrule number provided on both ends of wire and on terminal blocks.			Complied/ Not Complied	
2.5	Insulating material - resistant to heat, dust and dampness. It is non-hygroscopic, mould proof and treated with suitable varnishes.			Complied/ Not Complied	
2.6	Continuous earthing strips of material and size specified in the data sheet, designed to carry the peak short circuit and short time fault current as specified shall be provided for the complete length of the switchboard			Complied/ Not Complied	
2.7	A minimum of 2 terminals shall be provided on the strip for external connections to earth grid.			Complied/ Not Complied	
2.8	All doors and movable parts shall be connected to earth bus with flexible copper connection				

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL CHECK LIST – FORMAT</b>	<b>CD-RPH-SB-TPS-TCL</b>	
		<b>PAGE 12 OF 12</b>	<b>R1</b>

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
2.9	All non-current carrying metal work (including metallic cases of instruments and other panel mounted components) of the equipment shall be earthed.			Complied/ Not Complied	
2.10	All metal parts of the panel to undergo surface treatment that includes derusting, cleaning chemically, degreasing, pickling in acid, cold rinsing, phosphating and passivating followed by spraying with two coats of zinc oxide primer and baking in oven			Complied/ Not Complied	
2.11	The sheet steel housing and all the metal surfaces shall be properly cleaned and coated with two coats of anticorrosive paint over two coats of suitable primer. A final coat in gloss finish with a colour indicated shall also be given to the switchboard.			Complied/ Not Complied	
2.12	Painted mimic diagram provided on all the panels of the switchboard			Complied/ Not Complied	
2.13	Necessary foundation channels (if not integral), bolts and nuts shall be supplied along with the equipment.			Complied/ Not Complied	
2.14	Flexible test cord 2m long with plug and socket for testing the breakers in the withdrawn position shall be supplied in a separate case			Complied/ Not Complied	
2.15	Alternatively flexible cord used for test position shall have sufficient extra length to test the breaker in the withdrawn position also			Complied/ Not Complied	
2.16	Earthing and testing plugs for cables and busbars shall be supplied in a separate box.			Complied/ Not Complied	
2.17	Spare parts and special tools recommended for keeping stock for trouble free operation of CB panel for a minimum period of 2 years shall be supplied. List and catalogue numbers of these spare parts shall also be furnished.			Complied/ Not Complied	

TECHNICAL PROCUREMENT SPECIFICATION	PRICE FORMAT	CD-RPH-SB-TPS-PF	
		PAGE 1 OF 1	R1

TPS NO: CD-RPH-SB-TPS					
ITEM: 11KV, 7 PANEL SWITCHBOARD					
Sl. No.	Description	Quantity	Unit price	Tax	Total price
1.0	Design, engineering, manufacturing, testing at works and supply of 11 kV, 630 A, 26.3 kA SF6/Vacuum circuit breaker, 7 panel switchboard for Reservoir Pump House substation, conforming to attached specifications/documents.	1 Set			
2.0	Supply of spares as per spare list	1 Set			

DO NOT QUOTE HERE

R1	18.09.2018	REV 1	JERRY	PARAMESWARN	BINNY
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>GENERAL REQUIREMENTS FOR ELECTRICS</b>	<b>CD-RPH-SB-TPS-GRE</b>	
		<b>PAGE 1 OF 4</b>	<b>R1</b>

**1.0.0 SCOPE**

1.1.0 This specification covers the general requirements for supply and installation of all electrical items as applicable.

**2.0.0 REFERENCES**

2.1.0 The following documents shall be read in conjunction with this specification.

2.1.1 Engineering specifications, data sheets and technical particulars of individual equipment / items.

2.1.2 Scope of work, Scope of Inspection and Tests, Special Requirements of the project, Vendor Data Requirements, etc., attached with the Technical Procurement Specifications.

**3.0.0 COMPLETENESS OF CONTRACT**

3.1.0 The electrics supplied/ installed shall be complete with all accessories for the safe, smooth and efficient operation of the system. Such parts shall be deemed to be within the scope of this specification whether specifically mentioned or not.

**4.0.0 COMPONENTS AND CONSTRUCTION**

4.1.0 Each and every component shall be of reputed make and be of proven design for reliability and durability. They shall be brand new. Workmanship shall be of the highest grade and the entire construction shall be in accordance with the best modern engineering practice.

