Driving a greener tomorrow

PMI Electro Mobility Solutions Pvt. Ltd.

TENDER DOCUMENT

FOR

ELECTRICAL SYSTEM

ELECTRICAL CONSULTANT

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TENDER DOCUMENT

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SPECIAL CONDITION OF CONTRACT

1.0 INTENT OF SPECIFICATION

The equipment specified herein are intended for the EV Charging Station Project at **Dubagga, Lucknow** of **M/s PMI Electro Mobility Solutions Pvt. Ltd., Plot No. 26, Industrial Area, Dharuhera, Distt-Rewari, Haryana.**.

2.0 GENERAL INFORMATION

Any material or accessories which may not have been specifically mentioned but which is necessary usual for satisfactory & trouble free operation & maintenance of the equipment, shall be furnished by the contractor without any extra charge to the owner.

3.0 SCOPE OF WORK

Design, engineering, manufacture, assembly, testing, delivery, erection, testing and commissioning of electrical system of the plant as per specification.

3.1

DESCRIPTION	SUPPLY	ERECTION AND COMMISIONING
11kV Panels	By Customer	By Bidder
HT Cables/ LT Cables & Control cables	By Customer	By Bidder
2.5 MVA, 11kV/0.433 kV Distribution Transformer with OCTC	By Customer	By Bidder
415V LT Panels & Bus Trunking	By Customer	By Bidder
DBs / Lighting Fixtures/ Light DBs Switch/Socket Outlets/ Wires/Conduits	As per BOQ	By Bidder
Cable Trays/Earthing System/External Lighting/Lightning Protection	As per BOQ	By Bidder
Batery & Battery Charger	As per BOQ	By Bidder
Miscellaneous Items	As per BOQ	By Bidder
Preparation of Shop drawings as per Sl.No.6.0 (a & b) given below	By Bidder	By Bidder

The details of above items are as per enclosed technical specification and Bill of Materials.

3.2 SCOPE OF SERVICES

a) Furnishing of all labour, skilled and unskilled, supervisory and administrative personnel, erection tools and tackles, testing equipment, implements, supplies, consumables like welding rods and gas, oil and grease, cleaning fluids, insulating tape, anti corrosive paints, jute cotton waste etc. and hardware for timely and efficient execution of the erection work.

b) Transport vehicles necessary for efficient transportation of equipment from Owner's stores to site of erection and excess materials back to owner's stores.

c) Complete assembly, erection and connection, testing and commissioning, putting into successful and satisfactory commercial operations of above equipment.

d) The items of work to be performed on all equipment and materials shall include but not limited to the following:

i) Receiving, unloading and transportation at site. (To Owner's or Contractor's stores and from there upto actual place of erection).

ii) Opening, inspecting & reporting all damages and short supply items.

iii) Arranging to repair and/or re-order all damaged and short supply items.

iv) Storing at site with suitable all weather protection.

v) Assemblies, erection and complete Installation.

vi) Necessary coordination between the work done by other Contractors.

vii) Final check-up, testing and commissioning in presence of Owner's representative.

viii) Trial run for fifteen (15) days, rectification of defects, if any and adjustments as necessary.

ix) Obtaining Owner's written acceptance of satisfactory performance.

4.0 COMPLETENESS

a) It is not the intent to specify completely herein all details of the equipment. Nevertheless, the equipment shall be complete and operative in all aspects.

b) Any material or accessories which may not have been specifically mentioned but which is necessary usual for satisfactory and trouble free operation and maintenance of the equipment, shall be furnished by the contractor without any extra charge to the Owner.

5.0 EXCLUSION

a) Civil foundation work

b) Supply and installation of LT DG Sets.

6.0 INFORMATIONS REQUIRED FROM CONTRACTOR

a) **ALONG WITH THE OFFER**

i) Typical GA drawing of all equipment to be supplied and disposition of various fittings and loading.

ii) All Annexure of this specification duly filled in and signed by the contractor.

iii) Catalogue of all equipment and components explaining construction features.

iv) Transportation/shipping dimensions and weights, space required for handling parts for maintenance.

v) Type test certificates for all equipment on similar type of equipment.

b) **AFTER AWARD OF OFFER**

All drawings/documents to be submitted by the vendor, shall be prepared based on agreed technical specifications and tender drawing. The same shall be submitted in 3 sets (Hard copies) to the consultant and 2 sets to the client. However, six copies of each documents/ drawing along with CDs shall be submitted as FINAL drawings.

Documents/Drawings submitted less than above/softcopies forwarded shall **not be considered as "Drawing/Document Submitted"** for review/approval. However vendor may forward softcopies as advance information.

The following is the minimum requirement.

i) Final Single line diagram complete with relays, cable sizes etc.

ii) GA drawings, Bill of Materials, Control schematic, three line diagram for meter & relay panel, terminal connection/Master Terminal box diagram, wiring diagram with physical location of components for all equipment.

iii) GA drawings of equipments supplied by contractor.

iv) Detailed equipment layout coordinated with other services.

v) Detailed cabling layout showing cable trench /cable tray layout, bus-trunking arrangement with its supporting system duly coordinated with other services, earthing layout/ lightning protection layout.

vi) Detailed lighting layout showing position of fixtures / type of fixtures, circuiting and route of wires / cables / trunking, fixing details, DB details. Similar details to be prepared for low voltage services.

vii) Protection relay settings.

viii) Cable schedule & interconnection chart.

ix) Foundation plan, loading details for all equipment. Civil input drawings.

x) Test certificates.

xi) Instruction manuals of all major equipment.

xii) Test Procedures at sites.

xiii) Test reports of all tests carried out at site.

xiv) "AS BUILT" drawings (2 sets of soft copies on CD and six sets of hard copies duly wound).

xv) All layout drawings shall be made in scale of 1:50 or 1:100 unless until agreed by the Owner/ Consultant.

7.0 PRICES

a) The price quoted for supply items shall include all packing, crating, tax / duties (to be specified), insurance, freight, loading/ unloading etc,

b) The price quoted for erection & commissioning shall include cost of all consumables, taxes & duties (if any). No additional taxes/duties shall be payable by Owner.

c) Prices quoted shall be firm and no variation shall be allowed during contract period for any reason whatsoever, including but not restricted to tariff and taxes.

d) Contractor shall furnish prices separately for spare parts for two (2) year's trouble free operation of the equipment and shall furnish the list of the same.

8.0 PROVISIONS AGAINST ACCIDENTS AND SAFETY MEASURES

a) All safety rules and codes as applicable to work including rules applicable as per factory inspector shall be followed during execution of above work and shall confirm all relevant laws, regulations, guide lines and provisions as required and also customary.

b) All safety appliances and protective devices including hand gloves, aprons, helmets, shields, goggles, belts etc. shall be provided by Contractor for his personnel.

c) The Contractor shall arrange to provide guards and prominent display caution notices if access to any equipment / area is considered unsafe and hazardous.

9.0 SPECIFICATIONS

In the absence of specifications for any work or materials, relevant Indian Standard Specifications shall be applicable. If such codes for a particular subject have not been framed, the decision of the Employer / Consultant will be final and binding.

10.0 SECURITY RULES

The Contractor has to arrange security to the material by deputing his staff only. The Contractor shall follow at site security rules regarding the removal of material from site, issues of Identity cards, etc. as may be framed from time to time by the Employer. Employer shall not be liable for any loss, damage or theft.

11.0 ROYALTIES ETC.

All royalties, excise duties and other taxes on the materials brought by the Contractor at site will be paid by him. If refund of such payments are however admissible under the rules of local authorities, the Contractor may obtain such refund by following prescribed procedure laid down by the various authorities.

Assistance of Employer / Consultant will be limited to the extent of certificate stating that the materials so imported have become property of the Employer. The Contractor should take into account this fact while quoting his rates in the Tender.

12.0 VARIATION IN QUANTITY

a) The Owner shall have right to delete or increase / decrease quantity specified in this specification as specified in preamble to Bill Of Materials.

b) Quantities indicated in Bill of Materials are based on engineering status of the project as on date. It is necessary that proper engineering is carried out by the contractor before procurement of material.

c) For procurement of any material & sequential delivery at site from point of view of erection etc. Contractor shall take prior approval from the employer.

d) All left over material for which payment has been made by the employer, has to be taken back by the contractor. Necessary deduction shall be made from the bills of contractor by the employer.

13.0 CO-ORDINATION

a) The contractor shall co-ordinate with Owner / Consultant / Other contractor at Site for execution of his part of work.

b) The Contractor shall at all times work in close coordination with the Owner's supervising personnel and afford them every facility to become familiar with erection and maintenance of the equipment.

c) The Contractor shall arrange his schedule of work and the method of operation to minimize inconvenience to other Contractors working on the Project.

14.0 EXTRA ITEM / ALTERNATIVE ITEM

It should be noted that the rates of the extra / alternative items will be decided entirely on rate analysis method i.e. on calculations. In analysis of rates, where necessary, gross provision of 15% shall be made.

15.0 APPROVAL OF INSTALLATION

Contractor shall be Class A License Holder of the state. On completion of the installation, a certificate in an approved form shall be furnished by the contractor. The contractor shall prepare necessary drawings for approval & shall be responsible for getting the entire installation and drawing duly approved by Electrical Inspector or statutory authorities and shall bear all expenses in connection with the same.

16.0 "AS BUILT" DRAWINGS

The contractor shall mark in red on one (1) set of drawings all deviations / alternations, not shown on drawings but carried out at field. After completion of work the Contractor shall furnish drawings and print specified in clause 6 (b).

17.0 PROTECTION TO WORK

The contractor shall effectively protect at his own expense, such work, equipment or material as may be liable to damage, theft or tampering during dismantling, modification, transportation, storing, loading/ unloading, installation, commissioning till handing over to the Owner. Insurance charges etc. for the above shall be borne by the contractor till handing over of complete installation to the Owner as per terms and conditions of contract.

18.0 FACILITIES TO BE PROVIDED BY THE OWNER

a) Contractor will be given a plot of land for building his site office and store. However all construction work has to be carried out by the contractor.

b) Power supply shall be made available to the Contractor at one point at site. Further distribution shall be responsibility of the contractor at his own cost.

c) No labour / staff shall be allowed to stay within the complex of the plant except for security staff.

19.0 SITE VISIT

It is recommended that contractor shall visit site before submission of his offer. Time and date shall be fixed with employer.

20.0 GUARANTEE

At the close of work and before issue of final certificate of virtual completion by Owner / Consultant, the contractor shall furnish a written guarantee indemnifying the owner against defective materials and workmanship for a period of eighteen months after commissioning. The contractor shall hold himself fully responsible for reinstallation or replacement of defective material free of cost to the owner.

21.0 NOTES TO BIDDER

It is necessary to follow the following points while submitting the offer:

a) All equipment shall meet the requirement of this specification except wherever deviations have been agreed in writing by the Owner / Consultants.

b) Deviations (if any) with respect to this specifications including for the equipment manufactured by the recommended manufacturers shall clearly be indicated in the offer in under “Deviations’ with page no. and clause no. of specification.

c) Technical particulars & other details shall be furnished in Annexure given along with this specification only. Additional information, if desired by the bidder can also be furnished separately.

22.0 LEGAL COMPLIANCE WITH EMPLOYMENT OF HUMAN RESOURCES

All legal liabilities of the employment of HR rules to be paid by the contractor The respective challans are to be submitted with the owner along with attendance and running bills (ESI/PF).

23.0 PERFORMANCE GUARANTEE / LIQUIDATED DAMAGE

To be discussed during commercial negotiation.

24.0 INSPECTION

24.1 All equipment / material covered under this specification are liable for inspection by the Owner/ his representative unless otherwise waived off in writing by owner/ his representative. The vendor shall inform two weeks in advance for inspection to be carried out at the manufacturer's works. All decisions of the owner shall be final and binding.

24.2 The main contractor shall be responsible for liaison with his sub contractor (in case equipment is ordered to sub contractor) and shall ensure that the equipment is tested (internally) and is ready for client inspection (in all respect) and on test bed as per agreed programme with owner / his representative. Main contractor shall remain liable for quality and guarantee performances.

24.3 In case the equipments are found incomplete during visit of owner/his representative, owner shall have right to impose a penalty on main contractor of Rs.40,000/- to Rs.70,000/- per man day basis, other than from travelling / boarding expenses.

24.4 Short supply items like meters relays etc may not be considered as short supply items for inspection purpose. However vendor shall inform such short supply items while giving the call for inspection.

