

TECHNICAL PROCUREMENT SPECIFICATION			CD-ELE-ACIDS-LVSB		
			PAGE 1 OF 1		R0
TPS No.	CD-ELE-ACIDS-LVSB				
STATUS	<input checked="" type="checkbox"/> ENQUIRY <input type="checkbox"/> COMMITMENT				
ORIGINATING DEPT.	ELECTRICAL				
P.O / W.O NO.					
PROJECT	LOW VOLTAGE SWITCH BOARD FOR DG SUPPLY DISTRIBUTION IN SULPHURIC ACID PLANT				
ITEM	LOW VOLTAGE SWITCH BOARD				
LOCATION	SULPHURIC ACID PLANT- FACT CD, AMBALAMEDU				
CLIENT					
PURCHASER	M/S. FACT- COCHIN DIVISION				
VENDOR					
R0	08.04.2020	REV 0	SR / JJM	PK	SKA
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

FACT - COCHIN DIVISION

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TPS NO: CD-ELE-ACIDS-LVSB				
ITEM: LOW VOLTAGE SWITCH BOARD				
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, Technical procurement specification, scope of work, approved drawings, BOM, etc.	Reqd		
2.0	Routine tests as per IS	Reqd		
3.0	Verification of wiring	Reqd		
4.0	Safety interlocks of incomers and checking of change over scheme for control supply.	Reqd		
5.0	Verification of nameplate information	Reqd		
6.0	Verification of interchangeability of draw out modules of the same rating.	Reqd		
7.0	Checking of mechanical work like surface finish, movement and proper engagement of draw out modules, fixing of doors, etc.	Reqd		
8.0	Verification of CT ratio and polarity of CTs.	Reqd		
9.0	Checking of protective earthing circuits	Reqd		
10.0	On site Acceptance Tests.	Reqd	Reqd	

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		TPS. NO: CD-ELE-ACIDS-LVSB	
STATUS: ENQUIRY <input checked="" type="checkbox"/>	COMMITMENT <input type="checkbox"/>	P.O. NO.:	

Sl. No.	Grp. code	Description	Offer	After commitment			@@ Final	
			Qty.	Qty.	Lead time in weeks			Qty.
					Reqd	@ Propd	Agrd	
1.0	B	Duly filled in Technical particulars of Low Voltage Switch Board as per Pro forma enclosed	1S					
2.0	B	Duly filled and signed Compliance statement as per Performa enclosed	1S					
3.0	A	Dimensioned general arrangement drawings, Single line diagram, control schematic, wiring diagrams, inters panel wiring, terminal and bus wiring diagrams.		1S+1P	2		2P	
4.0	A	Bill of material for complete switchgear		1S+1P	2		2P	
5.0	A	Selection criteria and calculations for power bus, earth bus, bus bar spacing and control transformer.		1S+1P	2		1P	
6.0	B	Routine tests certificates as per IS		1S	2		2P	
7.0	C	Operation and maintenance manuals					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.

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1.0.0 SCOPE OF WORK

- 1.1.0 This specification covers the requirements for design, manufacture, shop testing, inspection, packing and delivery to site of Low Voltage Switchboard for distribution of Diesel Generator power supply in Sulphuric Acid Plant, FACT Cochin Division.
- 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 Data sheet of Low Voltage Switchboard.
- 2.1.2 Technical particulars of Low Voltage Switchboard.

3.0.0 STANDARDS

- 3.1.0 Requirements laid down in the latest revisions of the following Indian Standards and other relevant standards & regulations shall be strictly adhered to:

IS: 732	Code of practice for electrical wiring installations
IS: 3043	Code of practice for earthing
IS: 8623(Part I)	Specification for Low- Voltage Switchgear & Control gear Assemblies
IS/IEC60947-1	Low voltage switch gear and control gear :part 1-General rules
IS/IEC60947-3	Low voltage switch gear and control gear :part 3-Switches, disconnectors, Switch disconnectors and fuse combination units
IS: 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals
IS: 10118	Code of practice for selection, installation, and maintenance of switchgear and control gear
IS:13703	Specification of low voltage fuses for voltages not exceeding 1000V-AC or1500V-DC
IS: 2705	Current Transformers
IS: 4201	Application guide for CTs
IS:13947:part4:sec:1	Specification for low voltage switchgear and control gear -Part 4;Contactors and motor starters-Sec-1:Electro mechanical contactors and motor starters

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- IS:13947:part5:sec:1 Specification for low voltage switchgear and control gear -Part 5-control circuit devices and switching elements-sec1:Electromechanical control circuit devices
- IS: 1248 Direct acting electrical indicating instruments
- IS: 1901 Visual indicator lamps
- IS: 2551 Danger notice plates

4.0.0 SERVICE CONDITIONS

4.1.0 The equipment shall be designed to operate satisfactorily at rated load under the service conditions and power supply conditions specified in the data sheet of “Low Voltage Switchboards”.

5.0.0 CONSTRUCTION & GENERAL REQUIREMENTS

5.1.0 Switchboard shall comply with the requirements of IS 8623 applicable for Low-Voltage Switchgear and control gear assemblies.

5.2.0 The switchboard shall be of folded sheet steel construction, fully compartmentalized, floor mounted, free standing type and dust, damp & vermin proof. The degree of protection shall be as specified in the data sheet. Vertical units shall be assembled to form a continuous line up of uniform height and front line up.

5.3.0 Thickness of sheet steel shall not be less than 2 mm except for certain non-load bearing members like instrument plates, partitions, doors, etc. for which a minimum thickness of 1.6 mm shall be ensured.

5.4.0 All incomers and outgoing feeders shall have independent door, having handle padlocking facility. Doors shall not be a part of the draw out truck.

