College of Engineering, Muttathara

(Under Co-operative Academy of Professional Education, Estd. by the Government of Kerala)

QUOTATION DOCUMENT

PROVIDING ADDITIONAL FAN POINTS IN CLASS ROOMS [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] AT COLLEGE OF ENGINEERING, MUTTATHARA

FORM OF TENDER

Name of work	:	Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara
Name of Tenderer	:	
Address	:	
Class of Registration	:	C class or above

I. General

Name of work	:	**Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara**
Time of Completion	:	**10 days**

All communications shall be addressed to the Principal, in the following address by post/in person

The PRINCIPAL
College of Engineering, Muttathara,
St. Sebastian Church Road, Vallakkadavu P.O,
Thiruvananthapuram

Sd/-
PRINCIPAL

Thiruvananthapuram:
Date:

II- DETAILS OF TENDER

Name of Work: **Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara**

Competitive percent rate quotations are hereby invited by Co-operative Academy of Professional Education for the above-referred work.

1. The contract documents consisting of Technical specification, Bills of Quantities to be duly signed on every page by the bidder shall be submitted to the Principal.

2. The time allowed for the work is **10 days** from the date of execution of agreement

3. The quotation shall submit his tender only after carefully examining the whole tender documents and the conditions thereof.

4. This notice, the conditions of tender and the duly completed form of tender will interalia form part of the agreement to be executed by the tenderer with the Principal

Sd/-
PRINCIPAL

III- FORM OF COVERING LETTER

To

The Principal
College of Engineering, Muttathara,
St. Sebastian Church Road, Vallakkadavu P.O,
Thiruvananthapuram

Sir,

Sub: Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara

1. I/We do hereby tender to execute the works enumerated in the Schedule accompanying in accordance with the terms in your tender Notification date and specifications and conditions of contract in the bidding document.
2. Copy of the signed specifications signed is also enclosed.
3. I/We further agree to complete the whole work in weeks/months from date of receipt of order to start work, and / or in the case of piece-works, maintain the minimum rate or progress specified in the Tender Schedule.
4. I/We do/do not agree to accept and carry out such portion of the work included in my/our tender as may be allotted to me /us if the whole work be not given to me/us.
5. In consideration I/We being registered as a Bidder in the Kerala PWD and invited to tender, I/We agree to keep the tender open for acceptance 90 days from the date of submission thereof and not to make any modifications in its terms and conditions which are not acceptable to Government.
6. I/We agree that Arbitration shall not be a means of settlement of any disputes or claims arising out of the contract relating to the work. A sum of is hereby remitted as Earnest Money. If I/We fail to keep the tender open as aforesaid or make any modifications in that terms and conditions of the tender which are not acceptable to Government.

OR

If after tender is accepted, I/We fail to execute the agreement as provided in clause of tender notifications or to commence the execution of the work as provided in the conditions. I/We agree that the government shall, without prejudice to any other right or remedy be at liberty to forfeit the said earnest money absolutely and also recover from me/us the entire loss that may be caused to the Government by the retender or rearrangement of the work or otherwise under the provision of the Revenue Recovery Act or otherwise.

Acc:

i. Tender Schedule (submitted with Financial Bid):
ii. Signed copy of full quotation/bid documents:

Signature:
Full Name of Bidder:
Place of Residence:

NOTICE INVITING TENDER

Name of work : **Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara**

Competitive bids (Percentage rate) are invited by the **PRINCIPAL, College of Engineering, Muttathara St. Sebastian Church Road, Vallakkadavu P.O, Thiruvananthapuram** (THE OWNER) for the work "***Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara"*** from C or above class Electrical contractors in Kerala State Electrical Inspectorate /CPWD/Kerala PWD for executing this work. The details of contract together with the estimate cost are given under

1.01 Owner /Employer - The Principal, CE, Muttathara
1.02 Engineer - Assistant Engineer (Electrical), CAPE
Consultant - Project Director, CAPE
1.03 Site Engineer -Assistant Engineer (Electrical), CAPE
1.04 The Project contract mainly include the following

SL. No	Description of the work	Estimate cost
1	**Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara**	Rs. 96,884/- including GST

1.05 Location of work and site conditions

Quotation No.	Location and Terrain	Type of soil and subsoil condition
W-18/2025/CAPE	**College of Engineering, Muttathara St. Sebastian Church Road, Vallakkadavu P.O, Thiruvananthapuram**	NA

1. Brief description of work : Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara
2. Period of completion : 10 days
3. Classification of Bidder : C class or above
4. Last date of submission of Quotation : 16.11.2026 at 2.00 PM
5. Date of opening of quotation : 17.2026 at 11.00

TECHNICAL SPECIFICATIONS

INDEX

	Section I	**:**	General requirements
1.	**Section II**	**:**	Medium voltage distribution system
2.	**Section III**	**:**	MCB DB, MCB and RCCB
3.	**Section IV**	**:**	Earthing
4.	**Section V**	**:**	LT (1.1 KV Grade cables)
5.	**Section VI**	**:**	Medium voltage distribution board /panel
6.	**Section VII**	**:**	HT

SECTION I
General Requirements

1. Scope of Work:

1 General:

The scope of work shall be generally as given in the Tender Schedule and in the drawings for the electrification work. The intention of the specification, Tender Schedule and the drawings is to give finished work of approved and standard quality and all duly tested and commissioned. All minor items of details usually not shown or indicated but necessary for the completion of the system, including testing, commissioning and handing over shall deem to have been included in the work and in the rates quoted by the contractor.

2. The work is divided under following main groups:

a. The entire internal electrification work shall be with Cu wires in concealed/in open PVC conduits with necessary accessories and switch boxes, light/fan points, power points, etc.

b. The Supply and Erection of lighting luminaries, ceiling fans, exhaust fans etc.

c. The complete earthing system including earthing stations, earth conductors, earth bus and their connections.

d. Providing power supply from sub-station to the sub panels in different locations as indicated in the drawings. The complete installation, testing and commissioning of external lighting within the plot area including lighting poles, their earthing, cabling, control unit and DB, pole terminal boxes, lighting luminaries and lamps etc.

2. Liaison and Co-ordination work:

2.1 All liaison and co-ordination All liaison and co-ordination work with KSEB, Electrical Inspectorate or any other statutory body and agency will be contractor's responsibility and statuatory expenses towards the same will be met by the owner. This liaison work will include all activities in all stages starting from making application to KSEB and/ or other agencies and up to and including release of required permanent electric connections for this project. The owners will pay the official fees, deposits and such other payments, which are to be paid in the name of the owners.

2.2 After connection of regular supply by KSEB, the installation shall be again checked by the contractor.

2.3 The contractor shall carry out all minor civil works connected with the electrical job. The contractor shall repair and make good the damages caused by him to the civil structure while executing the electrification work. The foundations for the panel board, and distribution pillars, grouting of frames in the wall, erection of D.B./switchboards on the wall etc. are all to be carried out by the contractor.

3. Abbreviations:

The following abbreviations have been used in the specifications, drawings and bill of quantities.

BIS	: Bureau of Indian Standards.	SFU	: Switch fuse unit.
ISS	: Indian Standard Specifications.	E	: Earth conductor.
HRC	: High Rupturing Capacity.	Cu	: Copper conductor.
GI	: Galvanized Iron.	AL	: Aluminium conductor.
MV	: Medium Voltage.	MSB	: Main Switch board.
LV	: Low Voltage.	MS	: Mild Steel
AMP	: Amperes.	V	: Volts.
KV	: Kilo Volts.	KVA	: Kilo Volt Ampere
CI	: Cast Iron.	SDF	: Switch disconnector fuse
MCB	: Miniature Circuit Breaker.	TPN	: Triple pole and Neutral.
MCCB	: Moulded case circuit breaker.	SP	: Single Pole.
ACB	: Air circuit breaker.	CT	: Current transformer.
DB	: Distribution board.	DG	: Diesel generator.