**5.0.0 STANDARD AND REGULATIONS**

5.1.0 All electrical equipment / installations shall fully comply with the requirements laid down in following rules / regulations / acts / standards / codes as amended upto date.

- A) Indian Electricity Rules
- B) Indian Electricity Act
- C) Indian Electricity Supply Act
- D) Indian Factories Act
- E) Fire Insurance Act
- F) Petroleum Rules
- G) Standards / Regulations of statutory bodies applicable for the place of Installation

5.2.0 Relevant Indian / International Standards and in their absence, the standards of the Country of manufacture.

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>GENERAL REQUIREMENTS FOR ELECTRICS</b>	<b>CD-RPH-SB-TPS-GRE</b>	
		<b>PAGE 2 OF 4</b>	<b>R1</b>

5.3.0 Vendor shall furnish all necessary assistance and documents for obtaining approval from statutory bodies. Making whatever addition/ modifications considered necessary by the Electrical Inspectorate and other authorities to bring the equipment /installation in conformity with the above rules, regulations, acts and standards shall be in the scope of vendor.

5.4.0 All equipment shall be of tropical design according to relevant Indian / international Standards.

5.5.0 All electrics shall be suitable for the hazardous / non-hazardous area involved and or specified. Electrics suitable for hazardous area involved shall be selected as per the relevant Indian standards and shall be of proven design approved by CMRS / relevant statutory bodies. In such such cases copies of relevant certificates shall be furnished for purchaser's approval.

**6.0.0 SERVICE CONDITIONS**

6.1.0 All equipment shall be suitable for the service conditions specified in the data sheet of general requirements for electrics attached.

**7.0.0 EARTHING**

7.1.0 Duplicate earthing terminals, suitable for terminating earthing conductors of size indicated in the data sheets of individual equipment, shall be provided in the body of the equipment apart from those, if any, provided inside the terminal boxes.

**8.0.0 POWER SUPPLY DETAILS**

8.1.0 The equipments shall be suitable for the power system details furnished in the data sheet of General Requirements Of Electrics unless otherwise specified in the data sheets of individual equipment.

8.2.0 The equipment shall perform satisfactorily even with variation in supply voltage and frequency as detailed in the Data Sheets. The equipment shall operate at the specified rating without exceeding the permissible temperature rise as per the relevant IS in spite of the variation in supply voltage and frequency.

**9.0.0 NAME PLATES**

9.1.0 Necessary name plates, conforming to standards, giving relevant details of the equipment, shall be provided on individual equipment. Any additional details shall also be indicated in the name plate, if so specified in the specifications / data sheets of individual equipment.

**FACT - COCHIN DIVISION**



<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>GENERAL REQUIREMENTS FOR ELECTRICS</b>	<b>CD-RPH-SB-TPS-GRE</b>	
		<b>PAGE 3 OF 4</b>	<b>R1</b>

**10.0.0 PAINTING**

10.1.0 Unless otherwise specified in the specifications / data sheets of individual equipment /items, painting procedure described in this clause shall be adopted.

10.2.0 All exposed metal parts shall be subjected to at least the following pre-treatment before painting to suit the material and environment involved.

- a) De-greasing
- b) Rust removing
- c) Phosphating / equivalent chemical treatment.

10.3.0 Giving two coats of anti-corrosive painting shall be given after the above process so as to render the material suitable for the highly corrosive environment specified.

10.4.0 Final colour and finish of the equipment shall be dark admiralty grey as per IS: 5 unless specified elsewhere.

10.5.0 Vendor shall furnish detailed painting procedure proposed, along with the bid.

**11.0.0 INTER-CHANGEABILITY**

11.1.0 All similar parts shall be inter-changeable with each other.

**12.0.0 DANGER NOTICE PLATES**

12.1.0 Danger notice plates conforming to IS: 2551 and other statutory requirements shall be affixed on equipment wherever required.

**13.0.0 TOOLS AND APPLIANCES**

13.1.0 The vendor shall supply without any extra cost one set of special tools and appliances that may be required for carrying out the maintenance, special inspection etc. of the equipment offered.