5.5.0 Doors and openings shall be provided with neoprene gaskets. All hardware shall be corrosion resistant.

5.6.0 All doors shall be hinged at one end and shall be locked using special key on other end. All hinges shall be of concealed design for elegant appearance.

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

5.8.0 Bus bars shall be housed in separate metallic compartment (horizontal bus bar chamber & vertical bus bar chamber) and shall be accessible for inspection only with special tools.

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- 5.9.0 Individual feeder modules shall be housed in independent and separate enclosed compartments separated from each other by metallic barriers. All compartments except incomers, control transformers and relay compartment shall be draw out in nature. Independent vertical bus bar chamber, vertical bus bar and cable alleys shall be provided for each vertical section of the switch board.
- 5.10.0 Switchboards shall be with front opening and access to all components, cable connections, bus bars, etc. shall be from the front only.
- 5.11.0 The equipment shall be designed to ensure complete safety during operation, inspection, connection of cables, relocation of outgoing circuits and maintenance even with the bus bar system energized.
- 5.12.0 All exposed live terminals in the cable alley and incomer terminals inside modules shall be covered or shrouded to prevent accidental contact.
- 5.13.0 Both the incomer compartments shall be suitable for bottom entry of the cable and shall have sufficient space and support arrangement inside each compartment to terminate 1Rx4Cx185 sq.mm Al cable.
- 5.14.0 Necessary foundation bolts, nuts and washers shall be supplied along with the equipment.

6.0.0 BUS BARS

- 6.1.0 Bus bars shall be of high conductivity aluminum as specified in the data sheet. Insulating sleeves, complete with necessary joint shrouds shall be provided for bus bars.
- 6.2.0 Maximum allowable current density for bus bars shall be 1.25A/mm² for copper conductor and 0.78A/mm² for aluminium conductor.
- 6.3.0 Continuous and Short time current rating of switch board is specified in data sheet. Size/ cross section area of 3 phases of horizontal and vertical busbars, neutral and earth bus shall be selected based on the relevant IS standards. Calculations shall be submitted at the time of detailed engineering as per vendor data requirement.
- 6.4.0 The horizontal and vertical bus bars shall be rated for the same fault level specified in the data sheet. Cross-section of main horizontal bus to be uniform throughout the switchboard and continuous in one transport unit.
- 6.5.0 The bus bars and bus bar supports shall withstand the dynamic, thermal & magnetic stresses and strains due to the maximum short circuit current corresponding to the fault level indicated in the data sheet, without any deformation, deterioration or damage.
- 6.6.0 Rigid insulating barriers / protection guards /wire meshes shall be provided between the group of live bus bars and other parts, so as to eliminate danger to personnel due to accidental contact.

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6.6.0 The bus bar supports shall be of non-hygroscopic material with anti-tracking features to prevent flashovers. These shall have high tracking index and be mechanically strong. Hylam is not acceptable.

6.7.0 Appropriate identification shall be provided on the bus bars for distinguishing the various phases, neutral, earth and control / auxiliary buses.

7.0.0 FEEDER ARRANGEMENT

7.1.0 Feeder module / compartment sizes shall be integral multiples of one or two basic sizes.

7.2.0 Indicating lamps, meters and push buttons shall be mounted flush with the front-hinged cover.

7.3.0 The control components, except those coming on doors, shall be mounted on a base plate and fixed on the frame of the module.

8.0.0 CABLE COMPARTMENTS

8.1.0 Cable compartments / cable alleys shall be provided for easy termination of all incoming and outgoing cables. The width of this cable alley shall be sufficient to accommodate all the cables and shall have free access for cable terminations and in any case shall not be less than 150mm. Cable alleys shall be provided with suitable doors. It shall be possible to carry out maintenance work safely on cable connections to any independent circuit with the bus bars and adjacent circuit live.

8.2.0 Adequate supports and facilities for cable clamping shall be provided in cable alleys.

8.3.0 A horizontal wire way, extending over the entire length, shall be provided at the top / bottom for inter panel wiring.

8.4.0 Removable gland plates having a minimum thickness of 2mm shall be provided.

9.0.0 AUTO MAIN FAILURE RELAY

9.1.0 The switch board shall be wired for automatic changeover of main supply to DG set supply using an AMF relay. If mains voltage in any phase fails AMF relay shall initiate an automatic DG start cycle including load transfer by switching the contactors mounted in the panel. After the main supply is restored the load shall be automatically removed from DG and transferred to main supply.

9.2.0 AMF relay shall be suitable for the ratings specified in the data sheet.

9.3.0 AMF relay shall have following features:

1. LCD display unit and control switches for editing and viewing of parameters.
2. LED indications for main supply status, DG status, faults etc.

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3. Display of 3 Phase Voltage and Frequency of main supply and DG set supply.
4. Measurement and display of Load current and Instantaneous load in kW.
5. Energy metering facility for both Mains & DG supply.
6. Fault and event records with date and time stamp.
7. Emergency stop and Overload trip functions.
8. Under/Over Voltage protection for both main and DG supply.
9. Under/Over Frequency protection for both main and DG supply

9.4.0 AMF relay shall have facility to program its digital inputs and outputs for the following purposes using either its potential free contacts or potential free contacts of external auxiliary relay of AMF relay. If external auxiliary relays required, it shall be supplied and wired up to the terminal block by the panel board manufacturer.

9.5.0 Relay Digital inputs required for

1. Remote start
2. Remote stop
3. Emergency stop
4. Coolant temperature high
5. Spare

9.6.0 Relay Digital outputs required for

1. DG start
2. DG stop
3. Hooter
4. Alarm
5. Main supply contactor ON
6. DG supply contactor ON

10.0.0 SWITCH DISCONNECTOR FUSE UNIT

10.1.0 TPN switch disconnecter fuse units shall be of air break type confirming to relevant standards. The switches shall have a quick-make, quick-break, fault-make, load-break mechanism operated by an external insulated earthed handle, complete with ON-OFF position indicator/dial plates.