4. Regulations and standards:

The installation shall conform in all respects to Indian Standard code of Practice for Electrical Wiring installation IS 732-1963 and IS 2214-1963. It shall also be in conformity with the current Indian Electricity Rules, Indian Electricity Act. National Electric Code and Regulations of the Local Electrical Supply Authority is so far as these become applicable to the installation. Wherever this specification calls for a higher standard of material and/or workmanship than those required by any of the above regulations then this specification shall take precedence over the said regulations and standard. In general, the materials equipment and workmanship not covered by the above shall conform to the relevant Indian Standards.

5. Approvals and tests:

The contractor shall get approval for the work from KSEB and Electrical Inspectorate. On completion of the work the contractor shall obtain and deliver to the Consultant certificates of final inspection and approval by the local electric supply authority and electrical inspector. The consultant/client have full powers to test the materials or work or arrange to be tested by an independent agency at the electrical contractor's expense in order to prove their soundness and adequacy.

6. Actual route of cables / Conduits etc.

The locations of the DB's, light/fan points, power points and routing of the conduits, wires and cables as shown on the drawings are only indicative. Therefore, the actual route and locations may differ from the plans according to the working drawings for civil construction and site conditions.

7. Drilling and cutting:

The contractor shall supply and install at his expense all secondary materials and special fittings found necessary to overcome the interference and to supply the modifications on the route of mains and conduits that are found necessary during the work, to the complete satisfaction of the owner's representative.

Cutting of walls or other parts of the building for the complete and proper installation of the electrical equipment shall be the responsibility of the electrical contractor. However, Beams, girders and other principal structural members shall not be cut or drilled. Any damage to finished surfaces shall be made good by repair or replacement at the contractor's expense. The contractor shall possess and make use of necessary tools and equipment for cutting grooves on walls.

8. Material and equipment:

All material and equipment shall conform to the relevant standards and shall be of the approved make and design. Unless otherwise called for, only the best quality materials and equipment shall be used. The materials and equipment shall conform to relevant Indian Standards. The Contractor shall be responsible for the safe custody of all the materials and shall insure them against theft, damage by fire, earthquake etc. A list of items of materials and equipment, together with sample of each shall be submitted to the consultant.
All materials of the same kind of service shall be identical and made by the same manufacturer. The Consultant shall approve any deviation to this rule.

9. Voltage:

Except for supplies to specialist equipment, the normal utilization voltages shall be 3 phase, 4 wire, 50 Hz, 415 Volt between phases, 240 Volt between any phase and neutral, with a solidly earthed neutral.

10. Manufacturers:

Where manufacturers have furnished specific instructions relating to the materials proposed to be used in this job, covering points not specifically mentioned in these documents, these instructions are to be followed. Where manufacturer's names and/or catalogue numbers are given, this is an indication of the quality, standards and performance required.

11. Rating:

Rating of all items shall be appropriate for the conditions on the particular site on which the item will be used. All the equipment shall be fit for continuous work under the heaviest conditions of site and shall be rated for the following condition.

- Outdoor temperature 45^0C
- Temperature under shade 40^0 C

12. Inspection and testing:

The owner's representative reserves the right to request inspection and testing at manufacturer's works at all reasonable times during manufacture of items for this contract. Tests on site of complete works shall demonstrate, among other things.

1. That the equipment installed complies with specification in all particulars and is of the correct rating for the duty and site conditions.
2. That all item operates efficiently and quietly to meet the specified requirements.
3. That all circuits are correctly fused and protected and that protective devices are properly coordinated.
4. That all non-current carrying metal work is properly and safely grounded in accordance with the specifications.

The contractor shall provide all necessary instruments and labour for testing shall make adequate records of test procedures and readings, shall repeat any tests requested by the Consultant/client and shall provide test certificates signed by a properly authorized person. Such test certificates shall cover all works. If tests fail to demonstrate the satisfactory nature of the installation or any part thereof then no claims for the extra cost of modifications, replacements or retesting will be considered. The Consultant/client's decision as to what constitutes a satisfactory test shall be final. The above general requirements as to testing shall be read in conjunction with any particular requirements specified for testing and commissioning.

13. Allowance for future growth:

To allow for future increases in electric load it is desirable that all mains and DB shall be provided with spare capacity / ways. The no. of spare ways shall be discussed and finalized with the clients before placing order these materials.

14. Test certificates:

The contractor shall submit test certificates for all the electrical material/system. These shall be issued by a government recognized inspection office certifying that all equipment, materials, construction and functions are in agreement with the requirements of these specifications and accepted standards.

15. Samples and catalogues:

Before ordering the material necessary for these installations, the contractor shall submit to the Consultant/client for approval a sample of every kind of material such as cables, conductors, conduits, switches, socket outlets, boxes etc. along with the catalogues.
For big items such as switchboards the submission of shop drawings and catalogues shall be enough. After the selection by the Consultant/client the contractor shall arrange inspection and testing at the manufacturer's factory or assembly shop for final approval. No material shall be procured prior to the approval of the Consultant.

16. Vendor and shop drawings:

The contractor shall prepare and submit to the consultant/client for his approval two sets of detailed drawings of all distribution boards, switch boards, outlet boxes, special pull boxes, and other likewise materials and equipment to be fabricated by the contractor or other vendor.
Before starting the work, the contractor shall submit to the Consultant for his approval in the prescribed manner, the shop/execution drawings for the entire installation, specially the main connection and junctions, the route of Conduits and cables, no and size of wires to be drawn through the conduits, location of all the outlet points and switch boards and distribution boards and any other information required by the Consultant/client. The Consultant/client reserves the right to alter or modify these drawings if they are found to be insufficient or not complying with the established technical standards or if they don not offer the most satisfactory performance or accessibility for maintenance.

17. As built drawings:

At the completion of work and before issuance of certificate of virtual completion the contractor shall submit to the consultant/client layout drawing drawn at appropriate scale indicating the complete system "as installed". These drawings must provide.

1. Run, location and size of conduits and inspection, junction, and pull boxes, along with the location of sockets and switches containing the light and power outlets.
2. Location and details of DB's, main switches, switchgears and other particulars.
3. A complete wiring diagram as installed and scheduled drawings showing all connection in the complete electrical system.
4. Location of all earthing stations, route and size of all earthing conductors, Route and particulars of all cables, cable chambers, RCC pipes etc.

18. Safety of materials:

The contractor shall provide proper and adequate facilities to protect all the materials and equipment including those issued by the owner against damage from any cause whatsoever.

19. Completion certificate by Contractor.

On completion of the electrical installation (or extension to an installation) the contractor countersigned by the supervisor shall furnish a certificate, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local supply authority. The contractor shall be responsible for getting the electrical installation inspected and approved by the local concerned authorities, including electrical inspector.

20. Staff:

The contractor shall employ a competent fully licensed, qualified full-time electrical Engineer to direct the work at site, to receive instructions from Consultant/client and to correlate the progress of work in conjunction with all relevant requirements of the supply authority.

SECTION - II
Medium Voltage Distribution System

1. Wiring for lighting and power:

This specification covers, system and method of wiring, definition of point wiring, and supply, installation, connection, testing and commissioning of point wiring for light points, fan points, convenience socket outlet points, power socket outlet points, bell outlet points, etc. Wiring shall be with copper conductor PVC insulated wires drawn in rigid PVC conduits on walls, ceiling, etc. Wiring shall be from meter rooms to distribution boards, from DB to switch boards and from switchboard to outlet points. The method of wiring for this particular work shall be as mentioned under tender schedule.