13.2.0 Vendor shall also furnish list of tools and appliances required for different equipment.

**14.0.0 SERVICES OF MANUFACTURER'S TECHNICAL EXPERTS**

14.1.0 Services of Manufacturer's Technical Experts shall be made available to the purchaser, if found necessary, during erection, testing and commissioning and also during the guarantee period.

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>GENERAL REQUIREMENTS FOR ELECTRICS</b>	<b>CD-RPH-SB-TPS-GRE</b>	
		<b>PAGE 4 OF 4</b>	<b>R1</b>

**15.0.0 TRAINING**

15.1.0 The vendor shall render all facilities free of cost for imparting training purchaser's technical personnel at manufacturer's works, if required for proper assembly, installation, testing, commissioning, operation and maintenance of the equipment supplied. Travel and living expenses of the personnel deputed for training will be borne by the purchaser.

**16.0.0 PERFORMANCE FIGURES**

16.1.0 Duly filled in technical particulars of individual equipment / item shall be furnished as per formats attached. Performance figures of the equipment as per technical particulars furnished along with the offer shall be guaranteed.

**17.0.0 TESTS**

17.1.0 All the tests specified in the Scope of Inspection and Tests attached separately with the Technical Procurement Specification shall be performed.

**18.0.0 DOCUMENTS**

18.1.0 Drawings and documents shall be furnished as per data requirements attached with Technical Procurement Specification.

**19.0.0 INSTRUCTIONS TO TENDERER**

19.1.0 Drawings and documents as per Vendor Data Requirements shall be furnished along with the quotation. Offers without these details will be treated as incomplete and are liable for rejection.

19.2.0 In the absence of clearly spelt out item wise deviations from purchaser's specification, it will be presumed that the equipment offered are in conformity with the specification.

19.3.0 Vendor shall obtain purchaser's approval for makes of different electrical items / components wherever makes are not specified in the respective data sheets.

19.4.0 In the case of conflicting requirements, stipulations in the respective data sheets shall prevail.

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL PARTICULARS</b>	<b>CD-RPH-SB-TPS-TP</b>	
		<b>PAGE 1 OF 6</b>	<b>R1</b>

<b>1.0</b>	<b>Circuit Breaker</b>	
1.1	Make	
1.2	Country of manufacture	
1.3	Type reference	
1.4	Type of circuit breaker (SF6/Vacuum)	
1.5	Total weight of complete breaker (Kg.)	
1.6	Conformity to standards	
1.7	Rated voltage	
1.8	Maximum permissible operating voltage	
1.9	One minute power frequency withstand test voltage	
1.10	Capacitance current switching class	
1.11	Mechanical and electrical endurance class	
1.12	Rated normal current	
1.13	Rated frequency	
1.14	Number of poles	
1.15	Rated insulation level	
1.16	Rated line charging breaking current	
1.17	Rated cable charging breaking current	
1.18	Rated capacitor breaking current	
1.19	Rated small inductive breaking current	
1.20	Rated symmetrical short circuit breaking capacity	
	a) KA	
	b) MVA	
1.21	Rated asymmetrical short circuit	
1.22	Rated transient recovery voltage	

					PROJECT	SUPPLY OF 11KV, 630A, SWITCHBOARD FOR RESERVOIR PUMP HOUSE SUBSTATION
					P.O. NO.	
R1	13.01.2021	JJM	KPN	BKN	VENDOR	
REV	DATE	PRPD.	CHKD.	APPRD.		

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL PARTICULARS</b>	<b>CD-RPH-SB-TPS-TP</b>	
		<b>PAGE 2 OF 6</b>	<b>R1</b>

1.23	Rated making current (KA peak)	
1.24	Rated short time current	
	a) 1 sec	
	b) 3 sec	
1.25	Rated duty cycle	
1.26	Opening time	
1.27	Closing time	
1.28	Total break time at rated short circuit capacity	
1.29	Arc duration	
1.30	Number of breaks per phase	
1.31	Total length of break per phase	
1.32	Type of main contacts	
1.33	Type of arcing contacts	
1.34	Type of arc control employed	
1.35	Pole center to center distance	
1.36	Number of aux. Contacts (NO+NC) (without multiplying contactor)	
1.37	Method of power closing offered	
1.38	Normal voltage of the spring charging motor	
1.39	Power at normal voltage required for spring charging motor	
1.40	Time taken to charge the spring completely by the motor	
1.41	Normal and minimum operating voltage of closing mechanism	
1.42	Power at normal voltage required for closing coil	
1.43	Power at normal voltage required for trip coil	
1.44	Normal and minimum voltage required for trip coil	
1.45	Closing coil voltage and power required to close the breaker	
1.46	Normal and minimum voltage required for operation of solenoid closing mechanism	