10.2.0 TPN switch disconnecter fuse units for motor starter feeders shall have AC23 utilization category and suitable for Type-II co-ordination with HRC fuse, contactor and Over load relays. SDF for power supply feeders shall have AC22/AC23 utilization category.

10.3.0 TPN switch disconnecter fuse units shall have phase barriers to prevent phase to phase short circuit. Bolted type removable copper links of adequate size shall be provided for neutral.

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10.4.0 The cubicle door shall be interlocked with the switch mechanism so that the door cannot be opened unless the SDF is in the OFF position. Padlocking facility in OFF position shall be provided.

10.5.0 1NO+1NC auxiliary contact shall be provided in each SDF units. Control wiring of individual motor feeders shall be wired through this contact for switch off control supply of individual motor when SDF is in OFF position. For feeder supply units, feeder ON/OFF indication shall be wired through this auxiliary contact.

11.0.0 MINIATURE CIRCUIT BREAKERS (MCB)

11.1.0 Miniature Circuit Breaker shall comply with IS/IEC 60898-1 standards. Miniature circuit breakers shall be quick make and break type for 240/415 VAC, 50 Hz application with magnetic thermal release for over current and short circuit protection.

11.2.0 The breaking capacity shall not be less than 10 KA at 415 Volts AC. MCB's shall be DIN mounted and Current Limiting type (Class-3). MCB's shall be C Type as per their Tripping Characteristic curves defined by the manufacturer, unless otherwise specified in the data sheet.

11.3.0 MCB shall ensure complete electrical isolation of downstream circuit or equipment when the MCB is switched OFF.

11.4.0 The housing shall be heat resistant and having high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection.

12.0.0 CONTACTORS

12.1.0 Starter contactors shall be electromagnetic, air break type, suitable for uninterrupted duty and of AC3 / AC4 utilization category, conforming to relevant standards.

12.2.0 The operating coil shall be vacuum impregnated, with special varnish, to remove all traces of air and moisture. Alternatively, it can be of resin cast material as well.

12.3.0 The holding coils shall be rated for the control voltage specified in the data sheet.

12.4.0 Contactors shall preferably have switching position operation indicator.

12.5.0 A minimum of 1 N/O and 1 N/C spare auxiliary contacts, in addition to those required for control circuits, shall be available for each contactor. (If necessary, add on blocks or auxiliary contactor can be provided)

12.6.0 Motor ON/OFF indication shall be wired through N/O-N/C contact of contactor.

12.7.0 Type of co-ordination between contactor, overload protective device and short circuit protective device shall conform to Type II as per relevant standards.

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13.0.0 OVERLOAD RELAYS

- 13.1.0 All overload relays shall be designed to nullify the effects on settings due to changes in ambient temperature and humidity and they shall have adjustable accurately calibrated settings.
- 13.2.0 Overload protection shall be available for all the phases. The over load relay shall be manual / auto reset type.
- 13.3.0 Overload relays shall be CT operated type for 55kW motor feeders and directly connected type for 15kW motor feeder. For CT operated relays, cast resin insulated CTs shall be included in the scope of supply of vendor.
- 13.4.0 Thermal bimetallic overload relays provided for motor feeders shall have integral / built in single phasing protection feature.

14.0.0 CURRENT TRANSFORMERS

- 14.1.0 Current Transformers (CTs) shall be of cast resin insulated type, and shall conform to relevant standards like IS: 2705 & IS: 4201. The CT shall be of ring type or window type (bar type CT shall not be used).
- 14.2.0 Rating of CT shall be selected based on the Feeder rating specified in the data sheet.
- 14.3.0 CT for all three phases with secondary current of 5A shall be provided for both the incomers. Single phase CT with 1 Amp secondary rating shall be provided for each motor feeder for remote metering. Burden of these CTs shall be sufficient to compensate for the lead burden and for the burden of remote ammeter.
- 14.4.0 CTs for metering purposes shall have adequate capacity to cater for 130% of full load conditions. Metering CTs shall have an Instrument Security Factor not more than 5 and an accuracy class 1 unless otherwise specified.
- 14.5.0 All CT terminals to remote meters shall be provided with links to facilitate shorting as per data sheet.
- 14.6.0 CTs shall be provided with polarity markings adjacent to terminals, both for primary and secondary. These shall be legible even after years of service.
- 14.7.0 CTs shall be of class E insulation unless otherwise specified.
- 14.8.0 Unused CT terminals must be short-circuited.

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15.0.0 CONTROL TRANSFORMERS

- 15.1.0 A 230V/110V, 50Hz, AC Control transformer shall be provided common to all modules. Control transformer shall have adequate capacity to feed all control loads of entire switchboard as well as the inrush VA of contactors & relays applicable. All motor control stations are located at 200m away from switch board and connected using 1.5sq.mm copper cable. Voltage drop in these lines shall also be considered while choosing size of control transformer. Selection of rating of control transformer shall be submitted at the time of detailed engineering as per vendor data requirement.
- 15.2.0 Auto change over scheme shall be provided for incomer side of control transformer. Control transformer shall be energized through DG supply while main power failure occurs.
- 15.3.0 DG incomer and main supply incomer shall not get paralleled through control transformer. Adequate protective measures shall be taken.
- 15.4.0 Supply to the auto change over scheme for control transformer shall be taken from incoming side of power contactor of both incomers.
- 15.5.0 Auto change over shall be done using voltage sensing relays/control contactors and it shall be mounted in relay panel.
- 15.6.0 Control transformer shall have $\pm 5\%$ voltage tapplings on the primary side and with center tap of secondary winding earthed.
- 15.7.0 Control transformers shall have HRC fuse protection of suitable rating on primary side and double pole MCB on secondary side.
- 15.8.0 Control supply 'ON' indication shall be provided on the transformer module door.
- 15.9.0 Emergency Stop push button with mushroom head (Red colour) of press to lock and turn to release type shall be provided in the relay panel to disconnect the 110V AC distribution to all other compartments. Control supply to all vertical sections shall be fed from relay panel. Separate terminal block shall be assigned for the same.