2. System of wiring:

Medium voltage distribution system shall be applicable for wiring three phase, 4 wire, 415V, 50Hz, AC supply and single phase, 2 wire, 230V, 50Hz, AC supply. Light circuits shall be limited in any one of the three phases.

3 Applicable standards:

1	IS: 732	Code of Practice for Electrical wiring installation (system voltage not exceeding 650 V).
2	IS: 1646	Code of Practice for fire safety of buildings (General) Electrical Installation.
3	IS: 9537 (Part II)	Rigid steel conduits for electrical wiring.
4	IS: 694	PVC insulated cables
5	IS: 1293	3 pin plugs and sockets.

6	IS: 8130	Conductors for insulated electric cables and flexible cord
7	IE: Rules	Indian Electricity Act and Rules
8	IS: 5133	Boxes for enclosure of electrical accessories Part 1: Steel& CI boxes.
9	IS: 371	Ceiling roses (Second revision)
10	IS: 4615	Switch socket outlets (non-interlocking type)
11	IS: 3854	Switches for domestic and similar purposes.

4. General Requirements:

1 Before the conducts are installed the exact route shall be marked at the site for approval and the actual work shall be undertaken only after approval.

2 Load balancing of circuits in three-phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

3 **Definition of point wiring:**

A point shall consist of the branch wiring from the switchboard together with a switch and point control boxes as required, as far as and including the wiring accessories such as ceiling fan box of socket outlet point or suitable termination. A point shall include, in addition, the earth continuity conductor/wire from the switchboard to the earth pin/stud of the outlet/switch box.

5. Scope of work:

The medium voltage distribution system wiring shall be carried out in the under mentioned manner:

a) Supply, installation, fixing of conduits and necessary accessories, switch boxes, outlet boxes and pull / junction boxes.
b) Supplying and drawing of wires of required size including earth continuity wire.
c) Supply, installation and connection of switches, sockets, cover plates, switch plates, concealed fan hook boxes / fan hooks as specified etc.
d) The point shall be complete with the branch wiring from the switchboards to the outlet point, conduits and casing capping with accessories, control switch, socket outlet boxes, ceiling roses, batten/angle holder, connector etc.

6. Boxes:

6.1 **Junction boxes:**

All the boxes for junction boxes, pull boxes used in conduit wiring system shall be fabricated from 1.5 mm thick mild sheet steel with two coats of enamel paint of approved shade or powder coated as specified. The boxes shall have smooth external and internal finished surface. Separate screwed earth terminal shall be provided in the box for earthing purpose. All boxes shall have adequate no of knock out holes of required diameter for conduit entry. All PVC junction boxes shall be deep boxes.

The boxes shall be provided with a minimum of four fixing lugs located at the corners for fixing the covers. All fixing lugs shall have tapped holes to take machined brass screws. The boxes shall be sufficiently strong to resist mechanical damage under normal service conditions. Wherever different phase conductors are brought into the same enclosure, phase barriers shall be provided. The boxes shall have removable covers at top and bottom if specified.

6.2 **Switch boxes and Outlet boxes:**

Switch boxes to receive switches, socket outlets, power outlets, Telephone outlets and fan regulators etc. shall be 16 SWG cadmium plated GI/MS boxes as manufactured by the switch manufacturer for erection of plate of modular type switches.

The depth of the switchboard boxes shall be 50 mm and the size shall be selected so as to accommodate required number of switches, sockets and fan regulators without overcrowding the box.

6.3 **Fan Regulator:**

Fan regulators shall be incorporated in the front plate of switchboard and shall from a single unit under one front plate for switches erected on GI boxes.

7 Cables

7.1 All cables / wires used for internal wiring shall be PVC insulated single core stranded conductor (FRLS) as specified and of 1100 volts grade and with copper conductors.

7.2 The conductors shall be plain annealed circular copper conductors. The minimum number and diameter of wires for circular stranded conductor shall be as per relevant IS specifications. The insulation shall be PVC compound complying with the requirements of IS specifications and the thickness of PVC insulation shall be as set out in the relevant standards.

7.3 All wires shall be colour coded as follows.

Single phase	:	Red
Three phase	:	Red, Yellow and Blue
Neutral	:	Black
Earth	:	Green on Green/Yellow (insulated)
Control (if any)	:	Grey

7.4 The wires shall be supplied in sealed coils of 100 Mts length and bear the manufacturers name, trademark, ISI mark, voltage grade etc.

7.5 Bunching of cables:

a Wires carrying current shall be so bunched in the conduit that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

b. The number of insulated wires/cables that may be drawn into the conduits shall be as per the following table. In any case conduits having less than 20 mm dia shall not be used.

c. Bunching of cables in conduits:

Max permissible no. of 1 core cables that may be drawn through different conduits:

Cable size (sq.mm)		Size of conduits (in mm)		
		20	25	32
1.5 (stranding) (22/0. 3)		7	15	24
2.5 (36/0. 3)		5	11	17
4.0 (56/0. 3)		4	8	13
6.0 (		2	4	6
16.0		-	3	4

8. Drawing of conductors:

8.1 No wire shall be drawn into any conduit, until all work of any nature that may cause injury to wire is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Before the wires are drawn into the conduits the conduits shall be thoroughly cleaned of moisture dust and dirt or any other obstruction by forcing compressed air through the conduits. The drawing and joining of copper conductor or wires shall be executed with due regard to the following precautions.

8.2 While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks, which may cause breakage of conductors. There shall be no sharp bends in the conduit system.

8.3 Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or ringing.

8.4 Strands of wires shall not be cut for connecting to the terminals. The terminals shall have adequate cross section to take all the strands.

8.5 All looped joints shall be soldered and connected through terminal block/connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.

8.6 Conductors having nominal cross-section area exceeding 2.5sq. mm shall be provided with crimping type cable sockets.

8.7 At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used. Brass Nuts & Bolts shall be used for all connections.

8.8 Only certified wire man and cable joiners shall be employed to do jointing work.

8.9 For all internal wiring PVC insulated wires of 1100 volts grade shall be used. The sub-circuit wiring for point shall be carried out in looping system and no joint shall be allowed in the length of the conductors.

8.10 General wiring installation shall be as under.

a. Sub-main wiring
Wiring from meter room or main panel board to the distribution boards.

b. Circuit wiring
Wiring from DB's to point control boxes for lighting fan 6A sockets call bells etc. and from DB to the power sockets in the case of power wiring.

8.11 The sub-main wiring shall be either three phase, four wire or single phase, two-wire system. Each sub-main wiring circuit shall also have its own earth continuity wire. The no and size of earth continuity wire shall be as per detailed drawings or as specified.

8.12 The circuit wiring shall generally be in single-phase system. However a maximum of 3 to 4 single-phase circuits belonging to the same pole/phase could be installed in the same conduit or raceway Each circuit wiring shall be provided with suitable earth continuity conductor as per standard specifications.

8.13 Not more that 10 light points/fan points shall be grouped on the one lighting circuit. The load per circuit shall not exceed 800 watts. The minimum size of conductor for wiring of lighting circuit shall not be less than 1.0 Sq.mm. Power circuit wiring shall not have more than two sockets connected to one circuit.

9. Joints in wiring:

The wiring shall be by looping system, and hence all joints shall be made at main switches, distribution boards, socket outlets, lighting outlets and switch boxes only. No joints shall be made inside conduits and junction boxes. Conductors shall be continuous from outlet. For unavoidable joints due to any reason prior permission shall be obtained before making such connection. Joints by twisting conductors are prohibited.