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL PARTICULARS</b>	<b>CD-RPH-SB-TPS-TP</b>	
		<b>PAGE 3 OF 6</b>	<b>R1</b>

1.47	Current at normal voltage, required for solenoid operation	
1.48	Short circuit type test certificate no. or report no.	
1.49	<b>Bus bars</b>	
1.50	Conformity to standards	
1.51	Material and grade of bus bars	
1.52	Type of busbar covering	
1.53	Continuous current rating	
1.54	Normal area (mm <sup>2</sup> )	
1.55	Size of bus	
	a) Horizontal	
	b) Vertical	
1.56	Colour coding	
1.57	Type of insulation	
1.58	Derating factor applied in view of PVC covering	
1.59	Peak dynamic withstand capacity	
1.60	Rated short time current for 1 second	
1.61	Guaranteed temperature rise at rated current for bare bus bars	
1.62	Details of bus bar supports	
1.63	Guaranteed temperature rise at rated current for PVC covered bus bars	
1.64	Whether short circuit type test certificates attached or not	
1.65	Clearance of bus bars in air	
	a) Phase to phase	
	b) Phase to earth	
<b>2.0</b>	<b>Current transformers</b>	
2.1	Conformity to standards	
2.2	Make	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL PARTICULARS</b>	<b>CD-RPH-SB-TPS-TP</b>	
		<b>PAGE 4 OF 6</b>	<b>R1</b>

2.3	Whether bar primary/wound	
2.4	VA capacity	
2.5	Insulation class	
2.6	Rated primary current	
2.7	Rated secondary current	
2.8	Epoxy resin cast or other type with details	
2.9	Class of accuracy for O/C & E/F protection	
2.10	Class of accuracy for metering	
2.11	Short time current rating	
2.12	Accuracy limit factor for protection class CTs	
2.13	Instrument security factor for metering CTs	
2.14	Guaranteed temperature rise at rated current	
2.15	One minute power frequency withstand test voltage	
2.16	Impulse withstand test voltage	
2.17	Thermal overload capacity	
<b>3.0</b>	<b>Potential transformers</b>	
3.1	Conformity to standards	
3.2	Make of PT's	
3.3	Type	
3.4	Rated primary voltage	
3.5	Rated secondary voltage	
3.6	VA capacity	
3.7	Connection	
3.8	Class of accuracy	
3.9	PTs connected to cable side or bus bar side	
3.10	One minute power frequency withstand test voltage	
3.11	Impulse withstand test voltage	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL PARTICULARS</b>	<b>CD-RPH-SB-TPS-TP</b>	
		<b>PAGE 5 OF 6</b>	<b>R1</b>

<b>4.0</b>	<b>Protection Relays</b>	
4.1	Conformity to standards	
4.2	Make	
4.3	Withdrawal features provided or not	
4.4	Mounting: Flush / Projection	
<b>5.0</b>	<b>Multi Function Meters</b>	
5.1	Conformity to standards	
5.2	Make	
5.3	Type	
5.4	Mounting: Flush / projection	
5.5	Size of meters	
5.6	Class of accuracy	
<b>6.0</b>	<b>Indication Lamps</b>	
6.1	Conformity to standards	
6.2	Make	
6.3	Type	
6.4	Watts rating at specified auxiliary voltage	
<b>7.0</b>	<b>Panel board</b>	
7.1	Material & area of cross section of conductor between	
	a) Busbars and circuit breaker/switch or switch fuse (if any) of each rating	
	b) Switch and fuses of each rating (if any)	
7.2	Size & material of earth bus bar	
7.3	Thickness of panel doors (mm)	
7.4	Thickness of load bearing members (mm)	
7.5	Thickness of base frame (mm)	