25.0 TERMINATION OF CONTRACT BY OWNER

25.1 The contract can be terminated by the owner for breach of time limes, any of covenants work not satisfactory.

25.2 In case of contract is terminated prior to completion of work. It will be the choice of the owner to get the work completed at the expense of the Electrical Contractor.

25.3 In this connection. All decisions of the owner shall be final and binding.

26.0 **OTHERS**

Date & Time of Completion :	8-10 Weeks from date of award of LOI
Submission of Drawings for approval	Within 2 to 4 weeks from date of award of LOI
Validity of Offer:	45 days from date of submission of tender
Defects Liability Period:	24 months commencing from issue of Virtual completion certificate by the consultant/Owner.
Technical Clarification to be asked :	Mr. S.C. Singhal / Mr. Manoj Yadav M/s SN Consultants B-246A, Greater Kailash, Part-I, New Delhi – 110 048, India PH –011- 46517819, 9810026553 Email to: director@fotonpmi.com CC to: snc@sncons.com
Prices	Shall be FIRM and shall include: Basic Price, Packing and Forwarding, GST, Freight up to the site, Insurance, Other Tax / Duties (if any to be specified)

TECHNICAL SPECIFICATION

1.0 GENERAL INFORMATION

1.1 Maximum ambient air temperature shall be taken as 50 deg. C & Minimum temperature to be considered as 0 deg C for the purpose of designing of electrical equipment.

1.2 This specification shall be read and constructed in conjunction with the drawings and annexure to determine the scope of work.

1.3 All equipment shall be capable of continuous operation satisfactorily under the following conditions :

a)	Voltage variation	:	± 10%
b)	Frequency variation	:	± 5%
c)	Combined voltage & frequency variation	:	10%

1.4 Nominal system supply available shall be as follows

a)	Incoming	:	11 kV, 3 Ph., 50 Hz, with fault level of 476.3MVA, Insulation level of 28kVrms/75kVp
b)	Distribution	:	415V, 3 Ph., 4 W, 50 Hz, with fault level of 65KA
c)	Control supply voltage	:	24V, DC 2 wire.

2.0 CODES AND STANDARDS

2.1 All equipment and materials specified herein or not, shall be designed, manufactured and tested with the latest applicable standards & bureau of Indian standards.

2.2 All electrical equipment shall also conform to the latest electricity rules as regards safety and other essential provisions.

2.3 All electrical installation work shall comply with the requirements of the following Act /rules /codes as amended upto date :

a) Indian Electricity Act.
b) Indian Electricity Rules.
c) National Electric Code published by BIS.
d) All relevant IS codes of Practice.
e) Regulations published by Tariff Advisory Committee.

3.0 DESIGN CRITERIA

3.1 The equipment shall be used in high voltage system having characteristics as listed in this specification.

3.2 The equipment shall be installed in a hot, dusty, humid and tropical atmosphere.

3.3 There shall be no radio interference when the equipment are operated at maximum service voltage.

3.4 The max. Temp. in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.

3.5 The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

3.6 All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

3.6 The safety clearances of all live parts of the equipment shall be as per relevant standards.

3.7 All equipment/components of identical rating shall be physically and electrically interchangeable.

3.8 All outdoor equipment shall be suitable to mount on steel structure. Connectors shall be bimetallic conductor.

3.9 Wherever single core cables are terminated in any equipment, gland plate shall be of aluminum (3-4 mm thick).

3.10 There shall be no straight through joints in power & control cables.

3.11 All cable terminations shall be with double compression cable gland with armour holding system.

4.0 HT/LT POWER / CONTROL CABLES & TERMINATIONS

4.1 General

a) Two different power source of 11kV shall be arranged by State Electricity Board.

b) These power supply shall feed 11kV Ring Main Unit (RMU), same shall be supplied by the State Electricity Board.

c) Further 11kV RMU will feed the power to 11kV State Electricity Board Meter.11kV meter will feed power to the 11kV two pole structure.

d) Further this power will supplied to distribution transformer via 11kV HT Panel as shown in the SLD.

e) LT Power cables shall be used for distribution of 415V power supply & control cables for controls and indications of the electrical system.

f) For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard and / or this specification.

g) The insulation and sheath materials shall be resistant to oil, acid and alkali and shall be tough enough to withstand mechanical stresses during handling.

h) Armouring shall be single round/flat wire of galvanized steel for multicore cables & of non metallic material for all single core cables.

i) Core identification for multicore cable shall be provided by colour coding.

j) Drum length & tolerance

The cables shall be supplied in wooden drums. The length of the cable in the drum shall be based on site requirement in such a way that no straight through joints are required in any length of cable. Allowable tolerance on individual drum length is ± 2%.

h) Cable Identification

Cable identification shall be provided by embossing on the outer sheath the following:

i) Manufacturer's name or trade mark
ii) Voltage grade
iii) Year of manufacture
iv) Type of insulation
v) Printing of cable length on each meter

i) Core Identification

Respective cores of power/control cables shall be identified with the following pattern :

2 core	:	red (R), black (BK)
3 core	:	red (R), yellow (Y),blue (BL)
4 core	:	red (R),yellow (Y),blue (BL), black (BK)
5 core	:	red (R), yellow (Y),blue (BL), black (BK) & grey (GY)
7&14 cores	:	cores shall be numbered.

j) Tests

i) Shop Tests
The cables shall be subject to shop tests in accordance with relevant standards to prove the design and general qualities of the cables as below : -

ii) Routine tests on each drum of cables.

iii) Acceptance tests on drums chosen at random for acceptance of the lot.

iv) Type tests on each type of cable, inclusive of measurement of armour D.C. resistance of power cables.

4.2 **11 kV HT cables**

a) HT cables shall be of 11 kV (UE) grade.

b) HT cables shall be aluminum conductor. Single core, extruded semi conducting core shield, XLPE insulated, Copper tape screen, inner sheath Extruded PVC armoured and over all FRLS PVC sheathed conforming to IS-7098.

c) HT cables shall be aluminum conductor. Multi core, extruded semi conducting core shield, XLPE insulated, Copper tape screen, PVC fillers inner sheath Extruded PVC armoured and over all FRLS PVC sheathed conforming to IS-7098.

4.3 **LT Power Cables(PVC)-FRLS TYPE**

LT PVC power cables shall be of heavy duty with stranded aluminium / copper conductor, (with final temp. of 70 deg. C) single / multi core, 1.1 kV grade, PVC insulated, extruded PVC inner sheath, steel strip armored and extruded PVC overall sheath conforming to IS: 1554 (P-I).

4.4 **LT Power Cables (XLPE)-FRLS TYPE**

LT XLPE power cables shall be of heavy duty with stranded aluminium / copper conductor, (with final temp. of 90 deg. C) single / multi core, 1.1 kV grade, XLPE insulated, extruded PVC inner sheath, steel strip armored and extruded PVC overall sheath conforming to IS7098(P-I).

4.5 **Control Cables-FRLS TYPE**

Control cables shall be of stranded annealed copper conductors with cross section area of 1.5/ 2.5 sq.mm, PVC insulated, colour coded or with core identification, extruded inner sheathed, steel wire armoured and over all PVC extruded outer sheath etc. The cable shall conform to IS: 1554 (P-I).

4.6 **Cable Termination**

a) <u>HT Cable Terminations</u>

Cable termination shall be heat shrinkable type/cold shrink type suitable for sizes as specified in BOQ, XLPE insulated 66kV (UE),11kV (UE) grade for 66kV & 11kV voltage respectively , and aluminum conductor armoured cables. Termination shall confirm to IS: 13573 with latest amendment. Bimetallic washers shall be provided wherever required between copper and aluminium connections. However following points shall be taken into account:-

i) The termination shall have full track resistance materials between the cable jacket and lug.

ii) Separate lug seals shall be provided in the kit and sealing of the lug with the core covered tubing alone is not acceptable.

iii) The earth connection shall be firmly fix with the armour using a jubilee clamp and the metallic support ring.

b) LT power, control cable termination

i) LT cable termination shall be provided with cable glands of brass suitable for holding the armour of the cable with following features:-

Double Compression Weather proof (without CMRI Approval)

S.No.	PROPERTIES	
1.	Material	Brass (IS 319)
2.	Finish	Nickel Plated
3.	Thread	BSC
4.	Sealing Ring	Neoprene
5.	Reference Standard	BS 6121
6.	Protection Class	IP- 65 as per IS 13947
7.	Application	For outdoor/indoor for armoured cable
8.	Shrouds and Earth tags are to be supplied with glands	

ii) LT cable termination for hazardous area shall have following features:-

Double Compression Flame proof (with CMRI Approval)

S.No.	PROPERTIES	
1.	Material	Brass (IS 319)
2.	Finish	Nickel Plated
3.	Thread	BSC
4.	Sealing Ring	Neoprene
5.	Reference Standard	IS 2148-2004
6.	Protection Class	IP-65 as per IS 13947
7.	Application	For hazardous atmosphere
8.	Shrouds and Earth tags are to be supplied with glands	

iii) Lugs shall be crimping type and shall be of copper suitable for copper conductor cable and of aluminum for aluminum conductor cable.

iv) Bimetallic washers shall be provided wherever required between copper and aluminium connections.

Type & sizes of the special cables to be used for any other purpose, shall be worked out by the contractor depending upon the requirements.

5.0 LIGHTING SYSTEM

5.1 General Requirements

a) All lighting fixtures shall be suitable for 230 - 240V, single phase, 50 Hz system.

b) All fixtures shall be complete with accessories and fixtures necessary for installation.

a) Fixtures housing, frame or canopy shall provide a suitable cover for the fixture outlet box or fixture opening.

b) Fixtures and/or fixture outlet shall be provided with hangers to adequately support the complete height of the fixture. Design of hangers and method of fastening other than that shown on the drawings or herein specified shall be submitted for approval of Owner's representative.

c) Pendant fixtures within the same room or area shall be installed plump and at a uniform height from the finished floor. Adjustment of height shall be made during installation as per instructions of Owner's representative.

d) Flush mounted recessed fixtures shall be installed so as to completely eliminate light leakage within the fixture and between the fixture and adjacent finished surface.

e) Light reflecting surface shall be finished in bake white enamel having a reflection factor of not less than 80%. All parts of reflector shall be completely covered by finish and free from irregularities.

5.2 Fluorescent Fittings

a) One single and / or two lamp ballast shall be used in any one fixture. Ballast shall be Electronics type and shall be completely enclosed and shall have a corrosion resistant finish.

b) All fluorescent fixtures shall be provided with separated wiring channel with cover plate and an each terminal. All screws shall be of chromium plates. Lamps and starter holders shall be out of touch moulded plastic with spring loaded rotor type contactors rendered shock and vibration proof. Condensers shall be low loss, paper impregnated, hermetically sealed.

c) Surface mounted fixtures longer than 2 ft. shall have one additional point of support besides the outlet box. Pendant individually mounted fixtures 4 ft. long shall have ball aligners or similar devices and provision for a minimum of one 25mm vertical adjustment. Systems shall be of appropriate length to suspend fixtures at required mounting height. Lamps shall have bi-pin bases and a minimum appropriate rating and guaranteed life of 5000 hrs.

5.3 LED Fittings

a) LED fittings shall be integrated type complete with drivers, heat sink and LED chip and shall confirm to LM79 (IES NA) for testing of fixtures,LM80 (IES NA) for testing of chips.

b) The LED fittings including drivers and chips shall be guaranteed for minimum 30,000 burning hours.

5.4 High Pressure Mercury Vapour / Sodium Vapour / Metal Halide / High / Medium Bay Fittings

Fixtures shall be provided with copper ballast and capacitors. Ballast shall be made of copper wire & preferably be a part of the fixtures. Lamps shall be of screw type.

5.5 Industrial Wall Fan

Industrial Wall Fans shall be manufactured & tested as per the relevant standards. The fan shall have totally enclosed capacitor start suitable for operation on 240V, 1 Ph., 50 Hz. Supply.

All exhaust fans shall be of industrial type designed, manufactured & tested as per the IS: 2312-1967 with louvers & fine wire mesh, suitable for 240V, 1 Ph., 50 Hz. supply.

