THE FERTILISERS AND CHEMICALS TRAVANCORE LTD.
(A Govt. of India Enterprises)
CORPORATE MATERIALS
PD Administrative Building,
Udyogamandal P.O.,
Ernakulam Dist., Kerala State, INDIA PIN 683501
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NOTICE INVITING GeM- TENDER

TENDER No. MM/172/G31818 dt. 25. 07. 2025

FACT INVITES ONLINE BIDS FROM eligible vendors for the Supply of 11 kV , 50 Hz, 3150A, 40 kA/3 Sec Indoor Vacuum Circuit Breaker Switchboard, fully conforming to the attached Technical Procurement Specification .

Description	
Nature of Bidding	Two Part Bidding: (Through GeM) 1st Part : Techno Commercial Bid 2 nd Part : Price Bid
Bid Validity	120 days from the date of Opening of Tender
Bid Submission End date and Time:	15.08.2025 ; 02: 00 PM
Part A - Bid opening date and Time:	15.08.2025 ; 02: 30 PM
Price Bid Opening Date	Techno Commercially qualified Tenderers only will be intimated
Scope of Work	Design, engineering, manufacturing, shop testing, inspection, packing, delivery to site of 11 kV , 3150A, 40KA/3sec Indoor, Vacuum Circuit Breaker switchboard , conforming to the attached specifications/ documents. Supply of critical spares for 11kV Switchboard at the 110kV Substation as per Annexure II of TPS No. : TPS-UC-SS-HVSB-02 Supervision for testing and commissioning of 11kV Indoor Vacuum Circuit Breaker Switchboard as per TPS : TPS-UC-SS-HVSB-02
Payment Terms	a) Payment of 90 % of the total supply value shall be paid within 30 days from the receipt of materials at site and acceptance by FACT. b) Balance 10 % of the total supply value along with the payment for testing and commissioning shall be paid after successful installation and commissioning of the system as per the specification. c) The bidder shall submit a performance guarantee for the system including software. An amount equivalent to 10 % of the order value shall be retained towards performance guarantee and shall be released only after successful completion of the warranty period. Alternatively the supplied can submit a performance bank guarantee for 10 % of the order value from a scheduled / nationalized bank with validity till end of the warranty period and for claim period of 6 months.
Delivery Period	Within 24 weeks from the date of receipt of approved drawing or 32 weeks from the date of LOI, whichever is earlier.
Pre Bid Meeting	Pre Bid Meeting shall be conducted on 04.08.2025 through Video Conferencing at 02: 00 PM Link for Google meet: https://meet.google.com/vnk-nezx-ygm
Bid Evaluation Basis	Techno Commercially Qualified L1
EMD	INR 1,00,000/-(Indian Rupees one lakh only)

Detailed specifications and other terms and conditions are mentioned in the Tender Documents.

NOTE: -

1. The Tender Documents can be downloaded from FACT website (www.fact.co.in) or from GeM Portal (http://gem.gov.in).

2. Payment against EMD shall be remitted through NEFT/ RTGS to the FACT's account. Other mode of payment will not be accepted. The details of the remittance of amount such as UTR No. as applicable shall be uploaded along with the tender document. Original EMD (UTR document etc) shall be sent/submitted before the due date and time of OPENING OF THE TECHNICAL BID to the office of Assistant General Manager (Materials)-SP & PF/FACT-PD, Udyogamandal.

3. Offers against this NIT shall be submitted online on GeM portal https://gem.gov.in. Offers submitted on any other platform or in any other mode or including e-mails, physical offers etc. shall not be accepted.

4. FACT reserves the right to accept /reject any request for extension of the due date of tender.

5. FACT reserves the right to accept/reject any or all bids at any stage without assigning any reason thereof.

6. Submission of BIDS: Part- I & Part- II Bids are to be submitted online in 2 separate covers as mentioned in GeM Portal.

7. Offers submitted other than on-line mode shall not be accepted.

8. Time extensions, Corrigendums, etc if any, will be hosted in the GeM website only. The bidders are requested to visit the website regularly for Corrigendums, time extensions etc. if any.

9. Integrity Pact: The bidders shall sign and submit an " Integrity Pact (IP)" to be executed between the bidder and Fertilisers and Chemicals Travancore Ltd. along with the bid. IP shall be implemented through the following Independent External Monitor (IEM) for the bid.

   1. Shri.Pradeep Kumar Jajoria,
      Flat No. 1002, Oberoi Maxima,
      JVLR, Jogeshwari East,
      Mumbai -400060;
      Email: pkjajoria@yahoo.com

   2. Shri. Arvind Kumar Arora,
      B-333, Chittaranjan Park,
      New Delhi-110019;
      Email: arvindarora333@gmail.com

   Note: In case bidders require any clarification pertaining to the tender please contact rishab@factltd.com, Phn: 0484 256 8204 / binduja@factltd.com, Phn : 0484 256 8253. Kindly note that the Independent External Monitor should NOT be contacted for clarifications regarding the tenders.

   The Original Integrity Pact signed by the bidder is to be submitted (can be also in plain paper) on or before the due date of the tender by Post / Courier to The Assistant General Manager(Materials) ESS, Materials Department, PD Administrative Building, FACT Ltd., Udyogamandal P.O, Ernakulam - 683501

   Scanned Copy of the Integrity Pact document duly filled and signed by the authorised representative of the bidder shall be submitted along with PARTA (PQC cum Techno-commercial) of the bid.

LIST OF ENCLOSURES :-

a) Technical Procurement Specification TPS-UC-SS-HVSB-02
b) Eligibility Criteria
c) Compliance Statement
d) Integrity Pact- Proforma
e) Performance Bank Guarantee- Proforma

ELIGIBILITY CRITERIA

TENDER No. MM/172/G31818 Dated 25.07.2025

Sl No	Eligibility Criteria - Conditions	Documents to be submitted along with bid	Bidders compliance
1	Bidder shall be Original Equipment Manufacturer (OEM)/ authorised dealer/ Channel Partner/ franchisee of 11 kV (minimum) switchboard which are manufactured, tested and dispatched from OEM factory with OEM make vacuum circuit breaker and numerical protection relay. **Switchboards manufactured by system integrators/ assemblers are not acceptable.**	a) (i) In case of OEM, self declaration stating that the 11 kV(minimum) switchboard is manufactured , tested and dispatched from OEM factory with OEM make vacuum circuit breaker and numerical protection relay. (ii) Quotation from authorized dealer/Channel Partner /franchisee shall accompany an authorization from the Original Equipment Manufacturer (OEM) for quoting this tender along with OEM self declaration specified in clause a (i). AND b) Details of OEM's Manufacturing facility. AND c) Copy of Manufacturing license/ BIS License issued by competent authority.	
2	The Bidder shall have experience in supply of atleast seven numbers of 11 kV (minimum),3150 Amps, 40 kA or above rated switch boards in India during last seven (7) years ending on the date of bid submission due date.	a) Copies of relevant Purchase Orders/ work Orders AND b) At least one of the following documents in proof of completed supply of the purchase order/work order submitted against (a) above. (i) Copies of tax invoice/ bank statement for completed payment authorized by bank. (ii) Copies of delivery receipt authorized by client. (iii) Copies of AMC reports having relevant details to relate with Purchase Orders/Work Orders. (iv) Copies of MOM / Commissioning report/ Performance report having relevant details to relate with Purchase Orders/ Work orders.	
4	a) Average annual turnover of the bidder for the last three financial years ending on 31-03-2024 shall be at least Rs. 982/- Lakhs or above and b) Annual turnover for each year shall be at least Rs. 147 /- lakhs or above during the last three financial years ending on 31-03-2024	Self-attested copies of audited financial statements (Profit & Loss Account and Balance Sheet/ audited financial turnover certificate) for the last three financial years ending on 31-03-2024	

NOTE: -

1) All relevant documents for satisfying the pre-qualification criteria shall be enclosed in the techno-commercial bid, without which the offer is liable to be rejected without seeking further clarifications. FACT shall have the liberty to verify the documents /data submitted by the vendor as proof for meeting the pre qualification.
2) Pre- qualified bids will only be considered for technical evaluation. Technically and commercially acceptable bidders will only be considered for Price Bid opening. Copies of all the above documents shall be duly attested by the bidder.
3) If the bidder is an authorised dealer/channel partner /franchisee/system integrator of OEM, the submitted documents against clause no.2 shall be of the offered make. Documents proving supply experience of the offered make directly by OEM is also acceptable.
4) IMPORTANT: In case of ambiguity or incomplete or non submission of required relevant documents along with bid, FACT reserves the right, at its option, to reject the Bidders Bid without assigning any reason and without notice.

TECHNICAL PROCUREMENT SPECIFICATION

FOR

11kV, 50 Hz, 3150A SWITCH BOARD AT 110kV SUBSTATION

FACT-UC

TPS NO. : TPS-UC-SS-HVSB-02

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE ON:	REVISION:
26/03/25	26.03.25	Ashajmmmd		R 0
Anu Vyshnavi. R AMD (Electrical)	Faizal Latheef K.A AGM(E)-SS&SP	Shajan V.A DGM (E) UC		

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1.0 INTRODUCTION

1.1. This specification gives minimum user requirements for a new 11kV, 50Hz, 3150A Internally Arc Flash Protected Indoor Switch Board (IAC AFLR) with PLC / Numerical Relay controlled Auto Bus Transfer System, intended to commission in the 110kV substation of FACT Udyogamandal, Kochi, Kerala for replacement in lieu of existing ALIND make panel.

1.2. Fertilisers And Chemicals Travancore (FACT) is a Government of India Enterprise engaged in manufacture of fertilizer, chemical & petrochemical products, engineering consultancy and engineering fabrication. FACT-Udyogamandal Complex (FACT-UC) is a division of FACT located at Udyogamandal, Kochi, Kerala that manufactures intermediates and products like sulphuric acid, oleum, ammonia, ammonium phosphate, ammonium sulphate, caprolactum etc.

1.3 Vendor's scope shall include design, selection, material, manufacture, assembly, painting, packaging, supply, assistance for testing & commissioning and operational/ maintenance training of the Indoor switch board. Only reputed manufactures of 11 kV panels with their own Arc Flash protected switch board panels, circuit breakers and numerical protective relays or their authorized dealers/channel partners/franchisees are eligible to participate in the tender. The major works like design, engineering, manufacture, busbar assembly, power joints, interlock mechanisms and panel control wiring etc must be carried out at OEM's factory to ensure quality and reliability.

1.4 The feeder details of proposed switch board are provided in the data sheet.

1.5 The electrics supplied shall be complete with all accessories for the safe, smooth and efficient operation of the system and shall comply with all required latest statutory requirements and standards.

1.6 Every component shall be brand new and shall be of proven design for safety, reliability and durability. Makes of the offered components mentioned in Annexure-III shall be specified during the drawing approval stage and obtain approval from FACT.

1.7 The vendor shall provide warranty as specified in section 23 herein.

1.8 This is a two bid enquiry with Pre-Qualification Criteria. An unpriced copy of the price bid as specified in Annexure-IV shall be attached with the technical bid for technical evaluation.

1.9 Only offers that comply with the requirements as specified in the bid documents and specification shall be considered for further evaluation. If the vendor however finds some deviation unavoidable, such deviations shall be clearly mentioned in the compliance statement in the specified format (Annexure–V) with proper justification. The purchaser reserves the right to reject or accept the offer with such deviations.

1.10 Bidders are advised to visit the site before quoting for better understanding of the scope and prevailing site conditions before bidding.

2.0 PERIOD OF COMPLETION

2.1 The vendor shall complete the supply of the panel within a period of 24 weeks from date of final drawing approval or 32 weeks from the date of LOI, whichever is earlier. In case delivery is delayed beyond the period stipulated above, LD @ 0.5% of the total basic order value for every week delay, limited to a maximum of 10% of the total basic order value will be deducted from the bill. The drawings for review/approval shall be submitted within 20 days from the date of LOI. Revised final drawings for final approval, after incorporating the comments/changes from

Purchaser, if any, shall be submitted within 15 days from date of intimation of comments/changes in drawing from Purchaser.

2.2 Vendor shall complete the testing & commissioning assistance within a period of 4 weeks from date of work- to -proceed notice. The panel shall be commissioned only during annual shutdown of plants cited in Udyogamandal facility.

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

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

3 SCOPE

3.1 SCOPE OF VENDOR

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

3.1.2 Furnishing all drawings and documents as per section 22, 'Vendor Data Requirements'

3.1.3 Inspection and tests as per section 19.

3.1.4 Supply of critical spares as per Annexure-II.

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

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

3.2 SCOPE OF PURCHASER

3.2.1 Installation, commissioning and associated civil works comes under the scope of FACT. Commissioning of the 11kV panel shall be performed when the work front is ready, during the annual plant shutdown period.

3.2.2 230V, 50Hz AC auxiliary supply required for space heaters, panel illumination and socket outlets.

3.2.3 110V DC for control circuits.

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

4 GENERAL REQUIREMENTS

4.1 The panel covered in this specification is for replacing existing 11kV ALIND make panel at the 110 kV substation. Tentative schematic diagram incorporating all existing feeder panels is given in Annexure-VI attached with this TPS.

4.2 The switchgear shall be used to supply power to HV motors, transformers and other loads for various plants.

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4.3 Duty involves direct on line starting of large induction motors and also under certain emergency conditions transfer of loads from normal to stand-by source of supply.

4.4 The motor starting current varies from 6 to 8 times the full-load current, with a maximum of 3 starts per hour.

4.5 The switchgear shall be located in a clean but hot, humid and tropical atmosphere.

4.6 Switchgear ratings and quantities are detailed in the enclosed drawings and annexure. Equipment shall be furnished in strict accordance with the same. For indicative power distribution scheme "Proposed SLD for 11kV Switchboard, DRG. No: FACT-UD-110kV-SS-11kV-SWBD" shall be referred. All the rating shown in the above drawing represents the minimum requirement only; exact rating, number and type of feeders etc. shall be decided by the bidder.

4.7 For continuous operation at specified ratings, temperature rise of the various switchgear components shall be limited to the permissible values stipulated in the relevant IEC standards.

4.8 The Switchgear and components thereof shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit current listed in the annexure without any damage or deterioration of material.

4.9 Circuit breaker shall not produce any harmful over-voltage during switching off induction motors, unloaded lines and unloaded transformers. If required, surge protective device shall be provided in the scope of supply to limit over-voltage

4.10 The switchgear shall confirm to the latest IEC 62271-200, IAC-AFLR-40kA 1 sec, PM, LSC 2B which means that the panels shall be four side internal arc tested, shall have metal partitions and shall confirm to loss of service continuity.

4.11 To have a complete assurance of the quality of the product the manufacturer should have the capability of manufacturing of the critical components of the switchgear in-house. The Panel Enclosure, Circuit Breaker Mechanisms, Interrupting Poles / Vacuum Interrupters, Main Numerical Protection Relays shall be of the same make for totally co-coordinated and proven performance.

4.12 The proposed 11 kV switchboard shall have the following features-

i. Four incomers designated as I1, I2, I3 and I4.

ii. Three Bus-couplers designated as BC1, BC2 and BC3.

iii. Four Bus sections designated as Bus-1, Bus-2, Bus-3 and Bus-4.

iv. Bus risers as per standard manufacture's practice for connecting different horizontal bus sections of the switchboard.

v. 21 Nos. of outgoing feeders - 11 Nos. of power feeders, 8 Nos. of transformer feeders and 2 nos. capacitor bank feeders.

vi. Feeder Potential transformer for selected feeders. (Refer SLD in Annexure VI attached with the TPS).

vii. PLC/Numerical relay-controlled Auto Bus Transfer scheme (ABTS) as detailed in Section 21 and logic diagram attached with the TPS.

viii. Paralleling scheme using Synchro-check relay as per clause 4.17.