10. Switches, sockets and accessories:

10.1 Switches (Modular):

a. Switches shall confirm to IS 3854, IS 1293, IS 6538 and IS 4615. Switches shall be single pole, single or two-way as shown on the drawings.
b. The switches shall be rocker operated with a quite operating mechanism with bounce free snap action mechanism enclosed in an arc resistant chamber.
c. Switches at the same location shall be ganged to form a single unit under one cover plate. Where fan regulators are to be provided with the switchboards the same shall be incorporated.

10.2 Sockets (Modular):

a. The sockets shall conform to IS 1293. Each socket shall be provided with control switch of appropriate rating. The sockets shall be molded type, rated for 250 volts, and either of full 6 Amp or 16 Amp, capacity, as mentioned.
b. Sockets shall be of three-pin type, the third pin being connected to earth continuity conductor. The socket shall be flush type. The sockets installed in machine room plant room or wet/damp area shall be metal clad weatherproof type. The socket shall have fully sprung socket contacts and solid brass shrouded terminals to ensure positive electrical connections.
c. If specified, the sockets shall be provided with automatic shutters, which open only when earth pin of the plug inserts in the socket and provided with three pin plug top suitable to the socket and of the same make as socket.
d. All 6A sockets, 16A switched sockets, DP switches, connector boxes etc. shall be as specified and with the finishing and make same as lighting switches. These shall be erected on the boxes as specified in drawings.

10.3 Lamp holders, Ceiling roses etc.:

Accessories for light outlets such as lamp holders, ceiling roses, etc. shall be white in colour and in conformity with requirements of relevant IS specification. Ceiling roses shall be 3-plate type wherever specified. Angle and batten holder shall be erected on the junction boxes erected on wall/ceiling.

10.4 Installation of switch, socket and accessories:

a. Connection to be made only after testing the wires for continuity /cross phase etc with the help of a megger.
b. The switch controlling the light point or fan shall be connected on to the phase wire of the circuit and neutral shall be continuous, having no fuse or switch installed in the line except at the D.B. the third pin of the socket shall be connected to the earth continuity conductor of the circuit.

c. Outlets shall be terminated into ceiling rose for ceiling mounted points. For other wall light points the outlets shall be connected into an angle holder. For wall plug sockets the conductors may be terminated directly into the switches and sockets.

11. Earthing:

All earthing systems shall be in accordance with IS 3043 code of practice for earthing the type and size of earthing wire shall be as specified separately and in BOQ and drawings.

12. Testing and commissioning of installation:

Before a completed installation is put into service, the testing of the installation shall be done as per IS 732.

12.1 Insulation Resistance:

a. The insulation resistance shall be measured by applying 500 volt. megger with all fuses in places, circuit breaker and all switches closed.

b. The insulation resistance of an installation shall be required to have a value greater than one-mega ohms.

c. The insulation resistance shall be measured between.

1 Earth to phase

2 Earth to Neutral

3 Phase to Neutral

12.2 Earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker, measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed one ohm.

12.3 Polarity or single pole switches:

a. A test shall be made to verify that every non-linked, single pole switch is connected to one of the phase of the supply system.

b. In, a two-wire installation a test shall be made to verify that all non-linked single pole switches have been fitted in the same conductor throughout and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply.

c. In a three wire or four wire installation a test shall be made to verify that every non-linked single pole switch is fitted in a conductor and which shall be labeled or marked for connection to one of the outer or phase conductor of the supply.

SECTION -III

MCB DB, MCB and RCCB

1. Miniature Circuit Breaker Distribution boards:

1.1 Miniature circuit breaker distribution boards shall conform to IS 2675, IS 8623 and shall be suitable for operation on three phase, 4 wire, 415 V, 50 Hz, AC supply or single phase 2 wire 230 V 50 Hz, AC supply.

1.2 The MCB distribution board shall be in sheet steel enclosures with removable type cover with additional door for protecting accidental operation.

1.3 Enclosure and door shall be made out of CRCA sheet steel and powder coated and of approved shade. The interior shall be off white finish. The DB shall be totally enclosed with dust and vermin proof construction and shall be of domestic pattern. The DB boxes shall be as supplied by the original manufacturer.

1.4 Where distribution boards are specified to be complete with an isolator as incomer, the isolator shall be double pole for SP and N distribution boards and 4 pole for TP and N distribution boards.

1.5 Where distribution boards are specified to be complete with MCB + ELCB as incomer, the MCB + ELCB shall be double pole for SP and N distribution boards and 4 pole for TP and N distribution boards.

1.6 Bus bars shall be tinned copper. The internal connections in the DB shall be by using stranded copper conductor, PVC insulated wire with copper lugs crimped at both ends. Neutral busbar and earth busbars shall also be provided in the enclosure. Neutral busbar shall have equal rating of phase busbars.

1.7 Distribution boards shall be provided with circuit identification by means of directory on the from cover. Upon completion of the works, the contractor shall provide and fix accurate framed circuit lists for all distribution boards. These shall consist of Perspex envelopes, fixed securely by an approved method on the inside face of each distribution board front cover into which shall be inserted a neatly typed list of circuits, indicating the number of circuits, phase, cable, size, number of points connected, circuit rating and the loading.

The contractor, shall also provide and fix by means of brass screws tapped into the D.B. cover, labels, with black letter on a white background for all distribution boards, MCB +

ELCB, Isolator etc. The engraving on the labels and the inscription on the circuit lists shall be approved by the Consultants before the work is carried out.

1.8 All incoming terminals shall be fully shrouded.

1.9 The conduit entry plates shall be removable type and shall be provided at top and bottom. All the conduits shall be properly terminated using glands, grips, check nuts, female adapters with bush etc.

1.10 Wiring shall be terminated properly using crimping type copper plugs/sockets. Identification ferrules shall be provided on all wires.

1.11 Two No. earth terminals shall be provided on each Distribution Board.

Recessed mounted DB shall be erected in the chase/cut portion of the wall. The cutting or the walls shall be done while constructing the wall and shall be of adequate size to comfortably accommodate the DB. The cut portion shall be smoothened and made plain and shall be fine finished. The DB shall be fixed in this chased portion with suitable clamps and bolts. The top cover of the DB cabinet shall be projecting out of the wall surface and free from any obstruction so as to open the same smoothly.

2. Miniature Circuit Breakers:

2.1 MCBs shall be manufactured in accordance with IS 8828 having a short circuit breaking capacity category 10000 Amps at both 240 volts 50Hz. and 240/415 V, 50 Hz and complying with the test requirements for both reference calibration temperatures of 20 degree C and 40-degree C. (10kA as per IS/IEC 60898-1-2002(0.5-63A))

2.2 All miniature circuit breakers shall be rated to withstand the fault currents of the circuits they protect without causing any interference in any other protective device associated with the distribution system. At the same time the design of the circuit breakers shall be such that, it will protect the circuit for which it is intended and not cause or allow other protective devices to operate when fault conditions apply.

2.3 Miniature circuit breakers shall be capable of carrying its full rated current continuously without tripping out.

2.4 All the miniature circuit breakers shall be fitted with a magnetic un-delayed tripping mechanism.

3. Residual Current Operated Circuit Breakers (RCCB)

3.1 RCCBs shall be manufactured in accordance with IS 12640 and IS 8828 having a short circuit breaking and earth fault protection up to 10 KA at both 240 Volts 50 Hz and 240/415 V, 50 Hz and complying with the test requirements as per IS 2640.

3.2 All RCCB shall be highly sensitive and calibrated rating. This means that a 30-mA sensitivity RCCB should trip when the residual current is in the range of 15 to 30 mA and a 300 mA RCCB should trip when the residual current is in the range of 150 to 300mA.