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>TECHNICAL PARTICULARS</b>	<b>CD-RPH-SB-TPS-TP</b>	
		<b>PAGE 6 OF 6</b>	<b>R1</b>

7.6	Weight of switchgear complete with CB (kg)	
7.7	Weight of each switch board (kg). (Dynamic loading, if any shall be furnished)	
7.8	Shipping weight of the largest consignment and size	
7.9	Size of each panel – W x D x H	
7.10	Minimum distance required on the front side for withdrawal of circuit breaker	
7.11	Details of steps taken to render equipment dust, damp and vermin-proof	
7.12	Details of anti-corrosive treatment to make equipment suitable for the environment	
7.13	Technical details / catalogues/ leaflets & type test certificate of components / items enclosed	
7.14	Rating details & technical particulars of HV fuses (if any)	
<b>8.0</b>	<b>Special features of SF6 breakers</b>	
8.1	Normal working pressure of SF6 gas	
8.2	Material of contacts	
8.3	Number of operation of breaker on fault before changing hr SF6 bottle	
8.4	Number of operation of breaker at rated current	
8.5	Maximum and minimum pressure of SF6 for safe operation	
8.6	Material of shutter/contact barrier	
8.7	Guaranteed leakage of Sf6 gas/annum	
8.8	Special features provided for the breaker panel	



<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>SCOPE OF INSPECTION AND TESTS</b>	<b>CD-RPH-SB-TPS-SIT</b>	
		<b>PAGE 1 OF 2</b>	<b>R1</b>

TPS NO: CD-RPH-SB-TPS				
ITEM: 11KV, 7 PANEL SWITCHBOARD				
The following inspection and test shall be conducted and records submitted.				
Sl. No.	Description	Ins./Test Reqd	Witness Reqd	Remarks
1.0	Physical verification for compliance with P.O. specifications, scope of work, approved drawings, BOM, etc.	Reqd	Reqd	
2.0	Routine tests			
2.1	Power frequency voltage dry tests on main circuits.	Reqd	Reqd	
2.2	Voltage tests on control and auxiliary circuits.	Reqd	Reqd	
2.3	Measurement of the resistance of the main circuit.	Reqd		Test reports to be furnished
2.4	Mechanical operation test	Reqd	Reqd	
2.5	Tests of the auxiliary electrical devices.	Reqd		Test reports to be furnished
2.6	Verification of wiring	Reqd		Test reports to be furnished
2.7	Electrical operation test	Reqd	Reqd	
2.8	Megger test	Reqd	Reqd	
2.9	Safety interlocks and protection against electric shock and short circuits.	Reqd		Test reports to be furnished
2.10	Verification of nameplate information & marking	Reqd	Reqd	
2.11	Separate testing of operating mechanism and other accessories.	Reqd		Test reports to be furnished
2.12	Primary and secondary injection tests on panels and protective gears.	Reqd		Test reports to be furnished
2.13	High voltage tests on panels and protective gear.	Reqd	Reqd	

R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>SCOPE OF INSPECTION AND TESTS</b>	<b>CD-RPH-SB-TPS-SIT</b>	
		<b>PAGE 2 OF 2</b>	<b>R1</b>

Sl. No.	Description	Ins./Test Reqd	Witness Reqd	Remarks
2.14	Proper functioning of mechanical and electrical interlocks.	Reqd	Reqd	
2.15	Interchangeability of drawout breakers of the same rating.	Reqd	Reqd	
2.16	Checking of mechanical work like surface finish, movement and Proper engagement of withdrawable breakers, fixing of doors, etc.	Reqd	Reqd	
2.17	Verification of CT ratio and polarity of CTs.	Reqd		Test reports to be furnished
2.18	Checking of protective earthing circuits	Reqd	Reqd	
3.0	Tests at site			
3.1	Pre-commissioning tests and commissioning tests	Reqd	Reqd	
4.0	Copy of type test certificates/reports of the following tests conducted on representative functional unit to be furnished.			
4.1	Impulse voltage dry test.			
4.2	Power frequency voltage dry test.			
4.3	Temperature rise test.			
4.4	Verification of making and breaking capacity.			
4.5	Verification of temperature limits and characteristics of relays.			
4.6	Short time current tests on main circuits.			
4.7	Short time currents tests on earthing circuits.			
4.8	Short circuit breaking and making capacity.			
4.9	Short time rating of CB and switchboard.			
4.10	Mechanical and electrical endurance test.			
4.11	Internal arc withstand test			
4.12	Verification of dielectric properties			
4.13	Verification of degree of protection			

