

Inviting Bids from eligible Firms/Contractors/Agencies/Individuals for the Design, Supply, Installation, Testing and Commissioning Work of New Process MCC Panel and dismantling of old MCC Panel.

INVITATION FOR BID (IFB)



December 2024





West Assam Milk Producers' Co-operative Union Ltd.

PURABI DAIRY

INVITATION FOR BID

WAMUL/Admin/SITC OF MCC Panel/2024-2025/01

Dated: 17-12-2024

Sub: Inviting Bids from eligible Firms/Contractors/Agencies/Individuals for Civil and Structural Works.

West Assam Milk Producers' Cooperative Limited (WAMUL) is pleased to invite eligible Firms/Contractors /Agencies/Individuals for Civil and Structural Works inside WAMUL (Purabi Dairy) premises as details mentioned below:

Sl No.	Brief Description of works	BOQ	Technical Specification	Feeder & Load Details	Location	Completion Time
1	Design, Supply, Installation, Testing and Commissioning Works of New Process MCC Panel and dismantling of old MCC Panel.	Attached as Annexure- I(a) & I(b)	Attached as Annexure- II	Attached as Annexure- III	WAMUL (Purabi Dairy) Panjabari, Kamrup Metro-781037	60 days from the date of issue of Work Order

Schedule of bidding:

The bidding shall be done on the basis of two envelopes (technical and financial envelopes), single stage tendering process and shall be having the following timelines:

Sl. No.	Particulars	Date	Time
1.	Commencement of publishing of Tender	17-12-2024	-
2.	Pre Bid Meeting	20-12-2024	12.00 HRS
2.	Last date of submission of technical and financial bids	31-12-2024	12.00 HRS
3.	Date of technical bid opening	31-12-2024	12.30 HRS

Terms and Conditions

1. Eligibility criteria of the bidder

The Purchaser shall assess each Bid against the following Qualification Criteria.

- The bidder should be a manufacturer (Relevant document which proves that the bidder is a manufacturer e.g Incorporation certificate, MSME or any other relevant documents proves that the party is a manufacturer).

- ii. If the bidder is a dealer, authorization certificate from principle manufacturer will be considered (Authorisation of dealer is required)
- iii. The bidder's (Manufacturer/Dealer) average Financial Turnover should be minimum of Rs.300 Lakh in the last three financial years ending 31st March (FY 2021-22, 22-23, 23-24 & years should be consecutive). Relevant document required: Audited balance sheet or Chartered Accountant certified copy having valid UDIN no.
- iv. The bidder (Manufacturer/Dealer) should have completed minimum of 2 contracts for same works in the last 3 financial years mentioned herein FY 2021-22,22-23,23-24 having value equal or more than 50 Lakh (Relevant documents required: relevant P.O copies along with satisfactory work completion certificates or equivalent)
- v. The bidder (Manufacturer/Dealer) should have valid GST registration certificate (Certificate required).
- vi. MSME documents if applicable.

2. Earnest Money Deposit: The Bidders shall submit EMD amounting to Rs. 60,000/- in the form of Bank Draft in favor of "West Assam Milk Producers Cooperative Union Limited" payable at Guwahati. If the bidder is not earnest about the bid, then the bid security is liable to be forfeited.

3. Performance Security: The successful bidder shall furnish to the WAMUL a performance security of 10% of the contract value in the form of Bank Guarantee or a Bank Draft from any Nationalized/Scheduled Bank in favor of "West Assam Milk Producers Cooperative Union Limited", payable at Guwahati within 30 days after the issue of Work and shall be valid for one year from the date of completion of work. The Performance Security furnished by the successful bidder will be retained by the office up to 60 days after expiry of Performance Obligation Period/PBG. The PBG held by the office till it is returned to the successful bidder will not earn any interest.

4. Work Completion time: within 60 days from the issue of work order.

5. Payment terms: 80% payment of material supply will be made within 15 days after supply, inspection and certification of materials along with submission of bills. Balance payment of 20% will be made after completion of entire work.

6. Validity of the Bids: Bids must be valid for 120 days from the due date of submission. The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

7. Liquidated Damages: If the bidder fails to deliver any or all the goods or perform the services within the time period(s) specified in the purchase order/contract, the WAMUL shall, without prejudice to its other remedies under the purchase order/contract, deduct from the purchase order/contract price, as liquidated damages, a sum equivalent to the following clauses which is applicable as per Order.

b) 0.5% of the delayed items for each completed week of delay.

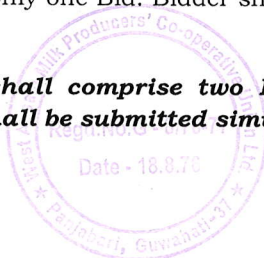
The total amount so deducted shall not exceed 10% of the purchase order/contract value. Once the maximum is reached, the WAMUL may consider cancellation/termination of purchase order/contract, and forfeiture of performance/ deposit bond

8. Price Bid

8.1. The Prices shall be quoted in Indian Rupees only.

8.2. Each bidder shall submit only one Bid. Bidder shall not contact other Bidders in matters relating to this Bids

8.3. **Documents:** *The Bids shall comprise two Parts, namely the Technical Part and the Financial Part. Both Parts shall be submitted simultaneously in a single cover.*



i) The Technical Part of Bids shall comprise the following:

a) Letter of Bids – Technical Part Comprises of all relevant documents as mentioned at point 1 of eligibility criteria of the bidder.

b) Complete address and contact details of the Bidder having the following information:

Name of Firm.

Address for communication.

Telephone No(s): Office

Mobile No.

Electronic Mail Identification (E-mail ID).

ii. The Financial Part of Bids shall comprise the following:

(a) Price Schedule as per specified format (BOQ) Attached as Annexure-I(a) & I(b).

9. Evaluation and Award of Contract:

9.1. The Purchaser will evaluate on overall basis and compare the Bids of the responsive bidders only to be responsive i.e. which are properly signed; and Conform to the terms and conditions, and specifications

9.2. **The Bids would be evaluated for complete set/works to be executed under this IFB.**

9.3. GST, charges in connection with the services shall be taken into account in evaluation.

9.4. The Purchaser will award the contract to the bidder whose Bid has been determined to be responsive and who has offered the lowest evaluated Bids price.

9.5. Notwithstanding the above, the Purchaser reserves the right to accept or reject any Bids and to cancel the bidding process and reject all Bids at any time prior to the award of contract.

9.7. The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the Bids validity period. The terms of the accepted offer shall be incorporated in the supply order.

10. Warranty: 12 months from the date of commissioning.

11. Insurance: Extra as applicable at actuals.

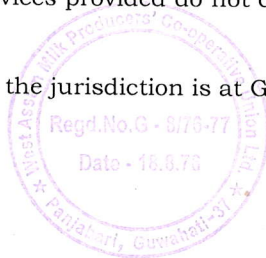
12. Drawings: To be furnished within 15 days from the date of issue of Work Order.

13. Freight charges or any other charges: Freight charges or any other incidental charges should be included in the BOQ.

14. Cancellation of Contract: WAMUL shall be free to cancel the order either in full or in part, in the case of non-delivery/ non-completion of execution within the stipulated completion period.

15. Rejection: WAMUL reserves the right to reject the goods either in part or full if at the time of delivery, it is noticed that the services provided do not conform to the specifications/description given in the purchase order

16. For any dispute/legal issues, the jurisdiction is at Guwahati Only.



17. $\pm 10\%$ variations in reference to the Work Order would be considered while making the final payment.

Bids can be submitted in person on or before the due date and time specified above. Such Bids should be dropped in the tender box only kept at the Office of the "West Assam Milk Producers Cooperative Union Limited," Juripar Panjabari-Guwahati-781037.

Alternatively, the bidder can submit the Bids by registered post so as to reach the above address on or before the due date and time specified above. Bids received after due date and time will not be considered and WAMUL shall not be liable or responsible for any postal delays.

The completed IFB document duly signed on all the scanned signed pages by WAMUL should be submitted by the bidder along with the offer letter.