16.0.0 INDICATING INSTRUMENTS

- 16.1.0 Meters shall be flush mounted and of a type and make approved by the buyer.
- 16.2.0 All meters shall be square type of size 96mm x 96 mm unless otherwise specified in the datasheet. Dials shall be white with black numerals and letters.
- 16.3.0 A moving iron voltmeter having a range of 0-500Volts AC shall be provided, along with a suitable selector switch, to read all line to line voltages on the incoming side of incoming feeders. The selector switches shall have 3 way and OFF positions. Necessary facia plates to denote switch positions shall be provided. Necessary control fuses/MCB shall be provided in the voltmeter circuit.

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16.4.0 Voltmeter shall be of Class 1.5 accuracy as per IS and shall have suppressed scale for the lower values in the range.

16.5.0 Ammeters shall be of accuracy Class 1 as per IS unless otherwise specified.

16.6.0 Ammeter having suitable range shall be provided along with ammeter selector switch to read line currents in the incomer feeders. The selector switches shall have 3 way and OFF position. Necessary fascia plates to denote switch positions shall be provided. These ammeters shall have approximately uniform scale up to about full load current and suppressed end scale from 100% to at least for 150% full load.

16.7.0 Ammeters shall be suitable for the current transformers chosen. Calibration of the ammeters shall tally with the ratio of the current transformers.

16.8.0 Cushion stoppers and zero correction screws shall be provided for all meters.

16.9.0 All selector switches shall be of rotary type, spring loaded and of robust construction. The operating handle of these switches shall be knob type.

16.10.0 All auxiliary equipment such as shunts, transducers, CTs, VTs, etc. that are required shall also be included in the supply of the switchboard.

17.0.0 INDICATING LAMPS

17.1.0 Three-phase supply (R, Y, B) indication shall be provided on incomer panels.

17.2.0 Indicating lamps shall be of long life LED type.

17.3.0 All lamps shall be indigenously available and rated for 7 watts maximum.

17.4.0 Indication circuit shall be through separate contacts only.

17.5.0 Necessary preventive measures shall be ensured to avoid any malfunction of the connected circuit in the case of any fault in the indicating LED's.

17.6.0 All signaling lamps must have clarity of colour. The colour shall be in LED and not as an applied coating.

17.7.0 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.

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18.0.0 PUSH BUTTONS

18.1.0 Start and Stop push buttons shall be provided in compartments, as specified in the data sheet. Colour of push buttons knobs shall be as per relevant IS.

18.2.0 All push buttons shall have 1 N/O + N/C contacts, unless otherwise required.

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

19.0.0 ANTICONDENSATION HEATERS

19.1.0 Anti-condensation heater of adequate capacity, rated for 240 V AC, shall be provided in cable chamber and other necessary areas at easily accessible position as per manufactures design philosophy.

19.2.0 Necessary two pole ON/OFF switch with HRC fuse & neutral link (or two pole MCBs) shall be provided for each anti condensation heater circuit along with suitable thermostat for automatic temperature control.

19.3.0 Wiring of anti-condensation heaters shall be isolated or separately bundled from other internal wiring, preferably using a different colour.

20.0.0 CONTROL CABLE TERMINATION

20.1.0 All terminal blocks shall have adequate current carrying capacity. Termination of control wiring shall be done using terminals of reputed make and of proven design for long trouble free life.

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

20.3.0 Shorting links shall be provided for all CT terminals.

20.4.0 Terminals shall be compact and shall have high dielectric strength so as to prevent flashover and have thermal strength to prevent deterioration. All terminals shall be mounted on aluminium rails, with provision for addition of terminals.

20.5.0 Direct conductor termination type terminals of approved make will be acceptable up to 10 Sq.mm size. Bolted type terminals with crimping type lugs shall be provided for all cable connections greater than 10 Sq.mm.

20.6.0 Sufficient clearances shall be available between terminals when terminal lugs are fitted to them.

20.7.0 Necessary hardware required for cable termination like nuts, bolts, washers, spacers etc. for incoming and outgoing feeder shall be fitted and supplied.

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21.0.0 WIRING

- 21.1.0 The switchboard shall be completely pre-wired and ready for external connections at site.
- 21.2.0 All control wiring shall be carried out through common wire ways. These shall not cross the bus bar chamber. All control wiring shall be easily accessible for maintenance.
- 21.3.0 Control and power wiring shall be kept separate. Necessary colour codes shall be adopted for power and control wiring for easy identification.
- 21.4.0 Power wiring (inside module) shall be carried out with PVC insulated, stranded copper conductors of 650 Volts grade having adequate current carrying capacity. Size of power cables shall be chosen based on the compartment rating specified in Data sheet. Minimum size of conductor for power wiring shall be 4 Sq.mm copper.
- 21.5.0 Control wiring shall be carried out with 650 V grade, PVC insulated, copper conductor of size not less than 2.5 Sq.mm. Circuits involving current transformers shall have 2.5Sq.mm, 1100 V grade conductors.
- 21.6.0 Wiring shall be terminated in easily accessible terminal blocks. The wires shall be arranged neatly and the two ends of each wire and terminal block shall bear identification number/letter using unbreakable ferrules.
- 21.7.0 Control wiring wherever terminated shall be in single layer formation.
- 21.8.0 All inter panel control wiring shall be taken through PVC sleeves and this shall be done by the switch board manufacturer with the identification of wires and terminals for interconnection.
- 21.9.0 Control wiring in motor modules shall be wired through Normally Open contact of SDF to ensure that control supply is isolated when SDF is switched OFF.