3.3 The RCCBs shall be truly current operated, which means that it shall be totally independent of the main voltage for tripping. RCCB must operate for nominal voltage well below the maximum safe value of 10 volts. RCCB shall interrupt the circuit within 30 milliseconds at a leakage current of 30 mA.

3.4 RCCB shall be provided with a neutral advance mechanism. RCCB shall be functioning even in the event of failure of neutral and/or any one or two of phase supply conductor. RCCB shall be provided with trip free mechanism ensuring that the device cannot be reclosed / resent if the fault persists. RCCB shall be functioning even in the case of interchange of load and supply side connections.

3.5 Test button shall be provided to check he correct operation of the unit.

3.6 RCCB shall be designed for a very long life of a minimum of 20,000 operations and shall be capable of withstanding inrush current of 4to 8 times the rated current. For the proper functioning the RCCB should not require any connection of earthing on the device.

3.7 The device should have high tripping accuracy of less than 5% of rated tripping current. The RCCB shall be provided with clear indication to show whether the tripping is due current leakage or overload/short circuit.

SECTION - IV

Earthing

1. Scope:

This specification covers supply of necessary materials, and erection at site, of complete earthing system including earth pits at the locations indicated, earth conductors from earth pit to the respective equipment, switchgears, pillars etc. and making connections, testing at site, commissioning and handing over.

2. Applicable Standards:

The entire work of earthing system, shall confirm to IS 3043, Indian Electricity Act and Rules and relevant regulations.

3. General requirements:

3.1 The earthing shall generally be carried out in accordance with the requirements of Indian Electricity Rules 1956 as amended from time to time and relevant regulations. Following IE rules are particularly applicable. IE Rule Nos. 32, 51, 61, 62, 67, 69, 88(2) & 90.

3.2 All earth connections shall be carefully made, visible for inspection, and the testing of individual earth electrode shall be possible.

3.3 All materials, fittings etc. used in earthing shall conform to IS specifications and in the absence of which the approval of competent authority shall be obtained.

3.4 The earthing electrode shall be at a minimum distance of 1.5 metres away from the outer face of the building wall. A minimum clearance of twice the depth of the electrode shall be maintained between two earthing stations.

3.5 A brick masonry chamber to facilitate easy identification and for carrying out periodical tests and inspection shall be constructed on top of the earth pit.

3.6 All metal conduits, trunkings, cable sheaths, HT and MV switchgears, Transformers, distribution boards, meters, light fixtures, fans, and all other metal parts forming part of the work shall be bonded together and connected to earthing network as specified.

3.7 Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passage of fault currents.

3.8 Joints shall be soldered, tinned and double rivet. All the joints shall be mechanically, electrically continuous and effective. Joints shall be provided against corrosion.

4. Earth Electrodes:

4.1 The materials of earth electrode and earth conductors shall be galvanized iron unless specified otherwise in Bill of Quantities, specifications or drawings.

4.2 The earth electrodes shall be free from paint, enamel, grease etc.

4.3 The earth electrode shall be embedded as far as practicable in a moist soil and below permanent moist level.

4.4 The earth electrode shall not be installed in the proximity of a metal fence.

5. Types of earth electrodes:

The earth electrodes shall be either a pipe electrode or plate electrode, the details of which are as given in the following sections of specifications, drawings and BOQ.

6. Pipe electrode:

6.1 Pipe electrode shall consist of 2.5-meter-long single piece G.I. pipe of min. 40 mm dia, as specified and shall be cut tapered at the bottom. 12mm dia. holes shall be drilled with 75 mm spacing between the holes and in a staggered manner as indicated in IS 3043.

6.2 The electrode shall be buried vertically in a specially prepared earth pit of size 35 cm x 35 cm and the earth pit shall be filled with alternate layers of charcoal, salt and fine washed sand for a minimum thickness of 150 mm. A funnel with wire mesh inside shall be fixed to the top of the GI pipe for watering purpose.

6.3 A masonry chamber with a cast iron cover hinged to the cast iron frame embedded in the top portion of the masonry shall be constructed on top of the GI pipe to house the funnel and the earth connection. The approximate size of the chamber shall be 300 mm x 300 mm and 300 mm deep.

6.4 The earth conductor from electrode shall be taken out of the masonry chamber through a protecting pipe embedded in the masonry.

6.5 The top of the masonry chamber shall be 50 mm above the finished ground level.

6.a Plate electrode:

6.a1 Plate electrode shall consist of GI or CI Plate of size 1200X1200X12mm as specified.

6.a2 The electrode shall be buried vertically in a specially prepared earth pit of size 1500x1500x600mm, earth pit shall be filled with alternate layers of charcoal, and fine washed sand for a minimum thickness of 150 mm upto 150mm above the plate. A funnel with wire mesh inside shall be fixed to the top of the GI pipe for watering purpose.

6.a3 A masonry chamber with a cast iron cover hinged to the cast iron frame embedded in the top portion of the masonry shall be constructed on top of the GI pipe to house the funnel and the earth connection. The approximate size of the chamber shall be 450mm x 450 mm and 450 mm deep.

6.a4 A test joint shall be provided mounted on the watering pipe below the funnel (the size of strip as per standards in IS 3043) with drilled holes for connecting earth leads, earth interconnection and lead from electrode.

6.a5 The earth lead and interconnection shall be based on the fault level calculation and all electrodes shall be interconnected.

7. Earth conductor:

All earthing conductors shall be or high conductivity copper and or GI as specified and shall be protected against mechanical injury or corrosion. The connection of earth continuity conductors or earth bus and earth electrode shall be strong and sound and shall be rigidly fixed to the walls, cable trenches, cable trays or conduits and cables by using suitable clamps made of non-ferrous metals.

8. Testing:

On completion of the entire installation, the earthing network shall be tested for their resistance to earth in accordance with IS 3043. All meters, instruments & about required for the test shall be provided by the contractor. The test results shall be submitted in triplicate to the owners for approval. The following tests shall be conducted.

a. Earth resistance of electrodes
b. Impedance of earth continuity conductors.
c. Effectiveness of earthing.

SECTION - V

HT & LT (1.1 KV Grade) Cables

1. Scope:

This specification covers supply, testing at works, supply at site, installation, termination, jointing, connection, testing at site, commissioning and handing over of11KV and 1.1 KV grade Cables.

2. System:

The 1.1 KV grade cables are to be used in underground distribution system with normal system voltage of 415 V, 50 Hz, 3 phase, 4 wire system.

3. Applicable standards:

Cables to be supplied under these specifications shall be with Copper or Aluminium conductor as specified in drawing or Bill of Quantities, PVC insulated and PVC sheathed, armored and with an outer PVC protective sheath, heavy duty type and shall confirm to.

IS 1554 (Part 1) 1976.	PVC insulated electric cables.
IS 1753:	Aluminium conductors for insulated cables
IS 3961:	Recommended current ratings for cables.
IS 7098(Part 2) 1985:	11kV XLPE cables

4. General requirements:

4.1 All cables shall be new without any kinks or visible damage. The manufacturers name, insulating material, conductor size and voltage class shall be marked on surface of the cable at distance not exceeding 1M.

4.2 Procurement of cables shall be on the basis of the actual site measurements and the quantities given shall be regarded as a guide. Before procurement of the cables, the contractor shall submit the cable lengths and after approval of the same place orders for the cables.

4.3 Cables shall be tested at factory as per IS requirement. The tests shall incorporate routine tests, type tests and acceptance test. The certificate for type test shall be produced by the Contractor.

4.4 The cables shall be one of the makes mentioned in the list of approved materials and with ISI mark.

4.5 The cables shall be supplied and delivered at site in original cable drums with manufacturer's name, cable size, type and length all clearly indicated on each drum.