6.0 LIGHTING DISTRIBUTION BOARDS

6.1 General

a) LDBs shall feed to various lighting fixtures, and socket outlets.

b) Generally LDBs shall consist of MCBs/ELCBs/ Isolators / Contactors / Push button / Indicating lights etc.

c) The type and rating of the LDBs covered herein shall be as follows :

System Voltage	:	415 V
System frequency	:	50 Hz
No. of phases	:	3 phases, (4 wires)
Fault withstand	:	10 kA for 1 sec.
High voltage test	:	2.5 KV for 1 minute.
Degree of enclosure	:	IP54 (As per IS:2147)

6.2 Construction Features

a) Lighting Distribution Boards shall be floor mounted (unless other specified) sheet steel enclosed, dust, weather and vermin proof with enclosure class IP54 / IP55 and shall be gasketed to avoid ingress of dust and foreign materials.

b) Each LDB shall be provided with double door.

c) LDBs shall be fabricated out of 16 SWG sheet metal and shall be factory fabricated and shall completely pre-wired.

d) Adequate space shall be provided for wiring for outgoing circuit and incoming cables. Separate terminals shall be provided for terminating the cables.

e) LDBs shall be painted with powder coating system.

f) All DBs shall be provided with surge arrester devices separately for each phase.

g) Wherever specified "START/ STOP" Push Buttons and indication lights at front of the Panel shall be provided.

6.3 MCBs/ Isolators

a) MCBs/Isolators shall be suitable for 415V/220/240V, 3–phase and neutral or 220/240V single phase and neutral system.

b) MCBs/Isolators shall be heat resistant plastic moulded type.

c) MCBS shall have quick make and break, non-welding silver alloy contacts, both on the manual and automatic operation.

d) Each current carrying pole of the breaker shall be provided with inverse time overload and instantaneous short circuit tripping elements with trip free mechanism.

e) In case of multipole CBs, the tripping must be on all the pole and operating handle shall be common.

f) MCBs/ELCBs/Isolators shall be suitable operating in an ambient temperature of 50 deg. C without derating.

g) The short-circuit breaking capacity of the MCBs shall not be less than 10kA.

h) All terminals shall be suitably shrouded.

i) Wherever MCB Isolators are specified, they are without the tripping elements.

6.4 Busbars

a) Busbars shall be of high conductivity copper and shall be suitably sized. Current density shall not exceed 1.2 Amps/sq.mm.

b) Busbars shall be designed for fault withstand capacity of 10 kA for 1 Sec.

c) Bus Insulators shall be flame resistant track resistant and of non-hygroscopic material such as epoxy/SMC/DMC.

6.5 Wiring /Conduiting / Lighting System

a) Conduit & Accessories

- All conduits shall be of MS steel of heavy duty type conforming to relevant IS. However, for LAN, conduit shall be of PVC.
- Minimum size of conduit shall be 19 / 20 mm. Thickness of conduit shall be 1.6mm upto 25mm dia and 2mm for above 25mm dia.
- Conduit accessories like associated couplers, elbows, tees, reducers, saddles, clamping material etc. shall also be of same type & quality as the conduit.
- Wherever wiring is to be carried out in the furniture / partitions, the same shall be thru' PVC casing capping, suitably supported within the partition.
- Ferrule no to be provide in the circuit for lighting system

b) Wires

All wires shall be PVC insulated with single core / stranded copper conductor as specified and shall be of 650 V grade conforming to IS 694.

Phase		Colour of wire
R	:	Red
Y	:	Yellow
B	:	Blue
N	:	Black
Earth	:	Green with yellow lines

6.6 Switches / Socket Outlets

a) Switches / socket outlets shall be of plate type.

b) Boxes for switches shall be of MS provided with adequate knockouts and with earthing terminal.

c) 5A/ 6A socket outlets shall be of 3 pin universal type with safety shutters in all pins of the socket. The colour of the plate for UPS supply shall be different & the same shall be based on furniture colour as decided by the Employer / Architect.

d) 15 / 16A socket outlet shall be of 6 pin type.

7.0 CABLE TRAYS

The cable tray and all accessories shall be fabricated from sheet steel and has to be hot dip galvanized against corrosion confirming to ISO 1461-1999 for installations in both indoor and outdoor applications & should have a Base Perforation Class B according to IEC 61537. The cable trays shall be supplied in standard lengths of 3000mm

Cable trays shall be fabricated out of 2/1.6 mm Hot dip galvanized steel sheet. Cable Trays shall be of stainless steel, wherever specified in Bill of Material.

All the cable tray accessories like Bends, TEEs, Cross overs etc should be designed in accordance with IEC 61537 and shall be factory fabricated. The accessories shall be from the same material as of the tray.

a) and modular type, it should be connected with the trays by using fasteners

b) In ladder type trays, ladder shall be provided at every 250 mm.

c) Tray height shall generally be 75mm or as specified in BOQ shall be suitable to accept tray covers.

d) Cable trays shall be provided with 1.6/2mm thick CRCA sheet cover wherever required.

e) Width of cable trays shall be as per the requirement indicated in the drawings.

8.0 LOCAL START / STOP PUSH BUTTON STATIONS

a) Push Button stations shall be fabricated out of 14 SWG CRCA MS.

b) Push Button stations shall be dust & vermin proof with both top and bottom cable entries.

c) Push Button stations shall be of the following types :

Start : Push to actuate, Oil tight, Green colour with 2 NO + 2 NC contacts.

Stop : Push to Lockable type, Oil tight, Red colour with 2 NO + 2 NC contacts.

d) Terminal blocks shall be Phoenix / WAGO type of 650V grade with min. 10 sq.mm size.

e) Internal wiring shall be carried out with stranded copper conductor PVC black wires of 1.5 sq.mm size of 1100/650V grade.

In addition to above, internal wiring shall also be provided with ferrules.

Each push button station shall be provided with 2 nos. earthing terminals.

9.0 PASSIVE FIRE SEALANT:

9.1 Design Criteria

a) It is intended to provide Passive Fire Sealant where cables/ cable trays, electrical conduits /pipes are penetrating, both vertical & horizontal in the brick/ RCC walls so that spreading of fire from one area to another area can be avoided.

b) The material for construction of fire sealant shall be such that it can sustain the fire for 2 hours on eruption of fire on either side of the brick/RCC wall.

c) The material shall be non-hydroscopic, compatible with the type of PVC/ XLPE cables.

d) The fire sealant shall be suitable for retrofitting of cables without disturbing the sealing of the cables already existing.

e) The fire sealant shall be used in the following listed areas:-

i) Along the passage of cables/cable trays, electrical pipe, sleeves / embedded conduits in walls/floors.

ii) Along vertical raceways carrying cables between successive floors, through openings provided in the RCC floor slab.

iii) Along openings in floor slab below HT/LT switchgears, MCC's, other panels from where cable entry/connection has to be done.

iv) Along the cable trays in intersections and tee-offs.

9.2 CONSTRUCTION FEATURES

The preferred material for sealant can be "Mortar Insulation"

The FPS system shall also include all the necessary accessories and equipment required for supporting, holding in position, fixing and installation of the fie-stop/fire-break.

9.3 Vendors need to supply necessary certification (subject to approval by owner) for the material considered by them for above purpose

10.0 BATTERY & BATTERY CHARGER

10.1 Battery

a) **General**

i) The battery shall be Lead -Acid type tubular type

ii) The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load

10.2 Battery Charger

a) **General**

i) The charger shall be natural air cooled, solid state type with full wave, fully controlled, bridge configurations.

ii) The charger shall be provided with automatic voltage regulation, current limiting circuitry smoothing filter circuit and soft start feature.

iii) Voltage control shall be step-less, smooth and continuous.

iv) The charger shall be self-protecting against all A-C and D-C transients and steady state abnormal currents and voltages.

v) Voltage setters shall be provided for setting the output of float boost charge. Setting shall be independent of each other so that setting of one voltage shall not require resetting other.

vi) There shall be separate transformers for float and boost charger.

vi) Charger A-C input and D-C output shall be electrically isolated from each other and also from panel ground.

viii) Isolation shall also be provided between power and control circuits.

ix) Batteries shall also be housed into the Battery Charger cubical.

b) **Construction**

i) The charger shall be free-standing, floor mounted with sheet steel enclosure with all access from the front.

ii) The panel shall conform to the degree of protection IP 42. Minimum thickness of sheet metal used shall be 2 mm.

i) Access door shall be with concealed hinges and neoprene gaskets. Ventilating louvers shall be covered with fine wire mesh.

ii) All equipment within the panels shall be arranged in modular units and laid out with sufficient space for easy maintenance.

iii) Switches, meters, relays etc. shall be flush mounted on the front of the panels.

f) Nameplates of approved size and type shall be provided for all circuits and devices.

c) **Charger Equipment**

i) All power diodes and control rectifiers shall be silicon type. Rectifier Transformer shall be dry type, double wound, with copper conductor and class B insulation.

i) Blocking diodes shall be fully rated and redundant so that failure of a single diode shall not incapacitate the system in any way.

ii) Isolating switches shall be heavy duty, load break type, operated by an external handle with provision for padlocking in ON and OFF position.

iii) Changeover switch shall be 3 position, 4 pole, load break type with 2 NO + 2 NC auxiliary contacts.

iv) Contactor shall be air-break type with thermal overload relays having in built single phase preventor.

v) Fuses shall be HRC type and arranged for easy replacement. Semi-conducting device fuses shall be fast-acting.

vi) Indicating lights shall be low-watt filament type with series resistor. Both lamp and lens shall be replaceable from front.

vii) Meters shall be 96mm x 96mm switchboard type, 250 deg. scale, antiglare glass, $\pm$ 2% accuracy with zero adjuster on the front.

d) **Alarms**

i) One (1) ten-points alarm facia shall be provided on charger panel, complete with proper actuating devices, circuitry and legends.

ii) The arrangement shall be such that on occurrence of a fault the corresponding window will light up and stays lighted until the fault is cleared and reset button is pressed.

i) Each time a window lights up, a master relay will get energised to provide group alarm signals for Owner's remote panel.

ii) Following minimum annunciation shall be provided :

- A. C. Supply failure *
- D. C. Voltage low *

- D. C. Voltage high *
- D. C. System ground *

- Charger overload *
- SCR fuse blown

- Filter fuse blown
- D. C. Output fuse blown

v) Alarm points marked with an asterisk (*) shall have electrically separate spare set of contacts wired up to the terminal block for Owner's use.

vi) Alarm contacts shall be rated 2A at 24V D.C. and 5A at 240V A.C.

e) **Outgoing Feeders**

i) Each Outgoing feeder shall be provided with double pole switch and with HRC fuses.

ii) Outgoing feeders shall be located in separate module forming part of charger panel with separate cable alley for terminated outgoing cable.

f) **Lamp/ Space Heaters/ Receptacles**

i) The charger panels shall be provided with :-

- Internal illumination lamp with door switch.
- Space heater with thermostat control.

ii) Lamp, heater circuits shall have individual switch fuse units.

g) **Wiring / Cabling**

i) The panels shall be completely wired-up. All wiring shall be routed through wiring troughs. Wires shall be ferruled at both ends for identification.

ii) Panels shall have removable gland plates at the bottom for cable entry. All incoming / outgoing cables shall be terminated in suitable terminal blocks.

i) Control terminal blocks shall be box-clamp type ELMEX 10 Sq. mm or approved equal.

h) **Grounding**

i) The charger panels shall be fully rated ground bus with two ground terminals, one at each end.

ii) Each terminal shall comprise two-bolt drilling with M10 G.I. bolts and nuts to receive Owner's ground connection of 50 x 6 mm G.I. flat.

i) **Tropical Protection**

i) All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.

ii) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insets.

j) **Painting**

i) All surfaces shall be sand blasted, pickled as required to produce a smooth, clean surface free of scale, grease and rust.

ii) After cleaning, the surfaces shall be given a phosphate coating followed by 2 coats of high quality primer and stoved after each coat.

iii) The panels shall be finished in powder coated Siemens Grey, RAL 7032.

k) **Tests**

i) All equipment & components there of shall be subject to shop tests as per relevant IS standards. The tests shall included but not limited to :-

ii) Tests on battery charger.

- Dielectric tests.
- Voltage regulation check from 0 to 100% load with ± 10% input voltage variation.

  - Ripple content measurement.
  - Heat run test on current limiting value.

l) **Test Witness**

All tests shall be performed in presence of Owner's representatives, if so desired by the Owner. The contractor shall give at least fifteen (15) days advance notice of the date when tests are to be carried out.