22.0.0 INSULATION

- 22.1.0 The insulation between phases, between phases & neutral 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. Hylam shall not be used.
- 22.2.0 Minimum clearance between phases, or between connections of same phases separated electrically from each other, or between phases and neutral, or between phases and ground, shall be as per relevant standards. Details shall be furnished at the time of detailed engineering as per vendor data requirement.

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23.0.0 EARTHING

- 23.1.0 Earthing arrangement shall be in accordance with relevant Indian standards.
- 23.2.0 Continuous earthing strips designed to carry short time fault current specified in the data sheet shall be provided for the entire length of the switchboard. Strips shall be connected to the body of the switchboard by means of integral bolts, spring washers and nuts. Details shall be furnished at the time of detailed engineering as per vendor data requirement.
- 23.3.0 A minimum of 2 terminals shall be provided on the bus for external connection to earth grid.
- 23.4.0 All compartments of the switchboard shall be properly connected to the earth bus.
- 23.5.0 All non-current carrying metallic parts of the equipment shall be earthed.
- 23.6.0 All hinged doors and covers shall be provided with suitable flexible earthing connections.

24.0.0 NAME PLATE

- 24.1.0 A nameplate with the switchboard designation shall be fixed at the top of the central panel with letters not less than 25 mm high. Separate nameplates, giving feeder designation shall be provided on each compartment.
- 24.2.0 Necessary functional nameplate shall be provided for each component such as lamps, PBs, relays, switches, etc. mounted on the panel front. Module No. and feeder ratings shall be provided on each compartment.
- 24.3.0 Nameplates shall be of Non corrosive metal like stainless steel with letters engraved in it.
- 24.4.0 Nameplates shall be fastened by screws and not by adhesives.
- 24.5.0 The component nos. shall be painted / suitably identified inside the panel at appropriate points to give a permanent marking.
- 24.6.0 The size of the letters giving switchboards designation shall be 25 mm, for feeder details 20mm and for components 6mm unless otherwise specified in the data sheet.
- 24.7.0 Label designation and size of lettering subject to approval.

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25.0.0 PAINTING

25.1.0 All sheet steel work used in the construction of the switchboard shall be pretreated with 7-tank chemical process before applying the two coats of primer followed by synthetic enamel/epoxy paint.

26.0.0 DANGER NOTICE PLATES

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

27.0.0 TOOLS AND APPLIANCES

27.1.0 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.

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

28.0.0 TESTS

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

29.0.0 DOCUMENTS

29.1.0 Drawings and documents shall be furnished as per vendor data requirements attached separately with the Technical Procurement Specification.

30.0.0 INSTRUCTIONS TO TENDERER

30.1.0 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.

30.2.0 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.

30.3.0 Typical layout attached with this specification is indicative. Vendor can follow his design philosophy and manufacturing procedures, confirming to the requirement specified in data sheet. The GA drawing, control scheme etc shall be subject to approval from engineer in charge.

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

DATA SHEET	LOW VOLTAGE SWITCHBOARD	CD-ELE-ACIDS-LVSB	
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Sl.No.	Item description	Specification		
1.0	Service conditions			
1.1	Altitude	< 1000m above mean sea level		
1.2	Humidity	Min 64% - Max. 93%		
1.3	Humidity design	100% at 400C		
1.4	Ambient temperature 0 C- Design	50		
1.5	Environment	Highly corrosive industrial area, Presence of SO2 and other corrosive gases and chemical dusts, which can form conductive tracks.		
2.0	Switch board rating			
2.1	System voltage	415 V ± 10 %		
2.2	Frequency	50 Hz ± 5 %		
2.3	No. of phases / wires	3 Phase, 4 wire		
2.4	Fault level (sym.)	36 kA		
2.5	Neutral earthing	Solid		
2.6	Continuous rated current	400A		
2.7	Installation	Indoor, Electrically non exposed		
2.8	Degree of protection	IP 52 or better		
2.9	Panel access type	Single front		
2.10	Cable entry	Bottom		
2.11	Bus bars	Power	Neutral	Ground
	a) Short time rating	36 kA/ 1s	36 kA/ 1s	36 kA/ 3s
	b) Material and Insulation	Al, Sleeved, joints shrouded	Al, Sleeved, joints shrouded	Aluminium/ Cu Bare
2.12	Painting	7 tank sheet treatment and Powder coating.		
3.0	Compartment Details	Compartment No.	Description	Type
		1	I/C -I	Incomer
		2	I/C- II	Incomer
		3	CONT. TR	Control Supply
		4	TO CSS	Power Feeder
		5	TO SAP	Power Feeder
		6	TO DB NEAR P3	Power Feeder
		7	SPARE	Power Feeder
		8	SPARE (15kW)	Motor Feeder
		9	DM -1 (15kW)	Motor Feeder
		10	J7 (55 kW)	Motor Feeder
		11	SPARE (55 kW)	Motor Feeder
		12	RELAY PANEL	Control panel
4.0	Control /Aux. voltages			
4.1	Contactor coil control supply	110V AC		
4.2	Motor control supply	110V AC		
4.3	ON/OFF/TRIP Indication lamps and control supply ON indication	110V AC		