The bidder should submit the bids (technical bid along with all the required supporting documents and the financial bid in the designated format mentioned in Annexure-I) in two (02) separately sealed envelopes and then insert them in a single large envelope duly sealed and shall address to on or before last date of submission of bid:

Sd-

Managing Director

**West Assam Milk Producers' Cooperative Union Limited (Purabi Dairy), Guwahati-781037,
Assam.**



Annexure-I (a) BOQ					
Sl No	Work Description	Qty	UOM	Unit Rate (Rs.)	Total Amount (Rs.)
Supply of Materials/Equipment including freight					
1	Indoor type floor mounted, cubicle type compartmental MCC Panel which also includes Capacitor Bank of required rating/size controlled by the APFC Relay	1	No		
2	HMI based PLC Panel for 5 KLPH and 10 KLPH Pasteurizer	2	Nos		
3	300 SQMM X 3.5 Core PVC Sheathed, 1.1 KV Grade, Armoured, XLPE Insulated, Aluminium Conductor Cable	300	RM		
4	Power Cable, Control Cable and Instrumentation Cables as per requirement	1	Lot		
5	Earthing System consisting of Earthing pit, Earthing Conductors and All Earthing Accessories	1	Lot		
6	Local Control Panel/Push Button Station	1	Lot		
7	Isolator Switches	1	Lot		
8	Fire Extinguishers	1	Lot		
9	SS Cable Tray and GI Cable trays, Clamps, Glands,Lugs, Route Marker, Identification tags, GI and SS Conduits etc as per requirement.	1	Lot		
				Total Supply amount (Rs.)	
				% GST (Rs.)	
				Freight or any other incidental charges	
				% GST (Rs.)	
				(A) Total Supply amount inclusive of GST (Rs.)	
Installation, Testing and Commissioning					
10	Indoor type floor mounted, cubicle type compartmental MCC Panel which also includes Capacitor Bank of required rating/size controlled by the APFC Relay	1	Nos		
11	HMI based PLC Panel for 5 KLPH and 10 KLPH Pasteurizer	2	Nos		
12	300 SQMM X 3.5 Core PVC Sheathed, 1.1 KV Grade, Armoured, XLPE Insulated, Aluminium Conductor Cable	300	RM		
13	Power Cable, Control cable and Instrumentation Cables as per requirement	1	Lot		
14	Earthing System consisting of Earthing pit, Earthing Conductors and All Earthing Accessories	1	Lot		
15	Local Control Panel/Push Button Station	1	Lot		
16	Isolator Switches	1	Lot		
17	Fire Extinguishers	1	Lot		
18	SS Cable Tray and GI Cable trays, Clamps, Glands,Lugs, Route Marker, Identification tags, GI and SS Conduits etc as per requirement.	1	Lot		
				Total ITC amount (Rs.)	
				% GST (Rs.)	
				Freight or any other incidental charges	
				% GST (Rs.)	
				(B) Total ITC amount inclusive of GST (Rs.)	
Dismantling Work					
19	Dismantling and Shifting of existing Process MCC Panel with removal of all the incoming and outgoing cables as required.	1	Job		
				Total Cost towards dismantling (Rs.)	
				% GST (Rs.)	
				Freight or any other incidental charges	
				% GST (Rs.)	
				(C) Total dismantling amount inclusive of GST (Rs.)	
				Total Amount (A+B+C)Rs.	

Annexure-I (b): BOQ for Laying, testing and commissioning of existing cables over MS Structure					
Sl. No	Description of work	Qty.	Unit	Rate (in Rs.)	Total Amount (Rs.)
1	Disconnection and reconnection, testing and commissioning of 3.5C x 120 mm ² cable from new PCC Panel and termination into LT Panel of Admin Building (including supply and fixing of lugs,glands and other accessories wherever necessary.)	1	Nos		
2	Laying of 3.5C x 120 mm ² Admin cable from new PCC Panel overhead from new PCC Panel to Admin building (including supply and fixing of lugs,glands and other accessories wherever necessary.)	330	RM		
3	Disconnection and reconnection, testing and commissioning of 3.5C x 240 mm ² cable from new PCC Panel and termination into boiler panel (including supply and fixing of lugs,glands and other accessories wherever necessary.)	1	Nos		
4	Laying of 3.5C x 240 mm ² cable from new PCC Panel overhead from new PCC Panel to Boiler Building (including supply and fixing of lugs,glands and other accessories wherever necessary.)	60	RM		
5	Supply and erection of MS Structure support with supply and fixing of cable tray of minimum 150 mm width, including necessary civil works, and necessary hardware fittings etc completed with painting wherever required as per site condition.	1	lot		
6	Jointing of cable with Heat Shrinkable cable jointing kit wherever required	1	Job		
Total					
% GST (Rs)					
Freight or any other incidental charges					
% GST (Rs)					
Grand Total including GST					

Annexure-II

DESIGN SPECIFICATIONS AND SCOPE OF WORK

WORK:

DESIGN, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF NEW PROCESS MCC PANEL AND DISMANTLING OF OLD MCC PANEL AT PURABI DAIRY PLANT, WAMUL.

LOCATION:

WEST ASSAM MILK PRODUCERS' CO-OPERATIVE UNION LIMITED,
R.K. JYOTIPRASAD AGARWALA ROAD, NEAR JURIPAR, PANJABARI,
GUWAHATI-781037, ASSAM



1. Schedule of Work

Sl. No.	Work Description	Qty.	UOM
Supply of Materials/Equipment			
1	Indoor type floor mounted, cubicle type compartmental MCC Panel which also includes Capacitor Bank of required rating/size controlled by the APFC Relay.	1	No
2	HMI based PLC Panel for 5 KLPH and 10 KLPH Pasteurizer	2	Nos
3	300 SQMM X 3.5 Core PVC Sheathed, 1.1 KV Grade, Armoured, XLPE Insulated, Aluminium Conductor Cable	300	RM
4	Power Cable, Control Cable and Instrumentation Cables as per requirement.	1	Lot
5	Earthing System consisting of Earthing pit, Earthing Conductors and All Earthing Accessories	1	Lot
6	Local Control Panel/Push Button Station	1	Lot
7	Isolator Switches	1	Lot
8	Fire Extinguishers	1	Lot
9	SS Cable Tray and GI Cable trays, Clamps, Glands, Lugs, Route Marker, Identification tags, GI and SS Conduits etc. as per requirement.	1	Lot
Installation, Testing and Commissioning			
10	Indoor type floor mounted, cubicle type compartmental MCC Panel which also includes Capacitor Bank of required rating/size controlled by the APFC Relay.	1	No
11	HMI based PLC Panel for 5 KLPH and 10 KLPH Pasteurizer	2	Nos
12	300 SQMM X 3.5 Core PVC Sheathed, 1.1 KV Grade, Armoured, XLPE Insulated, Aluminium Conductor Cable	300	RM
13	Power Cable, Control Cable and Instrumentation Cables as per requirement.	1	Lot
14	Earthing System consisting of Earthing pit, Earthing Conductors and All Earthing Accessories	1	Lot
15	Local Control Panel/Push Button Station	1	Lot
16	Isolator Switches	1	Lot
17	Fire Extinguishers	1	Lot
18	SS Cable Tray and GI Cable trays, Clamps, Glands, Lugs, Route Marker, Identification tags, GI and SS Conduits etc. as per requirement.	1	Lot
Dismantling Work			
19	Dismantling and Shifting of existing Process MCC Panel with removal of all the incoming and outgoing cables as required.	1	Job



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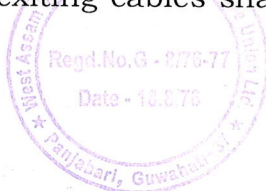
Sl. No.	Work Description	Qty.	UOM
Laying, testing and commissioning of existing cables over MS Structure			
20	Disconnection and reconnection, testing and commissioning of 3.5C x 120 mm ² cable from new PCC Panel and termination into LT Panel of Admin Building (including supply and fixing of lugs, glands and other accessories wherever necessary.)	1	No
21	Laying of 3.5C x 120 mm ² Admin cable from new PCC Panel overhead from new PCC Panel to Admin building (including supply and fixing of lugs, glands and other accessories wherever necessary.)	330	RM
22	Disconnection and reconnection, testing and commissioning of 3.5C x 240 mm ² cable from new PCC Panel and termination into boiler panel (including supply and fixing of lugs, glands and other accessories wherever necessary.)	1	No
23	Laying of 3.5C x 240 mm ² cable from new PCC Panel overhead from new PCC Panel to Boiler Building (including supply and fixing of lugs, glands and other accessories wherever necessary.)	60	RM
24	Supply and erection of MS Structure support with supply and fixing of cable tray of minimum 150 mm width, including necessary civil works, and necessary hardware fittings etc. completed with painting wherever required as per site condition.	1	Lot
25	Jointing of cable with Heat Shrinkable cable jointing kit wherever required	1	Job



2.Scope of Work

The Scope of the work is as follows:

1. Design, Supply, Installation, Testing and Commissioning of Indoor type floor mounted, cubicle type compartmental MCC Panel which also incorporates Capacitor Bank of adequate rating and size controlled by an APFC Relay as per approved diagram. The approval for the rating and size of the MCC Panel and APFC Panel shall be taken from the purchaser before designing. The details of outgoing feeders and load sheet shall be provided to the contractor.
2. Supply, Installation, Testing and Commissioning of Main Power Cable that will provide power to the MCC Panel from the PCC Panel. The cable shall be laid through a route as decided on site by the client.
3. Design, Supply, Installation, Testing and Commissioning 2 Nos of HMI-based PLC Panel for the 5 KLPH and 10 KLPH Pasteurizer. The Input and output configurations along with all the necessary details shall be worked out by the bidder with consultation with the purchaser.
4. LT power distribution to all motors and instruments wherever required are in the work scope that require electric power including design and sizing of the various power and control cables for the various electrical equipment.
5. The scope includes all the related remote control panels/local control panels and all control circuit wiring including field wiring for push buttons, indicators, solenoid valves, limit switches, single phase supply for digital instrumentation, UPS/Stabilizers etc. All necessary electrical accessories like isolators, junction boxes, push buttons station, cable trays, SS/GI conduits etc. with dressing and termination of cables at both ends. Insulation mats in front of the MCC to be provided. Final termination on to motor/ equipment shall be through flexible multi-core copper cable in SS flexible conduit from plug socket isolator (DOL started motors) or from junction boxes with lockable emergency stop push button (Star Delta Started motors) as per requirement.
6. Design and sizing of the earthing network required for the various electrical equipment under the scope of supplier including the supply, installation, testing and commissioning of all the required size earth flats/wires in double run formation along with sufficient GI/Copper Plate and Pipe earthing as per approved earthing network drawing. The scope includes all the related earthing accessories like earthing strips, lugs, terminal connectors etc.
7. Quantity of items including power and control cables, cable trays, earthing, instruments, structural are to be offered based on actual requirement at site. The bidder has to work out the exact details and requirement based on the system offered, as per site condition.
8. Complete Dismantling, Removal and Shifting work for the existing Process MCC Panel along with removal of all the incoming and outgoing cables from the existing panel and PCC. The panel shall be shifted to a place inside the WAMUL's premises as directed.
9. The design and location of the Outdoor structural MS bridge/supports and the new route for laying the exiting cables shall be worked out with consultation with the purchaser.



10. Necessary drawings, SLD, GAD and layout shall be submitted by the bidder for approval before working on the manufacturing.
11. All materials and equipment shall be conformed to latest revision of BIS/IS codes and specifications and it has to be ensured with supporting test reports from the OEM.
12. The bidders are requested to visit the proposed site & understand the site location with regards to design, transportation, labour, material availability and accordingly submit the offer without deviation in the basic configuration of the work.

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3.DESIGN SPECIFICATION OF MCC PANEL

Statutory Requirement:

Motor control center is to be manufactured/assembled as per the latest IS Specification, Indian Electricity Rules, including special requirements of concerned State Electricity Inspectorate and the detailed specification mentioned below.

Housing Details:

The switchboard shall be fabricated using pressed and shaped cold rolled steel sections structure of adequate thickness. The sheet steel used for panel shall be min. 14 SWG sheet except that the partition plates, inter-panel barriers and cubicle doors may be made of 16 SWG. The switchboard shall consist of free standing front and back open-able panels arranged to form a continuous line-up of uniform height. Cold rolled sheets shall be used for doors and front covers.

Doors shall be hinged type and bus bars and cable alleys covers shall be bolted type. Switch Board shall be extensible at both the ends by addition of vertical sections. Ends of the bus bars shall be suitably drilled for this purpose. Panels at extreme ends shall have openings, which shall be covered with plates screwed to the panel. The switchboard shall be provided with integral base frame. The panel base plate/cable gland plate shall be 2.5 mm thick.

The switchboard shall be totally enclosed, dust, weather and vermin proof. The switchboard shall conform to degree of protection not less than IP 44. Gaskets of durable material shall be provided for doors and other openings. Suitable hooks shall be provided for lifting the boards. These hooks when removed, shall not leave any opening in the board.

All hardware shall be corrosion resistant. All joints and connections shall be made by galvanized zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers secured against loosening.

The switchboard shall be wardrobe type suitable for indoor installation. Suitable cable & bus bar alleys shall be provided. In case plant room dimensions prohibit provision of cable/bus alleys in front, panel depth may be increased suitably to accommodate cables/buses on back of MCC. All components of the switchboard shall generally be approachable from front. However, MCC can be in double front execution also if specifically asked for. The maximum and minimum operating handle/push button height of any feeder shall not be more than 1900 mm or less than 300 mm with reference to panel bottom.

Total height of panel shall not exceed 2300 mm. Supporting arrangement for dressing of power and control cables in cable alleys also shall be provided. **Maximum shipping length of MCC shall be 2500 mm.**



Painting:

All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dirt. Fabricated structures shall be pickled and treated to remove any trace of acid. The under-surface shall be prepared by applying a coat of phosphate

paint and a coat of yellow zinc chromate primer. The under surface shall be made free from all imperfections before undertaking the final coat.

After preparation of the under surfaces, the panel **shall be finished with powder coated finish** with two coats of shade RAL 7035 Siemens grey. Thickness shall not be less than 60 microns. The finished panels shall be dried in stoving ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run-off paint, etc. All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust, corrosion, etc.

Name plates:

Nameplates for all incoming and outgoing feeders shall be provided on doors of each compartment and also for panel indicating voltage. **Nameplates shall be fixed by screws only and not by adhesives.** Engraved nameplates shall preferably be of 3-ply (Black-White-Black) acrylic sheets or anodized aluminum. Special danger plates shall be provided as per requirement. Inside the panels, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

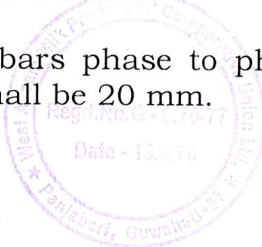
Bus bar Sizing Connection and Supports:

The bus bars shall be made from high purity & high conductivity copper. The bus bars and supports shall be capable of withstanding the rated and short circuit current stated in the single line diagram/feeder details. Minimum size of power (phase) bus bars shall not be less than 200 Amps rating. Maximum current density permissible for Copper Bus Bars shall be 1.0 Amp/mm². A suitable section aluminum earthing bus bar shall be provided in the panel at bottom throughout the length of the panel. Minimum cross section of Al earth bus shall be 300 sq. mm. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All doors shall be earthed using flexible copper connections to the fixed frame of the switchboard. The bus bars shall be tinned to protect against oxidation.

The bus bars shall be provided with heat shrinkable PVC insulating sleeves of 1100 V grade. Red, Yellow and Blue colour shall be used for phase bus bars and Black colour shall be used for neutral bus bars. The sleeves should be non-inflammable and self-extinguishing type. All joints in main horizontal bus bars and all tap-off connections from the main horizontal bus bars shall be suitably shrouded.

Supports for bus bars shall be made of suitable size non-hygroscopic and non-inflammable epoxy compound SMC / DMC blocks and these should be adequate in number so as to avoid any sag in the bus bars.

Minimum clearance between bus bars phase to phase shall be 25 mm and that between phases to neutral/earth shall be 20 mm.



Power Connection:

For power interconnection within the panel board, Copper conductor PVC insulated cables of adequate cross section shall be used. For current rating above 63 amps aluminum bus bar strips of adequate rating shall be used. Minimum size of copper conductor to be used shall be 4.0 sq.mm. Cable lugs/ sockets of Copper of suitable size and type shall be used for all interconnections.

For all outgoing motor feeders, the suitable size terminal blocks shall be provided in cable alleys. These terminal blocks shall be heavy duty type to withstand high starting currents.

For incoming feeders of the MCC, Aluminium conductor cables will be used and hence the panel is to be designed for receiving these and wherever required bus bar extensions for receiving more runs. of cables, shall be provided in panel by supplier. Removable gland plates of 2.5mm thickness shall be provided on top/ bottom of panel, for cable entries.

The cable alleys shall also be totally isolated from switchgears by suitable partition plates.

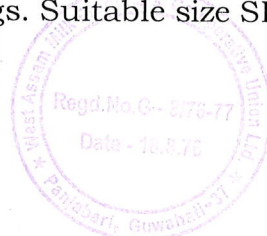
To prevent accidental contacts, all junctions of interconnecting cables and bus bars also shall be shrouded suitably using coloured PVC insulation tape. Standard colour code of red, yellow and blue for phases and black for Neutral to be followed for all bus bars/conductors.

Auxiliary wiring and Terminals:

Wiring for all controls, protection, metering, signaling etc. inside the switchboard shall be done with 1100 volts gray colour PVC insulated Copper conductors. Minimum size of these conductors shall be 1.5 Sq.mm., however, CT circuit wiring shall be done with 2.5 Sq.mm. Control wiring to components fixed on doors shall be flexible type. The complete panel may be sub-divided into different sections as required by purchaser and each section shall have its own control circuit with MCB and indication. Terminal block (Minimum 3-ways) for control wiring shall be provided for each outgoing Motor feeder in its cubical. 10% spare terminals shall always be available in each terminal block. Control wiring up to these terminal blocks shall be done by supplier.

All control wiring should be provided with necessary cable sockets/lugs at both ends.

Conductors shall be terminated using crimping type lugs. Each termination shall be identified at both the ends by PVC ferrules. The identification termination numbers should match with those on drawings. Suitable size SP MCB shall be used for tapping power for control circuit wiring.