10.3 **Requirement**

a) **Battery**

i)	Type	:	Lead Acid
ii)	Nos. of Cells per Battery	:	12
iii)	Battery nominal voltage	:	24 V
iv)	Ten hour rating to 1.85 Volt/Cell at 27 deg. C.	:	200 AH

b) **Battery Charger**

i)	Charger	:	Float & Boost.
ii)	Type	:	Solid state, rectifier
iii)	Rating	:	25A
iv)	A.C. Input Supply	:	415V, 3ph, 4W/230V, 1Ph, 50Hz, 2 wire
v)	Ripple content in charger DC output	:	± 1%
vi)	Outgoing feeders -8 Nos.	:	Each consisting of 16A DPMCB

ERECTION & COMMISSIONING

1.0 GENERAL

1.1 EQUIPMENT ERECTION

a) The equipment in disassembled condition shall be received at site by the contractor.

b) The contractor shall unpack, assemble all parts, mount and wire up loose equipment, fitting and accessories and complete all connections.

c) The contractor shall mount the equipment on respective foundation/ supports, level & align the same & arrange for necessary grouting/anchoring.

d) The erection work shall be carried out in compliance with manufacturer's instruction and shall include all adjustments, checks and measurements.

e) The contractor shall record results of all erection tests and measurements and furnish copies of the same to the owner for his reference and record.

f) Any internal wiring of the equipment, which has been left incomplete because of shipping, split or which requires minor modifications shall be carried out by the contractor. This includes mounting of items like relays, meters etc. and connecting the same as per wiring scheme diagram furnished by the original manufacturers.

1.2 CONSUMABLES AND HARDWARE

The contractor shall furnish all erection materials, hardware and consumables required for the completion of the installation.

The materials shall include but not limited to the following :

a) Consumables : welding rods & gas, oil & grease, cleaning fluids, paints, electrical tape, soldering materials etc.

b) Hardware : bolts, nuts, washers, screws, brackets, supports, clamps, hangers, saddles, cleats, sills, shims etc.

c) Materials : junction boxes, terminal blocks, connectors, ferrules, lugs, brass glands, rigid/flexible conduits, cables, ground wires etc.

Supply of cement, sand, stone etc. required for the execution of the contract shall be responsibility of the contractor.

1.3 ERECTION TOOLS & TACKLES

a) The contractor shall provide all tools, tackle, implements, module equipment such as chain pulley block, trailers etc. which are required for transportation, handling and erection of equipment.

b) Special erection tools, if any, furnished by the Manufacturer along with the equipment may be used by the contractor. such tools and equipment, however, shall be returned in good working conditions to the owner on completion of the job.

c) The contractor shall also arrange for major testing equipment as list below :

- Insulation Tester : Motor operated Megger 1000V & 10KV grade.
  Hand operated Megger 1000V.
- Hand driven earth resistance megger, range 0-1/3/30 ohms.

- Tong testers of suitable ranges.
- Contact resistance measuring set for micro-ohms.
- Torque wrench.
- Primary / secondary injection set and relay testing kit.
- Multimeters, test lamp, field telephone with buzzer sets, different gauges etc.
- Streamline filter.
- Chain pulley block, cable jacks & spindle, cable, collars, electricians tool kit, jointer's tool kit, fitters tool kit, welding transformer, phase sequence meter, HV testing kit, primary & secondary injection kit.

Other test equipment as required for testing and commissioning of the equipment shall have to be arranged by the contractor.

1.4 METHODS AND WORKMANSHIP

a) All work shall be installed in a first class, neat workman like manner by mechanics / electricians skilled in the trade involved.

b) The erection work shall be supervised by competent supervisors holding relevant supervisory license from the Government.

c) All details on installation shall be electrically and mechanically correct.

d) The installation shall be carried out in such a manner as to preserve access to other equipment installed.

e) If in the opinion of the contractor any work is insufficiently specified or require modification, the contractor shall refer the same in writing to the owner and obtain his instruction / approval before proceeding with the work.

f) If the contractor fails to refer such instances, any excuse for the faulty erection, poor workmanship or delay in completion shall not be entertained.

g) Equipment and material, which are wrongly installed shall be removed and re-installed to comply with the design requirement at the contractor's expense, to the satisfaction of the owner/consultant.

h) All scaffolding pipes and frames shall be of tubular steel. Bamboo's/ ballies/ timer frames are not permitted under any circumstances. All vertical & horizontal scaffolds shall be of MS pipes of adequate size to withstand the loads & pressures. The working platforms shall be either of conduit pipes or MS bars.

1.5 ALLOWABLE WASTAGE

a) The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed 1%

b) Measurement shall be taken at site jointly by contractor and owner's representative.

c) If the actual wastage be more than the quoted figure then equivalent price of the balance amount will be deducted from contractor's bills.

d) The contractor shall submit a detailed account of materials issued to him after completion of work. The excess materials after completion of job shall be returned back to the owner's store.

1.6 FOUNDATION AND CIVIL WORK

a) The contractor shall check the foundations provided by owner before commencement of erection to ensure their suitability.

b) All final adjustments of foundation levels, chipping and dressing of foundation surfaces, drilling holes on foundation channels to suit the equipment setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil work as may be required for erection.

c) Any cutting of masonry work which is necessary shall be done by the Contractor at his own cost and shall be made good to match the original work. The contractor shall obtain approval of owner/ consultant before proceeding with any cutting of masonry / concrete work.

1.7 EXCAVATION AND BACK FILLING

a) The contractor shall perform all excavation and back filling as required for the scope of work specified.

b) The contractor shall make his own arrangement for pumping out any water that may accumulate in the excavation.

c) All excavation shall be back filled to the original level with good consolidation.

1.8 REPAIR OF DAMAGE SUBSTAINED DURING TRANSIT

The contractor shall repair minor damages sustained during transit or subsequent storage in purchaser's store. The repair charges shall be paid to the contractor on the basis of extra work.

1.9 INSPECTION

a) After completion of erection/installation, each piece of equipment shall be thoroughly tested as per approved procedure and inspected in presence of the owner/consultant for correctness and completeness of erection and acceptability for start up.

b) A check list in triplicate will be furnished by the owner/consultant wherein all details to be checked and necessary instruction shall be listed. The inspection and checking shall strictly follow the checklist.

c) On completion of the inspection (2) copies of the check list duly filled-in shall be handed over to the owner/consultant.

d) This check list shall be jointly signed by the contractor and the owner/consultant. Such endorsement, however, shall not relieve the contractor of his obligations under the contract.

2.0 DETAILS OF ERECTION

2.1 11 kV HT PANEL

a) 11kV HT Panel shall be installed in accordance with IS: 3072 and manufacturer's instructions. The contractor shall be required to install and align any channel sills which form part of the foundation. The HT Switchgears shall be made absolutely vermin proof.

b) Control wiring (if any) between 11kV HT Panel & other electrical equipment shall be carried out as per the instructions of the manufacturers & site-in-charge.

2.2 TRANSFORMER

a) Installation of the transformers shall be in accordance with the IS: 1886, manufacturer's instructions and as per the enclosed drawings.

b) Care shall be taken during handling of insulating oil to preventing ingress of moisture or foreign material. Testing and sampling of oil shall be in accordance with manufacturer's instructions and related IS. If oil filtration is required the same shall be carried out at site by the Contractor.

c) Control wiring between Transformer, OLTC, RTCC & other electrical panels shall be carried out as per the manufacturer's drawings and as per the instructions of site - in - charge.

2.3 MAIN LT PANEL / DBs / CAPACITOR PANEL

a) All panels & DBs will be available in split - up - sections for ease of transportation and handling. However in some cases, breakers, busbars relays, meters and control switches may be supplied loose to be mounted and connected at site as per the relevant drawings.

b) All alignments leveling, grouting, anchoring and adjustments shall be carried out in accordance with manufacturer's instructions and/or as directed by the Engineer. All boards shall be cleaned by using blower before installation.

c) All connections in the panels shall be completed, checked and adjusted to ensure safety and satisfactory operation of the equipment. This includes the following activities: -

i) Functional test on circuit breakers.

ii) Setting of protective relays and thermal over load relays.

iii) Adjustment of zero error of various indicating instruments.

iv) Testing of thermal overload relays by primary injection and protective relays by secondary injection.

d) In some cases, minor modifications may have to be carried out at site in the wiring of an equipment to meet the requirements of the desired control scheme and the Contractor shall have to do the same at no extra cost.

2.4 MISC. ITEMS AND LOCAL PANEL INSTALLATION

a) The contractor shall install miscellaneous items such as local control station, start-stop push button stations (with illuminating lamp type), and local starter units control panels, misc. panel etc.

b) These equipment will be generally wall or column mounted excepting a few which are floor mounted. The exact locations will be as decided by the Engineer at site.

c) All supports or brackets need for installation shall be fabricated by the Contractor.

d) All welding, cutting, chipping and grinding as and when necessary shall be carried out by the Contractor at no extra cost.

2.5 LIGHTING SYSTEM

2.5.1 Conduiting

a) Maximum permissible number of 650/ 1100 volt grade PVC insulated wires the may be drawn into rigid conduits are as below:

Size of wire Nominal Cross section Area (Sq. mm)	Maximum number of wires within conduits of Size (mm)		
	25	32	38
1.5	10	14	--
2.5	10	14	--
4.0	6	10	14
6.0	5	8	11

b) **Connections**

i) All jointing methods shall be subject to the approval of the Engineer in charges. Separate conduits shall run for all power outlet wiring. Conduit connections for MS conduits shall be screwed metal to metal with white lead and exposed threads shall be painted with one coat of self etching zinc chromate primer and two coats of enamel paint.

ii) The threads and sockets shall be free from grease and oil. Connections between screwed conduit and sheet metal boxes shall be by means of a brass hexagon smooth bore bush, fixed inside the box and connected through a coupler to the conduit. The joints in conduits shall be free of burrs to avoid damage to insulation of conductors while pulling them through the conduits.

c) **Bends in Conduits**

Where necessary, bends or diversions may be achieved by means of bends and/or circular inspection boxes with adequate and suitable inlet and outlet screwed joints. In case of recessed system each junction box shall be provided with a cover properly secured and flush with the finished wall surface. No bends shall have radius less than 2-1/2 times the outside diameter of the conduit.

d) **Fixing of Conduits**

i) All conduits shall be installed as to avoid steam and hot water pipes. After the conduits, junction boxes, outlet boxes and switch boxes are installed in positions, their outlets shall be properly plugged or covered so that water, mortar, insects or any other foreign matter does not enter into the conduit system. Surface conduits shall be fixed by means of space bar saddles at intervals not more than 500 mm.

i) The saddles shall be of 2 mm x 19 mm galvanised mild steel flat, properly treated, primed and painted, securely fixed to supports by means of nuts and bolts / rawl bolts and brass machined screws.

2.5.2 **Wiring**

a) **Point Wiring**

i) Point wiring shall include all work necessary in complete wiring of a switch circuit of any length from the controlling switch to the following:

- Ceiling rose or connector (In case of Exhaust Fans).
- Back Plate (In case of fluorescent Fitting with Down rods etc.).
- Socket Outlet.
- Lamp Holder (In case of bracket & similar fittings).

ii) The following shall be deemed to be included in the Point Wiring:

- Switch.
- Ceiling rose or Connector as required.
- Conduit as required.
- Metal Switch Box to mount switches & sockets etc.
- All fixing accessories.
- Earth wire for three pin socket outlet etc.

b) **Circuit Wiring**

Circuit wiring shall mean the length of wiring from the LDB upto the switchboard measured along the run of wiring on linear basis. The same shall be included in point wiring if indicated in the bill of materials.

c) **Bunching of wires**

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

d) **Drawing of wires**

The drawing and jointing of PVC insulated copper conductor wires and cables shall be executed with due regard to the following precautions:

i) While drawing wires through conduits, care shall be taken to avoid scratches and links which cause breakage of conductors. There shall be no sharp bends.

ii) Insulation shall be shaved of like sharpening of a pencil and it shall not be removed by cutting it. PVC insulated copper conductor shall be soldered at the ends. Strands of wires shall not be cut for connecting terminals. The terminals shall have sufficient cross sectional area to take all strands and shall be soldered.

iii) Connecting brass screws shall have flat ends.

iv) All looped joints shall be soldered and connected through terminal block/ connectors.

v) The pressure applied to tighten terminal screws shall be just adequate (neither too much nor too less). Conductors having nominal cross sectional areas exceeding 10 Sq.mm shall always be provided with cable sockets.

vi) All wires and cables shall bear the manufacturer's label and shall be brought to site in original packing.

vii) For all internal wiring, PVC insulated wires of 650/1100 volts grade shall be used.

viii) The sub-circuit wiring for point shall be carried out in loop system and no joints shall be allowed in the length of the conductors.

ix) Before the wires are drawn into the conduits, the conduits shall be thoroughly cleaned of moisture, dirt of any other obstruction by forcing compressed air through the conduits.

x) The minimum size of PVC insulated conductor wires for all sub-circuit wiring for light points shall be 2.5 sq.mm.

xi) Separate conduit shall run for LAN wiring and the same shall not run in parallel to power wiring conduit

e) **Joints in wires**

All joints shall be made at main switches, distribution boards, socket outlets and switch boxes and in junction box wherever specified be continuous from outlet to inlet.

f) **Load Balancing**

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

2.5.3 Incoming Cable

The size of incoming cable to LDB shall be as indicated in the respective SLDs/lighting layout drawings.