4.6 The unit rate shall include loading, unloading, transport, storage, handling, unwinding the cable from cable drums and laying in the cable trench or erected on cable trays etc.

4.7 The cables shall be laid by skilled and experienced labour.

4.8 Where the cable route intersects roads, streets or pathways, RCC spun pipes shall be laid in the trenches to serve as cable ducts. The pipes shall be joined by RCC spun collars. The RCC pipes shall project at least 150 mm on either side of road crossing.

4.9 The cable loops shall be kept at both ends of the cable length Minimum 3 metres long loop shall be provided.

4.10 The contractor shall take care to see that the cables received at site are apportioned to various locations to ensure maximum utilization and cable joints are avoided. This apportioning shall be got approved before the cables are cut to lengths. Straight joints are permitted only under exceptional circumstances.

5 Storage and loading, unloading of cables:

5.1 Cable drums shall not be stored one above the other. Sufficient space between cable drums shall be left for air circulation and the drums shall stand on battens placed directly under the flanges.

5.2 Cable drums shall be stored preferably on a plain ground without having any hard stones or any other sharp materials projecting above the ground surface. The drums shall be stored preferably in the shed or otherwise they shall be covered by tarpaulin.

5.3 Drums shall be stored and kept in such a way that bottom cable end does not get damaged.

5.4 Drums shall be rotated only in the direction marked on the drum.

5.5 Loading and unloading shall be done with material handling equipment only.

6 Cable trenches (excavated):

6.1 The cable trenches shall be excavated 75 cms below the finished ground level and shall have a minimum width of 350 mm for laying of single cable. When more than one cable are laid in the same trench, the width of the trench shall be increased such that the spacing between the cables is 200 mm and the end cables are at minimum 100 mm from the side of the trench. At the turning of the cable route the trench shall be dug with radius equal to 15 times the cable diameter. For 11kV cables, the trench depth is 1.2mtr.

6.2 The trenches shall be cut square with vertical side walls and with uniform depth. Suitable shoring and propping may be done to avoid caving in of trench walls. The floor of the trench shall be rammed and leveled. The bottom of the cable trench shall be prepared with 100 mm sand bed for laying the cables.

6.3 The cables shall be laid in trenches over the rollers. After the cable is laid and straightened it shall be covered with sand, and bricks shall be placed on top and at the side of the cable.

6.4 Wherever specified, half round RCC pipes shall be placed above the cables.

6.5 The cable trench then shall be refilled with excavated materials after removing the stones and other sharp materials and the refilled materials shall be compacted with light ramming.

6.6 Approved Cable markers made of Aluminium or CI with 15 cms crown shall be provided along the route of cables at a spacing 0f 25 - 30 meters and also at both ends of crossings or at the cable turning point. The class, type, No. of cables shall be indicated on markers.

6.7 Cable shall be laid in Hume pipes at all road crossings and in GI pipes at the wall entries or at the crossing of the drains/gutters.

7 Cable Termination. :

7.1 All cable terminations shall have tinned copper/aluminium compression lugs.

7.2 Cable termination shall be done in cable end box or in terminal box or in pillars etc. The end terminations shall be insulated with a minimum of six half lapped layers of PVC tape.

7.3 Cable terminations are to be made with flange type brass cable glands so as to grip inner and outer PVC sheaths and also the cable armor. Cable gland shall be bonded to the earth.

7.4 The cable conductor ends are to be connected by crimping tinned heavy-duty copper lugs. Hydraulic crimping tool shall be used.

7.5 Every connection at a cable termination shall be mechanically and electrically sound and protected against mechanical damage and any vibration liable to occur shall not impose any harmful mechanical damage to the cable conductor.

SECTION - VI

Medium Voltage Distribution Panel Boards

1 Scope:

This section shall cover supply, assembly, installation, connection, testing and commissioning of medium voltage distribution panel boards as described in this specifications, drawings and schedule of quantities.

2 System:

All the medium voltage distribution panel boards shall be suitable for operation on three phase, 4 wire or single phase, 2 wire with normal system voltage of 415.240 volts, 50 Hz, A.C. supply with solidly grounded neutral system.

3 Weather condition at site:

The panel boards shall be suitable for continuous operation and designed to withstand heaviest conditions at site, which is a coastal area.

a) Temperature range : 40 to 45^{o} C
b) Relative humidity : 50 to 100%
c) Weather : Dusty

4 Applicable IS Standards:

The panel boards to be supplied under this specification shall confirm to latest editions of relevant Indian Standards and Indian Electricity rules and regulations. The following Indian Standards shall be complied with.

IS 4237 : General requirements for switch gear and control gear for voltage not exceeding 1000 V.

IS 2208 : HRC cartridge fuse links up to 610 V.

IS 2705 : Current transformers

IS 1248 : Electrical Indicating Instruments.

IS 375 : Switch gear bus-bars, main connection and auxiliary wiring, marking and arrangement for.

IS 2147 : Degree of protection provided by enclosures for low voltage switch gear and control gear.

IS 2675 : Enclosed distribution fuse boards and cutouts.

IS 2557 : Danger notice plates.

5 General

5.1 Shop drawing:

Prior to fabrication of the panel boards, the contractor shall submit for the approval of the Engineer in charge the shop /vendor drawing and design calculations indicating type, size, short circuit rating of all the electrical components used, busbar size, internal wiring size, panel board dimension, colour, mounting detail etc. The contractor shall submit manufacturer's catalogues of the electrical components installed in the panel boards.

5.2 Inspection:

At all reasonable times during production and prior to transport of the panel boards to site, the contractor shall arrange and provide all the facilities at manufacturer's plant for inspection and testing and any state inspection agreed upon.

5.3 Test certificates:

Testing of panel boards shall be carried out at factory or at site as specified in Indian Standards in the presence of Engineer in charge. The test results shall be recorded on prescribed forms. The test certificates for the test carried out at factory or at site shall be submitted in duplicate to the Engineer in charge for approval.

6 Cubicle type panel boards:

6.1 Construction:

6.1.1 Structure:

The panel boards shall be metal enclosed sheet cubical, compartmentalized suitable for indoor or outdoor installation having dead front, floor mounting type. All M.S. sheets used in the

construction of panel boards shall be 14 SWG thick for main panel and 16SWG for other panels unless specified otherwise in the item and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet steel shall be seam welded, all welding slag ground off and welding pits wiped smooth with plumber metal.

The panel boards shall be totally enclosed, completely dust and warm proof Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be lockable and fully gasketed with foam rubber or neoprene rubber strips.

All panel and covers shall be properly fitted and secured with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with bolt and nuts. Self-threading screws shall not be used in the construction of panel boards. Suitable base channels (min size 75 mm x 75 mm x 5 mm thick) shall be provided at the bottom. A Clearance of 300 mm between the floor of the panel board and the bottom of the lower most units shall be provided. Panel boards, if necessary, shall be preferable arranged in multitier formation. The panel boards shall be of adequate size with a provision of spare space (as jointly decided with EIC) to accommodate possible future additional switchgear. The size of the panel boards shall be designed in such a way that the internal space is sufficient for hot air movement, and the electrical component does not attain temperature more than 40 degree Celsius. Opening for natural ventilation shall be provided and shall have screens or grills made of brass or stainless-steel wire mesh. Silica gel bags shall be placed at the bottom of every compartment. This requirement is in addition to space heater.

The panel boards shall be provided with removable sheet steel plates at top and bottom with knockout holes of appropriate size and number in conformity with the number, and size of incoming and outgoing conduits /cables.