Control wiring for motor feeders should be such that the "green" light of motor feeder is "ON" only when control as well as power circuit of feeders is "ON" and it shall have its own fuse.

For all motor starter feeders, provision for control wiring to remote ON/OFF control is to be made. In addition, ON and OFF provision for the motor feeders from the MCC should be provided. The auxiliary wiring for the same shall be brought up to terminal block in the feeder's cubicle.

Supplier to submit GA & power circuit drawing for approval to purchaser before starting manufacturing of MCC.

Insulating elastomer mats with suitable thickness as per IS 15652:2006 shall be provided in front of the MCC under scope of this supply.



4. Switchgears

Molded Case Circuit Breakers (MCCB):

MCCBs shall always be provided with separate rotary operating handle mechanism with door interlocking for incoming feeders. The MCCBs shall be of three / four pole construction (as required in the feeder details) arranged for simultaneous three / four pole manual closing or opening and automatic instantaneous tripping on short circuits. MCCBs shall be provided with adjustable type tripping device with inverse time characteristics for over load protection. Closing mechanism shall be quick make, quick break & trip free type.

Operating handle shall give a clear 'ON', 'OFF' & 'TRIP' indications. Control voltage for MCCB shall be 240 volts. The MCCBs shall be rated for continuous maximum duty as specified. The rating of the MCCBs shall be as per the feeder details. Minimum rated breaking capacities shall be as under:

MCCBs up to 200 Amps 35 KA

MCCBs above 200 Amps 50 KA

Note: All feeders having 3 pole MCCB shall be provided with neutral link complete with isolating link. However, the MCCBs for incoming and non-motor outgoing feeders shall be of 4 pole construction, unless stated otherwise.

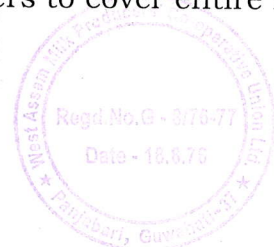
Motor Protection Circuit Breaker (MPCB):

All motors below 40 HP shall be protected by Motor Protection Circuit Breakers (MPCB) having suitable rating thermal overload relays. These shall be used along with contactors as specified in feeder details. The MPCB will have motor protection tripping characteristics, current limiting and shall have low let through energy. It shall have bi-metallic overload protection and electromagnetic release for short circuit protection. MPCB shall have inbuilt single phase protection and adjustable overload settings.

In the MPCB, it shall be possible to have accessories like auxiliary contacts, trip alarm contacts, shunt release/under voltage release, as required for motor control and protection. MPCB shall give indication for 'ON'/'OFF' and tripping on fault. The breaking capacity of MPCB shall not be less than 50 KA. MPCB shall have rotary operating mechanism with door interlock and provision to lock it in 'OFF' position with a padlock.

Fuses:

These shall be non-deteriorating HRC cartridge link type with operation indicator which will be visible without removing fuses for the service. These shall be complete with molded phenolic fuse base and cover. The fuse base shall be so located in the modules to permit insertion of fuse pullers and removal of fuse links without any problem. One set of fuse pullers to cover entire range of fuses used in the panel shall also be provided.



Contactors:

The rating of the power contactors shall be as required depending upon the feeder rating indicated in the specifications and as per the feeder details table provided in this specification below. Contactors coils shall be suitable for 240 volts, 50 Hz. unless otherwise specified. All contactors shall be supplied with minimum 2 NO + 2 NC auxiliary contacts. Additional contacts if required for interlocking etc. shall also be provided. Minimum contactor rating for power shall be 9 Amp. All the three contactors of Star Delta Starter shall be of same rating. Rating of contactors shall be based on feeder rating. All contactors of motor starters shall be suitable for AC 3 duty unless specified otherwise.

Timers:

The timers shall be continuously adjustable and electronic type, suitable for 240 V, 50 Hz. supply. The timers for Star Delta automatic starters shall have time delay of 0 to 60 seconds between change-over of contacts.

Push Buttons (PBs):

Push buttons shall be complete with actuator and contact block and shall be generally mounted on doors of the cubicles. Colors shall be as follow:

Stop/open/emergency - Red

Start/close - Green

It should have minimum 1 NO + 1NC contacts. Push buttons shall be of minimum 22.5 mm dia. and conform to IP-65 protection against dust and water ingress.

Indication Lamps:

All outgoing & incoming feeders shall be provided with indication lamps. Colors shall be as under:

Phases: Red, Yellow & Blue

ON: Red

OFF: Green

TRIPPED: Yellow

Indicating lamps shall be of LED (cluster of high intensity light emitting diodes) type, suitable for 240 V AC supply. These shall be provided with translucent covers of red, green and amber colors as required. These lamps shall be of minimum 22.5 mm dia. Indication lamps to be provided for all feeders.

Current Transformers (CTs):

CTs shall be cast resin insulated type. Primary and secondary terminals shall be marked indelibly. CTs shall preferably be mounted on stationery parts. These shall be capable of withstanding momentary short circuit and symmetrical short circuit current for 1 second and shall have a minimum rating of 10 VA. Neutral side of CTs shall be earthed.

Protection CTs shall be of low reactance, accuracy class "5P" and an accuracy limit factor greater than "10". Instrument CTs shall be of accuracy class "1.0" and accuracy limit factor less than "5.0".



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Separate CTs to be provided for protection & metering purpose.

Measuring Instruments:

These shall be of square pattern having approximate dimensions 96 mm x 96 mm, flush mounting type. Necessary auxiliary instruments like CTs, VTs, etc. are also included in the scope of supply.

All AC meters shall be of Digital type for displaying three phases and single phase reading. Suitable selector switch shall be provided if the digital meter does not have provision for simultaneous display of three phase readings.

Digital Voltmeter shall be suitable for direct line connection. Voltmeters shall be connected through MCBs only. Digital Voltmeter and Ammeters should be possible to display simultaneously 3 line or phase voltages. Intelligent Panel Meter shall be provided with incoming feeder of the MCC for the measurement and digital display of Multifunctional Electrical Parameters such as voltage, current, active power, reactive power, frequency, power factor, active energy, reactive energy, etc. Data port will be provided to communicate all these parameters to Main PLC Panel through suitable data bus/ signal communication cable.

All motor feeders of 15 HP and above shall be provided with Ammeter. Ammeter shall also be provided for all incoming & outgoing ACB / MCCB / switches of rating 100 A & above.

Ammeters shall always be CT operated.

Special Requirements:

All motor feeders above 10 HP shall have soft starter or Star-Delta Starters or VFD.

For capacitors, special capacitors duty contactors of suitable rating shall be provided.

For incoming feeder of rating higher than 600 Amps., ACB shall be provided unless otherwise stated in the feeder details.

If the outgoing feeder rating is higher than 63 Amps., MCCB shall be provided unless stated otherwise and preferably these shall be located at the lower portion of the panel. These feeders shall also have isolating link for neutral.

Electrical interlocking shall be provided between various feeders as required by the process and specified in feeder details.

If the total operating load on MCC is more than 600 KW, MCC shall be provided with two incoming feeders with a bus coupler unless specified otherwise. Each incoming feeder shall have independent instrumentation and protection. Induction motors (above 15 H.P) having 3000 RPM shall require higher rating for fuses, contactors and electronic timers due to very high starting current. MCC supplier to specially check this requirement from purchaser.



5.LT POWER AND CONTROL CABLES

4.1 LT Power Cable

Cables from PCC to MCC shall be of Aluminium conductor, XLPE insulated, armoured and overall PVC sheathed strictly as per IS 1554 (as amended up to date)/IS: 7098(PART 1/as amended up to date). Power cables for use from MCC to all feeders on 415 V system, up to 70 Sq.mm shall be of 1100-volt grade, copper conductor, PVC insulated, metal braided, rodent proof.

Power cables for use from MCC to all feeders on 415 V system above 70 Sq.mm shall be of 1100-volt grade, copper conductor, XLPE insulated, armoured.

Cables between isolators and motor terminals shall be of suitable size flexible copper conductor, PVC insulated, metal braided.

4.2 LT CONTROL CABLES

Control cables for use on 415 V system shall be of 1100 volts' grade, copper conductor, PVC insulated, metal braided, Rodent proof and overall PVC sheathed, strictly as per IS: 1554 (Part I, as amended up to date). The minimum conductor diameter shall be 1.5 sq.mm.

Proforma for Testing Cables

Date of Test:

- a. Drum No from which cable is taken
- b. Cable from _____ to _____ Meter.
- c. Length of run of this cable _____ Meter.
- d. Insulation Resistance test:

Rating and Model of Megger:

Voltage of Megger: _____ Volts

- i) between core-1 to earth _____ Mega-ohm
- ii) between core-2 to earth _____ Mega-ohm
- iii) between core-3 to earth _____ Mega-ohm
- iv) between core-1 to core-2 _____ Mega-ohm
- v) between core-2 to core-3 _____ Mega-ohm
- vi) between core-3 to core-1 _____ Mega-ohm

(This proforma shall be jointly signed by the Site Engineer from both the client and the contractor).