DATA SHEET	LOW VOLTAGE SWITCHBOARD	CD-ELE-ACIDS-LVSB	
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Sl.No.	Item description	Specification
4.4	Supply on (R,Y,B) indication in both incomers	230V AC
4.5	Anti-condensation heater	230V AC
4.6	AMF relay Aux. supply	24V DC
4.7	Auxiliary relay for AMF inputs and outputs (if required)	24V DC
5.0	AMF relay	
5.1	Auxiliary supply	24V DC
5.2	Voltage rating for both main and DG	415V± 10%
5.3	Rated frequency	50±5% Hz
5.4	Rated secondary current input	5A
5.5	Minimum number of programmable inputs required	5 Nos.
5.6	Minimum number of programmable inputs required	6 Nos.
5.7	Mode of operation required	Auto and Manual
5.8	Breaker/ Contactor control switches	Required
5.9	DG set Start/Stop control switches	Required
5.10	DG Start/Stop delay (programmable)	Required
6.0	Switch disconnecter fuse unit	
6.1	Utilization category	
	a) For motor feeder	AC23
	b) For power feeder	AC22 /AC23
6.2	ON-OFF position indicator/ dial plates.	Required
6.3	Padlocking facility in OFF position	Required
6.4	1NO+1NC auxiliary contact	Required
7.0	Metering CT	
	a) ISF	5
	b) Accuracy class	1

DATA SHEET	LOW VOLTAGE SWITCHBOARD	CD-ELE-ACIDS-LVSB	
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Sl.No.	Item description	Specification				
8.0	Requirement					
	Description	Compartments				
		Incomers	Control TR panel	Power Feeder	Motor Feeder	Control panel
8.1	Type of Compartment	Fixed	Fixed	Draw out	Draw out	Fixed
8.2	TPN Switch Disconnecter Fuse unit with HRC fuse and removable neutral link	Reqd.	-	Reqd.	Reqd.	-
8.3	TPN Ampere Rating	400	-	125	Reqd.	-
8.4	3 pole contactor	Reqd.	-	-	Reqd.	-
8.5	Bimetal overload relays with single phase preventer	-	-	-	Reqd.	-
8.6	SDF auxiliary contact 1NO+1NC	Reqd.	-	Reqd.	Reqd.	-
8.7	Contactor auxiliary contact 1NO+1NC	Reqd.	-	-	Reqd.	-
8.8	Current transformers for all phases (secondary 5A)	Reqd.	-	-	-	-
8.9	Current transformers for Y phase only (secondary 1A)	-	-	-	Reqd.	-
8.10	Availability of CT terminals for remote ammeter and shorting links	Reqd.	-	-	Reqd.	-
8.11	ON indication	Reqd.	Reqd.	Reqd.	Reqd.	-
8.12	OFF indication	Reqd.	-	Reqd.	Reqd.	-
8.13	Trip indication	-	-	-	Reqd.	-
8.14	ON Push Button	Reqd.	-	-	Reqd.	-
8.15	OFF Push Button	Reqd.	-	-	Reqd.	-
8.16	Ammeter	Reqd.	-	-	Reqd.	-
8.17	3 way & off ammeter selector switch	Reqd.	-	-	-	-
8.18	Voltmeter	Reqd.	-	-	-	-
8.19	3 way & off voltmeter selector switch	Reqd.	-	-	-	-
8.20	Terminal block	Reqd.	-	-	Reqd.	Reqd.
8.21	HRC fuse protection for control transformer primary	-	Reqd.	-	-	-
8.22	Control MCB (415V AC, 4 P) for Voltmeter, R,Y,B indication and AMF voltage input	Reqd.	-	-	-	-
8.23	Control MCB (230V AC)	As Reqd.	As Reqd.	As Reqd.	As Reqd.	As Reqd.
8.24	Control MCB (110V AC)	As Reqd.	As Reqd.	As Reqd.	As Reqd.	As Reqd.
8.25	R,Y,B indication	Reqd.	-	-	-	-

TECHNICAL PARTICULARS	LOW VOLTAGE SWITCHBOARD	CD-ELE-ACIDS-LVSB	
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1.0	Panel board					
1.1	Manufacturer's name					
1.2	Rated voltage					
1.3	Rated insulation voltage					
1.4	Maximum permissible operating voltage					
1.5	Nominal current rating of board					
1.6	Maximum temperature rise over ambient					
1.7	Thickness of load bearing members in mm					
1.8	Thickness of base frame in mm					
1.9	Thickness of door in mm					
1.10	Overall dimensions of switchboard (Length X Depth X Height) in mm					
1.11	Overall weight of switchboard in KG (Dynamic Loading if any shall be furnished)					
1.12	Dimension and weight of each shipping section (if transported as separate sections)					
2.0	Bus bar					
2.1	Material and grade of bus bars					
2.2	Type of bus bars	Horizontal Run		Vertical Run		Earth
		Phase	Neutral	Phase	Neutral	
	a) Rated current in amps					
	b) Short circuit withstand current in KA for 1 sec					
	c) Material & grade					
	d) Area of cross section					
	e) Type of insulation					
	f) Type of insulation at joints and tap-offs					
	g) Type of bus bar support					
2.3	Clearance of bus bar in air-Phase to phase					
2.4	Clearance of bus bar in air-Phase to neutral					
2.5	Clearance of bus bar in air-Phase to earth					

3.0	Auto Main Failure relay	
3.1	Auxiliary supply for the relay	
3.2	Voltage rating for both main and DG	
3.3	Rated frequency	
3.4	Rated Current input	
3.5	Mode of operation (Auto/ Manual)	
3.6	No. of programmable inputs and outputs	
3.7	Whether relay has Energy metering facility for both Mains & DG supply	
3.8	Whether remote start and stop for DG set available	
3.9	Whether potential free contacts for main and DG supply contactors available.	
4.0	Ammeter	
4.1	Make	
4.2	Range	
4.3	Accuracy Class	
5.0	Voltmeter	
5.1	Make	
5.2	Range	
5.3	Accuracy Class	
6.0	Connectors	
6.1	Make	
6.2	Rating	
7.0	LED Indication Lamps	
7.1	Make	
7.2	Rating	