The panel boards shall be designed to ensure maximum safety during operation, inspection, connection of cables, maintenance and repairs etc. with busbar system energised. Means shall be provided to prevent shorting of power and /or control terminals due to accidental drop of maintenance tools etc. inside the panel board. Partitions between feeder compartments, busbar chamber, cable alleys, vertical panels etc. shall be provided to take care of this aspect. The panel boards shall be sufficiently rigid to support the equipment without distortion under normal and short circuit condition; they shall be suitably braced for short circuit duty.

For buses and cables, access shall be limited from front and top only. All other equipment shall be mounted on the front side, (unless specified otherwise for any specific panel) and shall be accessible from the front. All joints and connections shall be made by cadmium plated high tensile steel bolts nuts and washers secured against loosening. The erection switchboards shall be in conformity with IE 51 (1) c

It shall be possible to insert any new cable and to connect all load side wiring with the busbar energised, without any special precautions. Opening of the busbar chamber shall be possible with special tools only. Indication lamps and meters shall not be fitted on the door of the switches or busbar chamber cover.

6.1.2 Protection class:

All the outdoor panel boards shall have protection class of IP 55 The complete board shall be double jacketed with insulation material to withstand outdoor temperature. All the indoor panel boards shall have protection class IP 52

6.1.3 Circuit compartments:

Each switch fuse units and meters shall be housed in a separate compartment and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with breaker/switch fuse units in “ON” and “OFF” position. However, it shall be possible to bypass this interlock for inspection purpose.

6.1.4 Instrument compartment:

Separate and adequate compartment shall be provided for accommodating instruments, indicating lamps, control contactors /relays, and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker/switch fuse units, busbar and connections.

6.1.5 Bus bar:

The bus bars shall be of three-phase four wire system with separate neutral and earth bar. The bus bar and interconnection between bus bars and various components shall be with high conductivity, hard drawn, electrolytic copper strips.

The busbars shall be of rectangular cross section designed to withstand full load current for phase busbars and half rated current for neutral bus bars and shall be extensible on either side. The busbar shall have uniform cross-section throughout the length. The rating of the busbars shall be as specified in BOQ and/or drawings.

The busbars and interconnections shall be insulated with color-coded insulation tapes/covers. The busbars shall be supported on unbreakable, non-hygroscopic insulated supports at sufficiently close intervals to prevent sagging and shall effectively withstand electromagnetic stresses in the event of short circuit. The busbars shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick hylam sheet to avoid any accidental contact. All bus bar connection shall be done by drilling holes in busbars & connecting by chromium plated brass bolt and nuts. Additional cross section of bus bars shall be provided in all distribution boards to cover up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts. All interconnections between busbars and circuit breakers/switches and between circuit breakers/switches and cable terminals shall be through solid copper strips of proper size to carry full rated current. These strips shall be insulated with insulating tapes/covers.

6.1.6 Terminals:

The outgoing terminals and neutral link shall be brought out to a cable alley suitably located and accessible from the panel front. The current transformers for instruments metering shall be mounted on the terminal blocks. No direct connection of incoming or outgoing cables to internal components of the panel board is permitted. Only one conductor may be connected

in one terminal. Adequate no of spare terminals of required size shall be left in each compartment.

6.1.7 Wireways:

A horizontal wire way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical sections.

6.1.8 Cable compartments:

Cable compartments of adequate size shall be provided for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate proper supports shall be provided in the cable compartments to support cables. All outgoing and incoming feeder terminals shall be brought out to terminal blocks in the cable compartment.

6.1.9 Earthing:

Copper earth bars shall be provided for the entire length of the panel. Size of the earth busbars, unless specified otherwise in BOQ, shall be 25mm x 3mm horizontally and 25 mm x 3mm vertically in cable alleys etc. Provision shall be made for connection from this horizontal earth bar to the earth pit on both side of panel board. The earth continuity conductor of each incoming and outgoing feeder shall be connected to the vertical earth bar.

All non-current carrying parts and the framework of panel board shall be connected to this earth bar. All doors and movable parts shall be connected to earth bus with flexible copper connections. Armour of the cable shall be properly connected with earthing clamp, and the clamp shall be bonded with the earth bar.

6.1.10 Danger notice plates:

Danger notice plates with symbol as per IS shall be provided on panel boards.

6.1.11 Fuse puller etc.

One set of fuse puller (for various amps of fuses), panel keys and special tools etc. shall be supplied with each panel board.

6.2 Indicating lamps

Panel mounting type low power consumption solid state lamps suitable for specified voltage shall be used Lamps shall be provided with suitable current limiting resistors. Lamps shall be provided with translucent lamp covers to diffuse light Lamps shall be provided with bayonet cap bulbs.

6.3 Measuring instruments:

All measuring instruments shall be square pattern moving from 90 deg. scale, 96mm x 96mm, flush mounting type. Instrument shall be of accuracy class 1 as per IS 1248 Ammeters for motor and other feeders shall be graduated for full load current of motor with a compressed

scale at the end for at least 6 times full load current. The KW meter and PF meter shall be suitable to measure unbalance loads on 3-phase 4 wire system PF meter shall be in 0.5-1- 0.5 range.

6.4 Installation:

The panel boards shall be installed at the location as indicated in the drawings. The contractor shall submit for approval a shop drawing indicating room size, panel size and method of installation prior to installation.
The cubicle type panel board shall be installed on suitable foundation. Foundation shall be as per the dimensions supplied by the panel manufacturer. The foundation shall be flat and level. Suitable grouting holes shall be provided in the foundation. Suitable MS base channel shall be embedded in foundation on which the panel can be directly installed. If the panel is provided with an angle iron pedestal or base plate the same shall be grouted firmly in the floor. The panel boards shall be properly aligned and erected in plumb and bolted to the foundation by bolt parallel to the walls.

After installation of the panel boards, various components of the boards shall be checked and be put in working order. The cables laid through cable trench or on cable trays/racks etc. shall be terminated on the bottom plate or top plate as the case may be by using Siemens type brass compression glands. The individual cables shall then be led through the panels to the required feeder compartments for necessary terminations. The cables shall be clamped to the supporting arrangement. The switchboard earth bus shall be connected to the local earth grid. Connection of cables shall be by crimping type Cu /Al lugs using hand operated or hydraulic crimping tool as per cable sizes.

6.5 Testing:

1) Testing at factory:
   Panel boards shall be inspected at factory at pre-assembly stage and any modifications or changes as suggested shall be incorporated. The panel boards shall be again inspected and tested at the factory after assembly of all components and completion of all inter-connections and wiring. The tests shall include all routine and type tests as per relevant ISS.

2) Testing and pre-commissioning checks at site:
   Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried out in the presence of Engineer in charge.

6.6 Pre-commissioning checks

1) Check all panels are aligned in line and property erected in plumb.
2) All with draw able portions shall be capable of smooth extraction and isolation
3) All main and auxiliary bus bar connections shall be checked and tightened.
4) All wiring terminations and bus bar joints shall be checked and tightened.
5) Wiring shall be checked to ensure that it is according to the drawing.

6) Before fitting the covers, all chambers, compartments, cable alleys etc. shall be checked for complete cleanliness and removal of foreign matter if any, particularly the tools used for erection, cut pieces of cable armour etc. Covers shall be properly fixed with all fixing screws in places.
7) All mechanical interlocks shall be checked and all fuses and links shall be inserted.
8) Earthing connections shall be checked.
9) Operational checks on all circuit breakers or switch gear shall be carried out, both mechanically and electrically to check that correct indications are provided for closed and open positions.
10) The panel boards will be, if required, subjected to Inspectorate inspection, checking and testing at the site and the contractor shall arrange to provide Inspectorate seals wherever required.
11) The panels shall be checked to ensure that moisture ingress has not taken place during transit and storage.