2.5.4 Earthing of Lighting System

a) 25 x 6 mm GI Strips shall be laid from the plant earthing network for earthing of LDB.

b) From LDB to switch boards / boxes and further to the fixtures, 1.5 sq.mm copper conductor PVC insulated wire (green colour with yellow strips) shall be used for earthing.

c) Earthing wires shall be connected in such a way that accidental disconnection at any one point shall not result in removal of earth connection.

d) For earthing of 20A power sockets, 2.5 sq.mm copper conductor PVC wires shall be laid for earthing.

e) All conduits, lighting fixtures, 3rd pin of socket outlets junction boxes shall be effectively earthed by using min. 1.5 sq.mm. copper insulated wire of green colour.

2.5.5 Testing of Lighting System

The entire installation shall be tested for:

a) Insulation resistance

b) Earth continuity

c) Polarity of single pole switches.

2.6 CABLING SYSTEM

2.6.1 Cable Trays and Racks

a) The contractor shall install the cable racks, trays, risers, shafts and supports.

b) Cable trays and risers shall be aligned and leveled correctly. All runs shall be installed parallel to the trench/building walls and floors except otherwise noted on the drawings.

c) The contractor shall provide embedded steel inserts/supports on wall, ceiling or floor by suitable anchoring & shall secure racks and supports by welding these to inserts.

d) The trays in general shall be supported at a distance of 1.5 to 2 meters on horizontal and vertical run.

e) Cable trays shall be installed as per drawings furnished to the Contractor. Any deviation in routes shall have the prior approval of the Engineer In-charge.

f) Prefabricated cable trays and accessories shall be assembled and erected at site as per instructions of Manufacturer. Alternately, the Contractor shall fabricate and install all cable trays, risers, shafts and supports as agreed upon during finalization of the award.

g) Sufficient spacing not less than 250 mm shall be provided between trays and maintained to permit adequate access for installing and maintaining the cables.

h) Contractor shall co-ordinate with other contractors (such as for piping etc.) where there is a common support for cable trays and for other services.

i) All necessary steel & all consumables as specified elsewhere shall be provided by the contractor.

2.6.2 Storage and Handling

a) Cable drums shall be stored on hard and well drained surface so that they may not sink. In no case the drum shall be stored on the flat, i.e., with flange horizontal.

b) Rolling of drum shall be avoided as far as practicable. For short distance, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

c) In absence of any indication the drums may be rolled in the same direction as it was rolled during taking up the cable.

d) For unreeling the cable, the drum shall be mounted on jacks or on cable wheel. The spindle shall be strong enough to carry the weight without bending.

e) The drum shall be rolled on the spindle slowly so that cable should come out over the drum and not below the drum.

f) While laying cable, cable rollers shall be used at an interval of 2000 mm. The cable shall be pushed over the roller by a gang of people positioned in between rollers.

g) Cable shall not be pulled from the end without having intermediate pushing arrangement. Bending radius of the cable shall not be less than that is specified by the manufacturer.

h) All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends.

2.6.3 Cable Laying

a) Cable shall generally be installed in ladder type / perforated trays in trenches or buried in ground except for some short runs in conduit for protection or crossings the roads etc.

b) Each length of run shall be physically measured at site before cutting the cable. Contractor shall furnish cable cutting the schedule to engineer in charge with respect to able drum length available at site and runs of cables & sizes of cables.

c) Cable may also be laid through hume pipes in road crossings etc. The hume pipes shall be supplied and placed in position by the Contractor.

d) Cable laid on trays and risers shall be neatly dressed and clamped at an interval of 3000 mm and 900 mm for horizontal and vertical cable run respectively and at each bend of cable.

e) All power cables shall be clamped individually and control cables shall be clamped in groups of three or four cables.

f) Clamps for multicore cables shall be fabricated of 25 x 3 mm G.I. flats. Single core power cables shall be laid in trefoil formation and clamped with trefoil clamps made of Fiber glass/PVC.

g) Cable openings etc. in walls/floor made by the Contractor or by others shall be sealed by the Contractor suitably by Hessian tape and bitumen compound or by any other proven method to prevent ingress of water.

h) Directly buried cables shall be laid as per detail shown in drawing. These cables shall be laid on and covered with sand/raddle earth and protected by brick barriers as sides and precast concrete slab brick on top. Job also involves digging/excavation of earth and refilling the same after laying of cables.

i) For cables laid underground a loop of diameter of 3 meters shall be provided near each terminating ends.

j) After completion of installation and prior to connection, all High Voltage Power cables shall be given a high potential test. The contractor shall provide this Hipot Test set having provision of leakage current measurement.

k) Laying cost shall include all above activities including supply and fixing of clamps etc.

l) Cables for machines in clean area shall be laid in suitable size of stainless steel conduit.

2.6.4 Cable Tags and Markers

a) Each cables and conduit run shall be tagged with numbers that appear in the cable schedules. Cables and conduits shall be tagged at every thirty (30) meters. Cables and conduits shall also be tagged on either side of a floor/wall passage.

b) The tags shall be of PVC or Aluminium with the number engraved on it and securely attached to the cable by not less than two turns of G.I. wire.

c) Location of cables laid directly underground shall be indicated clearly by cable marker made of cast iron.

d) The location of cable joints, if any, shall be clearly indicated with cable marked with an additional inscription “Cable Joint”.

e) The marker shall project 100 mm above ground and shall be spaced at an interval of 30 meters at every change of direction.

f) Where cables are cut from the drums the ends of the cables at the drums shall be properly sealed.

g) The power and control cable shall be laid with a provision of extra length at one of the end terminations. This length shall be confirmed by the Engineer in charge before laying.

h) Cost of laying shall also include supply and fixing of tags, cable markers etc.

2.6.5 Terminations Joints and Connection

a) The termination, Joints and connections of cables shall be done by qualified jointers strictly in accordance with manufacturer’s instruction drawings and/or as directed by the Engineer.

b) The work shall include all clamping, fittings, fixing, plumbing, soldering, taping, compound filling, epoxy cable jointing, crimping, connecting, shorting and earthing as required for all such operations should be available with concerned contractor. For all size of LT termination, crimping tool (Hydraulic type) shall be used. Further, inhibiting compound shall be provided before termination.

c) The equipment will be generally provided with blank plates for cable/conduit entry and cable end box for power cables.

d) The Contractor shall perform all drilling, cutting on the blank plates and any minor modification work required to complete the job.

e) If the cable-end box or terminal enclosure provided on the equipment is found unsuitable and requires major modification, the same shall be carried out by the Contractor as extra work item.

f) Control cable cores entering control panel / switch gear / MCC etc. shall be neatly bunched and served with nylon cord or PVC perforated tape to keep in position at the terminal block.

g) The contractor shall provide oil resistance ferrules for all control cable cores at all terminations including at all junction boxes and at all terminations. The ferrules shall carry terminal numbers as per drawing. The ferrules shall be of interlocked plastic type or approved equal.

h) Spare cores shall be similarly tagged, crimped with lug and taped on the ends. Spare cores shall be tagged with individual cable number.

i) Terminations and connections shall be carried out in such a manner as to avoid strain on the terminals.

j) All cable entry points shall be sealed and made vermin and dust proof. Unused opening, if any shall be effectively closed.

k) Termination kits for HT cables, Straight through joint kits for HT & LT cables, cable of all glands lugs shall be arranged by the Contractor, which includes furnishing consumable materials such as plumbing and soldering material, electrical tape including bitumen compound/resin if not a part of kit shall be included in the erection rates.

2.7 EARTHING

a) The Contractor shall install the entire earthing system and complete all earth connections for the plant. Installation of earthing electrode, earthing conductor, excavation, back filling etc. wherever required is in the scope of Contractor.

b) The earthing grid shall be formed at one meter below grade or at column foundation level or as specified in the relevant dwgs, around plant. The grid conductors 50 x 10mm GI. The details of the earth pits shall be as per enclosed drawings.

c) Above ground, 50x 6 mm GI shall be run on cable trays or any support by clamping at interval not exceeding 1500mm. These earth conductors shall be connected to the earth mat through 50 x 6mm M.S. riser. Taps from the above earth conductor shall be used in earthing equipment and structure.

d) When riser from underground mat have been provided for equipment earthing, the equipment conductor shall be welded to the riser at one end and its other end shall be connected to the equipment, in case the riser length is not adequate.

e) All earth conductors shall be painted black for easy identification. Wherever earthing strips are welded bituminous paint shall be applied. All earth conductor connection shall be made by electric arc welding unless otherwise specified.

f) Bolted earthing connection shall be used for equipment earthing. The contact surface shall be thoroughly cleaned before connection.

g) Equipment will generally be furnished with two separate earth pads with tapped holes, bolts and spring washers. If however, the same are not furnished, Contractor shall drill and tap holes and provide bolts and spring washers for connection.

h) Equipment earth connection, after checked and tested by the Engineer, shall be coated with anti-corrosive paint/cold compound.

i) Whether specifically shown or not, all conduits, trays, cable armour and end box, electrical equipment such as switchboards, panels, cabinets, junction boxes, local push button stations etc. shall be effectively earthed.

j) The local start-stop push button stations, junction boxes, control supply change over panels etc. shall be earthed through 8 SWG G.I. wire.

k) To make an effectively earthed 415V system, the 1 neutral bus of all 415V switchboards, MCCs shall be connected to earth grid at two different and distinct points unless otherwise specified.

l) The various size of earth conductor shall be as follows :

-	LT Panels/Capacitor Panel	-	50 X 10 GI
-	DBs/Lighting DBs	-	25x6 GI Flat.
-	Motors		
-	61KW and above	-	50x6 GI Flat.
-	11KW to 60KW	-	25x6 GI Flat.
-	1 KW to 10 KW	-	8 SWG
-	All Fractional KW	-	8 SWG

m) All earthing materials like rods, strips and wires shall be supplied by the Contractor.

2.8 IMPORTANT NOTES FOR ERECTION ACTIVITIES

2.8.1 Cables and Conduits

a) Approximate lengths of cables and conduits runs will be given in the cable schedule. Before commencement of work the Contractor shall take actual measurements and prepare his own cable cutting schedules to reduce wastage to a minimum.

b) During the erection period the Contractor shall furnish weekly / fortnightly report on cable position in an approved proforma so as to keep the Engineer In Charge apprised of the position and to enable him to intimate any procurement action in time.

c) The Contractor shall also maintain and submit when requested, a record of cable insulation value when drawn from store, after laying, before and after termination/jointing.

2.8.2 Excavation and Back Filling

a) The Contractor shall perform all excavation and back filling as required for the scope of work specified.

b) The Contractor shall make his own arrangement for pumping out any water that may accumulate in the excavation.

c) All excavation shall be back filled to the original level with good consolidation.

2.8.3 Foundation and Civil Work

a) The contractor shall provide foundations wherever required & in case same has been provided by the employer earlier, same shall be checked for correctness before commencement of erection to ensure their suitability.

b) All final adjustments of foundation levels, chipping and dressing of foundation surfaces, drilling holes on foundation channels to suit the equipment setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the Contractor including minor modification of civil work as may be required for erection.

c) Any cutting of masonry work which is necessary shall be done by the Contractor at his own cost & shall be made good to match the original work.

d) The Contractor shall obtain approval of Engineer before proceeding with any cutting of masonry /concrete work.

2.8.4 Structural Fabrication Works

a) All chequer plate covers, cable racks, trays, supports, hangers and brackets wherever necessary shall be supplied/fabricated by the Contactor. Steel for fabrication shall be straightened and cleaned of rust and grease. All fabrication shall be free of sharp edge.

b) Every effort shall be made to minimize the wastage of steel as far as practicable during fabrication. The wastage in no case shall exceed as specified else where in this specification.