R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>SPARES LIST</b>	<b>CD-RPH-SB-TPS-SL</b>	
		<b>PAGE 1 OF 1</b>	<b>R1</b>

TPS NO: CD-RPH-SB-TPS				
Sl. No.	Description	Quantity	Unit price	Total price
1.0	11KV, 7 PANEL SWITCH BOARD SPARES			
1.1	Breaker Pole	3 Nos.		
1.2	PT secondary fuse	3 Nos		
1.3	11kV side PT fuse	3 Nos.		
1.4	Breaker control switch	2 Nos.		
1.5	Closing coil	2 Nos.		
1.6	Tripping coil	2 Nos.		
1.7	Closing spring	1 No.		
1.8	Tripping spring	1 No		
1.9	Spring charging motor	1 No.		
1.10	Breaker rack-in handle	1 No.		
1.11	Manual spring charging handle	1 No.		
1.12	Bus support insulator (11kV)	2 Nos. of each rating		
1.13	LED Indication lamps	3 Nos. of each rating		
1.14	Numerical feeder protection and control relay	1 No.		
1.15	Numerical transformer protection and control relay	1 No.		
1.16	Anti pumping relay	1 No.		
1.17	DC failure relay	1 No.		

R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>SUB VENDOR LIST</b>	<b>CD-RPH-SB-TPS-SVL</b>	
		<b>PAGE 1 OF 1</b>	<b>R1</b>

<b><u>INSRUMENT TRANSFORMERS</u></b>	<b><u>MULTI FUNCTION METER</u></b>
AUTOMATIC ELECTRIC	SCHNEIDER ELECTRIC
PRAGATHI	SIEMENS
SILKANS	ABB
SIEMENS	AUOTMATIC ELECTRIC
ALSTOM /AREVA	RISHAB
ABB	MECO
ECS	SELEC
INTRANS	<b><u>HRC FUSES</u></b>
KAPPA	SIEMENS
SCHNEIDER ELECTRIC	L&T
<b><u>PROTECTIVE RELAYS (NUMERICAL)</u></b>	HAVELLS
ALSTOM/AREVA	ALSTOM
ABB	
C &S	
SIEMENS	
SCHNEIDER ELECTRIC GE	
EASUN REYROLLE	
<b><u>CONTROL &amp; SELECTOR SWITCHES</u></b>	
KAYCEE ALSTOM	
SULZER SIEMENS	
EASUN REYROLLE	
KHAITAN	
JYOTI	
ABB	
L&T	
SCHNEIDER ELECTRIC	
Note: Panel manufactures have a freedom for using their own type tested components and NABL lab certified components in offered panels.	

R1	13.01.2021	REV 1	JJM	KPN	BKN
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

**FACT - COCHIN DIVISION**

<b>TECHNICAL PROCUREMENT SPECIFICATION</b>	<b>VENDOR'S EXPERIENCE - FORMAT</b>	<b>CD-RPH-SB-TPS-VE</b>	
		<b>PAGE 1 OF 1</b>	<b>R1</b>

TPS NO: CD-RPH-SB-TPS
Vendor shall furnish here a list of similar orders executed by him for reference.

Sl. no.	Client	Description of order	Value of order along with size & quantity	Month & year of supply	Name, Address, Telephone, E-mail, Fax of the contact person
1					
2					
3					
4					
5					

Name of Vendor:		
Date:	Name & Designation	Signature & Seal

**FACT - COCHIN DIVISION**

<b>RESERVOIR PUMP HOUSE SUBSTATION</b>	<b>COMPLIANCE STATEMENT</b>	<b>CD-RPH-SB-TPS-CS</b>	
		<b>PAGE 1 OF 1</b>	<b>R1</b>