All the testing devices/equipment shall be arranged by the contractor.



6.ELECTRICAL ACCESSORIES

i. MOTOR ISOLATORS/EMERGENCY Push Button Switch:

- a. Isolators shall be installed inside the plant or outside as per the site conditions for isolating the power to all motors.
- b. For isolators /PBS installed outside the plant shall be of thermoplastic/polycarbonate enclosure plug & socket (IP 65 protection) type.
- c. For isolators /PBS installed inside the plant shall be of SS-304 enclosure (IP55 protection) with plug & socket (IP 65 protection). Test type certificate should be submitted for SS enclosure.

General requirement:

- a. The plug & socket/isolator box should be of dust, vermin and weather proof suitable for wall/structural mounting. All the mating surface should be provided with round rubber gasket (min 6 mm) in the groove so as to make it effectively dust and vermin proof.
- b. Each plug & socket/isolator must be provided with emergency push button. One no. hole of required dia. at the bottom for the cable entry must be provided. Connection to motor shall be through flexible copper cable. 30 amps 6-way terminal block is to be provided inside the isolators. All wires / cables must be terminated using suitable crimping type tinned copper lugs. Two nos. brass screws with washers must be provided on either side of box for earthing.

ii. CABLE TRAYS

- a. Functional requirement: Cable trays shall be used (based on the site condition) for laying the power, control & instrument cables as per approved cable layout drawing.
- b. All cable trays within the plant process area/corridor shall be SS cage/perforated type.
- c. All cable trays outside the plant shall be GI perforated type. These shall be of heavy duty, return flange or inward bend shape, manufactured from mild steel conforming to IS-226 and hot dip galvanized as per IS-2629/BS-729.
- d. **General Requirement:** Width of cable tray shall be as per the requirement. Height to be minimum 50 mm and thickness of plate to be 1.5 mm up to 300 mm cable tray width. For cable trays having width more than 300 mm, height to be 75mm and thickness of plate to be 2.0 mm. Cable trays shall be supplied to site in standard lengths of 2.5 M. Necessary accessories of cable trays such as coupler side plates for joining cable trays, bends, riser, inside riser, tee etc. must also be factory fabricated. Plain cable tray covers 1.5 mm thick to be supplied if specially required. Sample of cable tray to be got approved from NDDDB before supply. Suitable supports required for installation of cable trays shall also be supplied/installed along with cable trays.



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iii. CABLE GLANDS

These shall be provided at both ends of armoured/unarmoured electrical cables. Cable glands shall be manufactured as per performance requirements of BS6121, amended as on date, with brass material accurately machined and nickel-plated. These shall be of heavy duty single compression type for cable conductor sizes above 35 Sq.mm and weather proof double compression type for cable conductor sizes up to 35 Sq.mm. Single compression cable glands will be complete with check nut, gland body, 3 nos. metal washers, and outer seal rubber ring and compression nut. Double compression glands shall be complete with check nut, gland body, neoprene outer ring, armour clamping cone, armour clamping ring, armour clamping nut, skid washer & outer seal nut. For metal braided cable, polyamide glands should be used.

iv. CABLE CONNECTORS

Cable connectors, lugs/ sockets, shall be copper/ Aluminium alloy, suitably tinned, solder less crimping type.

v. CABLE ROUTE MARKERS

These shall be galvanized Cast Iron plate with marking (LT/HT) diameter 150 mm with 600 mm long 25x25 mm GI angle riveted/bolted with this plate.

vi. CABLE INDICATORS

These shall be self-sticking type and of 2 mm thick lead strap for overall cable. PVC identification numbers, ferrule shall be used for each wire.

vii. CONDUITS

All cable (power/control/instrument/signal) drops shall be in conduit/pipe. The open ends of power/control cables at termination shall be protected through suitable conduit. Instrument/signal cable/wire drops up to termination point shall be also routed through conduits. Conduits within process area shall be of SS.



7. EARTHING SYSTEM

The intent of this specification is to define the requirement for the supply, installation, testing and commissioning of the earthing system.

Chemical (Pipe in pipe/maintenance free) type copper earth pits (For PLC/Instrument earthing):

Complete with masonry chambers and CI hinged covers. Maintenance free, chemical filled, dual pipe electrode technology: 40 x 6 mm copper flat; 3-meter-long copper pipes; outer copper pipe-76 mm dia., 2 mm thick & inner copper pipe-42 mm dia., 2 mm thick with special conducting compound material (CCM) filled in both pipes, with 50 KG of moisture booster to be filled to retain moisture around the outer pipe in the pit, duly tested and certified by CPRI.

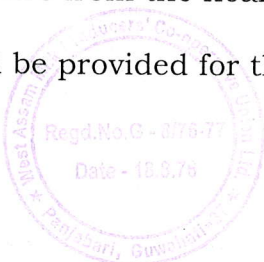
Chemical (Pipe in pipe/maintenance free) type GI earth pits (For power earthing):

Complete with masonry chambers and CI hinged covers. Maintenance free, chemical filled, dual pipe electrode technology: 40 x 6 mm GI flat; 3-meter-long GI pipes; outer GI pipe-76 mm dia., 2 mm thick & inner GI pipe-42 mm dia., 2 mm thick with special conducting compound material (CCM) filled in both pipes, with 50 KG of moisture booster to be filled to retain moisture around the outer pipe in the pit, duly tested and certified by CPRI.

Earthing for automation and instrumentation shall be independent of power earthing.

Earth Pit

- All earth electrodes shall preferably be driven to a sufficient depth to reach permanent moist soil. Electrodes shall preferably be situated in a soil which has a fine texture and which is packed by watering and ramming as tightly as possible. Wherever practicable the soil shall be dug up, all lumps broken and stones removed from the immediate vicinity of the electrodes.
- All earth electrodes shall be tested for earth resistance by means of standard earth test meter. The tests shall take place in dry months preferably after a protected dry spell. All earth electrodes shall be connected in parallel to reduce the earth resistance.
- The electrodes shall have a clean surface not covered by paint, enamel, grease or materials of poor conductivity.
- The exact location and number of earth electrodes required at each location shall be determined in the field in consultation with the owner/engineer-in-charge or his authorized representative, depending upon the soil data and resistivity to meet the ohmic values as per statutory requirement.
- The distance of Earth Pit centre from the nearest building shall not be less than 3 meter.
- Test disconnect facility shall be provided for the earth pits to check their earth resistance periodically.



Earth Bus, Earthing Lead & Earth Wire/Strip

All electrical equipment is to be doubly earthed by connecting two-earth strip/ wire conductor from the frame of the equipment to an earthing pit/ main earthing ring. The earthing ring will be connected via links to several earth electrodes. The cable armoured will be earthed through the cable glands. Conductor size for connection to various equipment shall be as specified in the drawing or as instructed by the Engineer-in charge. All hardware for earthing installation shall be hot dip galvanized. Spring washers shall be used for all earthing connections of equipment having vibrations. Size of earthing lead/ wire shall be as specified in schedule of quantities/drawings. Below Table may be considered as general guidelines.

However, while deciding type & size of earth lead, the resistance between the earthing system and the general mass of the earth shall be as per IS code of practice. The earth loop impedance to any point in the electrical system shall not be in excess of 5.0 Ω in Contract to ensure satisfactory operation of protective devices.

Earthing wire shall be connected to the equipment by providing crimping type socket/ lug.

Wherever earthing strip to be provided in cable tray, it shall be suitably bolted on cable tray and electrically bonded to the cable tray at regular interval.

Excavating & refilling of earth, necessary for laying underground earth bus loops shall be the responsibility of the Supplier.

Wherever earth leads/ strips/ wire are laid in cable trenches, these shall be firmly and suitably cleared to the walls/ supporting steel structure on which cable is clamped.

Sizing of Earthing Lead/Wire

Sl. No.	Item	Size
1	Control switches/ glands Copper wire 14 SWG	Copper wire 14 SWG
2	Motor up to 10 HP	4/6/10 sq.mm Insulated copper wire
3	Motor/Isolators from 12.5 HP up to 40 HP	Copper wire up to the Cable tray & GI strip 25 X 3 mm
4	Motor above 50 HP up to 125 HP	GI strip 40 X 3 mm
5	Motor above 125 HP	GI strip 25 X 6 mm
6	Switch Board / Motor Control Centre	GI strip 50 X 6 mm
7	Earthing main in trenches	GI strip 50 X 6 mm

8. Battery Limits

This specifies in brief the scope of the contractor and Owner/ Purchaser by specifying the limits at which contractor's scope Starts and Ends.