2.8.5 **Testing and Commissioning**

a) On completion of erection work, the Contractor shall request the Engineer, for inspection and tests with minimum of fourteen (14) days' advance notice.

b) The Engineer shall arrange for joint inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the Contractor.

c) The installation shall be then tested and commissioned in presence of the Engineer.

d) The Contractor shall provide all men, material and equipment required to carry out the tests.

e) All rectification, repairs or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the Contractor, without any extra cost. The handing over of the installation shall be effected only after the receipt of written instruction from the Purchaser/his authorized representative.

3.0 SCHEDULE OF PRE-COMMISSIONING TESTS

3.1 SWITCHBOARDS / LT PANELS

a) Measurement of insulation Resistance of Bus-bar System.

b) Measurement of I.R. of Control Circuit.

c) Functional check of circuit components

d) Continuity check of different circuits.

e) Calibration test of Relays and Meters.

f) Space heater operation.

g) Annunciations.

3.2 CIRCUIT BREAKER

a) Insulation resistance test on each pole by Meggar.

b) Insulation resistance test on control circuit.

c) Checking of all joints for leakage in breaker.

d) Measurement of contact resistance for all the Three Phases.

e) Checking the auxiliary circuits associated with circuit breaker.

f) Functional check of breaker operation electrically at 70% and 110% of rated D.C. supply voltage.

g) Checking of interlock provided in Control Circuits and tripping through simulated protective relay contacts.

h) Auto-reclosing duty cycle check wherever auto-reclosing is required.

i) Measurement of resistance of closing and tripping coils.

3.3 **TRANSFORMERS:**

a) The position of rating & diagram plate, silica gel breather, marshaling box and other equipments to be checked as per the G.A. drawing.

b) Colour of silica gel breather should be dark blue before loading of the transformer else heating of transformer has to be done before loading the transformer.

c) Oil level in the transformer to be checked through oil level indicator.

d) Various protective devices (OTI, WTI, Buchholz relay, MOG etc) should have proper setting and in Buchholz relay, floats should not be locked.

e) Check the position of alarm & trip contacts on oil temperature and winding temperature & it should be at desired position.

f) The earthing of transformer, marshalling box, cable box and fans should be done properly.

g) Check for the tightness of the terminal connection on bushing, cable or bus bar.

h) Ratio & vector group of the transformer to be checked.

i) Dielectric strength test of oil to be done.

3.4 **CURRENT TRANSFORMER**

a) Checking of all ratios on all cores by Primary injection set.

b) Polarity check on each winding.

c) Continuity test.

d) Check for connection to correct taps.

3.5 **RELAYS & METERS**

a) Calibration test.

b) Operation / performance test.

3.6 **EARTHING**

a) Continuity of earthing connection.

b) Testing of Earth Resistance of Individual Electrode.

c) Testing of Earth Resistance of the combined earthing system.

3.7 **CABLES**

a) IR test

b) Continuity test

c) Visual inspection

NOTE:

Tests required for some of the major items are indicated for Bidder's reference. Apart from the tests listed herein and also as mentioned elsewhere in this specification, any other test as necessary per relevant standards, CBIP recommendations, Code of Practice, Manufacturer's recommendations etc., shall have to be carried out by the Contractor without any implication within the quoted price and time schedules.

ANNEXURE - I
PROPOSAL PARTICULARS
(to be filled by the Bidder)

1.0 **GENERAL**

1.1 Bidder's Complete Company Name and Address :

1.2 Proposal Ref. & Date :

1.3 Validity of Proposal :

1.4 Name and contact no. of the Officer of Contractor to whom all references shall be made for expeditious technical co-ordination :

1.5 a) Bidder's license No. :
b) License issued by :
c) Validity date of License :

1.6 Performance guarantee period for :

a) The equipment offered :

i) From the date of Commissioning at site. :
ii) From the date of dispatch :

b) Installation work from date of commissioning.

2.0 **SPECIFIC**

2.1 Details of facilities for Design/ Engg. Available: with the Contractor.

2.2 Details of documents enclosed with this offer:

2.3 Prices quoted are

- inclusive of :
- exclusive of :

3.0 **GENERAL TECHNICAL REQUIREMENT**

3.1 Ambient temp. considered :

3.2 Equipment offered are suitable for :

a) Voltage variation :

b) Frequency variation :

c) Combined voltage & Frequency Variation :

3.3 Details of Codes / Standards to be followed :

ANNEXURE – II
TECHNICAL PARTICULARS
(to be filled by the bidder)

1.0	**LIGHTING SYSTEM**		
	Lighting Fixture		
a)	Make	:	
b)	Type	:	
c)	Technical catalogues for the offered luminaires with Picture / Model No. enclosed	:	Yes / No
2.0	**CONDUIT AND ACCESSORIES**		
a)	Wire	:	
b)	Type	:	
c)	Thickness	:	
3.0	**WIRE**		
a)	Make	:	
b)	Type	:	
c)	Rated voltage	:	
d)	Type of conductor	:	
4.0	**SWITCHES AND SOCKETS**		
a)	Make	:	
b)	Type	:	
c)	Type of boxes	:	
5.0	**CABLE TRAYS**		
a)	Make	:	
b)	Type	:	
c)	Material	:	
d)	Size	:	
e)	Coating	:	
f)	Thickness of Tray	:	
g)	Accessories	:	

ANNEXURE – II
TECHNICAL PARTICULARS
(to be filled by the bidder)

6.0	**BATTERY**				
6.1	**General**				
a)	Make/Type		:		
b)	Reference Standard		:		
6.2	**Rating**				
a)	Rated Voltage	Volt	:		
b)	10-hour rating at 27^0 C to 1.75 Volt per cell	AH	:		
6.3	**Battery Characteristics**				
a)	Recommended charging rate for		:	Volt/Cell	Amp
	- Float charging		:		
	- Boost charging in 10 hrs.		:		
	Start		:		
	Finish		:		
b)	Battery internal resistance	Ohm	:		
6.4	**Cells**				
a)	Number of cells per battery		:		
b)	Type of the cell/ designation as per I.S.		:		
c)	Material of the container		:		
6.5	**Inter cell Connector**		:		
a)	Type		:		
b)	Material of inter cell connector		:		
6.6	**Plates**				
a)	Number of positive plates per cell		:		
b)	Type of positive plate		:		
c)	Type of negative plate		:		
6.7	**Separator**				
a)	Type		:		
b)	Material		:		
c)	Thickness		:		

ANNEXURE – II
TECHNICAL PARTICULARS
(to be filled by the bidder)

6.8	**Dimension & Weights**			
a)	Overall dimension (L x B x H)	mm	:	
b)	Approximate Weight	Kg.	:	
c)	Battery layout drawing furnished ?		:	
6.9	Ventilation requirements		:	
6.10	Accessories furnished with each battery		:	
7.0	**BATTERY CHARGER**			
7.1	**General**			
a)	Make/Type		:	
b)	Thickness of sheet steel		:	
c)	Enclosure category		:	
d)	A.C. Input supply with permissible Variation.		:	
7.2	**D.C. Output**			
a)	Voltage	Volt/Cell	:	
b)	Current	Amp	:	
c)	Ripple content in D.C. output		:	
	- With battery	%	:	
	- Without battery	%	:	
d)	Guaranteed efficiency at rated load		:	
7.3	**Miscellaneous**			
a)	Charger provided with as specified in spec		:	Yes/No
7.4	**Rectifier Transformer**			
a)	Make/Type		:	
b)	Ratings		:	
	-KVA		:	
	-Voltage		:	
	-% reactance		:	

ANNEXURE – II
TECHNICAL PARTICULARS
(to be filled by the bidder)

c)	Class of insulation		:
d)	Method of cooling		:
7.5	**Controlled Rectifier (SCR)**		
a)	Make		:
b)	Type/Cat. No.		:
c)	Reference Standard		:
7.6	**Alarm – Facia**		
a)	Make		:
b)	Type/Cat. No.		:
c)	No of window per facia		:
7.7	**Overall dimension** (L x B x H)	mm	:
7.8	Approximate weight	Kg.	:

ANNEXURE – III

LIST OF APPROVED MAKES

SL.NO.	DETAILS		MANUFACTURERS NAME
(A)	**11KV PANEL**		
(i)	BREAKERS	:	SIEMENS/ ABB / GE
(ii)	CURRENT TRANSFORMERS / VOLTAGE TRANSFORMERS	:	KAPPA / PRAGATI / G & M/AE
(iii)	RELAYS	:	ALSTOM/ L&T/ ABB
(iv)	DIGITAL METERS/ ENERGY ANALYSER	:	ENERCON / SOCOMEC / L & T / NEPTUNE
(v)	PUSH BUTTONS / INDICATING LAMPS (LED)	:	L & T / SIEMENS
(vi)	TERMINALS	:	ELMEX / WAGO
(vii)	SELECTOR SWITCH	:	L & T / KAYCEE
(viii)	MCB	:	L&T/ SIEMENS/ ABB/ SCHNEIDER (MG) / C&S/LEGRAND
(ix)	PANEL MANUFACTURER	:	SIEMENS / ABB / GE / TRICOLITE / AMBIT
(B)	**CABLES**		
(i)	11kV CABLES	:	UNIVERSAL / HAVELL'S / NICCO/ CABLE CORPORATION OF INDIA
(ii)	LT CABLES	:	UNIVERSAL / RPG / POLYCAB / HAVELL'S / BATRA HENLAY / RALISONS / CMI
(iii)	GLANDS AND LUGS	:	DOWELL'S / JAINSON / FCG / BALINGA / SUDHIR SWITCHGEAR / COMMET / GRINDWELL
(C)	**LIGHTING SYSTEM**		
(i)	LIGHTING FIXTURE	:	WIPRO / PHILIPS / BAJAJ / HAVELLS / C&S
(ii)	CONDUIT PIPE	:	PRECISION / FINOLEX / POLYCAB / BEC
(iii)	WIRES	:	FINOLEX/ POLYCAB / KEI/RR CABLE/C&S
(iv)	MODULAR SWITCHES & SOCKETS	:	MK/ANCHOR ROMA/ CLIPSAL /CRABTREE / LEGRAND
(v)	MCB DBs	:	HAGER / SIEMENS / SCHNEIDER / LEGRAND / C&S
(vi)	EXIT LIGHTS	:	LEGRAND
(D)	**OTHERS**		
(i)	PLC	:	AB / ABB / SCHNEIDER / SIEMENS
(ii)	BATTERY	:	EXIDE/AMAR RAJA/HBL
(iii)	BATTERY CHARGER	:	STATCON / BCH
(iv)	HT JOINTING KIT	:	RAYCHEM / 3M / FRONTEC

LIST OF APPROVED MAKES

SL.NO.	DETAILS		MANUFACTURERS NAME
(v)	CABIN FAN	:	CROMPTON / HAVELLS
(vi)	INDUSTRIAL FAN	:	ALMONARD/ CROMPTON
(vii)	CABLE TRAY	:	OBO BETTERMAN/MAHESHWARI
(viii)	LIGHTNING PROTECTION	:	INDLEC / DUVAL MESSIEN / ALLTEC
(ix)	INDUSTRIAL SOCKETS	:	HENSEL / LEGRAND / NEPTUNE
(x)	STREET LIGHTING POLE	:	BAJAJ/WIPRO
(xi)	PASSIVE SEALING MATERIAL	:	OBO BETTERMAN
(xii)	EARTH ENHANCING MATERIAL	:	SGI/ALLTEC/INTER-TECH
(xiii)	FLEXIBLE CABLE	:	LAPP / RR CABLE
(xiv)	UPS	:	SCHNEIDER/SOCOMEC/LEGRAND/VERTIV

NOTES:

1.0 It is the responsibility of the contractor to meet all technical requirements of this specifications whether the same are covered with standard product of above manufacturers or not. Any specific deviation shall be listed under “Deviation” with the offer.

2.0 The names of the manufacturers are mentioned above. The contractor shall quote rate for materials & equipment mentioned above only. In the event the material or equipment of makes called for are not available and alternative makes are approved for incorporation in the work, the rate quoted shall be suitably amended based on the price variation between the specified makes and as per tender the alternative makes on the day alternative makes are accepted.

ANNEXURE-IV

DEVIATION SHEET

Bidder shall list out deviations (if any) with respect to clause no. and page no. of specification.