4.13 Metal clad switch board shall be complete with all the accessories for efficient and trouble-free

operation. The equipment offered shall be safe, reliable, and compact to install. The circuit breaker, switches and protective device shall be of latest design to ensure rapid and efficient interruption of fault current, small arcing time and freedom from fire hazards.The equipment shall operate satisfactorily at the rated load under the service conditions and power supply conditions specified in the data sheets.

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

4.15 Offered switchgear panel shall be four side internal arc fault type tested for 40kA-1 sec and shall be compliant to the latest IEC 62271-200. Internal arc testing is intended to verify the effectiveness of the switchgear design in protecting persons in case of an internal electrical explosion, to safely contain any internal pressure rise and vent the flame and exhaust gas into designated areas. Bidder to submit 40kA- 1 sec Internal arc type test report carried out on the offered model of 11kV panel, at the time of bidding. The type test certification shall be done by OEM and shall carry out assembly as per type tested design. Suitable relays to be provided as per manufacture's standard practice for tripping respective breaker during an internal arc. Arc flash optical sensors of required quantity are to be provided in each cable compartment, each breaker chamber and entire bus bar chambers.

4.16 The arc flash protection relay shall be integrated with numerical protection relay as per manufacture's standard practice. Arc flash protection relay shall be configured to provide different trip settings and zone segregation based on the zone in which the detected arc flash event occurs. Internal arc in breaker chamber or bus bar chamber shall trip the respective incomer and an internal arc in outgoing cable compartment shall trip the respective breaker. In case of internal arc detection in incoming panel cable chamber, respective multiplication contacts to be provided for tripping upstream breaker (upstream breaker in customer scope).

4.17 It shall be possible to parallel two separate live buses manually with the support of Synchro-check relay for each point of paralleling. For closing of desired Bus coupler/ Incomer, initially synchro-check relay shall be activated with the help of ON/OFF switch. When energized, the relay will check the electrical parameters for all three phases on both live buses. GREEN LED shall glow if synchro-check is OK. When electrical parameters on both the sections of Bus-coupler/ Incomer is synchronized with GREEN LED ON and TNC switch is in 'close' position, the intended Bus coupler/ Incomer shall get closed.

4.18 The ABTS scheme shall work only if 'ON'/'OFF (Manual)' switch is in ON position. However, it shall be possible to manually close the breaker if the switch is shifted to OFF (MANUAL) position. MANUAL closing is to be activated through PLC or relays and shall take care of associated conditions of breaker, voltage, relay etc as per manufacturer's design. Manual closing shall be activated only after ensuring the absence of fault on both the buses to ensure safe closing.

4.19 The workmanship shall be of the highest quality and shall conform to the latest modern practices for the manufacture of high technology machinery and electrical switch board.

4.20 In case if the ABTS scheme is implemented using PLC, sufficient number of multiple potential free contacts have to be provided for required relays for integration of PLC.

4.21 The Switch board panel shall be free standing, floor mounted, fully compartmentalized, metal enclosed construction complying latest IS and IEC standards. Each breaker panel shall be compartmentalized with separate metallic partition. Separate breaker draw out truck compartments, HV bus compartment, incomer cable compartments and control cubicles are required.

4.22 The offered switchboard shall be compatible to incorporate SCADA connectivity considering future expansion.

4.23 Temperature sensors shall be mounted for thermal monitoring on all the three phases of incoming and outgoing feeder's bus bars, bus bar chambers (qty. as per manufacturer's standard design) and inside cable chamber. Required number of HMI to be provided on panel. Temperature sensors shall be communicable and shall transfer data to the respective HMI via IEC 61850 or other available communication protocol. The temperature sensors installed shall be installed with direct contact to hot point, to achieve accuracy of $\pm$ 2°C, self-powered (no auxiliary supply, no battery), communicate wirelessly, Operate from -25°C to +125 °C. The system shall allow 2 configurable thresholds (pre-alarm and alarm). This system shall have integrated algorithms enabling to anticipate as early as possible an abnormal temperature before damage occurs i.e. strong predictive capacity.

4.24 It shall be possible to carry out all operations of circuit breaker, disconnection, earthing, spring charging etc. from front side of the Switch board.

4.25 Each panel shall be provided with one earth bus of suitable size. The earth bus shall be of suitably rated tinned/nickel plated copper or aluminium.

4.26 Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

4.27 The switchgear assembly shall comprise a continuous, dead-front, line-up of free standing, vertical cubicles. Each cubicle shall have a front-hinged door with latches and a removable back cover. All covers and doors shall be provided with neoprene gaskets.

4.28 Switchgear cubicle shall be so sized as to permit opening of the front access door only when the breaker is pulled out to TEST position. The movement of the Circuit Breaker from TEST to SERVICE position should be possible only with the Breaker door closed. The working zone shall be restricted within 750 mm to 1950 mm from floor level.

4.29 Circuit breakers, instrument transformers, bus bars, cable compartment etc., shall be housed in separate compartments within the cubicle. The design shall be such that failure of one equipment shall not affect the adjacent units.

4.30 All relays, meters, breaker control switches, selector switches and indicating lamps shall be flush mounted on the respective cubicle door or on control cabinet built on the front of the cubicle. AC/DC auxiliary supply switches / isolation switches for cubicle space heater, cubicle lamp, spring charging motor circuit shall be located inside metering compartment.

4.31 Dummy panel shall be provided in the switchgear line up, if required, for easy termination access

of power and control cables. Dummy panel / bus trunking panel shall be of full cubicle with closed roof and rear cover similar to enclosures for active cubicles.

4.32 The panel and associated spares shall be dispatched in suitable wooden packing or equivalent packing to prevent any damage during transit.

4.33 The panel is intended to be installed on the first floor of the 110kV substation building. There are three beams located in the designated panel area. The panel design shall ensure that the dummy panel, bus coupler, or bus riser occupies the beam locations, so that the incomer and outgoing feeders do not interfere with the beams. This will facilitate bottom cable entry. The beam layout and room dimensions for the designated panel placement area will be provided during the detailed engineering stage.

4.34 The manufacturer should do the complete assembly and testing of the Circuit Breaker, the associated cubicle inside his own premises.

5.0 CODES AND STANDARDS

All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

Sl.No.	Standard	Title
1.	IEC 62271-200	High-voltage switchgear and controlgear- AC metal-enclosed switchgear and controlgear for rated voltages above 1kV and upto and including 52kV.
2.	IEC 62271-100	High-voltage switchgear and control gear - Alternating-current circuit-breakers
3.	IS:3156/ IEC 61869-1&3	Voltage Transformers
4.	IS:2705/ IEC 61869-1&2	Current Transformers
5.	IS:5578	Guide for marking of insulated conductors
6.	IS:1248	Direct acting electrical indicating instruments
7.	IS:3231	Electrical relays for power systems protection
8.	IS:2551	Danger Notice Plates
9.	IS:11353	Guide for uniform system of marking and identification of conductors and apparatus terminals
10.	IS:3043	Code of practice for earthing
11.	IS:10601	Dimensions of terminals of high voltage switchgear and control gear
12.	IS:722	AC electricity meters
13.	IS:1901	Visual indicator lamps
14.	IS:3842	Application guide for electrical relays for ac systems
15.	IS:4146	Application guide for Voltage Transformers
16.	IS:4201	Application guide for Current Transformers
17.	IS:4483	Flush mounting IDMTL relays
18.	IS:6875	Push buttons and related control switches (for voltages upto

Sl.No.	Standard	Title
19.	IEC 62271-102:	High-voltage switchgear and control-gear- Alternating current disconnectors and earthing switches.
20.	IEC 61850	Communication Networks and Systems for power utility automation

All other included items shall conform to latest IEC/IS standards. The electrical installation shall meet the requirements of Indian Electricity Rules/ CEA Rules and regulations as amended up to date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

6.0 CONSTRUCTION

6.1.0 GENERAL

6.1.1 The panel material, excluding doors and end covers, shall be made of highly corrosion-resistant Aluzinc with a minimum thickness of 2 mm. The doors, end covers, and cubicle partitions shall be made of high-quality steel sheets with a minimum thickness of 2 mm. The panel shall be fully enclosed, dust, damp and vermin proof, floor mounted and free-standing type with service- test-draw out features. The degree of protection shall be as specified in the data sheet. Vertical units shall be assembled to form a continuous line up of uniform height and front lineup.

6.1.2 Front access with hinged doors shall be available to all components in the cubicle, which require adjustment, maintenance or replacement.

6.1.3. Rear access shall be available to cable box, cable glands, multi core terminal block etc. with bolted covers. It is not accepted to open a door or a cover to make measurement or access data if it compromises internal arc performance.

6.1.4 Mesh like construction shall be provided beneath the rear cover to prevent immediate access to the live cable and bus. Special attention must be given so that all the apparatus shall be designed to obviate the risk of accidental short circuit due to insects, mites, rodents or microorganisms.

6.1.5 All doors shall be hinged at one end and shall be bolted (knob/equivalent type) on the other end.

6.1.6 All barriers used shall be manufactured from non-inflammable material. All hardware shall be corrosion resistant. Inspection windows shall be provided on VCB door and shall be made of toughened glass. As per IEC 62271-200, it should bear the same mechanical strength as that of the enclosure.

6.1.7 Each Circuit breaker shall be housed in a separate compartment and shall be enclosed on all sides.

6.1.8 Switchboard comprising of a number of Circuit breaker panels, shall be of unit construction to enable the board to be broken down into sections for shipping to site and to be correctly reassembled and erected on prepared foundations. Inter panel and inter compartmental wiring shall preferably be protected by heavy gauge solid metal conduit, trunking or through gromet provided in LV chamber.

6.1.9 The construction of switchboard shall be reliable, safe, self-contained, compact, interchangeable,

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

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

6.1.11 Gland plate of sufficient size shall be provided for both power cables and control cables in each panel.

6.1.12 Special provisions should be made for anti-condensation/moisture proof to eliminate high voltage tracking phenomenon, corrosion effect and improve insulation life. Design each feeder with additional space heater arrangement. Parts such as hangers, supports shall be hot dip galvanized as per IS: 2629 (latest edition) & IS: 4826 with zinc plating and olive green passivation. The material for springs of shutter mechanism etc. shall be rust proof. All metal bolts and nuts to be used in busbars, panels and earthing work shall be made of stainless steel (SS) with heavy duty double flat washer (SS) and locking spring washer. Each individual feeder panel shall be provided with metal enclosure on all sides and shall be sent as individual panel.

6.1.13 Each power compartments should be fitted with individual pressure relief flaps on its top surface. Switchgears shall be equipped with all safety interlocks for upmost safety of personnel and equipment. Special Deflector/Gas duct type of arrangement should be provided at top of every breaker confirming to IAC test for 1 sec. i.e. as per IEC 62271-200 ensuring full safety.

6.2.0 **MOVABLE SECTION**

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

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

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

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

6.3.0 **FRONT COMPARTMENT RECEIVING OF THE MOVABLE TRUCK**

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

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6.3.2 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 available and clearly marked.

6.4.0 **CABLE HEAD COMPARTMENT**

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

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

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

6.4.4 Suitable arc propagation barriers / Independent pressure relief flaps shall be provided for different compartments as per manufacture's standard design.

6.5.0 **BUS BAR COMPARTMENT**

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

6.5.2 The bus bar compartment shall be provided with riveted covers with suitable arc pressure relief mechanism. Provision for inspection and cleaning of the busbar shall also be provided as per manufacture's standards.

6.6.0 **LOW VOLTAGE COMPARTMENT**

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

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

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

6.7.0 **ACCESSIBILITY**

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

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

6.7.3 Access to Current Transformers shall be through rear bolted covers. Access to busbar chamber shall be as per the OEM type tested design.

7.0 CIRCUIT BREAKER

7.1.0 The circuit breaker shall be vacuum circuit breaker and rating as mentioned in the data sheet and suitable for indoor use. The Circuit breaker shall be of three pole, horizontal draw-out type, low surge type, encapsulated with embedded pole, unless otherwise specified in the data sheet. The ratings specified shall be for operating condition inside the panel, at site. Circuit breaker shall have in-built trolley/truck for ease of handling and maintenance. Cassette type VCB is not acceptable. VCB shall be tested for E2,C2,M2 class as per IEC 62271-100. The vacuum interrupters used in the circuit breaker must be manufactured by the same manufacturer as that of the switchgear. Both the incoming and outgoing moving contacts shall be uniform in design, either figure type or tulip type, mixing of different types of contact in same CB truck is not allowed. The vacuum interrupter is compulsorily to be vertically mounted. Horizontal mounted vacuum interrupters are not acceptable.

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

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

7.4.0 Lockout-Tagout provisions shall be provided for circuit breakers for ensuring the safety of workers during maintenance or repair works.

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

Circuit Breakers shall be compatible to switch capacitor bank feeders also. Additional surge protections required if any shall incorporated in such feeders.

Vaccum Circuit breaker assembly shall be of same OEM make as that of panel OEM (Original Equipment Manufacturer).

7.6.0 Minimum technical requirements of Vacuum Circuit breaker:

a.	Rated Voltage	11kV	
b.	Rated Current	Incomer	3150 A
		Bus coupler	3150 A
		Outgoing feeders	2000 A
c.	Rated Frequency	50 Hz	
d.	Impulse withstand voltage (peak)	75kV (min), 1.2/50 µs	
e.	Power frequency withstand voltage (rms)	28kV (min) for 60sec	
f.	Symmetrical breaking capacity	40 kA (min)	
g.	Short time current	40kA for 3 sec	
h.	Short circuit making current (peak)	100 kA (min)	
i.	Closing coil voltage	110V DC	
	Tripping coil voltage	110V DC	

7.7.0 **CIRCUIT BREAKER CONTACTS**

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

7.7.2 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.

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

7.8.0 **OPERATING MECHANISM**

7.8.1 The operating mechanism of the CB shall be quick make, quick break type and trip free as per relevant code of practice.

7.8.2 Circuit breaker shall be provided with electrically operated motor charged spring closing mechanism.

7.8.3 The closing coils and other auxiliary devices shall operate satisfactorily between 85 and 110% of the rated auxiliary supply voltage indicated in the data sheet.

7.8.4 In motor charged spring closing mechanism, the charging of the closing spring shall be automatically initiated after every closing operation. It shall be ensured that the closing operation shall be possible only when the springs are fully charged. Suitable protection circuit, limit switches, etc. shall be provided for protection of the spring charging motor and to cut out the motor when the springs are fully charged.

7.8.5 Irrespective of the mode of operation of the breaker, independent manual closing arrangements shall also be provided as a standard feature, for emergency and testing purposes. Necessary operating handles shall also be supplied.

7.8.6 Closing and tripping devices for both electrical and mechanical arrangements shall be provided & shall be located in the front of CB.

7.8.7 A mechanical interlock shall be provided for preventing any inadvertent, undesired operation. For instance, closing the breaker when the springs are being charged.

7.8.8 Anti pumping relay & circuitry / anti pumping feature shall be provided in the closing circuit of the CB to ensure that it does not reclose automatically after a tripping or in the case of failure to close, even if the closing impulse is maintained. Anti-pumping device can be part of VCB also.

7.8.9 The control circuit shall be suitable for local as well as remote control. Each control circuit tapping shall be provided with fuses.