Terms & Conditions for the Electrification work as per schedule accompanying the tender

1. Only approved make of materials accepted as per list appended shall be used for the work. All other materials not mentioned in the list specifically shall conform to relevant IS standards.
2. M.V. installation shall conform IS. 732.
3. Earthing shall conform IS 3043 / 1988.
4. All wires shall be colour coded as below:
8. a) Single phase - Red.
9. b) Three phase - Red, Yellow, Blue.
10. c) Neutral - Black.
11. d) Earth - Green.
5. The final rates for the various items of work and materials if any coming under your scope of supply will be as detailed in the schedule.
6. The work shall be commenced immediately and carried out strictly in accordance with a time schedule prepared by you and approved by our consultants.
7. It shall be the responsibility of the contractor to prepare detailed drawings as per the design and guidelines given by the consultant and to submit the scheme for necessary approval under Rule 63 of IER 1956 from the Electrical Inspectorate. The contractor shall keep close liaison with the Electrical inspectorate and KSEB to expedite formalities like measurement of soil resistivity, scheme approval, power allocation and sanction for energisation.
8. The schedule in general contains almost all the work and the material required for the work. In case any additional work / modification is found necessary during the actual execution of work it shall be carried out only with prior approval of the Client and on mutually agreed terms.
9. It shall be the responsibility of the contractor to carry out to the satisfaction of the client all necessary pre-commissioning tests before preparing the completion certificate for submission to the KSEB.
10. The contractor shall comply with the provisions of IER 1956 and Licensing Board Rules in regard to the execution and completion of the work.
11. The work shall be completed in all respects in accordance with the schedule within a period of **10 days** from the date of execution of the agreement.
12. Any alteration or rectification of works of the existing installations suggested by Electrical Inspectorate shall be treated as extra items.
13. A copy of this shall be signed and returned to the Client as a token of acceptance.
14. **The contractor should sign on all pages of tender documents**
    The successful bidder to whom the work is awarded should furnish 5% of the quoted value towards security deposit in the form of FD/DD from nationalized bank. It will be released after completion of the guarantee period of one year.
15. The successful bidder to whom the work is awarded should also furnish additional performance guarantee, if the works quoted from 11% below estimate rate. The collection of additional deposit is a disincentive to the bidder who offers to execute a work below estimate rate and this will induce the contractor to quote a rate equal to or higher than estimate rate.
16. Retention of 2.5% of the gross amount of each running bill will be deducted. The retention amount will be released on commissioning of work.

17. The amount towards Earnest Money Deposit, Security Deposit and retention will not carry any interest.
18. The rate provided for each item are inclusive of all taxes.

APPROVED MATERIAL FOR THE WORK

Sl.no	Items	Makes preferred
1.	LT Switches/SDF	L&T/HPL/C&S/Legrand/Hager/Indo Asian
2.	PVC Wires	RR Cabel/ Finolex/ V guard
3.	LT Armoured cables	Nicco/ Finolex/Vguard/Gloster/ Polycab
4.	PVC Conduits	Precision/Circle Arc/Balco/Konseal
5.	MS Conduits and accessories	BEC or Other ISI branded Products.
6.	Industrial Plug	C&S/ HPL/Legrand/BCH
7.	Switches Modular type	Crabtree/MK/Mosaic/LEGRAND/GM/Indo Asian
8.	Ceiling Fan	Crompton/Bajaj/Havells/Kulirma (star rated)
9.	Light Fittings	Philips/Crompton/Bajaj/ Havells
10	LED light fittings	Definity, Inventor, Aei, Crompton, Philips, Stan LED, Unirans, Lighting science

Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara

QUOTED RATE OF THE CONTRACTOR

I/We agree to undertake to execute the work

1. At estimate rate.

2. ……% below estimate rate.

3. ……..% above estimate rate.

Note: i) Score out which is not applicable.

ii) The rates may be quoted in **words** and **figures.**

Signature of Bidder

EST No. : OEO/CAPE/EST/16516/2026_6_1_1 (Edit Id : 1), GST : 18%

DAR ELECTRICAL DSoR Year : 2022 Cost Index : Trivandrum - 134.24

ABSTRACT ESTIMATE

GENERAL-Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara-Providing additional fan points in class rooms [CSE (A) B-112, B- 103, B 104, CSE (B) B-110, B 102] at College of Engineering, Muttathara-General Electrical Work

Sl No	Specification	Quantity	Rate	Amount
1	**Fan & Light fittings**			
1.001	1.17.2			
	Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.2 x 1.5 sq. mm			
	Net Total	60.000metre	@82.21/metre	4932.60
1.002	1.17.3			
	Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.3 X 1.5 sq.mm			
	Net Total	40.000metre	@111.97/metre	4478.80
1.003	1.25			
	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required.			
	Net Total	15.000each	@433.73/each	6505.95
1.004	1.27.4			
	Supplying and fixing following size/ modules, GI box alongwith modular base & cover plate for modular switches in recess etc as required.6 Module (200mmX75mm)			
	Net Total	6.000each	@472.70/each	2836.20
1.005	1.28.4			
	Supplying and fixing following Modular base & cover plate on existing modular metal boxes etc. as required.6 Module			
	Net Total	6.000each	@213.88/each	1283.28
1.006	1.33			
	Supplying and fixing 3 pin, 5 amp ceiling rose on the existing junction box/ wooden block including connection etc as required.			
	Net Total	20.000each	@102.02/each	2040.40

Sl No	Specification	Quantity	Rate	Amount
1.007	1.45			
	Installation, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable, including providing and fixing phenolic laminated sheet cover on the fan box etc. as required.			
	Net Total	5.000no	@324.70/no	1623.50
1.008	1.47			
	Supplying and fixing extra down rod of 10 cm length G.I. pipe, 15 mm dia, heavy gauge including painting etc. as required. (Note: More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)			
	Net Total	103.000each	@54.33/each	5595.99
1.009	OD183625/2026-2027			
	Supply and installation of 1x20 W, good brand 4 feet LED Tube light fittings with required accessories as required.			
	Net Total	16.000each	@290.38/each	4646.08
1.010	OD183626/2026-2027			
	Supply, drilling and fixing 10 mm size Anchor bolt for providing ceiling fan.			
	Net Total	16.000each	@290.38/each	4646.08
1.011	90.4.5.4			
	Supply, Installation, testing and commissioning of ceiling fan of following sizes including wiring the down rods of standard length (up to 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable etc. as required. 1200mm sweep - ceiling fan complete with service value minimum 4.0(cub meter/minute/Watt), Air delivery minimum 210(cubic meter/minute), Copper winding suitable for 230V/240V single phase AC supply			
	Net Total	15.000each	@2250.40/each	33756.00
1.012	1.21.1			
	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/ recess including cutting the wall and making good the same in case of recessed conduit as required.20 mm			
	Net Total	55.000metre	@151.05/metre	8307.75
1.013	1.24.1			
	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.5/6 amps switch			
	Net Total	12.000each	@121.04/each	1452.48
	Heading Total(Rs)			82105.11
	Total Estimation PAC			82105.11
3	**Extra Charges**			
2.001	Provision for GST			
		82105.11	18.00%	14778.92

Sl No	Specification	Quantity	Rate	Amount
			Grand Total	0.00
			Round off	0.00
			Rounded Total(Rs)	96884.03
	Rupees Ninety Six Thousand Eight Hundred Eighty FourThree Paise			

Disclaimer:- This document has been generated using PRICE3.0 OEO software, but the officer of the organization who finalized the estimate bears sole responsibility for the accuracy of specifications, rates, and data analysis.

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