.....
Bidder's Signature

ANNEXURE-V

GANTT CHART

Bidder shall submit a Gantt chart for various activities with time schedule.

.....
Bidder's Signature

ANNEXURE-VI

SPARE PARTS

Bidder shall list out the spare parts for each equipment suitable for two year's trouble free operation.

.....
Bidder's Signature

ANNEXURE-VII

NOTES TO BIDDER

It is necessary to follow the following points while submitting the offer:

1.0 All equipment shall meet the requirement of this specification. Deviation (if any) with respect to this specification shall clearly be indicated in the offer in ANNEXURE-IV under “Deviation” with page no. and clause no. of specification.

2.0 Quantities of equipment indicated herein are subjected to change.

3.0 All technical particulars and other details as asked shall be furnished in the Performa in the specification only. Additional information, if desired by the bidder can also be furnished separately.

4.0 Offer shall be submitted in Duplicate with all the enclosures with both the copies.

5.0 Bidder shall indicate the penalty (per KW basis) to be paid by him to the owner 1No. Transformer losses found more than declared losses offer considering variation specified in IS: 2026.

Bidder’s Signature

ANNEXURE-VIII

LIST OF DRAWINGS

S.NO.	DRAWING TILTLE	DRAWING NO.	REVISION	NO OF SHEETS
1	11kV SYSTEM SLD(DUBAGGA SUB-STATION)	SNC-21/LUCKNOW-DUBAGGA/E101	01	01
2	11KV PANEL SLD(DUBAGGA SUB-STATION)	SNC-21/LUCKNOW-DUBAGGA/E102	01	01
3	LT SLD (DUBAGGA SUB-STATION)	SNC-21/LUCKNOW-DUBAGGA/E103	01	01
4	SUB-STATION LAYOUT (DUBAGGA)	SNC-21/LUCKNOW-DUBAGGA/E201	01	03
5	TYPICAL EARTHING LAYOUT	SNC-21/LUCKNOW-DUBAGGA/E401	01	01

SUMMARY SHEET

SL.NO.	SECTION	DESCRIPTION	TOTAL (RS.)	
			SUPPLY	ERECTION
1	SECTION – I	11KV SYSTEM		
2	SECTION – II	TRANSFORMERS		
3	SECTION – III	415V LT PANELS & BUSDUCTS		
4	SECTION – IV	LT CABLES & TERMINATIONS		
5	SECTION – V	EARTHING SYSTEM		
6	SECTION – VI	CABLE TRAYS & STEEL FABRICATION WORK		
7	SECTION – VII	MISCELLANEOUS ITEMS		
		GRAND TOTAL (RS.)		

The above prices are inclusive of :-

A) GST **YES / NO**

(Bidder's Signature)

BILL OF MATERIALS
SECTION - I 11KV SYSTEM

SL No.	DESCRIPTION	SUPPLY	ERECTION	QTY	UNIT	TOTAL	
		UNIT RATE (Rs.)				SUPPLY (Rs.)	ERECTION (Rs.)
1.0	Supply, erection, testing and commissioning of following :						
1.1	Two pole structure of size (approx. 2.7M (W) x 8.0M (H) above ground level) for receiving power supply from SEB 11 KV O/H line complete with all the accessories and mounting channels etc. consisting of the followings :			1*	Set		
i)	Steel structure made out from ISMC 200 & 100x50 MS channel along with protection, guarding and fencing etc. insulators and civil foundation work.						
ii)	11 KV, 630A 3 pole Isolator with handle & other accessories (1 No.)						
iii)	10 KV, 10 kA, Station type lightning arresters (3 Nos.) .						
iv)	Drop out fuse (3 Nos.)-if Ampere rating available						
v)	Earthing Pits with GI pipe (5 Nos)						
vi)	11KV Pin type Insulators for down conductor of LAs to earth pit (6 Nos.)						
vii)	ACSR conductor from LAs to earth pits (as required)						
viii)	50x6 GI strip for pole earthing (25M)						
ix)	Pot Head (ACSR conductor to XLPE cable termination) suitable for 2Rx3C-300 sq.mm 11 KV XLPE cable and vertical pipes for cables: 2 Sets						
1.2	11kV 3-Panel Board as Per Drawing Title-SINGLE LINE DIAGRAM OF 11kV SYSTEM (Drawing No:SNC-21/LUCKNOW-DUBAGGA/E102),R-01	NIL		1	No.		
1.3	Supply, Laying, testing & Commissioning of 11/11 kV UE, HT AL ARM XLPE cable. Cable shall be laid partly in Overhead Structure, partly in buried ground, partly in ready RCC cable trench on cable trays using MS spacers and GI saddles, cable clamps etc complete in all respect. Testing & Commissioning of the cable.						
	Aluminium Cables :-						
	3C-300 SQ.MM AL(ARM) XLPE CABLE, 11kV (UE)			180*	M		
	3C-185 SQ.MM AL(ARM) XLPE CABLE, 11kV (UE)			QR	M		

BILL OF MATERIALS
SECTION - I 11KV SYSTEM

SL No.	DESCRIPTION	SUPPLY UNIT RATE (Rs.)	ERECTION UNIT RATE (Rs.)	QTY	UNIT	TOTAL SUPPLY (Rs.)	TOTAL ERECTION (Rs.)
1.4	Supply, Testing & Commissioning Indoor Raychem Type End termination of HT cable for 11/11KV including all required Glands, MS channel supports to support the end termination.						
a)	11 kV HT Cable End terminations (Indoor Type) suitable for above size of cables.			6	Nos.		
b)	11 kV HT Cable End terminations (Outdoor Type) suitable for above size of cables.			10	Nos.		
1.5	11 kV Metering kiosk for housing energy meter (make and CT/PTs shall be as per the electricity board requirement)			1	No.		
	TOTAL						

*** Contractor shall take approval from SEB before start facrication of two pole structure.**

**** Actual requirement to be checked at site.Please note Length From HT Meter to 11KV Two Pole Structure is considered 50Meter.**

BILL OF QUANTITIES
SECTION-II - TRANSFORMERS

SL No.	DESCRIPTION	SUPPLY	ERECTION	QTY	UNIT	TOTAL	
		UNIT RATE (Rs.)				SUPPLY (Rs.)	ERECTION (Rs.)
1.0	2500KVA, copper wound, 11/0.433 KV, 50 Hz, Dyn11 Delta Star connected, oil immersed, outdoor type transformer with off circuit tap changer (OCTC) from (+5%) to (-5%) on HV side, HT side cable termination box shall be suitable for 11KV 3Cx300 sq. mm XLPE cable and LT Side suitable for 4000A, Al, Busduct. Complete with first filing of oil, acessories as per specification, data sheet, drawings including control cable.	NIL		2*	Nos.		
2.0	Transformer oil filtration for improving the IR value of the transformer oil (if required).	NIL		Q.R.	Ltr.		
	TOTAL						

BILL OF QUANTITIES
SECTION -III - 415V LT PANELS & BUSDUCTS

SL No.	DESCRIPTION	SUPPLY	ERECTION	QTY	UNIT	TOTAL	
		UNIT RATE (Rs.)				SUPPLY (Rs.)	ERECTION (Rs.)
1.0	**Unloading, shifting, erection, testing and commissioning of following 415V LT Panels as required:-**						
1.1	MAIN LT PANEL (as per Single Line Diagram, drawing no SNC-21/LUCKNOW-DUBAGGA/E103), Rev-01 Sheet 1 of 1	NIL		1	No.		
1.2	CAPACITOR PANEL-1,2&3(TYP.) (as per Single Line Diagram, drawing no SNC-21/LUCKNOW-DUBAGGA/E103), Rev-01 Sheet 1 of 1.**(OPTIONAL)**	NIL		3	Nos.		
1.3	UTILITY PANEL (as per Single Line Diagram, drawing no SNC-21/LUCKNOW-DUBAGGA/E103), Rev-01 Sheet 1 of 1(Details shall be provided by M/s PMI)			1	No.		
2.0	Design, manufacturing, testing & supply and erection of following sizes of 415V Bus ducts including Copper/Al. flexible connections at termination ends, wall sealing etc. as per specification & drawings:						
2.1	4000A, 65kA Busduct from 2500KVA Transformer-1 to Main LT Panel including two Nos. vertical bends and two no. horizontal bend, copper flexible at transformer end and Al. Flexible at panel end. (as per Single Line Diagram, drawing no. SNC-21/LUCKNOW-DUBAGGA/E103),Rev-01 Sheet 1 of 1	NIL		10	M		
2.2	4000A, 65kA Busduct from 2500KVA Transformer-2 to Main LT Panel including two Nos. vertical bends and two no. horizontal bend, copper flexible at transformer end and Al. Flexible at panel end. (as per Single Line Diagram, drawing no. SNC-21/LUCKNOW-DUBAGGA/E103),Rev-01 Sheet 1 of 1	NIL		10	M		
2.3	1000A, 65kA Busduct from Main LT Panel to Capacitor Panel-1 including two Nos. vertical bends and two no. horizontal bend, Al. Flexible at both panel ends. (as per Single Line Diagram, drawing no. SNC-21/LUCKNOW-DUBAGGA/E103),Rev-01 Sheet 1 of 1.**(OPTIONAL)**	NIL		10	M		

BILL OF QUANTITIES
SECTION -III - 415V LT PANELS & BUSDUCTS

SL No.	DESCRIPTION	SUPPLY	ERECTION	QTY	UNIT	TOTAL	
		UNIT RATE (Rs.)				SUPPLY (Rs.)	ERECTION (Rs.)
2.4	1000A, 65kA Busduct from Main LT Panel to Capacitor Panel-2 including two Nos. vertical bends and two no. horizontal bend, Al. Flexible at both panel ends. (as per Single Line Diagram, drawing no. SNC-21/LUCKNOW-DUBAGGA/E103),Rev-01 Sheet 1 of 1.**(OPTIONAL)**	NIL		10	M		
2.6	Design, manufacturing, testing & supply of horizontal & vertical bend for 4000A, 415V Bus duct.	NIL		Q.R.	Nos.		
2.7	Design, manufacturing, testing & supply of horizontal & vertical bend for 1000A, 415V Bus duct.**(OPTIONAL)**	NIL		Q.R.	Nos.		
2.8	Design, manufacturing, testing & supply of phase cross over for 4000A, 415V Bus duct.	NIL		Q.R.	Nos.		
2.9	Design, manufacturing, testing & supply of phase cross over for 1000A, 415V Bus duct.**(OPTIONAL)**	NIL		Q.R.	Nos.		
	TOTAL						

Note :

1) *Capacitor Panel-1, 2 are Same.*

2) *Vendor need to fill the Deviation Sheet, if there is no deviation then please write "No Deviation".*

3) *Length of the Busduct from Transfomer to Main PCC & Main PCC to Capacitor Panel is tentative, same need to be measured at Site before Procurement.*

BILL OF QUANTITIES
SECTION - IV - LT CABLES & TERMINATIONS

SL No.	DESCRIPTION	SUPPLY UNIT RATE (Rs.)	ERECTION UNIT RATE (Rs.)	QTY	UNIT	TOTAL SUPPLY (Rs.)	TOTAL ERECTION (Rs.)
1.0	Supply, laying, testing & commissioning of following sizes of Al./Cu conductor 1.1 kV grade, armoured, XLPE/PVC insulated, FRLS LT Cables on cable trays or in trenches or through PVC pipes, using MS spacers and GI saddles, Cable clamps etc. complete in all respect.						
1.1	**Aluminium Cables :-**						
a)	3.5C-300 sq. mm. Al (Arm) XLPE Cable			2600	M		
b)	3.5C-240 sq. mm. Al (Arm) XLPE Cable			QR	M		
c)	3.5C-185 sq. mm. Al (Arm) XLPE Cable			QR	M		
d)	3.5C-120 sq. mm. Al (Arm) XLPE Cable			QR	M		
e)	3.5C-70 sq. mm. Al (Arm) XLPE Cable			50	M		
f)	3.5C-35 sq. mm. Al (Arm) XLPE Cable			50	M		
g)	3.5C-25 sq. mm. Al (Arm) XLPE Cable			QR	M		
h)	4C-16 sq. mm. Al (Arm) XLPE Cable			160	M		
1.2	**Copper Cables:-**						
a)	10C-2.5 SQ. MM CU.(ARM.) PVC CABLE			100	M		
b)	5C-2.5 SQ.MM CU.(ARM.) PVC CABLE			100	M		
c)	3C-4 SQ. MM CU.(ARM.) PVC CABLE			110	M		
d)	3C-2.5 SQ. MM CU.(ARM.) PVC CABLE			60	M		
e)	2C-4 SQ. MM CU.(ARM.) PVC CABLE			30	M		
f)	4C-4 SQ. MM CU.(ARM.) PVC CABLE			QR	M		
g)	4C-6 SQ. MM CU.(ARM.) PVC CABLE			QR	M		
h)	4C-10 SQ. MM CU.(ARM.) PVC CABLE			QR	M		
2.0	Supply, erection, testing & commissioning of following sizes of 1.1 kV grade, LT cables end terminations with single compression glands for 1.1 kV grade, XLPE insulated, Al./Cu. Conductor cables						
2.1	**Aluminium Cables :-**						
a)	3.5C-300 sq. mm. Al (Arm) XLPE Cable			36	M		
b)	3.5C-240 sq. mm. Al (Arm) XLPE Cable			QR	M		
c)	3.5C-185 sq. mm. Al (Arm) XLPE Cable			QR	M		
d)	3.5C-120 sq. mm. Al (Arm) XLPE Cable			QR	M		
e)	3.5C-70 sq. mm. Al (Arm) XLPE Cable			6	M		
f)	3.5C-35 sq. mm. Al (Arm) XLPE Cable			2	M		
g)	3.5C-25 sq. mm. Al (Arm) XLPE Cable			QR	M		
h)	4C-16 sq. mm. Al (Arm) XLPE Cable			6	M		