7.8.10 The control and other auxiliary connections from the CB to the cubicle shall be through plugs and

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sockets, as per manufacturer's standard rating, located at either ends and connected through flexible jumpers. The jumper shall have sufficient number of spare cores to utilize all the spare auxiliary contacts and it shall be long enough to maintain connection in the test position of the truck. Spare auxiliary contacts are to be wired up to LT chamber of panel terminated in suitable connectors.

Each breaker shall be provided with the following:

a) Auxiliary switch, with sufficient number of separate NO + NC contacts, mounted on the draw out portion of the switchgear. Additional 20% spare contacts each for NO & NC are to be provided.

b) Position/cell switch one each for TEST and SERVICE position.

c) Auxiliary switch, with sufficient number of separate NO + NC contacts (minimum 4 contacts each), mounted on the stationary portion of the switchgear and operated mechanically by a sliding lever from the breaker in SERVICE position. Additional 20% spare contacts each for NO & NC are to be provided.

7.9.0 CB POSITIONS & INDICATION

7.9.1 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.

7.9.2 It shall be possible to release the mechanical stop of the truck in the "test position" in order to drawout the truck fully after severing the control connections. Cable and bus bar isolating connections shall be automatically screened by the automatically operated shutters, before the CB reaches isolation position.

7.9.3 An automatic visual indication shall be provided to indicate "spring charged" / "discharged" positions, in the case of circuit breaker with spring charging mechanism.

7.9.4 Red / Green / Amber / Clear indicating lamps shall be provided for ON /OFF / TRIPPED ON FAULT / BREAKER READY FOR ON indications respectively. Blue lamps shall be provided in the case of non-trip alarms and DC failure alarms. A White lamp and test button shall also be provided for 'TRIP CIRCUIT HEALTHY' indication. Indication circuit shall be through separate contacts only.

7.9.5 Lamps shall be clustered type LED module pilot lights in thermoplastic enclosure. LED shall have sufficient illumination and shall be replaceable from front.

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7.10.0 **POSITIVE INTERLOCKS OF THE CB**

7.10.1 It shall not be possible to close the circuit breaker unless it is fully "plugged in" (truck in service position) or in test position or fully isolated or has been completely removed from the cubicle.

7.10.2 It shall not be possible to discharge the closing spring if the CB is in closed position already.

7.10.3 It shall not be possible to close the circuit breaker unless the closing spring is fully charged.

7.10.4 Interlock shall be provided to prevent pushing in/ drawing out of the breaker truck when the breaker is in the closed position.

7.10.5 A breaker in closed condition cannot be inserted into a panel in the Service position or cannot be taken out from panel when in SERVICE position.

7.10.6 A breaker cannot be operated in between TEST & SERVICE position.

7.10.7 The breaker shall not be moved either test to service or vice versa in ON position.

7.10.8 The breaker shall not be switched ON in any position other than test or service.

7.10.9 Suitable interlocks shall be provided to prevent faulty operation as per manufacturer's standard design.

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

8.0 BUS BAR

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

8.2 Bus bars shall be of high conductivity aluminium and shall be continuously rated for the rated current and service conditions specified. Busbars shall be provided with heat shrinkable PVC insulated sleeves and busbar joints shall be shrouded.

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

8.4 Rigid insulating barriers / protection guards /wire meshes as applicable as per type tested design shall be provided between the group of line busbars and other parts, so as to eliminate danger to personnel due to accidental contact.

8.5 Thermal design of the bus bars shall be based on installation of the switch board in poorly ventilated conditions. Current carrying capacity of bus bar shall be in-panel rated.

8.6 The busbar supports shall be non-hygroscopic, epoxy resin material with anti-tracking features to prevent flashovers. These shall have high tracking index and be mechanically strong. Hylam is not acceptable.

8.7 The bus bars and busbar supports shall withstand the dynamic, thermal & magnetic stresses and strains due to the maximum short circuit current corresponding to the fault level indicated in the data sheet, without any deformation, deterioration or damage.

8.8 Suitable provisions shall be made for the expansion and contraction of the bus caused by temperature variation and due consideration shall be given for reactance, proximity and skin effects also, while choosing the sizes and spacing of busbars.

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

8.10 Appropriate identification marking / labels shall be provided on the busbars and tappings for distinguishing the various phases. Bus bars shall be color coded for easy identification.

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

8.12 Busbar sizing calculation to be submitted.

9.0 INSTRUMENT TRANSFORMERS

9.1.0 CURRENT TRANSFORMER

9.1.1 CTs shall conform to relevant IS/IEC and shall be cast resin insulated. They shall be mounted on switch board stationary part. All secondary connections shall be brought out to terminal blocks where wye or delta connection shall be made.

9.1.2 CTs for metering and protection shall be selected suitably to meet the individual requirements of meters and relays specified in the datasheet.

9.1.3 CTs 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 0.5, unless otherwise specified.

9.1.4 CTs for protection purposes shall have sufficient accuracy, burden and accuracy limit factor for necessary co-ordination/discrimination for clearing the faults. Accuracy limit factor for protection shall not be less than 20 and accuracy class shall be 5P.

9.1.5 CTs shall be provided with polarity markings, adjacent to terminals, both for primary and secondary. These shall be legible even after years of service.

9.1.6 Unused CT terminals must be short circuited.

9.1.7 The CT terminals which have been used shall be provided with links to facilitate shorting / earthing as and when required (when load / burden on CT is disconnected).

9.1.8 All live terminals shall be shrouded to prevent accidental contact.

9.1.9 All CTs shall have undergone routine tests as specified in relevant Indian standards

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9.2.0 **VOLTAGE TRANSFORMER**

9.2.1 VTs shall conform to relevant Indian Standards/ IEC and shall be cast resin insulated.

9.2.2 VTs shall have suitable accuracy and capacity for the satisfactory operation of the protection, instrumentation and metering specified in the data sheet / drawings enclosed. The class of accuracy and the burden of VTs selected shall be adequate for the destined different purposes.

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

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

9.2.5 Line VT (on each incomer) and Bus VT on each bus section are required. VTs on certain outgoing feeders are required as detailed in data sheet.

9.2.6 Line PTs shall be mounted on VCB truck also. Rack in rack out operation of PT, inside the panel, shall be independent/ along with VCB. Racking operation of the PT shall be possible only in closed door condition similar to VCB. The complete switchgear panel surfaces inside as well as outside should be powder coated with epoxy resin, standard colour RAL 7035 with 7 tanks pre-treatment process, after application of anti-rusting paint.

10.0 RELAYS, INDICATING INSTRUMENTS, LAMPS, ETC.

10.1.0 **RELAYS**

10.1.1 Relays shall conform to the requirements of IS:3231 / IEC 60255 standards with respect to features/ construction/design etc.

10.1.2 Relays shall be flush mounted and of a type and make approved by the buyer.

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

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

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

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

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

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

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

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

10.1.11 All Protective relays shall be numerical type and shall have ethernet connectivity with necessary software for PC interface and programming. They shall be IEC 61850 compliant. Ethernet switch with sufficient length of cables shall be provided by the vendor.

10.1.12 Numerical protection relay shall be of same OEM make as that of panel OEM (Original Equipment Manufacturer).

10.1.13 The relay shall have minimum 4 CT inputs, which can be used as 3 Nos. over current and 1 Earth fault. The relay shall be suitable for both 2 CT and 3 CT connections.

10.1.14 Synchro check relay shall be capable of checking the synchronism between two voltage sources. It shall facilitate the paralleling of the two sources by giving close permission to bus coupler/incomer circuit breaker. Synchro check relay change over switch shall have two postions-ON/OFF.

10.1.15 The offered protection relay shall have LED / LCD display for settings, status, measurement and fault data & indication. It shall have Fixed function LEDs (for fault trip, relay healthy, control supply ON & Relay out of service).

10.1.16 Apart from protection relays, each breaker shall be provided with separate discrete auxiliary relays for anti-pumping (94), trip annunciation (30), trip supervision (74), electrically reset type breaker contact multiplication (52X) relay and lockout (86) functions. Lockout relay shall be hand reset type. For multifunction relays however, trip circuit supervision function as an integral feature of the relay is acceptable. Individual trip circuit supervision function shall be provided with respect to each trip coil of circuit breaker.

10.1.17 Fault Reporting/ Disturbance Recording:-
It shall be possible for Numerical relays to get interrogated both from an integral keypad and from a serial port. The relay intended for O/C & E/F shall have in-built disturbance, fault & event recording features for both voltage and current. The storage capacity of the relay shall be suitable for storing fault records and disturbance records. The pre-fault/ pre-disturbance and post-fault / post-disturbance triggering times shall be selectable. The fault and event records will be extracted from the relay by the higher-level SCADA system / laptop computer connected to the front port. The triggering setting for disturbance/fault recording shall be independently configurable and not dependent on any other settings such as fault tripping setting.

10.1.18 The offered relay must be immune to any kind of electromagnetic interference.

10.1.19 Relay shall have inbuilt arc flash protection. Arc flash protection shall be of light and current only.

10.1.20 Relay shall have sufficient DI and DO to meet the specified logic. All DI/DO shall be inbuilt part of numerical relay , no additional accessory/ IO device is acceptable.

10.1.21 Relay shall support RSTP/HSR/PRP type of redundancy over dual ethernet port.

10.1.22 Relay shall be suitable to operate in temperature range -40°C to +70°C.

10.1.23 Relay shall have sufficient analog channels and Digital channels and shall be recorded in the DR waveform.

10.1.24 Protection relay shall measure current , voltage , frequency, power, power factor, harmonic and Total harmonic distortion.

10.1.25 PCB cards of relay shall be conformal coated and tested in environmental condition according IEC 60721, 3C3.

10.1.26 Numerical relay shall be cyber secured tested according to IEC 62443 standard.

10.2.0 **INDICATING INSTRUMENTS**

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

10.2.2 Voltmeter, if specified, shall be moving iron type complete with suitable selector switch and control fuses and it shall be of class 1 accuracy as per IS:1248. Voltmeter shall have initial suppressed scale for the lower values in the range.

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

10.2.4 All control / selector switches used shall be of rotary type, spring loaded and of robust construction. The operating handle of these switches shall be knob type and of black colour. The switches shall have 3 way with OFF position. Necessary facia plates shall be black anodized aluminium with white lettering.

10.2.5 Digital multifunction meters shall be provided wherever specified in the data sheet. These meters shall be serially connected to each other for implementation of energy management system. A maximum of 14 meters shall be connected to each gateway, requiring a total of three gateways, including one spare gateway for future expansion. All gateways shall be linked to a single computer system. The bidder shall provide suitable software for the EMS, while the computer system, intranet/internet and associated cabling from panel to system will be under the scope of FACT.

10.2.6 All auxiliary equipment such as shunts, transducer, etc., as required, shall be included in the supply of switchboard.

10.3.0 **PUSH BUTTON**

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

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

10.3.3 All push buttons shall have minimum 1 NO + 1NC contacts, unless otherwise specified in the data sheet. Changeover contacts are not acceptable.

10.4.0 **INDICATING LAMPS**

10.4.1 Indicating lamps shall be of LED type with appropriate colour.

10.4.2 All lamps shall be indigenously available.

10.4.3 All signaling lamps must have clarity of colour.

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

10.5.0 **ANTICONDENSATION HEATER**

10.5.1 Space heater shall be provided in the CB panel / cable chamber. It shall be of adequate capacity and rated for the auxiliary supply specified in the data sheet.

10.5.2 Necessary ON / OFF isolator, HRC protection fuses & link and thermostat shall be provided for the heater.

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

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

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

11.1.0 Separate visual and audible annunciation scheme shall be available for;

a) Automatic tripping on fault conditions

b) D.C. failure condition

c) Non-trip alarm conditions

11.2.0 Common facilities and accessories for the trip annunciation scheme & DC failure annunciation scheme like flasher relay, hooter, buzzer etc, shall be mounted on the bus coupler panel. Alarm operation and cancellation relays for trip annunciation scheme shall be mounted on the respective panels, wherever indicated in the data sheet. The trip annunciation schemes shall be rated for D.C. auxiliary supply indicated in the data sheet covering the switchboard.

11.3.0 **TRIP ANNUNCIATION SCHEME**

11.3.1 In the event of a fault in any one of the feeders, the relay sensing the fault, initiate trip annunciation scheme in that panel in addition to initiating the tripping of the circuit breaker concerned. The amber lamp provided on the panel starts flashing on the flasher bus (derived from flasher relay) and the common hooter starts sounding. When the alarms accept PB is pressed the hooter shall stop and the amber lamp shall glow steady. After resetting the flags and contacts on the protective relay which initiated the alarm, the alarm scheme can be reset by pressing the reset. Now the amber lamp, which was glowing steady till then, shall go off.

11.3.2 The annunciation scheme shall be repetitive and shall be ready to receive and initiate systematically a second or third fault, irrespective of whether the alarm due to first or second fault in other panels is in 'initiated' or 'accepted' or 'relay reset' condition prior to fully resetting of the annunciation scheme.

11.3.3 It shall be possible to check the healthiness of all amber lamps by pressing the lamp test PB.

11.3.4 Necessary interlock shall be provided to prevent closing of the circuit breaker before resetting the alarm in that panel, by using suitable contact of the alarm operation and cancellation relay in the closing circuit of the circuit breaker. Contacts for this purpose shall also be available.

11.4.0 **DC FAILURE ANNUNCIATION SCHEME**

11.4.1 For DC failure annunciation scheme instantaneously operated DC under voltage relay shall sense the DC failure and shall initiate the flag indication and the DC failure annunciation scheme. The indicating lamp comes ON and the buzzer is initiated. On pressing the 'accept' PB, the audible alarm shall stop. When DC is restored, the scheme shall get automatically reset.

11.4.2 The DC failure sensing relay shall have hand reset flag indication.

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11.5.0 **NON-TRIP ANNUNCIATION SCHEME**

11.5.1 Non-trip annunciation scheme shall be provided on transformer feeder, wherever indicated in the data sheet. Window type alarm facia shall be fitted. Accept, Reset, Test Buttons shall preferably on each switchboard. Audio alarm shall be common bell.

12.0 CABLE TERMINATION & WIRING

12.1.0 **CABLE TERMINATION**

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

12.1.2 Terminal connectors shall be of the screw type, and not more than one incoming / outgoing cable is to be connected per terminal.

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

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

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

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

12.1.7 Shorting links shall be provided for all CT terminals.

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

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

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

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

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

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

12.1.14 Additional spare terminal connectors of 20% shall be provided in every panel to accommodate future modifications.

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

12.2.0 **WIRING**

12.2.1 Control and power wiring shall be kept separate.

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12.2.2 All wiring for controls shall in general be carried out with 1100 volts grade FRLS insulated multistranded copper conductors of size not less than 2.5sqmm. The CT wiring shall be of 4.0sqmm. The wiring shall be of suitable grade and shall have flame resisting insulation.

12.2.4 Wiring shall be terminated in easily accessible terminal blocks. The wiring in the panel should be laid through proper cable trays with proper identification ferules.

12.2.5 The wires shall be arranged neatly and the two ends of each wire and the terminal blocks shall bear the circuit number by using unbreakable ferrules for identification purposes.

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

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

12.2.8 Whenever a VT is mounted on the breaker carriage, all auxiliary wiring shall be done in conduits.

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

13.0 INSULATION

13.1 The insulation between phases and between phases & ground for power or control conductors shall be made of suitable insulating material resistant to heat, dust and dampness. It shall be non-hygroscopic, mould proof and treated with suitable varnishes.