TPS No: CD-RPH-SB-TPS

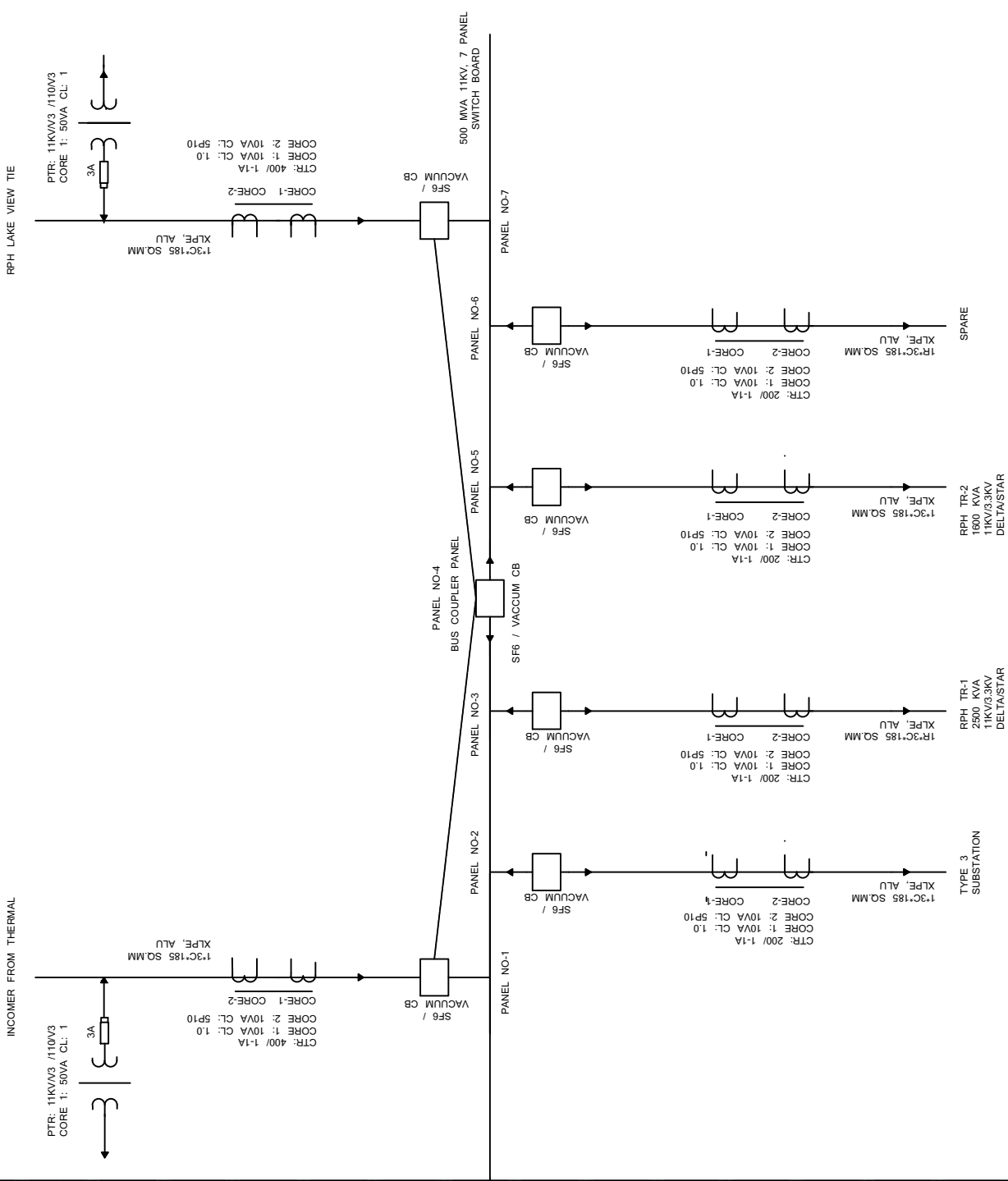
We here by state that our Quotation No ..... is in full compliance with the documents issued against the Enquiry No ..... except for the deviations listed below.

**LIST OF DEVIATIONS**

Sl. No.	Descri ption	Reasons for Deviation

Name of Vendor:

Date:	Name & Designation	Signature & Seal
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TYPICAL SINGLE LINE DIAGRAM OF 11 KV .7 PANEL SWITCHBOARD