Sl. No.	Purchaser's Scope	Contractor's Scope
1	All civil buildings for the indoor type equipment and RCC foundations/platforms for installation of the MCC Panel.	Civil works related to earth pits such as digging of earth, making watering Chamber and any additional requirements etc. are in the scope of the contractor.
2	Civil cable trenches in MCC Panel Room with MS nosing angle for laying LT cables.	Laying of underground cables, digging of trenches, or laying cables overhead through pre-existing cable tray (if available) or by providing sand/bricks/pipes, refilling of trench and for fixing cable route markers are in the scope of the contractor. Cable tray has to be provided if not readily available.
3	Necessary Shutdown in the PCC Panel, if required, shall be arranged. However, the contractor needs to provide intimation to the client prior to their work in the PCC.	Laying of Armoured power cable from the main PCC to the New Process MCC Panel. Distribution of power and controls up to the consumption points. Necessary earthing of MCCs & other equipment are also included in the scope of the contractor.
4	Only Internal Lighting (through Single Phase distribution) shall be provided.	If the three phase power is provided by the Purchaser, the recovery shall be made @ 0.5% of the total purchase order value. However, the supplier shall supply all the items such as switchgear, cabling etc. required for getting temporary power.



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9. UNLOADING, TRANSPORTATION AND INSPECTION

The Supplier shall be required to unload all the Goods from the carriers, received at site after Supplier's team arrives at site. The Supplier shall plan in advance, based the information received from the Purchaser, Supplier's requirement of various tools, tackles, jacks, cranes, sleepers etc. required to unload the material/equipment promptly and efficiently. The Supplier shall ensure that adequate and all measures necessary to avoid any damage whatsoever to the equipment at the time of unloading are taken. Any demurrage/detention charges incurred due to the delay in unloading the material/equipment and releasing the carriers shall be charged to the Supplier's account. The Supplier shall be responsible for receipt at site of all Goods and Supplier's equipment delivered for the purposes of the Contract.

The Supplier shall safely transport/shift the unloaded Goods and equipment to the storage area.

All the Goods received by the Purchaser prior to arrival of the Supplier at site shall be handed over to the Supplier and there upon the Supplier shall inspect the same and furnish a receipt to the Purchaser. The manner in which the inspection shall be carried out is enumerated below:

1. The materials/equipment would be carefully unpacked by opening the wooden cases/other modes of packings as the case may be.

2. Detailed inventory of various items would be prepared clearly listing out the shortages, breakages/damages after checking the contents with respect to the supplier's packing list, the Purchaser's Contract and approved equipment drawings. The Supplier shall also check every equipment for any shortage/shortcoming that may eventually create difficulty at the time of installation or commissioning.

3. All the information and observations by the Supplier shall be furnished in the form of INSPECTION REPORT to the Purchaser with specific mention / suggestions which in the opinion of the Supplier should be given due consideration and immediate necessary actions, to enable the Purchaser to arrange repair or replacement well in time and avoid delays due to non-availability of equipment and parts at the time of their actual need.

4. The inspection for all the Goods handed over to the Supplier shall be completed within three week's period.

5. The protection, safety and security of the Goods so taken over from the Purchaser shall be the responsibility of the Supplier, until they are handed over to the Purchaser after erection, commissioning and testing as per the terms of the Contract.



10. STORAGE OF GOODS

The Supplier shall be responsible for the proper storage and maintenance of all Goods under Supplier's custody. Supplier shall take all required steps to carry out frequent inspection of equipment/materials stored as well as erected equipment until the same are taken over by the Purchaser. The following procedure shall apply for the same.

1. The Supplier's inspector shall check stored and installed Goods to observe signs of corrosion, damage to protective coating to parts, open ends in pipes, vessels and equipment, insulation resistance of electrical equipment etc. The Supplier shall immediately arrange a coat of protective painting whenever required. A record of all observations made on Goods, defects noticed shall be promptly communicated to the Purchaser and Purchaser's advice taken regarding the repairs/rectifications. The Supplier shall thereupon carry out such repairs/ rectifications at Supplier's own cost. In case the Supplier is not competent to carry out such repairs/ rectifications, the Purchaser reserves the right to have this done by other competent agencies at the Supplier's responsibility and risk and the entire cost for the same shall be recovered from the Supplier's bills.

2. The Supplier's inspector shall also inspect and provide lubrication to the assembled Goods. The shafts of such equipment shall be periodically rotated to prevent rusting as well as to check freeness of the same.

3. The Inspector shall check for any signs of moisture or rusting in any Goods.

4. If the commissioning of Goods is delayed after installation of the Goods, the Supplier shall carry out all protective measures suggested by the Purchaser during such period.

5. Adequate security measures shall be taken by the Supplier to prevent theft and loss of Goods handed over to the Supplier by the Purchaser. The Supplier shall carry out periodical inventory checks of the Goods received, stored and installed by the Supplier and any loss noticed shall be immediately reported to the purchaser. A proper record of these inventories shall be maintained by the Supplier. The Supplier should not sell, assign, mortgage, hypothecate or remove Goods which have been installed or which may be necessary for completion of the work without the written consent of the Purchaser.

6. A suitable grease recommended for protection of surfaces against rusting (refined from petroleum oil with lanolin minimum (70 deg. C) and water in traces) shall be applied over all Goods as required once in every six months.

7. All Goods shall be stored inside a closed shed or in the open depending upon whether they are of indoor or outdoor design. The space heaters where provided into the electrical equipment shall be kept connected with power supply irrespective of their type of storage. Where space heaters are not provided adequate heating with bulb is recommended. For transformers heating of oil shall be done by giving 440 V supply and short-circuiting the LT terminals. Frequent checks on insulation resistance are essential for all electrical equipment and record of the inspection reports and megger readings shall be maintained equipment wise. Such records shall be presented to the Purchaser whenever demanded.

8. All the necessary Goods required for protection as described above shall be arranged by the Supplier and such cost shall be included in the Contract Price.



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11. APPROVALS

The Supplier shall obtain the necessary approvals of the Factory Inspector, Electrical Inspector, Weights & Measures Inspector, Explosive Inspector and any other state and local authorities as may be. All the necessary details, drawings, submission of application and proformas will be furnished by the Supplier to the purchaser for verification/ signature. The necessary application duly filled-in, together with the prescribed fees shall be submitted to the appropriate authorities by the Supplier on behalf of the Purchaser. However, all the actual statutory prescribed fees paid by the Supplier shall be reimbursed by the Purchaser upon production of the receipt/vouchers.

Wherever necessary or required, the Supplier shall furnish the necessary test and/or inspection certificates etc. from the appropriate authorities as per IER and other statutory regulations and the cost for obtaining these certificates shall be included in the Contract Price.



12. LIST OF SUGGESTED MAKES

VFD	SIEMENS/ALLEN BRADLEY/DANFOSS/SCHNEIDER
Level Transmitter & indicator	E&H/EMERSON/ANDERSON NEGELE/JUMO
Temperature/Pressure Transmitter	E&H/EMERSON/ANDERSON NEGELE/ BAUMER/JUMO
Conductivity & pH Transmitter	E&H/EMERSON/ANDERSON NEGELE/BAUMER/JUMO
Density transmitter	E&H/EMERSON/YOKOGAWA
RTD for Tanks	E&H/EMERSON/ANDERSON NEGELE
RTD for Lines	E&H/EMERSON/ANDERSON NEGELE/ RADIX/ GIC/JUMO
Flow Switch	E&H/ANDERSON NEGELE/BAUMER/IFM
Proximity switch	SICK/P&F/IFM
Level Switch	E&H/EMERSON/ANDERSON NEGELE /BAUMER/SAPCON
Vortex/ Magnetic Flow meter	E&H/EMERSON
Mass Flow meter	E&H/EMERSON
Control Valve	DANFOSS/ SAMSON/ TOSHBRO/ FORBES MARSHALL-ARCA/AVCON/FISHER XOMOX/DEMBLA/BURKERT
PID Module	YOKOGAWA/HONEYWELL
Pressure switch/temp switch	DANFOSS/ALCO/HANSEN/PARKER/ E&H/EMERSON/ANDERSON NEGELE/IMF
Pressure & Temperature Gauge	FIEBIG/H GURU/WAAREE/WIKA/PRICOL
Dual type Pressure/temp gauges	FIEBIG/H GURU/WAAREE/WIKA/PRICOL
Temperature digital indicator/controller	E&H/EMERSON/ANDERSON NEGELE/IFM/RADIX/SICK/ YOKOGAWA/HONEYWELL
Load Manager/Power/ Energy Monitor	ROCKWELL/SIEMENS/ABB/L&T/SCHNEIDER
PC (Personal Computer)	HP/DELL
Electric Motors	SIEMENS/BHARAT/BIJLEE/ABB/CROMPTON GREAVES/KIRLOSKAR
Air Circuit Breaker	L&T/SIEMENS/SCHNEIDER/ABB
MCCB	L&T/SIEMENS/ABB/SCHNEIDER/LEGRAND
MPCB	L&T/SIEMENS/SCHNEIDER/ABB
Starter Overload Relays	L&T/SIEMENS/SCHNEIDER/ABB
Contactors	L&T/SIEMENS/SCHNEIDER/ABB
Intelligent Motor Protection Relays	L&T/ SIEMENS/ ALLENBRADLEY/ ABB/SCHNEIDER ER
Timers Electronic	L&T/SIEMENS/SCHNEIDER/ABB