13.2 Minimum clearance between phases, or between connections of same phases separated electrically from each other, or between phases and ground, shall be as per relevant standards.

14.0 EARTHING

14.1 Earthing arrangement shall confirm to IS 3043.

14.2 Continuous earthing strips of material and size specified in the data sheet shall be provided for the complete length of the switch board. Strips shall be connected to the body of the switchboard by means of integral bolts, spring washers and nuts.

14.3 Earthing terminals shall be provided on the trucks to earth the body of the truck when pushed into the cubicle.

14.4 A minimum of 2 terminals shall be provided on the strip for external connections to earth grid.

14.5 All doors and movable parts shall be connected to earth bus with flexible copper connection.

14.6 All non-current carrying metallic parts of the equipment shall be earthed.

14.7 Earth bus shall be extended upto each cable compartment and earthing bolts shall be provided to ground cable armours.

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15.0 PAINTING AND LABELLING

15.1 The complete switchgear panel surfaces (doors/end covers) inside as well as outside should be powder coated with epoxy resin, standard colour RAL 7035/7032 with 7 tanks pre-treatment process, after application of anti-rusting paint. All other sheets shall be made up of highly corrosion resistant Aluzinc material.

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

15.3 Painted MIMIC DIAGRAM shall be provided on all the panels of the switchboard, unless otherwise specified in the data sheet.

15.4 Special warning plates shall be provided on all removable covers or doors giving access to high voltage cables / bus bars and inside the switchboard also wherever considered necessary.

15.5 Nameplates shall be fastened by "screws" and not by adhesives.

15.6 A nameplate with the switch board designation shall be fixed at the top of the central panel

15.7 Name plates shall be provided for each equipment, such as lamps, PBs, meters, switches, relays, aux. contactors etc., mounted on the switchboard, indicating the operation / function.

15.8 The size of the letters giving switchboard designation shall be as per standard practice.

15.9 Necessary DANGER nameplates to be provided as per IS 2551.

15.10 Warning notice "Isolate supply before opening" shall be written on back side of the panel as per CEA regulations.

15.11 Sufficient quantity of touch-up paint shall be furnished for application at site.

16.0 EARTHING TRUCK

16.1 Two numbers of Earthing Truck shall be supplied- one for incoming feeders and the other for outgoing feeders. The Earthing truck shall be fully draw out pattern, complete with necessary earthing links to facilitate earthing on the cable side. Locking facility shall be available. Earthing links shall be of size to withstand the fault current specified in the single line diagram/data sheet.

16.2 As an alternative to the above, vendor may offer integral earthing switch in each outgoing feeder of the switchboard. Such earthing switches shall be fitted with interlocks such that circuit breakers cannot be made "ON" while earthing switch is in the 'earth position'.

16.3 Earthing Truck shall be provided with Audio -Visual Annunciation to warn the operator against earthing of live connections.

17.0 SPARES AND SPECIAL TOOLS

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

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18.0 DRAWINGS

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

19.0 INSPECTION AND TESTS

19.1 Comprehensive Inspection and Testing Plan in the form of Quality Assurance Manual for switch board shall be submitted by the bidder including testing, inspection & witnessing required by the Purchaser before dipatch. The Comprehensive Inspection and Testing Plan shall be approved by the Purchaser.

19.2 **Interim Inspection**:- To ensure the quality and reliability, the purchaser or their authorized representative reserves the right to conduct interim inspections at the OEM's factory during various stages of manufacturing. The OEM shall provide full co-operation and support for these quality control inspections. The OEM shall furnish the weekly manufacturing schedule of the panel within 20 days from the date of LOI to facilitate interim inspection planning. .

Pre-dispatch Inspection:- The Pre-dispatch Inspection including all routine tests as per the relevant IS/IEC mutually agreed between manufacturer and Purchaser is to be conducted at OEM's works which is to be witnessed by FACT / FACT's authorized representative.

The tests shall include but not necessarily limited to the following :

a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme & proper functioning of the equipment.

b) All wiring and current carrying part shall be given appropriate High Voltage test.

c) Primary current and voltage shall be applied to all instrument transformers.

d) Routine test shall be carried out on all equipment such as circuit breakers, instrument transformers, relays, meters etc. as per relevant standard.

19.3 Bidder's quality assurance manual shall include all details of type tests & routine tests as per IS/IEC.

19.4 Bidder shall submit type test certificates of Power Switchgear assemblies and Arc flash protection as per IS/IEC.

19.5 Bidder shall bear the cost of all tests. The purchaser will witness inspection & testing at mutually agreed date. The cost of the purchaser's visit to the factory for inspection and testing will be borne by the Purchaser.

19.6 Bidder shall give 15 days advance intimation to Purchaser for inspection and witnessing of routine tests on completely assembled switch board.

20.0 DATA SHEET

1.0	**SERVICE CONDITIONS**	
1.1	Location	Udyogamandal, Cochin
1.2	Humidity Min.	64 %
1.3	Humidity Max.	95 %
1.4	Humidity Design	100 % at 40 Degree Celsius
1.5	Ambient Temperature Min.	19 °C
1.6	Ambient Temperature Max.	40 °C
1.7	Ambient Temperature Design	40 °C
1.8	Environment	Tropical atmosphere
2.0	**POWER SYSTEM DETAILS**	
2.1	Voltage	11kV ± 10%
2.2	Frequency	50 Hz ± 5%
2.3	No. of Phases/wires	3 phase 3 wire
2.4	Fault level (sym.)	762 MVA
2.5	Neutral earthing	Solidly Earthed
2.6	Continuous rated current	Power bus 3150 A
2.7	Short time current (kA/s)	Power bus : 40 kA / 3sec
3.0	**GENERAL DATA**	
3.1	Location	Indoor
3.2	Degree of protection	IP 4X (min)
3.3	Electrically exposed / non exposed	Non Exposed
3.4	Cable entry	Bottom
3.5	Type of Circuit breaker	Vacuum CB
3.6	Breaker closing	Motor charged spring closing
3.7	DC control supply voltage	110V DC for shunt trip coil, closing coil, indication lamps, etc. (DC supply ON/ OFF switch in addition to fuse shall be provided inside cubicle for each vertical panel.Alternatively suitably rated double pole MCB shall be provided.

3.8	AC auxiliary supply voltage	240V±10%, 1 ph, 50Hz ± 5% AC supply for spring charging motor supply, panel anti condensation heater, panel illumination and socket outlets. (AC auxiliary supply ON/ OFF switch in addition to fuse shall be provided inside cubicle for each vertical panel. Alternatively suitably rated double pole MCB shall be provided.			
3.9	VT secondary voltage (Phase to phase)	110V			
3.10	Bus bars-material	Insulated aluminium (Bus bars shall be insulated with heat shrinkable sleeves rated for phase voltage and joints shall be shrouded.)			
3.11	Earth bus – size & material	As per manufacturer's design			
3.12	Enclosure material/ Panel Construction	The panel material, excluding doors and end covers, shall be made of highly corrosion-resistant Aluzinc material. The doors, end covers, and cubicle partitions shall be made of high-quality sheet steel.			
3.13	Mimic diagram	Required			
3.14	Current transformers	**Core**	**Accuracy Class**	**Burden (VA)**	**Insulation Class**
		Metering core	0.5	As per manufacturer standard design	As per manufacturer standard design
		Protection core	5P20/ 5P10		
		Differential protection core	PS		
3.15	Voltage transformers	**Core**	**Accuracy Class**	**Burden (VA)**	**Insulation Class**
		Metering core	0.5	As per manufacturer standard design	As per manufacturer standard design
		Protection core	3 P		
3.16	Ammeter – accuracy class	1.0			
3.17	Multifunction Meter (Digital)	Measuring Current, Voltage, kW, KWh, kVA, kVAR, Frequency, PF etc. Shall be communicable and IEC 61850 compatible.			
3.18	Painting	Two coats of anticorrosive paint (RAL 7032) over two coats of suitable primer.			
3.19	Interlocks	Required			
3.20	Earthing truck	Required (2 No)			

4.0	**COMPONENT DETAILS**					
	TYPE OF PANEL	**INCOMER**	**BUS COUPLER**	**FEEDERS**		
				POWER	**TRANSFORMER**	**CAPACITOR**
	Nos	4 Nos	3 Nos	11 Nos	8 Nos	2 Nos
4.1	**CURRENT TRANSFORMER**					
	(3 Nos for each panel)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.2	**VOLTAGE TRANSFORMER**					
4.2.1	a) On cable side	Reqd.	-	Reqd. for selected feeders (Refer SLD in Annexure-VI)	-	-
4.2.2	b) On busbar side	Required for each bus section				
4.3	***INDICATION LAMPS***					
4.3.1	Breaker ON	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.2	Breaker OFF	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.3	Breaker Auto trip	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.4	Trip Circuit healthy	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.5	Spring charged	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.6	Breaker ready to close	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.7	Test position	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.8	Service position	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.9	Panel space heater ON	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.10	DC fail	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.3.11	R-Phase	Reqd.	-	-	-	-
4.3.12	Y-Phase	Reqd.	-	-	-	-
4.3.13	B-Phase	Reqd.	-	-	-	-
4.3.14	Trip alarm	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.

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	TYPE OF PANEL	INCOMER	BUS COUPLER	FEEDERS		
				POWER	TRANSFORMER	CAPACITOR
4.3.15	Non trip alarm	Reqd.	-	-	Reqd.	
4.4	**ANNUNCIATION FACIA**					
4.4.1	Trip Relay operated	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.4.2	Trip circuit unhealthy	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.4.3	O/C & E/F operated	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.4.4	Standby E/F operated	Reqd.	-	-	Reqd.	Reqd.
4.4.5	Check Synchronising permission OK	-	Reqd.	-	-	-
4.4.6	Transformer Differential protection operated	Reqd.	-	-	Reqd.	-
4.4.7	Oil Temperature Alarm	-	-	-	Reqd.	-
4.4.8	Winding Temperature Alarm	-	-	-	Reqd.	-
4.4.9	Buchholz Alarm	-	-	-	Reqd.	-
4.4.10	Oil Temperature Trip	-	-	-	Reqd.	-
4.4.11	Winding Temperature Trip	-.	-	-	Reqd.	-
4.4.12	Buchholz Trip	-	-	-	Reqd.	-
4.4.13	Neutral Displacement Trip	-.	-	-	-	Reqd.
4.4.14	Under Voltage Trip	Reqd.	-	Reqd. for feeders with PT (Refer SLD in Annexure-VI)	-	Reqd.
4.4.15	Over voltage Trip	-	-	-	-	Reqd.
4.4.16	Spare	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.5	**CONTROL SWITCHES**					
4.5.1	Trip-Neutral-Close Switch	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.5.2	Ammeter Select Switch	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.5.3	Voltmeter Select Switch	Reqd.	Reqd.	Reqd. for feeders with PT (Refer SLD in Annexure-VI)	-	-
4.5.4	Auto changeover ON-OFF switch	-	Reqd.	-	-	-

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	TYPE OF PANEL	INCOMER	BUS COUPLER	FEEDERS		
				POWER	TRANSFORMER	CAPACITOR
4.6	**PUSH BUTTON**					
4.6.1	Lamp Test	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.6.2	DC Fail Test	-	Reqd. (on any bus coupler for entire panel)	-	-	-
4.7	**METERS**					
4.7.1	Voltmeter (analog type)	Reqd.	Reqd. (Bus voltage monitoring voltmeters shall be provided in Bus couplers / Bus Risers)	Reqd. for feeders with PT (Refer SLD in Annexure-VI)	-	-
4.7.2	Ammeter (analog type)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.7.3	Multifunction Meter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.7.4	Hour Run Meter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.8	**RELAYS**					
4.8.1	Numerical O/C & E/F Relay with serial, Ethernet, USB ports and multiple protocols for SCADA connectivity.	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.8.2	Capacitor feeder protection relay	-	-	-	-	Reqd.
4.8.3	Neutral displacement relay(can be integral with capacitor protection relay)	-	-	-	-	Reqd.
4.8.4	Standby E/F relay	Reqd.	-	-	Reqd.	Reqd.
4.8.5	Master trip relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.8.6	Inter-trip Relay	Reqd.	-	-	Reqd.	-
4.8.7	Trip circuit supervision relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.8.8	Breaker contact multiplication relay	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.

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	TYPE OF PANEL	INCOMER	BUS COUPLER	FEEDERS		
				POWER	TRANSFORMER	CAPACITOR
4.8.9	Transformer Differential Protection Relay (can be integral with transformer protection relay)	-	-	-	Reqd.	-
4.8.10	Transformer protection Aux. relay for BUCHZ, OT, WT ALARM	-	-	-	Reqd.	-
4.8.11	Transformer protection Aux. relay for BUCHZ, OT, WT Trip	-	-	-	Reqd.	-
4.8.12	DC fail relay	-	Reqd.	-	-	-
4.8.13	Check Synchronizing relay	Required as per manufacturer's standard practice		-	-	-
4.8.14	Relay for PT selection	As per manufacturers standard design				
4.8.15	Flasher relay	As per manufacturers standard design				
4.8.16	Under Voltage Relay	Required for line side incomers, capacitor feeder and feeders with PT (Refer SLD in Annexure-VI)				
4.8.17	Over voltage relay	Required for capacitor feeder				
4.8.18	Arc Flash Protection relay with arc flash sensors and connecting cables as per relevant IEC 62271-200	As per manufacturers standard design to cover bus chamber, outgoing chamber and breaker compartment. Vide clause 4.6				
4.9	**TRANSDUCER**					
4.9.1	Voltage Transducer	Reqd.	Reqd. (for bus sections)	-	-	-
4.9.2	Current Transducer	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.9.3	Power Transducer	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
	Voltage, Current and Power transducers shall have dual output of 4mA-20mA					
4.10	**ADDITIONAL TERMINALS**					
4.10.1	Remote Trip provision	-	-	-	Reqd.	Reqd.
4.11	**OTHER ITEMS**					
4.11.1	Breaker operation counter	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.11.2	Panel anti condensation heater (strip type)	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.

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	TYPE OF PANEL	INCOMER	BUS COUPLER	FEEDERS		
				POWER	TRANSFORMER	CAPACITOR
4.11.3	Test & Service position limit switches	Reqd.	Reqd.	Reqd.	Reqd.	Reqd.
4.11.5	Hooter for trip alarm	Common to entire panel				
4.11.6	Buzzer for DC failure alarm	Common to entire panel				
4.11.7	Bell for non-trip alarm	Common to entire panel				
4.11.8	Temperature monitoring sensors	Temperature sensors shall be mounted for thermal monitoring on all the three phases of incoming and outgoing feeder's bus bars, inside bus bar chamber (sufficient nos.) and cable chamber as per manufacturer's standard design. (Vide clause 4.23 of TPS).				
5.0	**OTHER REQUIREMENTS**					
5.1	The breakers shall be fully withdrawable floor rolling type.					
5.2	The cable compartment shall have ample space for termination kits suitable for XLPE cables of sizes specified in the data sheet.					
5.3	Wiring terminations inside the panels shall be by crimping type lugs only.					
5.4	The connection to breaker from main busbars shall be rated for breaker rating, irrespective of CT rating of outgoing feeders.					
5.5	Indicating lamps shall be of LED type.					
5.6	The vendor shall provide all software and hardware required for programming of numerical relays.					
6.0	**FEEDER DETAILS**					

	Name	Breaker Rating (A)	CT ratio Metering	CT ratio Protection	CT ratio Differential Protection	Numerical Protection Relay	Power cable
6.1	Amm Sulphate Fdr-I	2000	200-400/5	200-400/5	200-400/5	Reqd.	3x3x300 sq.mm XLPE Al.
6.2	No.1- 5 MVA Trf (Voltamp) at 110 kV S/S	2000	400-800/5	400-800/5	400-800/5	Reqd.	3x3x400 sq.mm XLPE Al.
6.3	Incomer No.1	3150	3200/5	3200/5	3200/5	Reqd.	4x3x400 sq.mm XLPE Al.
6.4	Petro Fdr-1	2000	2000/5	2000/5	2000/5	Reqd.	3x3x400 sq.mm XLPE Al.
6.5	Spare power Fdr	2000	2000/5	2000/5	-	Reqd.	3x3x400 sq.mm XLPE Al.
6.6	SO_2 Acid plant 4MVA, 11/3.45kV Trf Fdr.	2000	400-800/5	400-800/5	400-800/5	Reqd.	1x3x300 sq.mm XLPE Al.