DATA SHEET	LOW VOLTAGE SWITCHBOARD	CD-ELE-ACIDS-LVSB	
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Sl.No.	Item description	Specification				
8.0	Requirement					
	Description	Compartments				
		Incomers	Control TR panel	Power Feeder	Motor Feeder	Control panel
8.1	TPN SDF					
8.1.1	Make					
8.1.2	Utilization category					
8.1.3	Rated Current					
8.1.4	Whether HRC Fuse and removable neutral link included					
8.1.5	Whether Padlocking facility in OFF position available					
8.2	Power Contactor					
8.2.1	Make					
8.2.2	utilization category					
8.2.3	Rated Current					
8.3	Thermal Overload Relay					
8.3.1	Make					
8.3.2	Current Range					
8.3.3	Whether single phasing preventing feature available with the relay					
8.4	Current Transformer					
8.4.1	Make					
8.4.2	CT ratio					
8.4.3	Accuracy Class					
8.4.4	Insulation class					

TECHNICAL PROCUREMENT SPECIFICATION	SUB VENDOR LIST	CD-ELE-ACIDS-LVSB	
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Note: Make of switchgears shall be selected based on this sub vendor list. Offers without following this sub vendor list shall be rejected.

<u>TPN SDF</u> ABB GE L&T SIEMENS SCHNEIDER MITSUBISHI BCH	<u>BIMETAL OVERLOAD RELAY</u> ABB GE L&T SIEMENS SCHNEIDER
<u>CONTACTOR</u> ABB GE L&T SIEMENS SCHNEIDER MITSUBISHI BCH	<u>CONTROL & SELECTOR SWITCHES</u> KAYCEE ALSTOM TEKNIC EQVT. REPUTED MAKE
<u>MCB</u> ABB GE L&T SIEMENS SCHNEIDER LEGRAND INDO-ASIAN HAVELLS	<u>CONNECTOR</u> CONNECTWELL SIEMENS PHOENIX ELMEX EQVT. REPUTED MAKE

R0	08.04.2020	REV 0	SR / JJM	PK	SKA
REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

FACT - COCHIN DIVISION

TECHNICAL PROCUREMENT SPECIFICATION	COMPLIANCE STATEMENT	CD-ELE-ACIDS-LVSB	
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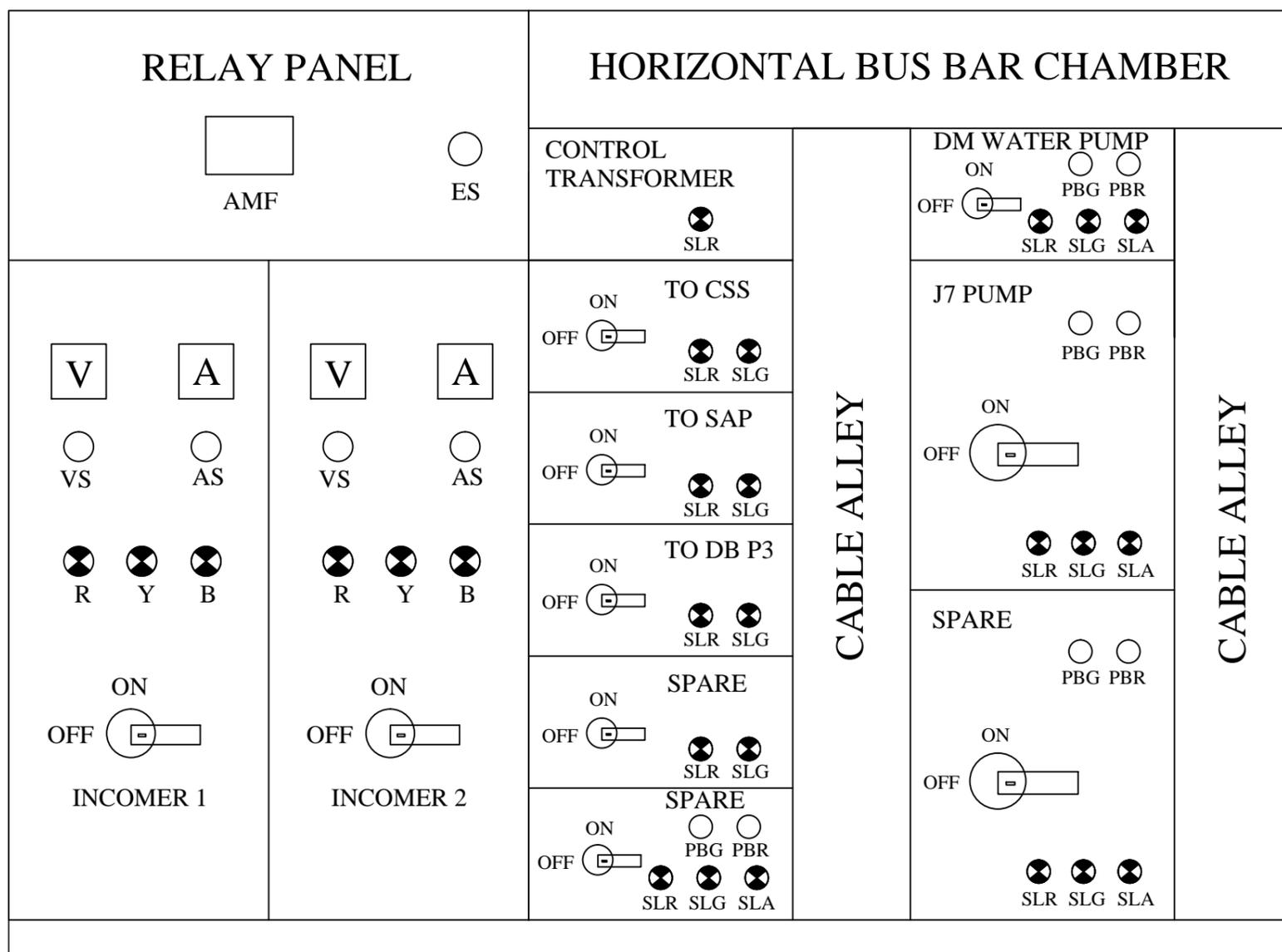
TPS No: CD-ELE-ACIDS-LVSB
We here by state that our Quotation No is in full compliance with the documents issued against the Enquiry No except for the deviations listed below.