Switch Fuse Units	L&T/SIEMENS/SCHNEIDER/ABB
MCBs	LEGRAND/SCHNEIDER/SIEMENS/HAGER/L&T
Push Buttons	SIEMENS/L&T/SCHNEIDER/ABB/GE/TEKNIC
Indicating Lamps (LED)	L&T/SIEMENS/SCHNEIDER/ABB/ BINAY/TEKNIC
Digital Ammeter & Voltmeter	SIEMENS/L&T/SCHNEIDER/RISHABH
Analog Ammeter & Voltmeter	RISHABH/IMP/MECO/AE
Digital Energy Meter	SIEMENS/L&T/SCHNEIDER/HPL
PVC Conduit & accessories	PRECISION/CLIPSAL/POLYCAB/PRESTO PLAST
Digital Power Factor Meter	SIEMENS/L&T/SCHNEIDER/RISHABH/EPCOS
Programmable Protection Relay	MINILEC/L&T/SCHNEIDER
MCBs	LEGRAND/SCHNEIDER/SIEMENS/HAGER/L&T
Current Transformer	KAPPA/BHARTI/L&T/NEWTEK/PRECISE/AE
LT armoured Power Cables	POLYCAB/FINOLEX/RR KABEL/HAVELLS/KEI
LT armoured Copper Control Cables	POLYCAB/FINOLEX/RR KABEL/HAVELLS/KEI
LT steel braided copper power & control cables	POLYCAB/FINOLEX/RR KABEL/HAVELLS/KEI
Signal & Instrument cable	FINOLEX/POLYCAB/RR KABEL/HAVELLS/KEI
Power Capacitors	EPCOS/SCHNEIDER/DUCATI/L&T/KHATAU JANKAR/
Terminal Blocks	WAGO/LAPP INDIA/CONNECT WELL/ ELMEX
Rotary Selector Switch	L&T/SIEMENS/SALZER/KAYCEE
Cable Glands	LAPP KABEL/DOWELS/COMET/BRACKO
Cable Lugs	LAPP KABEL/DOWELS/COMET
Cable Trays	INDIANA, MEK, PILCO, ELCON, METALICA, PRESSING S, POWER CONTROLS, OBO, SWASTIK
Mechanical Interlock	L&T/SCHNEIDER/ABB
Electronic Soft Starter	DANFOSS/ROCKWELL/SIEMENS/ SCHNEIDER/L&T/ABB
Servo Voltage Stabilizer	SUVIK/APLAB/NEEL/CRYCARD
UPS	EMERSON/HI-REL/HITACHI ELECTRONICS
SMF Battery	EXIDE/AMARA RAJA/AMCO YUASA
MS Structure	JINDAL/ TATA/ SAIL/ NEZONE
GI Structure	JINDAL/TATA/SAIL/NEZONE



13. BIS Codes and Standards

Following BIS Codes and other standards/codes relevant to the works under scope of the Supplier shall be followed. In absence of BIS codes equivalent/relevant IEC Codes shall be followed.

Sl No	Title	Codes
1	PVC insulated cables (light duty) for Working voltage up to & including 1100 volts	694-1990 Part I and II
2	PVC insulated cables (heavy duty) for voltage up to 1100 Volts	1554-1988 Part I
3	PVC insulated cables (heavy duty) for voltage 3.3 kV to 11 KV	1554-1988 Part II
4	Guide for marking of insulated conductors	5578-1984
5	Code of practice for installation and maintenance of power cables up to and including 33 kV rating	1225-1983
6	Code of practice for earthing	3043-1987
7	Recommendations on Safety Procedures and Practices in Electrical Work	5216-1982 Part I
8	Recommendation on Safety Procedures and Practices in Electrical Work - Part II: Life Saving Techniques	5216-1982 Part I
9	Code of practice for installation and maintenance of induction motors	900-1992
10	Code of practice for selection, installation and maintenance of Switchgear and Control gear	10118-1982 Part I,II,III and IV
11	Code of practice for selection, installation and maintenance of Transformers	10028-1985 Part-I, II,III
12	Code of Practice for Electrical Wiring Installations	732-1989
13	Guide for Testing Three-Phase Induction Motors	4029-1967
14	XLPE Cables for working voltage up to and including 1100 Volts	7098-1988 Part I
15	XLPE Cables for working voltage up to 33 KV	7098-1988 Part II
16	General Requirements for Enclosures for Accessories for Household and similar Fixed Electrical Installations	14772-2000
17	Specification for Electric Power Connectors	5561-1970
18	Methods of Test for Cables	10810-1984
19	National Electrical Code	SP:30



14. Special Technical Requirements

1. Motor Starter Selection Table:

The following selection table shall be generally followed for starters of motor feeders unless otherwise specified. However, technical requirements/ specifications, if any, mentioned under technical specifications in Part 11, will supersede the table given above.

Sl. No.	3 Phase Motor	Contactors Rating in Amps	MCCB Rating in Amps	MPCB Rating in Amp	Type of Starter
1	Upto 3 HP	9	-	9	DOL
2	5-10 HP	16	-	16	DOL
3	12.5-15 HP	25	-	25	Star Delta
4	20-25 HP	-	-	40	Soft Starter/VFD
5	30-35 HP	-	-	50	Soft Starter/VFD
6	40 HP	-	63	-	Soft Starter/VFD
7	45 HP	-	100	-	Soft Starter/VFD
8	50-60 HP	-	125	-	Soft Starter/VFD
9	65-70 HP	-	200	-	Soft Starter/VFD
10	75-90 HP	-	200	-	Soft Starter/VFD
11	100-125 HP	-	250	-	Soft Starter/VFD
12	150-180 HP	-	400	-	Soft Starter/VFD
13	200-250 HP	-	400	-	Soft Starter/VFD
14	275-400 HP	-	630	-	Soft Starter/VFD

2. MPCB Selection Table:

For motors of smaller ratings, MPCB with suitable thermal release may also be provided as per the requirement given in the feeder details. The following selection table shall be followed for MPCB of motor feeders unless otherwise specified:

Sl. No.	3 Phase Motor	Contactors Rating in Amps	MPCB Rating in Amp
1	0.5-1 HP	16	1.6
2	1.5 HP	16	3.2
3	2 HP	16	5
4	3 HP	16	6
5	5 HP	16	8
6	7.5 HP	16	13
7	10 HP	16	16
8	12.5 HP	16	20
9	15 HP	16	20
10	17.5 HP	16	25

- For capacitors, rating of contactors/switch shall be double of rated current of capacitor.
- All motor feeders upto 10 HP shall have DOL starters unless specified otherwise.
- All Motor feeders above 10 HP shall have soft starter.
- All motor feeders up to 20 HP shall be provided with switch fuse unit or MPCB as specified in the feeder details
- All motor feeders above 20 HP shall be provided with MCCB having a minimum breaking capacity of 50 KA.
- All the power contactors of Star-Delta starters shall have same current rating.

3.Power Cable Selection Tables

Cable selection charts are to be followed for Ambient Air Temperature of 40°C and Ground Temperature of 30°C. Rating factors must be applied while deciding cable size for actual operation applications & conditions of cable laying i.e. through air, ducts, ground, masonry/structural surfaces, hume pipe, cable tray, pipes, conduits etc.

3.1 Following selection table shall be generally followed for XLPE insulated, Aluminium armored, 1.1 kV grade power cables for motors, unless otherwise specified. However, technical requirements/ specifications, if any, mentioned under Part 11, will supersede the table given above.

3 Phase, 415V Motor H.P.	XLPE Insulated, Aluminium Armoured Cables, 1.1 kV grade, Size in mm ²			
	DOL/VFD/ Soft Starter		Star-Delta Starter	
	Supply side	Motor side	Supply side	Motor side
Up to 7.5 HP	4	4	4	2 X 4
10	6	6	6	2 X 4
12.5	6	6	6	2 X 4
15	10	10	10	2 X 6
20	16	16	16	2 X 6
25	16	16	16	2 X 10
30	25	25	25	2 X 10
40	35	35	35	2 X 16
50	50	50	50	2 X 25
60	70	70	70	2 X 35
75	95	95	95	2 X 50
100	120	120	120	2 X 70
125	185	185	185	2 X 95
150	240	240	240	2 X 120
180	300	300	300	2 X 150
200	2 X 150	2 X 150	2 X 150	2 X 150
250	2 X 185	2 X 185	2 X 185	2 X 185
275	2 X 240	2 X 240	2 X 240	2 X 240



300	2 X 240	2 X 240	2 X 240	2 X 240
425	2 X 400	2 X 400	2 X 400	2 X 400

Above cable selection table is for general guidance only. Approved cable schedule shall be followed for specific applications. Unarmoured flexible Copper Cables may be provided only if specifically mentioned in Technical Specifications or approved drawings for specific applications.