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	Name	Breaker Rating (A)	CT ratio Metering	CT ratio Protection	CT ratio Differential Protection	Numerical Protection Relay	Power cable
6.7	BUS COUPLER-1	3150	3200/5	3200/5	3200/5	Reqd.	-
6.8	Link Fdr. To Jyothi Panel	2000	2000/5	2000/5	-	Reqd.	3x3x400 sq.mm XLPE Al.
6.9	Capacitor bank-1	2000	400/5	400/5		Reqd.	1x3x300 sq.mm XLPE Al.
6.10	No.2 - 5MVA Trf (TELK) at 110kV S/S	2000	400-800/5	400-800/5	400-800/5	Reqd.	1x3x400 sq.mm XLPE Al.
6.11	Incomer No.2	3150	3200/5	3200/5	3200/5	Reqd.	4x3x400 sq.mm XLPE Al.
6.12	Petro Fdr-2	2000	2000/5	2000/5	2000/5	Reqd.	3x3x400 sq.mm XLPE Al.
6.13	Township Feeder- I	2000	150-300/5	150-300/5	150-300/5	Reqd.	2x3x150 sq.mm XLPE Al.
6.14	BUS COUPLER-2	3150	3200/5	3200/5	3200/5	Reqd.	-
6.15	Township Feeder-III	2000	150-300/5	150-300/5	150-300/5	Reqd.	2x3x150 sq.mm XLPE Al.
6.16	Spare Transformer Fdr	2000	400-800/5	400-800/5	400-800/5	Reqd.	3x3x400 sq.mm XLPE Al.
6.17	Fdr. to 11kV S/S TR.No.6	2000	400-800/5	400-800/5	400-800/5	Reqd.	3X3x400sq.mm XLPE Al
6.18	Incomer No.3	3150	3200/5	3200/5	3200/5	Reqd.	4x3x400 sq.mm XLPE Al.
6.19	Capacitor bank-II	2000	400/5	400/5	-	Reqd.	1X3x300sq.mm XLPE Al
6.20	900 TPD Ammo. Fdr-1	2000	1000/5	1000/5	1000/5	Reqd.	3x3x300 sq.mm XLPE Al.
6.21	BUS COUPLER-3	3150	3200/5	3200/5	3200/5	Reqd.	-
6.22	Spare Power Fdr.	2000	2000/5	2000/5	-	Reqd.	3x3x400 sq.mm XLPE Al.
6.23	Petro Fdr-3	2000	2000/5	2000/5	2000/5	Reqd.	3x3x400 sq.mm XLPE Al.
6.24	FDR. TO 11kV S/S TR No.3	2000	400-800/5	400-800/5	400-800/5	Reqd.	3x3x400 sq.mm XLPE Al.
6.25	Incomer No.4	3150	3200/5	3200/5	3200/5	Reqd.	4x3x400 sq.mm XLPE Al.

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6.26	Township Feeder-II	2000	150-300/5	150-300/5	150-300/5	Reqd.	2x3x150 sq.mm XLPE Al.
6.27	Amm Sulphate Fdr-II	2000	200-400/5	200-400/5	200-400/5	Reqd.	3x3x300 sq.mm XLPE Al.
6.28	900 TPD Ammo. Fdr-2	2000	1000/5	1000/5	1000/5	Reqd.	3x3x300 sq.mm XLPE Al.

Note:-

1. All the breaker trucks of same rating shall be identical and interchangeable for outgoing feeders and incomer-bus coupler respectively.
2. Township Feeder I, II and III shall have indoor surge arrestor also. (Type test certificate shall be submitted for the offered surge arrestor)

21.0 AUTOMATIC BUS TRANSFER SCHEME (ABTS)

21.1 The Automatic Bus Transfer Scheme [ABTS] shall be provided for the Switch Board to increase the power supply reliability to the process plants. A two-position [ON - OFF] ABTS selector switch shall be provided, on Bus coupler-1, 2 & 3 panels, to enable the breaker to be closed with ABTS scheme. Corresponding bus coupler which is selected in ON mode shall get closed during outage of its incoming supply.

21.2 Logic circuit for closing Bus coupler BC1, BC2 and BC3; tripping Incomers I1, I2, I3 and I4 is given in Annexure VII attached with this TPS.

21.3 Automatic Bus Transfer Scheme shall be implemented in either two of the following ways:-

i. ABTS implemented using suitable Programmable Logic controller for ease of operation, less maintenance and ease of troubleshooting. The PLC shall be housed inside the panel itself. Detailed specification of PLC mentioned in clause 21.4.

OR

ii. ABTS implemented using sync check feature in the numerical protection relay with suitable number of interlocking relays and contactors to achieve closing of bus couplers and tripping of incomers as per logic specified in Annexure VII.

21.4 GENERAL SPECIFICATION FOR PROGRAMMABLE CONTROLLER SYSTEM :

21.4.1 The following guidelines detail the minimum requirements of the Programmable Logic Controller system.

- Programming of PLC shall be as per logic circuit provided in Annexure VII.
- The Programmable Controller shall be a Programmable Logic Controller with Power supply, Processor and I/O units. The base unit shall be expandable by adding modules.
- The system shall have a data protection scheme for the preservation of data during the power outage and this shall be automatic.

- The vendor has to engineer all the Interlocks, sequence of operations for safe operation of the system. The final logic diagram shall be handed over to M/s FACT during engineering stage.
- The Programmable Logic Controller system shall be operational under the worst operating conditions like Voltage variation more than +10%, Frequency variation more than +3%, Ambient temperature up to 45 ° C and relative humidity up to 95%.
- The Power supply for the Programmable Logic Controller shall be derived from the input power supply of 230V AC/110V DC provided by FACT. If 230VAC power supply is required suitable UPS shall be provided by the vendor.
- A spike protection device to be added in all systems in order to protect the components from lighting spikes and power supply spikes.
- Separate MCBs shall be provided for each Programmable Logic Controller system for AC and DC power.
- Suitable number of DIs and DOs are to be provided as per PLC IO list further mentioned.
- The PLC shall have licensed software-having capacity to accommodate all the existing IOs with spare in all categories (DI & DO).
- Necessary software (licensed) for configuration, programming, debugging & I/O forcing of the PLC/ logic shall be supplied by the vendor. The software, its hardware & licenses shall be handed over to FACT at the time of installation. Suitable laptop for field configuring and fault assessment shall also be supplied. It shall be possible to easily trace/modify the logics.
- Supply of required programming kit (including necessary cables, hardware & software) for the configuration, programming, debugging of the offered PLC.
- Documentation such as Internal General arrangement drawing of the PLC and sub system, terminal assignment drawing, complete Operational and Maintenance manuals of PLC, All Guarantee/ Warranty certificates shall be supplied by the vendor.

21.4.2 **PROCESSOR**

- The processor shall have the capability to handle arithmetic, logical, sequential, comparison, timing and counting functionalities. The application program and data memory shall be non-volatile and EEPROM/Flash memory shall be available for application and data storage. The storage shall be automatic.
- Retentive timers and clock functions shall be available for batch operation.

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21.4.3 **INPUT AND OUTPUT SYSTEM**

PLC I/O LIST

Sl No.	DESCRIPTION	IO TYPE	SIGNAL TYPE	INSTRUMENT TYPE
1	I_1 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
2	I_1 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
3	I_1 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
4	I_2 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
5	I_2 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
6	I_2 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
7	I_3 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
8	I_3 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
9	I_3 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
10	I_4 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
11	I_4 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
12	I_4 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
13	Bus-1 V_{RY} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
14	Bus-1 V_{YB} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
15	Bus-1 V_{BR} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
16	Bus-2 V_{RY} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
17	Bus-2 V_{YB} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
18	Bus-2 V_{BR} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
19	Bus-3 V_{RY} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
20	Bus-3 V_{YB} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
21	Bus-3 V_{BR} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
22	Bus-4 V_{RY} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
23	Bus-4 V_{YB} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
24	Bus-4 V_{BR} > 80% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
25	Bus-1 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
26	Bus-1 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
27	Bus-1 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
28	Bus-2 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
29	Bus-2 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
30	Bus-2 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
31	Bus-3 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
32	Bus-3 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
33	Bus-3 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY

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Sl No.	DESCRIPTION	IO TYPE	SIGNAL TYPE	INSTRUMENT TYPE
34	Bus-4 V_{RY} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
35	Bus-4 V_{YB} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
36	Bus-4 V_{BR} < 30% of rated	DI	POTENTIAL FREE	VOLTAGE MONITORING RELAY
37	BC-1 RTC	DI	POTENTIAL FREE	CONTACTOR/ RELAY
38	BC-1 ABTS	DI	POTENTIAL FREE	CHANGE OVER SWITCH
39	BC-2 RTC	DI	POTENTIAL FREE	CONTACTOR/ RELAY
40	BC-2 ABTS	DI	POTENTIAL FREE	CHANGE OVER SWITCH
41	BC-3 RTC	DI	POTENTIAL FREE	CONTACTOR/ RELAY
42	BC-3 ABTS	DI	POTENTIAL FREE	CHANGE OVER SWITCH
43	I_1 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
44	I_1 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
45	I_2 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
46	I_2 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
47	I_3 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
48	I_3 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
49	I_4 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
50	I_4 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
51	BC-1 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
52	BC-1 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
53	BC-2 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
54	BC-2 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
55	BC-3 CB ON	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
56	BC-3 CB OFF	DI	POTENTIAL FREE	BREAKER AUXILIARY SWITCH
57	SPARE	DI	–	–
58	SPARE	DI	–	–
59	SPARE	DI	–	–
60	SPARE	DI	–	–
61	SPARE	DI	–	–
62	SPARE	DI	–	–
63	SPARE	DI	–	–
64	SPARE	DI	–	–
65	TRIP I_1	DO	POTENTIAL FREE	TRIPPING COIL THROUGH AUXILIARY RELAY
66	TRIP I_2	DO	POTENTIAL FREE	TRIPPING COIL THROUGH AUXILIARY RELAY

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Sl No.	DESCRIPTION	IO TYPE	SIGNAL TYPE	INSTRUMENT TYPE
67	TRIP I_3	DO	POTENTIAL FREE	TRIPPING COIL THROUGH AUXILIARY RELAY
68	TRIP I_4	DO	POTENTIAL FREE	TRIPPING COIL THROUGH AUXILIARY RELAY
69	CLOSE BC-1	DO	POTENTIAL FREE	CLOSING COIL THROUGH AUXILIARY RELAY
70	CLOSE BC-2	DO	POTENTIAL FREE	CLOSING COIL THROUGH AUXILIARY RELAY
71	CLOSE BC-3	DO	POTENTIAL FREE	CLOSING COIL THROUGH AUXILIARY RELAY
72	SPARE	DO	–	–
73	SPARE	DO	–	–
74	SPARE	DO	–	–
75	SPARE	DO	–	–
76	SPARE	DO	–	–
77	SPARE	DO	–	–
78	SPARE	DO	–	–
79	SPARE	DO	–	–

- Suitable Interposing relays to be provided for digital inputs and digital outputs. Interposing relays shall have 2 NO, 2 NC contacts. Interposing relays with two Change-over contacts is not acceptable. All input and output interposing relays shall be wired to Programmable Logic Controller, Input TB, output TB with proper lugs and cross ferrules according to the requirements. All spare contacts, if any shall also be wired up to the terminal blocks. The interposing relays shall be of DIN rail mountable type with suitable mounting base units.
- All field input contacts are to be potential free.
- For DC Interposing relays, fly back diodes to be provided for the protection against induced surge voltage. Interposing relays shall be individual relays and not relay boards.
- The power supply for the Digital out puts from Programmable Logic Controller shall be as per manufacturer's standard practice.
- All field terminals (DI/DO) are to be provided with fuses and shall have fuse blown indication. Each field signal shall be provided with two terminals. The power looping can be done at panel side only for the safe isolation of field devices.
- Each I/O shall be protected against the reversal of polarity and shall be provided with filters to filter out any noise in the input line.

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- Each I/O channels shall have a LED per channel to indicate the status of input / output. The interposing Relays shall be provided with LED for status indication.

21.4.4 SYSTEM SOFTWARE REQUIREMENTS

- The basic programming language for Programmable Logic Controller shall be Ladder diagram.
- It shall be able to modify the application software, if sequence of operation needs changes as per site requirement during the commissioning.
- Functions, sequence of operations and details of control scheme for safe operation of the system shall be furnished as a part of software.
- The complete software package shall be provided with backup. This shall include all application software and complete documentation of the project.

21.4.5 PROGRAMMER UNIT

- The Programmable Logic Controller shall be provided with a portable programmer unit common for all Controllers. The programmer unit shall be a Laptop loaded with the required software. The programmer unit shall have min. 15" display, Dell or equivalent make, with all accessories and interconnecting cables, latest windows operating system and shall have following features:

  12^{th} Gen Intel Core i5 with minimum clock speed of 1.70 GHz, 16GB RAM, 512GB ROM or superior model. Laptop shall be supplied even in case of numerical protection based ABTS.
- Programmer unit shall have all diagnostic features and troubleshooting functions. It shall have I/O forcing functions. Forced/masked I/O list shall be available.
- The programming terminal shall display logic and/or ladder diagram indicating signal flow and shall show description and status of each contact. It shall also be possible to display process alarms and diagnostic messages as and when they appear. Further it shall also be able to display I/O map in a user defined format.
- It shall also be able to display process dynamic interlock sequences. All such displays shall be user configurable.
- The software shall include all programs for the Programmable Logic Controller, which is required to perform all Programmable Logic Controller functions including communication and self-diagnostics.
- One number of licensed programming software in CD/DVD shall be supplied along with Programmable Logic Controller system.
- The laptop with above mentioned specification has to be supplied in case of protection relay logic based scheme also.

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21.4.6 **SPARE PARTS AND CONSUMABLES**

- Mandatory spares: One number standalone pre-programmed PLC system need to be supplied as standby spare.
- Commissioning spares: All commissioning spares required for Installation, testing and commissioning of Programmable Logic controller system shall be in the scope of vendor.

21.4.7 **MAKE OF PLC**

The bidder shall specify the make of the offered PLC during the drawing approval stage and obtain approval from FACT.

21.4.8 If the execution of the ABTS scheme requires any protection relay not specified in the FACT specification, the bidder shall incorporate it into the panel.