LIST OF DEVIATIONS

Sl. No.	Document	Clause	Reasons for Deviation

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

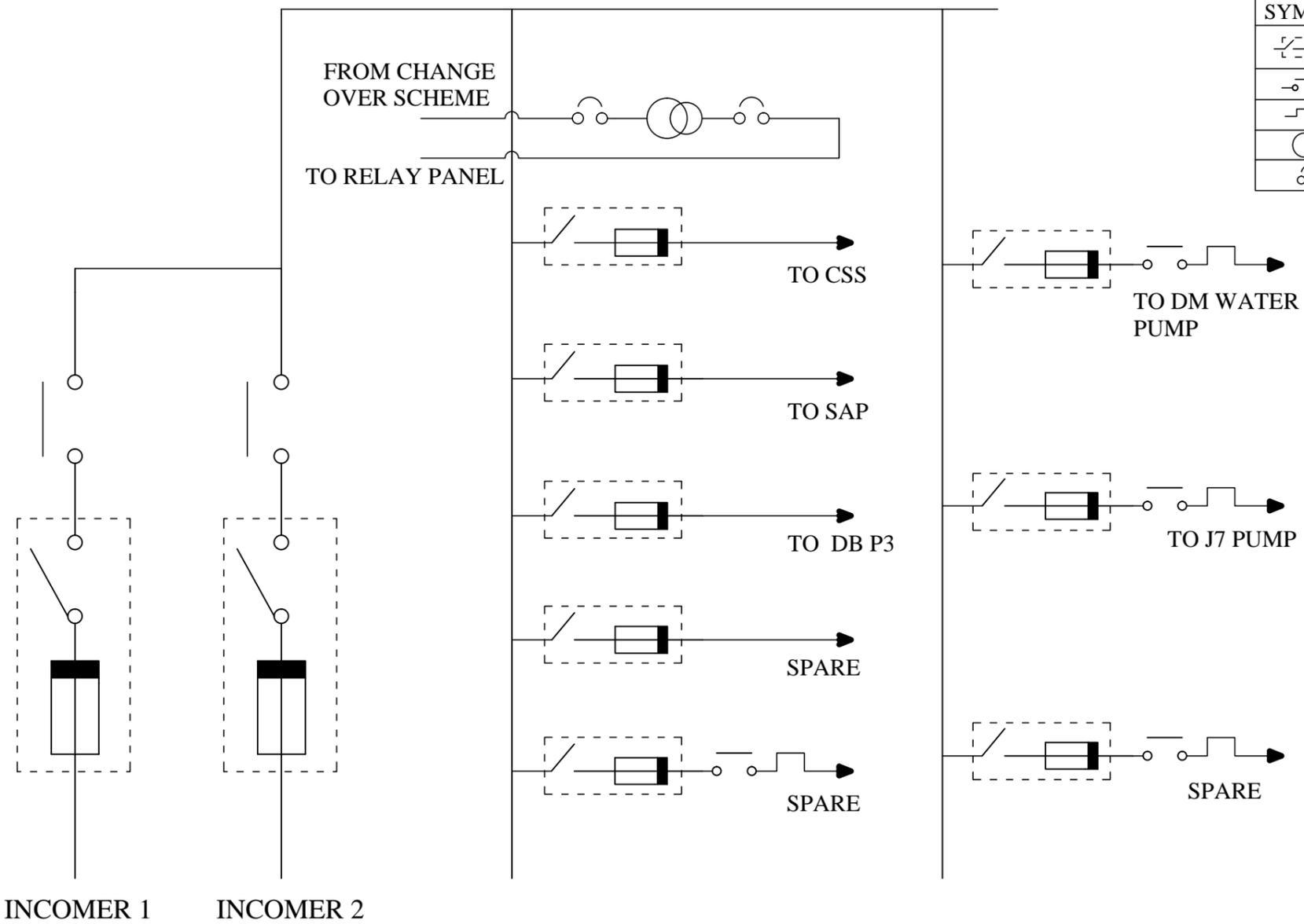
FACT - COCHIN DIVISION



LEGEND	
SYMBOL	DESCRIPTION
	AUTO MAINS FAILURE RELAY
	EMERGENCY STOP
	VOLT METER
	AMMETER
	VOLT METER SELECTOR SWITCH
	AMMETER SELECTOR SWITCH
	ISOLATOR
	SIGNAL LAMP RED ON INDICATION
	SIGNAL LAMP GREEN OFF INDICATION
	SIGNAL LAMP AMPER TRIP INDICATION
	STOP PUSH BUTTON
	START PUSH BUTTON
	3 PHASE SUPPLY ON INDICATION

GENERAL ARRANGEMENT

3 PHASE + N



LEGEND	
SYMBOL	DESCRIPTION
	SWITCH DISCONNECTOR FUSE UNIT
	CONTACTOR
	OVERLOAD RELAY
	CONTROL TRANSFORMER
	MCB

SINGLE LINE DIAGRAM