3.2 Following selection table shall be followed for XLPE insulated, Copper armored cables for motors, unless otherwise specified. However, technical requirements/ specifications, if any, mentioned in Technical Specifications at Part 11, will supersede the table given above.

3 Phase, 415 V Motor H.P.	XLPE Insulated, Copper Armoured Cables, 1.1 kV grade, Size in mm ²				
	DOL/VFD/Soft Starter		Star-Delta Starter		
	Supply side	Motor side	Supply side	Motor side	
Up to 7.5 HP	2.5	2.5	2.5	X	2.5
10	4	4	4	X	2.5
15	6	6	6	X	2.5
20	10	10	10	X	4
25	16	16	16	X	6
30	16	16	16	X	6
40	25	25	25	X	10
50	35	35	35	X	16
60	50	50	50	X	25
75	70	70	70	X	35
100	95	95	95	X	50
125	150	150	150	X	70
150	185	185	185	X	95
180	240	2 X 120	240	X	120
200	2 X 120	2 X 120	2 X 120	X	120



250	2 X 150	2 X 150	2 X 150	2x150
275	2 X 185	2 X 185	2 X 185	2x185
300	2 X 850	2 X 185	2 X 185	2x185
425	2 X 240	2 X 240	2 X 240	2x240

Above cable selection table is for general guidance only. Approved cable schedule shall be followed for specific applications. Unarmoured flexible Copper Cables may be provided only if specifically mentioned in Technical Specifications or approved drawings for specific applications.

- 3.3 In case **LAPP/Concab**/Equivalent design of steel braided **Copper Cables** are used then, Minimum size of cables for various rating of motors, to be laid between MCC and Motors shall be as given in table below:

Motor rating HP	Full load current (Amp)	Type of Starter	Power Cable Rating for LAPP/ Concab cables (at 45 °C)
0.5	1	DOL	3 C or 4 C x 1.5 sq. mm
0.75	1.3	DOL	3 C or 4 C x 1.5 sq. mm
1	1.9	DOL	3 C or 4 C x 1.5 sq. mm
1.5	2.6	DOL	3 C or 4 C x 1.5 sq. mm
2	3.7	DOL	3 C or 4 C x 1.5 sq. mm
3	4.8	DOL	3 C or 4 C x 1.5 sq. mm
4	5.2	DOL	3 C or 4 C x 1.5 sq. mm
5	7.8	DOL	3 C or 4 C x 1.5 sq. mm
7.5	11.2	DOL	3 C or 4 C x 2.5 sq. mm
10	16	Star Delta	3 C or 4 C x 2.5 sq. mm
12.5	19	Star Delta	3 C or 4 C x 4 sq. mm (2 runs)
15	20.8	Star Delta	3 C or 4 C x 4 sq. mm (2 runs)
20	28	SS/VFD	3 C or 4 C x 6 sq. mm
25	34	SS/VFD	3 C or 4 C x 10 sq. mm
30	40	SS/VFD	3 C or 4 C x 10 sq. mm
40	53	SS/VFD	3 C or 4 C x 16 sq. mm
50	65	SS/VFD	3 C or 4 C x 25 sq. mm
60	78	SS/VFD	3 C or 4 C x 35 sq. mm
75	96	SS/VFD	3 C or 4 C x 50 sq. mm

100	131	SS/VFD	3 C or 4 C x 70 sq. mm
125	156	SS/VFD	3 C or 4 C x 120 sq. mm
150	189	SS/VFD	3 C or 4 C x 150 sq. mm
180	227	SS/VFD	3 C or 4 C x 185 sq. mm
215	271	SS/VFD	3 C or 4 C x 240 sq. mm
250	325	SS/VFD	3 C or 4 C x 300 sq. mm
275	360	SS/VFD	3C or 4C x 185 sq.mm- 2 runs
300	390	SS/VFD	3C or 4C x 185 sq.mm- 2 runs
335	400	SS/VFD	3C or 4C x 240 sq.mm- 2 runs
375	455	SS/VFD	3C or 4C x 300 sq.mm- 2 runs

Above cable selection is for guidance only. Approved cable schedule shall be followed for specific applications. Cables for motors above 20 HP have been indicated considering soft starters or VFD. Unarmored flexible Copper Cables may be provided only if specifically mentioned in Technical Specifications.



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Annexure III :FEEDER AND LOAD DETAILS OF PROCESS SECTION

Annexure III :FEEDER AND LOAD DETAILS OF PROCESS SECTION						
Sl No.	Item	HP	KW	Qty	Starter Type	Remarks
5 KLPH Pasteurizer						
1	Milk Transfer Pump	3	2.24	1	DOL	PLC required.
2	Timing Pump	3	2.24	1	DOL	
3	Booster Pump	3	2.24	1	DOL	
4	Hot Water Pump	3	2.24	1	DOL	
10 KLPH Pasteurizer						
5	Milk Transfer Pump	3	2.24	1	DOL	PLC required.
6	Timing Pump	3	2.24	1	DOL	
7	Booster Pump	3	2.24	1	DOL	
8	Hot Water Pump	3	2.24	1	DOL	
Transfer Pumps						
9	Flavoured Milk Transfer Pump	3	2.24	1	DOL	
10	Paneer Milk Transfer Pump	5	3.73	1	DOL	
11	Milk Packing Transfer Pump	5	3.73	1	DOL	
12	Curd Milk Transfer Pump	3	2.24	1	DOL	
13	PMST CIP Return Pump	7.5	5.60	1	Star-delta	
14	RMST CIP Return Pump	7.5	5.60	1	Star-delta	
15	5 KLPH Cream Separator	7.5	5.60	1		
SILO						
16	60 KL RMST (FBE)	1.5	1.12	1	DOL	
17	60 KL RMST (FBE)	1.5	1.12	1	DOL	
18	60 KL RMST (IDMC)	1	0.75	1	DOL	
19	30 KL PMST (OLD)	1	0.75	1	DOL	
20	30 KL PMST (FBE)	1	0.75	1	DOL	
21	40 KL PMST (IDMC)	1	0.75	1	DOL	
22	15 KL PMST (OLD)	1	0.75	1	DOL	Kept Inside
23	15 KL PMST (OLD)	1	0.75	1	DOL	Kept Inside
24	15 KL PMST (OLD)	1	0.75	1	DOL	Kept Outside
25	5 KLPH Homogenizer (VFD Operated)	50	37.30	1	DB 160 A MCCB	
Future feeders:						
10 KLPH Pasteurizer						
25	10 KLPH Milk Transfer Pump	3	2.24	1	DOL	
26	10 KLPH Skid Mounted Milk Pasteurizer			1		
27	10 KLPH Self Cleaning Separator			1		
28	10 KLPH Cream Separator	10	7.46	1	VFD	
29	10 KLPH Homogenizer	75	55.95	1	DB 200 A MCCB	
30	Hydroflow System for Separator			1		
31	10 KLPH Electric Hoist for separator			1		
32	Sludge Collection Tank (Suitable)			1		
33	10 KLPH Milk Transfer Pump for New Ice Cream Section	3	2.24	1	DOL	
34	5 KLPH Cream Transfer Pump to New Ice Cream Plant	3	2.24	1	DOL	
	DISTRIBUTION SUP. 230VAC (16 A)	8.0428954	6.00	4	DP MCB	1.5 KW each
	DISTRIBUTION SUP. 415VAC (32A)	20.107239	15.00	4	FP MCB	3.75 KW each
TOTAL LOAD (IN HP/KW)		216.5	161.5			
SPARE FEEDERS						
35	SPARE FEEDER-1	10	7.46	1	STAR-DELTA	
36	SPARE FEEDER-2	7.5	5.60	1	STAR-DELTA	
37	SPARE FEEDER-3	5	3.73	1	DOL	
38	SPARE FEEDER-4	5	3.73	1	DOL	
39	SPARE FEEDER-5	3	2.24	1	DOL	
40	SPARE FEEDER-6	3	2.24	1	DOL	
41	SPARE FEEDER-7	3	2.24	1	DOL	
42	SPARE FEEDER-8	1	0.746	1	DOL	
43	SPARE FEEDER-9	1	0.746	1	DOL	
44	SPARE FEEDER-10	1	0.746	1	DOL	
TOTAL LOAD IN SPARE FEEDER (IN HP/KW)		39.5	29.47			
	DETAILS	WORKING	SPARE	TOTAL LOAD (IN KW)	RATING IN AMP	INCOMING FEEDER RATING
1	MCC PANEL FOR PROCESS SECTION	161.51	29.47	190.98	309.22	400 A
	INCOMING CABLE SIZE					
	2R (1W+1S) X 3.5 C X 300 SQMM					