22.0 VENDOR DATA REQUIREMENTS

Sl. No.	Description	With offer		After LOI/PO		Final	
		No.of copies	Date	No.of copies	Date	No.of copies	Date
1	Duly filled in Technical Particulars of High voltage switchboard, as per Annexure-I	S	With tech bid	-	-	-	-
2	Signed copy of Technical Procurement Specification with tentative SLD	S	With tech bid	-	-	-	-
3	Dimensioned general arrangement drawing-internal & external, including busbar disposition and bus bar sizing calculation along with heat load calculation for the panel.	-	-	S	Within 20 days from LOI	S/1P	As per Clause 2.1
4	Foundation plan, showing cutouts/floor openings, foundation pockets etc. along with outline dimensions	-	-	S	Within 20 days from LOI	S/1P	As per Clause 2.1
5	Single line diagram, control schematic, wiring diagrams, terminal and bus wiring diagrams, inter-panel wiring schedule	-	-	S	Within 20 days from LOI	S/4P + Autocad	As per Clause 2.1
6	Schedule of materials / components, with quantity, rating, type, make, etc.	-	-	S	Within 20 days from LOI	S/1P	As per Clause 2.1
7	Type test certificates of the switchgear assembly, vacuum bottle M2 endurance test certificate of similar panel	S	With tech bid	-	-	-	-
8	Type Test Certificates for Internal Arc Classification from accredited laboratory as per IEC 62271-200.	S	With tech bid	-	-	-	-
9	Inspection and Testing Plan	-	-	S	Within 20 day from LOI	S	As per Clause 2.1

Sl. No.	Description	With offer		After LOI/PO		Final	
10	Routine test certificates.	-	-	-	-	S/1P	Along with Panel
11	Test certificates of bought out items like protective relays, CTs, energy meters etc.	-	-	-	-	S/1P	Along with Panel
12	Relay coordination details, with recommended settings, calculations, etc. *	-	-	-	-	S/1P	Along with Panel
13	Technical literature, Pamphlets and brochures relating to the various equipment used.	S	With tech bid	-	-	-	-
14	Operation and maintenance manuals	-	-	-	-	S/2P	Along with Panel
15	Spare parts list	S	With tech bid	S	Within 20 days from LOI	S/1P	Along with panel
16	Duly filled and signed Compliance statement as per format attached.	S	With tech bid	-	-	-	-
17	Unpriced copy of price bid.	S	With tech bid	-	-	-	-
18	Weekly manufacturing schedule of the panel	-	-	S	Within 20 days from LOI	-	-

Notes:

S: Soft copy, P: Printout

Vendor shall fill in proposed lead time if different from the required lead time.

*: vendor to reproduce existing protection relay settings from old relays to new relays during commissioning.

Additionally, the manufacturer shall share all the project documentations as mentioned above in the form of a digital repository which can be accessed by scanning a QR/Bar Code available on the panel at any point.

23.0 WARRANTY

23.1 The vendor shall provide warranty for the entire switch board and accessories, for a period of 12 months from the date of commissioning or 18 months from date of dispatch, whichever is earlier.

23.2 Vendor shall be fully responsible for proper design, manufacture, testing, packing, dispatch and supply of complete system including all accessories.

23.3 Equipment and its components shall be covered under warranty against faulty design, defective / improper materials poor workmanship or failure from normal use during the warranty period. The warranty shall also cover all bought-out items by the vendor, for the same period mentioned.

23.4 Vendor shall have full defect liability during the warranty period. It shall be obligatory on the part of vendor to modify and/ or replace any hardware completely at vendor's cost, in case any malfunction is revealed during the warranty period.

23.5 Other warranty terms shall be as stated in the Terms and Conditions governing the Purchase Order.

24.0 PAYMENT TERMS AND CONDITIONS.

24.1 Payment of 90% of the total supply value shall be paid within 30 days from the receipt of materials at site and acceptance by FACT.

24.2 Balance 10% of the total supply value along with the payment for testing and commissioning shall be paid after successful installation and commissioning of the system as per the specification.

24.3 The bidder shall submit a performance guarantee for the system including software. An amount equivalent to 10% of the order value shall be retained towards performance guarantee and shall be released only after successful completion of the warranty period. Alternatively the supplier can submit a bank guarantee for 10% of the order value from a scheduled/ nationalized bank with validity till end of the warranty period.

ANNEXURE I

TECHNICAL PARTICULARS (TO BE FILLED BY VENDOR)

1.0	VACCUM CIRCUIT BREAKER	
1.1	Make	
1.2	OEM manufacturing facility address	
1.3	Type of reference	
1.4	Conformity to standards	
1.5	Rated voltage	
1.6	Trip/close control voltage	
1.7	Maximum permissible operating voltage	
1.8	Rated current	
1.9	Rated frequency	
1.10	Number of poles	
1.11	Whether floor rolling / cassette type	
1.12	Rated insulation level (Indoor)	
1.13	Internal arc compliant for 40kA-1sec (Yes/No)	
1.14	Panel designed and supplied by OEM as per IEC 62271-200 (Yes/No)	
1.15	Rated Short time withstand current and time	
1.16	Rated cable charging breaking current	
1.17	Rated capacitor breaking current	
1.18	Rated small inductive breaking current	
1.19	Rated symmetrical short circuit breaking capacity	……KA / ……MVA
1.20	Impulse test voltage	
1.21	Rated transient recovery voltage	
1.22	Rated making current (KA peak)	
1.23	Rated short time current - (a) 1 Sec. (b) 3 Sec.	
1.24	Rated duty cycle	

1.25	Opening time	
1.26	Arc duration	
1.27	Total break time at rated S.C capacity	
1.28	Closing time	
1.29	No. of breaks per phase	
1.30	Total length of break per phase	
1.31	Type of main contact	
1.32	Type of arc control employed	
1.33	Minimum clearance in vacuum	
	(a) Between phases	
	(b) Live parts to earth	
1.34	Minimum clearance in air	
	(a) Between phases	
	(b) Live parts to earth	
1.35	No. of aux. Contacts (NO+NC) (Without multiplying contactor)	
1.36	Whether manual closing & tripping facility is available, in addition to the power closing & tripping	
1.37	Whether this extra manual closing be used for switching	
1.38	Whether the circuit breaker is fitted with fixed trip or trip free mechanism	
1.39	Normal voltage of the spring charging motor	
1.40	Power at normal voltage required for spring charging motor	
1.41	Time taken to charge the spring completely by the motor	
1.42	Normal and minimum operating voltage of closing mechanism	
1.43	Power at normal voltage required for closing coil	
1.44	Normal and minimum voltage required for trip coil	

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1.45	Power at normal voltage required for trip coil	
1.46	Normal & minimum voltage required for operation of solenoid closing mechanism	
1.47	Current at normal voltage, required for solenoid operation	
1.48	Whether anti-pumping relays and circuitry provided along with solenoid operating mechanism	
1.49	Short circuit type test certificate or report enclosed	
1.50	Make of Vacuum Bottle	
2.0	**BUS BARS**	
2.1	Conformity to standards	
2.2	Material & grade of bus bars	
2.3	Bus bars PVC covered or not	
2.4	Type of covering	
2.5	Continuous current rating	
2.6	Whether the size of bus bars is same throughout switchboard	
2.7	Size of bus bars – Horizontal Vertical	
2.8	Colour coding	
2.9	Type of insulation	
2.10	Type of insulation at joints / tap-offs	
2.11	Peak dynamic withstand capacity	
2.12	Details of bus bar supports	
2.13	Rated short time current and time	
2.14	Guaranteed temp. rise at rated current for bare bus bars	
2.15	Guaranteed temp. rise at rated current for PVC bus bars	
2.16	Whether type test certificates attached or not	

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

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4.6	Withdrawable or not	
4.7	Connection	
4.8	Class of accuracy	
4.9	Quantity of oil required	
4.10	Current limiting resistor provided or not	
4.11	VTs connected to cable side or bus bar side	
4.12	Mounted on top of switchboard or in separate PT panel	
5.0	**RELAYS**	
5.1	Conformity to standards	
5.2	Make	
5.3	Withdrawal features provided or not	
5.4	Contact - Hand reset / self reset?	
5.5	Whether hand reset flags available?	
5.6	Type of protection relays	
5.7	Mounting	
5.8	Whether arc flash protection relay scheme provided as per clause 4.16 (Yes/No)	
5.9	Type and make of arc flash protection relay	
5.10	Number of arc flash sensors provided for following: Cable chamber- Breaker compartment- Busbar chamber-	
5.11	Attach catalogues of different types of relays with details of VA consumption, operating data, Contact arrangement etc.	
5.12	Number of Synchro-check relays provided for paralleling of two live buses	
6.0	**METERS**	
6.1	Conformity to standards	
6.2	Make	
6.3	Type	

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6.4	Communicable (Yes/No)	
6.5	Mounting: flush / projection	
6.6	Size of meters	
6.7	Scale size	
6.8	Class of accuracy	
6.9	VA consumption of different meters	
7.0	**INDICATION LAMPS**	
7.1	Conformity to standards	
7.2	Make	
7.3	Type	
7.4	Watts rating at specified auxiliary voltage	
7.5	Protective resistors provided or not	
8.0	**PLC DETAILS**	
8.1	PLC make and model	
8.2	Number of I/O and O/P modules respectively	
8.3	Spare I/O and O/P considered (Yes/No)	
8.4	Whether spike protection device included with PLC (Yes/No)	
8.5	Details of monitoring laptop provided	
9.0	**PARTICULARS OF THE EQUIPMENT**	
9.1	Enclosure material of the Panel	
9.2	Size & material of earth bus bar	
9.3	Thickness of panel doors (mm)	
9.4	Thickness of load bearing members (mm)	
9.5	Thickness of base frame (mm)	
9.6	Weight of switch board complete with CB (Kg)	
9.7	Weight of each S/B (kg) (Dynamic loading, if any, shall be furnished)	
9.8	Shipping weight of the largest consignment and size	

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9.9	Size of each panel / W x D x H	
9.10	Minimum distance required on the front side for withdrawal of circuit breaker	
9.11	Whether the equipment dust, damp and vermin proof	
9.12	Details of steps taken to render equipment dust, damp and vermin proof	
9.13	Details of anti-corrosive treatment to make eqpt. suitable for the environment	
9.14	Details of earthing truck	
9.15	Rating details & technical particulars of vacuum contactor (if any)	
9.16	Technical particulars of surge arrester	
10.0	**Other details**	
10.1	ABTS scheme as detailed in Section 21 considered. (Yes/No).	
10.2	ABTS implemented using PLC or Relays?	
10.3	Provision for Manual closing of breaker on 'OFF'(MANUAL) mode of ABTS ON/OFF switch considered. (Refer Clause 4.18)-(Yes/No)	
10.4	Paralleling scheme using Synchro-check relay as detailed in Clause4.17considered. (Yes/No)	
10.5	Whether the offered switchboard is compatible to incorporate SCADA connectivity in future. (Yes/No)	
10.6	Technical particulars of temperature sensors as detailed in Clause 4.23	
10.7	Signed and sealed TPS (Yes/No)	
10.8	Signed and sealed Technical Particulars (Yes/No)	
10.9	Signed and sealed Compliance Statement (Yes/No)	
10.10	Type test certificates (including Internal Arc type test) attached (Yes/No)	

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10.11	Technical literature, Pamphlets and brochures relating to the various equipment used attached (Yes/No)	
10.12	Whether supply of critical spares as per Annexure II is considered (Yes/ No)	
10.13	Whether transducers provided as per data sheet(Yes/ No)	
10.14	Whether panel structures are Aluzinc material(Yes/ No)	
10.15	Whether panels are built in OEM's own facility(Yes/ No)	
10.15	Whether panel, breaker and numerical protection relay are under same brand(Yes/ No)	

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ANNEXURE II

CRITICAL SPARES

1.0	HV SWITCHBOARD SPARES	No.
1.1	VCB Breaker truck 3150 A complete	1
1.2	VCB Breaker truck 2000 A complete	1
1.3	Disconnecting cluster contacts – Breaker side	6
1.4	Disconnecting contacts– Panel side, with Insulating Shroud	3
1.5	Current Transformer 3200/5/5/5	3
1.6	Current Transformer 2000/5/5/5	3
1.7	Current Transformer 1000/5/5/5	3
1.8	Current Transformer 400-800/5/5/5	3
1.9	Current Transformer 200-400/5/5/5	3
1.10	Current Transformer 150-300/5/5/5	3
1.11	Voltage Transformer $(11/\sqrt{3})$kV / $(110/\sqrt{3})$V	3
1.12	Trip-Neutral-Close breaker control switch (as used in panel)	5
1.13	Limit switch for breaker test / service position	10
1.14	Spring charging limit Switch (as used in CB)	6
1.15	Closing coil	6
1.16	Tripping coil	6
1.17	Check Synchronizing relay	1
1.18	Master Trip relay	4
1.19	Inter-trip relay	1
1.20	Spring charging motor	4
1.21	Bus support insulator (11kV)	6
1.22	11kV side PT fuse	6
1.23	LED Indication lamps	6 nos. each
1.24	Numerical protection relays including arc flash relay(each type)	1 each
1.25	Pre- programmed Programmable Logic Controller (In case if ABTS is implemented using PLC)	1
1.26	110V DC Aux. relays with base used for contact multiplication (as used in panel wiring)	2

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ANNEXURE III

MAKES FOR COMPONENTS

Sl. No.	COMPONENT	MAKE
1.	INSTRUMENT TRANSFORMERS	The bidder shall specify the makes of the offered components during the drawing approval stage and obtain approval from FACT.
2.	CONTROL & SELECTOR SWITCHES	
3.	INDICATING INSTRUMENTS	
4.	HRC FUSES	
5.	ALARM ANNUNCIATORS	
6.	PROGRAMMABLE LOGIC CONTROLLER	
7.	TRANSDUCER	

ANNEXURE IV

PRICE BID FORMAT

Sl. No.	Code	Item	Quantity	Price (Rs)
1.	672101803	11kV, 50Hz, 3150A, 40kA/3sec Indoor Vacuum Circuit Breaker Switchboard complete with all other accessories as per the detailed specifications attached. (TPS NO: TPS-UC-SS HVSB-02)	1 SET	
2.	673104110	Critical spares for 11kV Switchboard at the 110kV Substation as per Annexure-II of TPS NO: TPS-UC-SS-HVSB-02	LS	
3.	New Activity Code	Supervision for testing and commissioning of 11kV Indoor Vacuum Circuit Breaker switchboard as per TPS NO: TPS-UC-SS-HVSB-02	LS	

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ANNEXURE V

COMPLIANCE STATEMENT

ENQUIRY No: _____

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

LIST OF DEVIATIONS

Sl. No	Description	Reason for deviation

Name of Vendor:

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

Date: Name & Designation Seal & Signature

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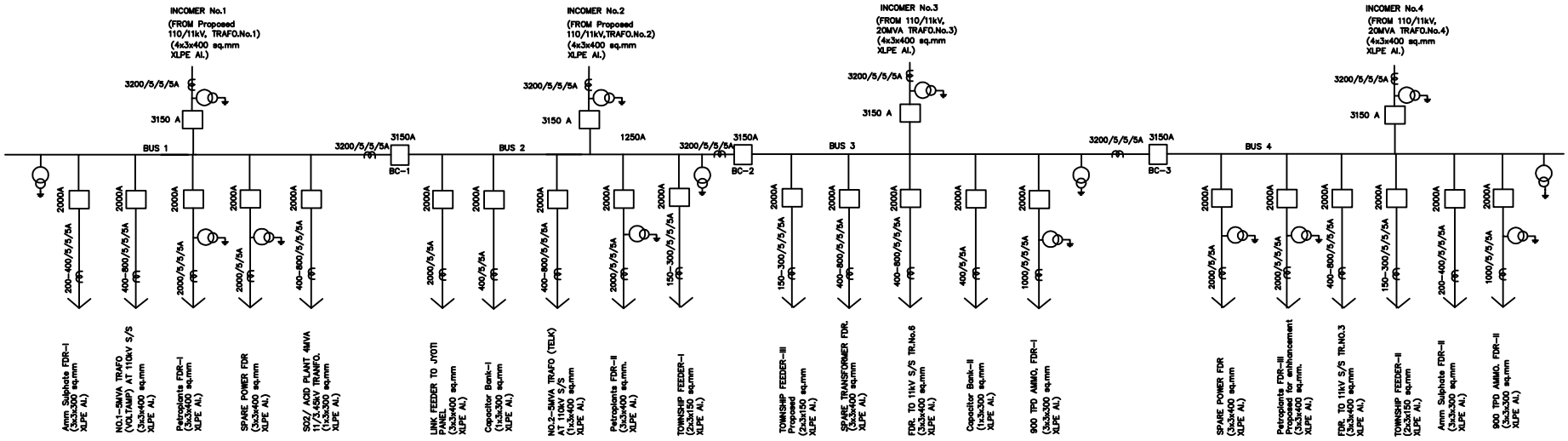
Annexure VI

11kV, 40kA, 3150A SWITCH BOARD WITH 2000A O/G VCB



THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL COMPLEX
UDYOGAMANDAL KERALA

FACT

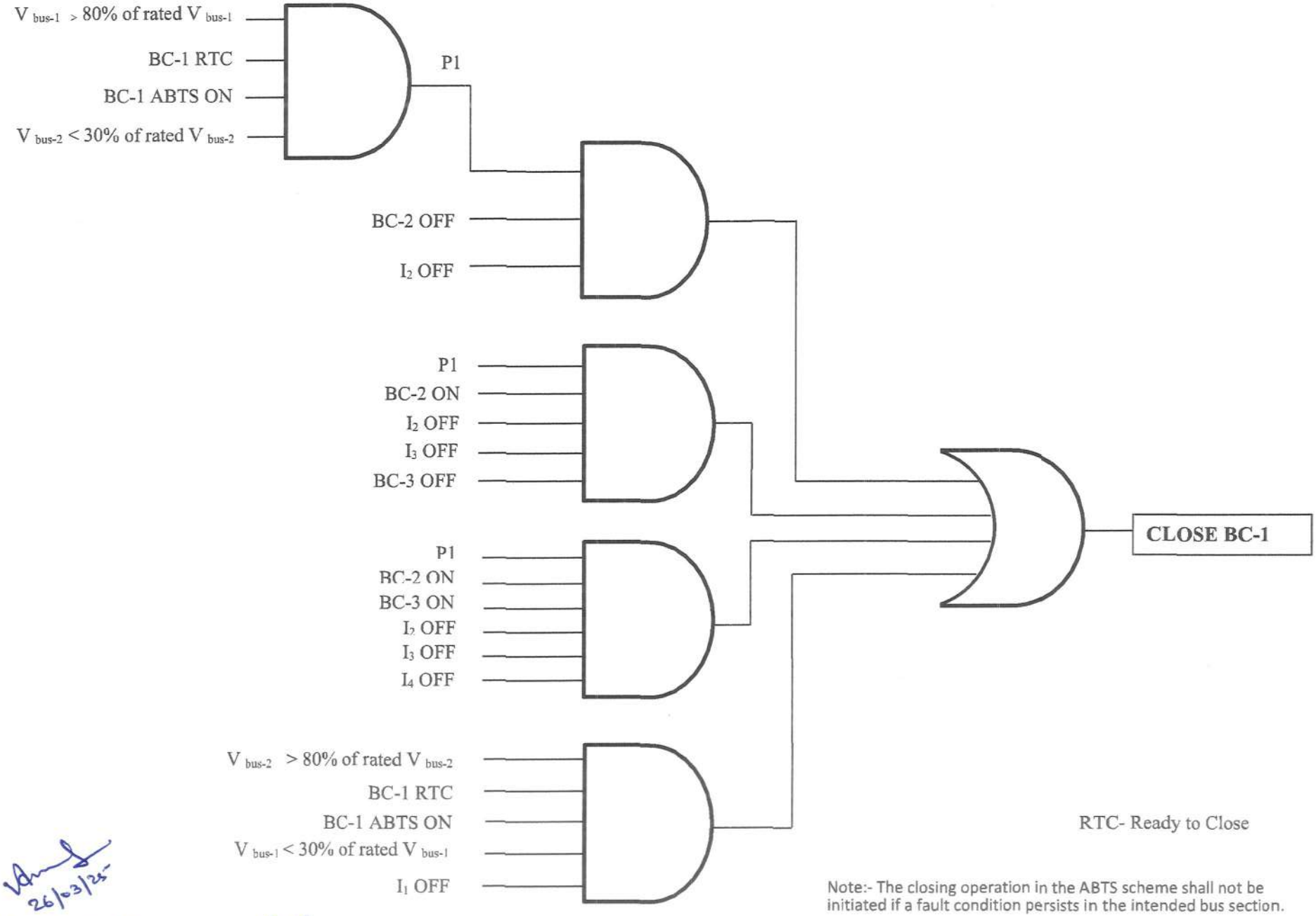
TITLE
Proposed SLD for 11kV Switch board

SHEET NO. 1 of 1

DRG No: FACT-UD-110KV-SS-11KV-SWBD

ANNEXURE VII

CLOSING LOGIC: BC-1

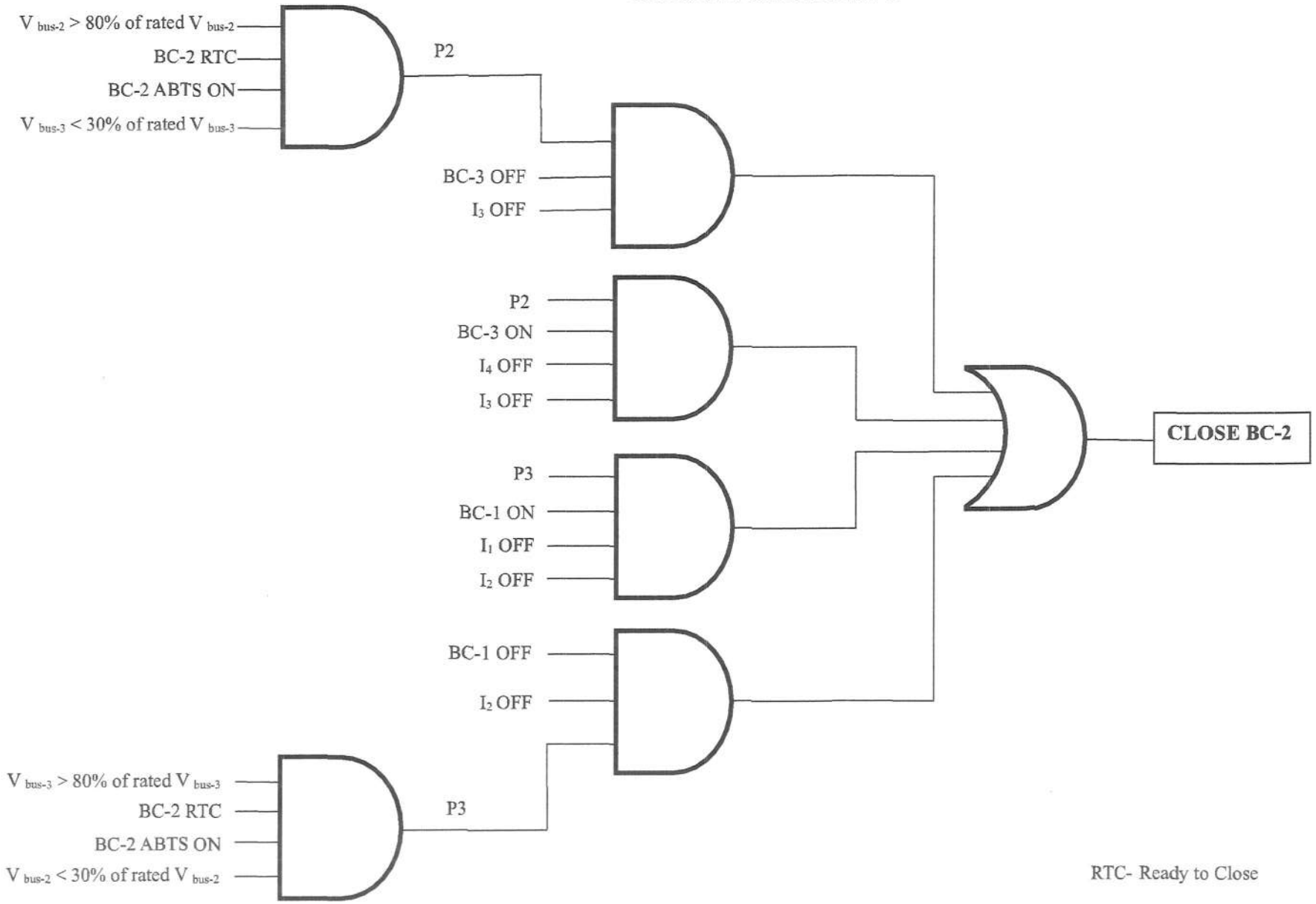


RTC- Ready to Close

Note:- The closing operation in the ABTS scheme shall not be initiated if a fault condition persists in the intended bus section.

26/3/25
Am(Des)-Elec

CLOSING LOGIC: BC-2



RTC- Ready to Close

Note:- The closing operation in the ABTS scheme shall not be initiated if a fault condition persists in the intended bus section.

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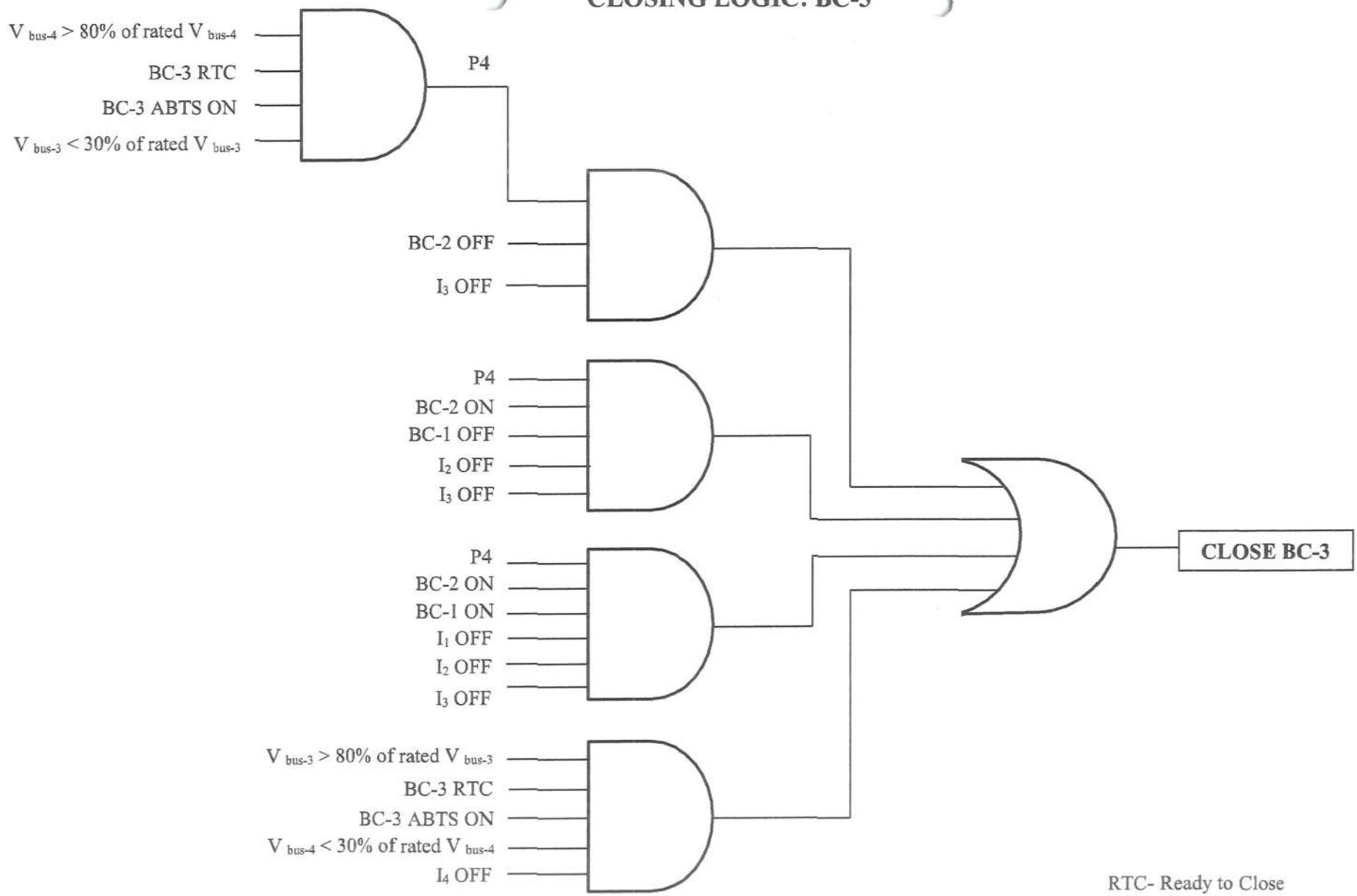
CLOSING LOGIC: BC-3



RTC- Ready to Close

Note:- The closing operation in the ABTS scheme shall not be initiated if a fault condition persists in the intended bus section.

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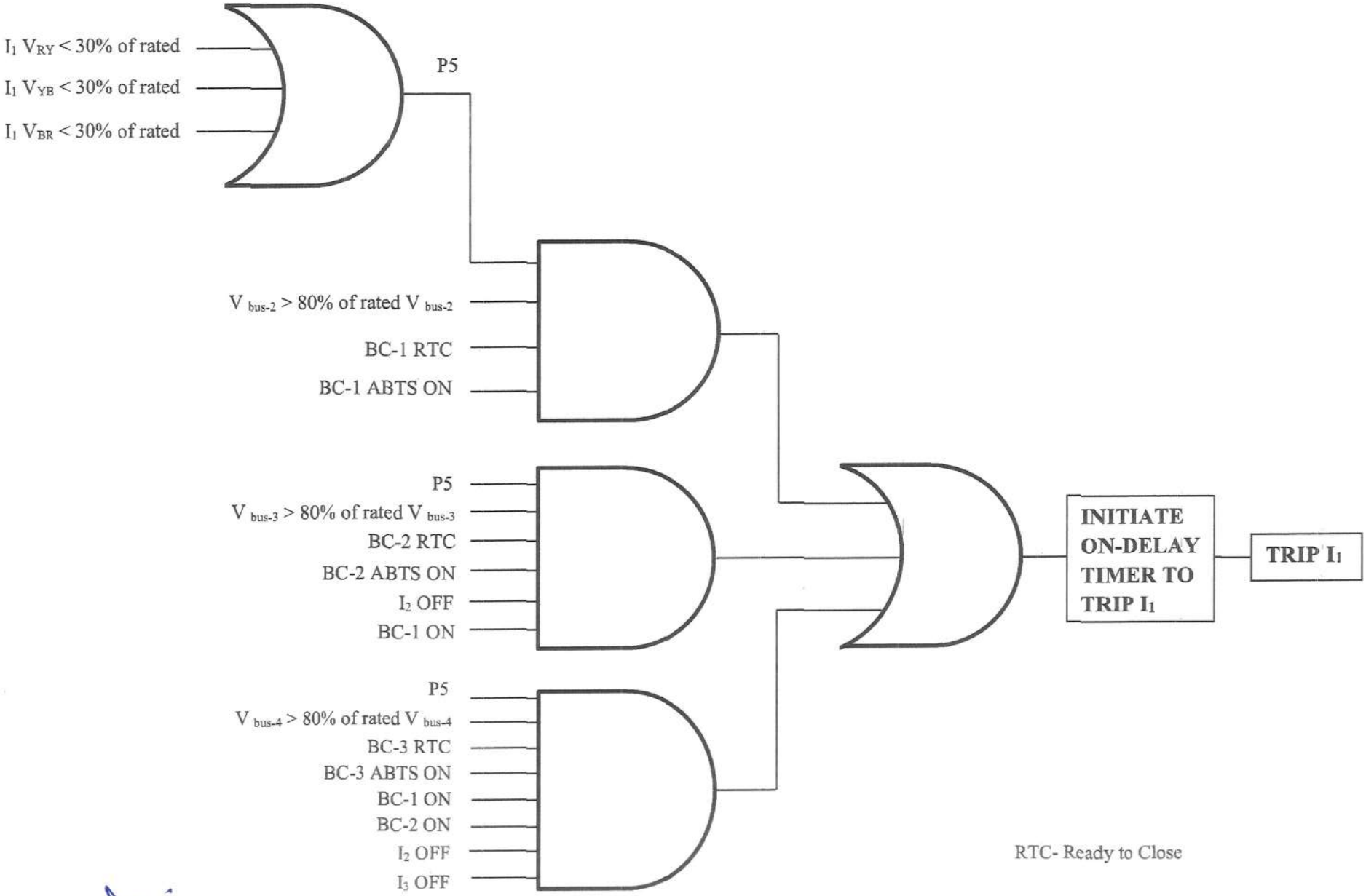
TRIPPING LOGIC: I_1



RTC- Ready to Close

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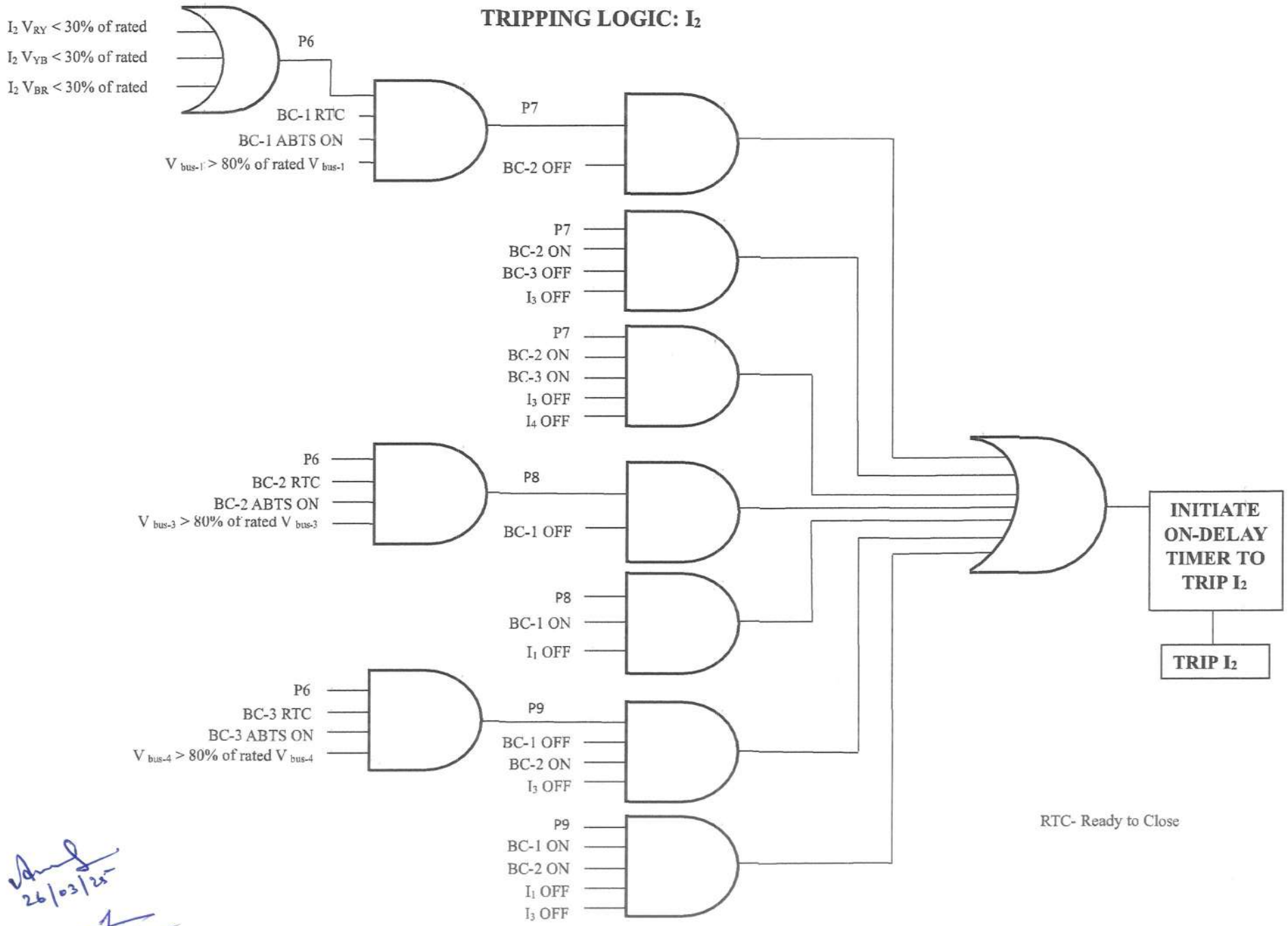
TRIPPING LOGIC: I_2



RTC- Ready to Close

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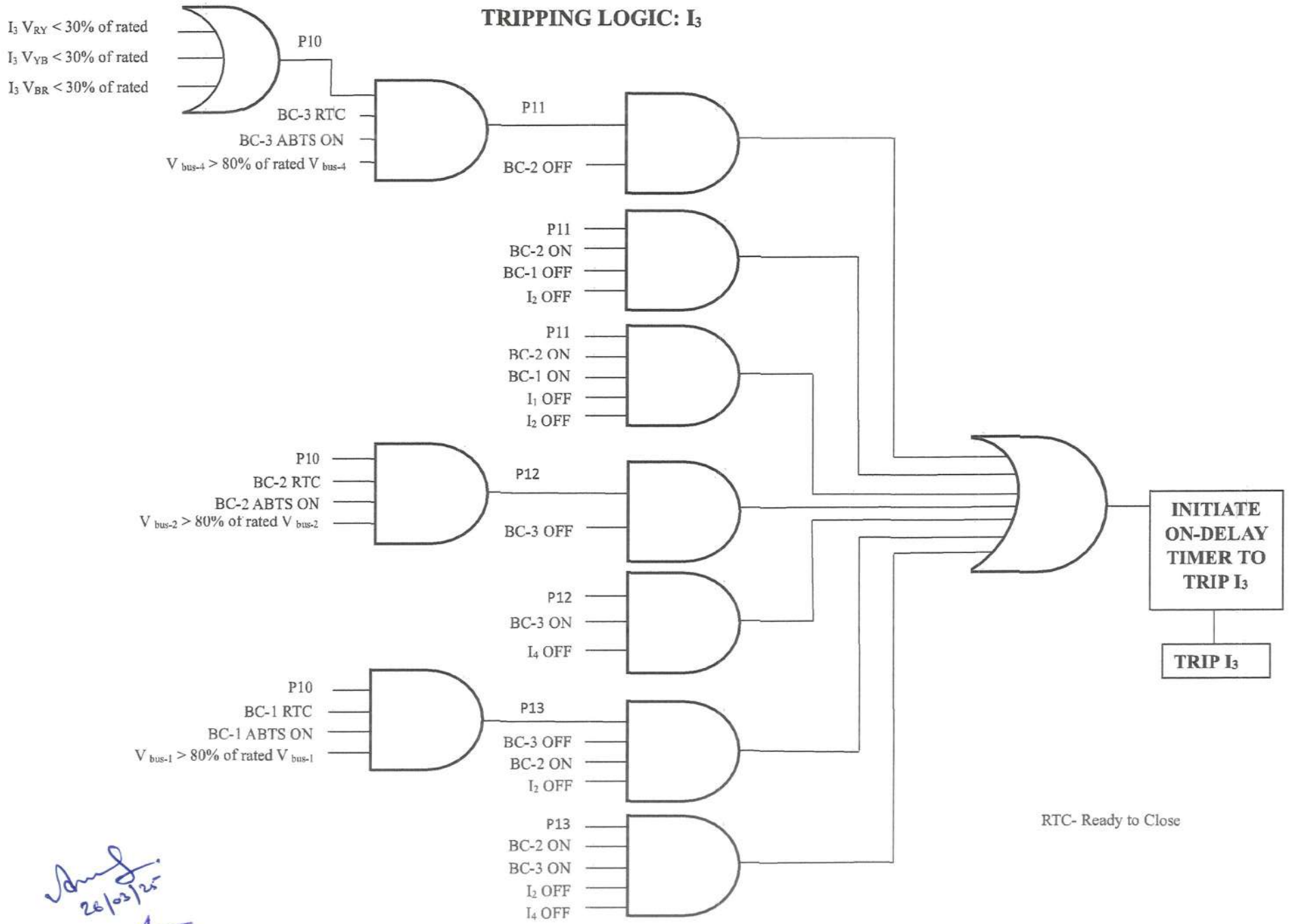
TRIPPING LOGIC: I_3



RTC- Ready to Close

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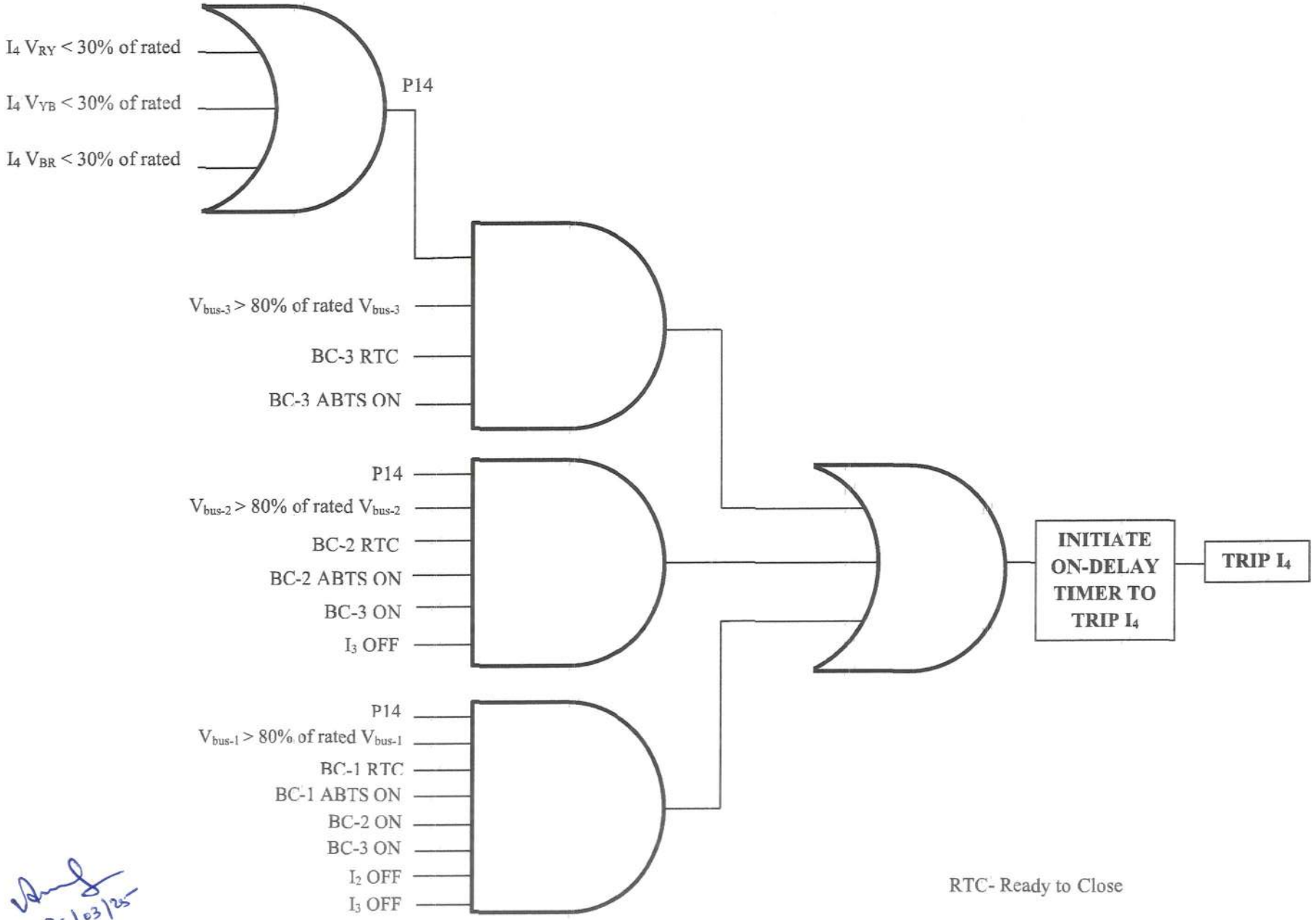
TRIPPING LOGIC: I_4



RTC- Ready to Close

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COMPLIANCE STATEMENT
MM/172/G31818

Sl. No.	Terms	Bidder confirmation
1	All quotations shall be as per the TPS-UC-SS-HVSB-02	
2	Interim Inspection and Pre-Dispatch Inspection required as per the TPS	
3	The vendor shall provide warranty for the entire switch board and accessories , for a period of 12 months from the date of commissioning or 18 months from date of dispatch, whichever is earlier.	
4	The vendor shall supply the items within 24 weeks from the date of receipt of approved drawing or 32 weeks from the date of LOI, whichever is earlier.	
5	Please confirm : Price Basis – FOR FACT Stores (as per Gem T & C)	
6	Please confirm : Taxes and Duties - The Price offered in GEM is all inclusive of TAX. (as per Gem T & C). Please mention the GST %.	
7	Please confirm: a) Payment of 90 % of the total supply value shall be paid within 30 days from the receipt of materials at site and acceptance by FACT. b) Balance 10 % of the total supply value along with the payment for testing and commissioning shall be paid after successful installation and commissioning of the system as per the specification. c) The bidder shall submit a performance guarantee for the system including software. An amount equivalent to 10 % of the order value shall be retained towards performance guarantee and shall be released only after successful completion of the warranty period. Alternatively the supplier can submit a performance bank guarantee for 10 % of the order value from a scheduled / nationalized bank with validity till end of the warranty period and for a claim period of 6 months in FACT provided proforma.	
8	Please confirm : Liquidated Damages: As per GeM – "@ 0.5% of the contract value of delayed quantity per week or part of the week of delayed period as pre-estimated damages not exceeding 10% of the contract value of delayed quantity without any controversy/dispute of any sort whatsoever"(as per GeM T & C)	

Note : All the above columns shall be filled properly, without leaving blanks. Please upload / return this document duly filled-in, along with your bid.