BILL OF QUANTITIES
SECTION - IV - LT CABLES & TERMINATIONS

SL No.	DESCRIPTION	SUPPLY UNIT RATE (Rs.)	ERECTION UNIT RATE (Rs.)	QTY	UNIT	TOTAL SUPPLY (Rs.)	TOTAL ERECTION (Rs.)
2.2	**Copper Cables:-**						
a)	10C-2.5 SQ. MM CU.(ARM.) PVC CABLE			4	Nos.		
b)	5C-2.5 SQ.MM CU.(ARM.) PVC CABLE			6	Nos.		
c)	3C-4 SQ. MM CU.(ARM.) PVC CABLE			8	Nos.		
d)	3C-2.5 SQ. MM CU.(ARM.) PVC CABLE			4	Nos.		
e)	2C-4 SQ. MM CU.(ARM.) PVC CABLE			4	Nos.		
f)	4C-4 SQ. MM CU.(ARM.) PVC CABLE			QR	Nos.		
g)	4C-6 SQ. MM CU.(ARM.) PVC CABLE			QR	Nos.		
h)	4C-10 SQ. MM CU.(ARM.) PVC CABLE			QR	Nos.		
	Total						

Notes:
1) Actual Lengths to be checked at site between Panels / Panel & Equipment and then only cables shall be procured. Accordingly drum schedule shall be prepared by contractor to avoid the straight through joints in the cable.
2) Major deviation (if any) shall be inform to M/s SN Consultants to check the cable size.
3) Lighting Cables from DB onwards is not considered in above quantities.
4) For any Clarification refer LT Cable Schedule.
5) If Length of Cable from LT Panel to Charger is Less than 170mtr, then use 1R-3.5C-300 sq.mm Al Cable.
And If Length of Cable from LT Panel to Charger is greater than 170mtr, then use 2R-3.5C-120 sq.mm Al Cable.

BILL OF QUANTITIES
SECTION - V - EARTHING SYSTEM

SL No.	DESCRIPTION	SUPPLY UNIT RATE (Rs.)	ERECTION UNIT RATE (Rs.)	QTY	UNIT	TOTAL SUPPLY (Rs.)	TOTAL ERECTION (Rs.)
1.0	Supply, erection, testing & commissioning of treated earthing pit with 600mm X 600mm X 6mm thick copper plate including digging, putting the plate/ charcoal/ salt with masonary work			10	Nos.		
2.0	Supply, erection, testing & commissioning of treated earthing pit with GI pipe including digging, putting the pipe/ charcoal/ salt with masonary work.			10	Nos.		
3.0	Supply, erection, testing & commissioning of treated rod earth pit with 3 meters long 25 mm dia MS rod			6	Nos.		
4.0	Supply, erection, testing & commissioning of earth strip in ground/ trench/ tray. The job includes straightening/ welding/ bolting applying cold galvanising paint wherever required for following size (including digging & refilling, wherever required):						
4.1	25 x 6 GI flat strip			QR	M		
4.2	50 x 10 mm GI flat strip			235	M		
4.3	75 x 10mm GI flat strip			120	M		
4.4	50 x 6 mm insulated copper strip			50	M		
4.5	8 SWG GI Earth Wire			100	M		
4.6	1C X 25 Sq. mm (Cu.) Armoured FRLS PVC Cable. Green for UPS system earthing			100	M		
5.0	Supply, erection, testing & commissioning of earthing of chargers as per technical requirement of supplier.			18	Nos		
	TOTAL						

Note:
1) Ground Conductor quantity is also included in the above earthing BOQ, Same need to be cross checekd at site before procurement of Earthing Material.
2) 50X10 mm GI Strip Quantity is considered in Cable Trays.

BILL OF QUANTITIES
SECTION-VI - CABLE TRAYS & STEEL FABRICATION WORK

SL No.	DESCRIPTION	SUPPLY UNIT RATE (Rs.)	ERECTION UNIT RATE (Rs.)	QTY	UNIT	TOTAL SUPPLY (Rs.)	TOTAL ERECTION (Rs.)
1.0	**CABLE TRAYS & FABRICATION WORK**						
1.1	Supply, erection, testing & commissioning of **prefabricated ladder type hot dip GI cable trays** as per IS2629 including Tees / Bends / Crossing / Reducers / Coupling to be laid in cable trench, overhead on wall or hanged from ceiling as required.The thickness of galvanisation/coating of Zinc shall be minimum 65Microns for Normal applications & 86 Microns for Corrosive environment.The Rung spacing shall be 250mm minimum **similar to Profab**						
a)	750 (W) x 75 (H) x 2mm (T)			400	M*		
b)	600 (W) x 75 (H) x 2mm (T)			QR	M*		
c)	450 (W) x 75 (H) x 2mm (T)			QR	M*		
1.2	Supply, erection, testing & commissioning of prefabricated perforated type hot dip GI cable trays as per IS2629 including Tees / Bends / Crossing / Reducers / Couping to be laid in cable trench, overhead on wall or hanged from ceiling as required.The thickness of galvanisation/coating of Zinc shall be minimum 65Microns for Normal applications & 86 Microns for Corrosive environment. **similar to Profab**						
a)	750 (W) x 50 (H) x 2mm (T)			QR	M*		
b)	600 (W) x 50 (H) x 2mm (T)			QR	M*		
c)	450 (W) x 50 (H) x 2mm (T)			200	M*		
1.3	Supply of MS cable trays supports / brackets / base frame of various sizes including straightening cutting, welding on existing structure, grouting, leveling and painting etc. as required.			2.00	T(*)		
1.4	Supply & erection of threaded rod support material **similar to Profab**						
	Threaded rod 6x1000mm long			QR	Nos.		
	Threaded rod 8x1000mm long			QR	Nos.		
	Threaded rod 10x1000mm long			QR	Nos.		
	Threaded rod 10x1500mm long			QR	Nos.		
	Threaded rod 10x3000mm long			QR	Nos.		
	Threaded rod 12x1000mm long			QR	Nos.		
	Threaded rod 12x3000mm long			QR	Nos.		
	TOTAL						

Notes :-

a) Al paint shall be applied on welded, cut sections.

b) * Quantity may be revised based on actual requirement.

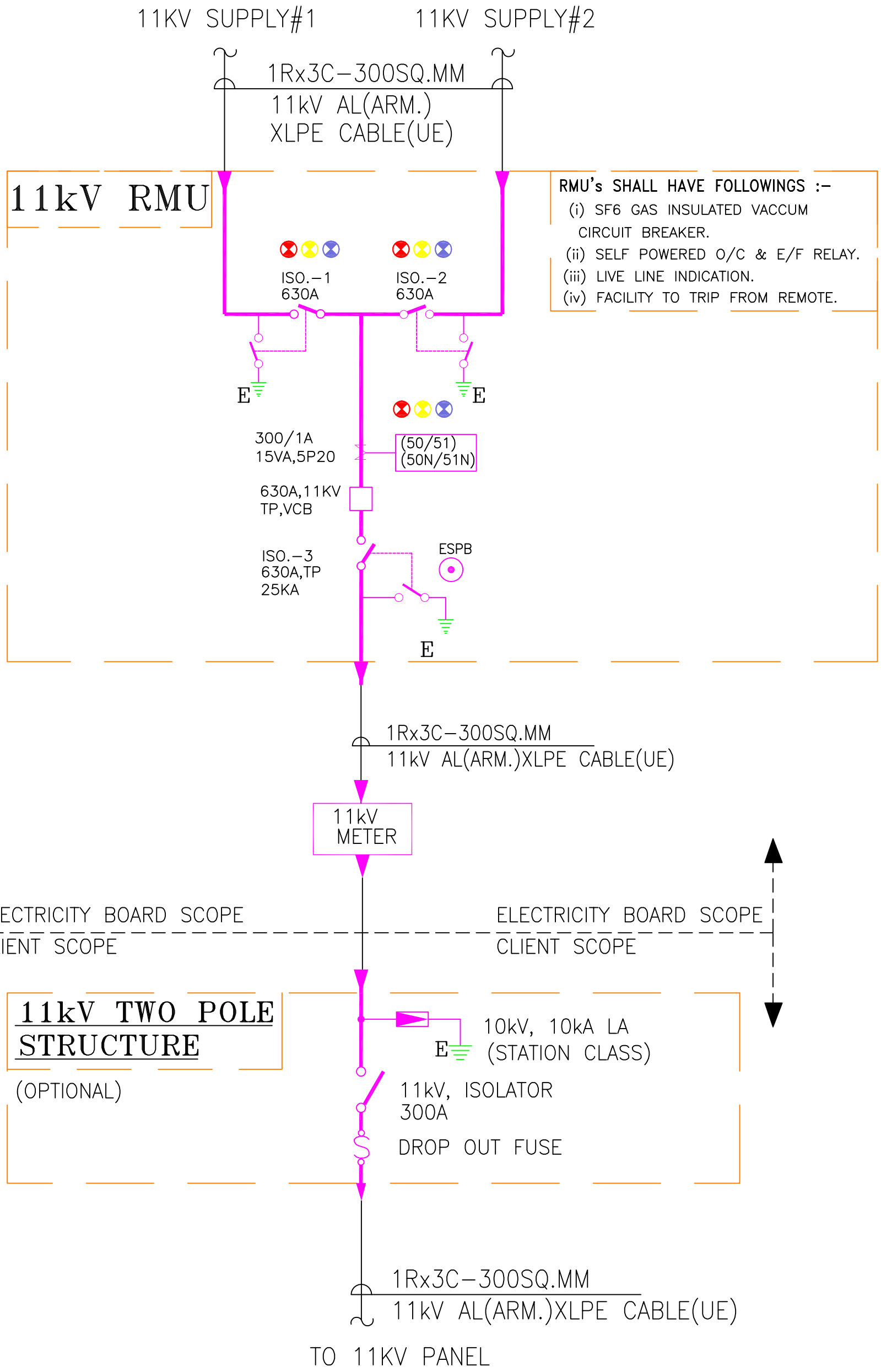
BILL OF QUANTITIES
SECTION - VII - MISCELLANEOUS ITEMS

SL No.	DESCRIPTION	SUPPLY UNIT RATE (Rs.)	ERECTION UNIT RATE (Rs.)	QTY	UNIT	TOTAL SUPPLY (Rs.)	TOTAL ERECTION (Rs.)
1.0	Supply and installation of shock treatment charts.			4	Nos.		
2.0	Supply and installation of Danger Board.			4	Nos.		
3.0	Supply and installation of First Aid Chart displaying artificial respiratory system in Hindi, English, and Regional Languages.			2	Nos.		
4.0	Supply and installation of Two nos. Fire buckets with stand.			4	Set		
5.0	Supply & installation of Rubber mat as per IS 15652:2006, 1 metre wide and length as per requirement (Make- Electromat)						
a)	For 11KV switchgear (2.5mm thickness)			10	Sq.M		
b)	For 415V switchgear (2.0mm thickness)			100	Sq.M		
6.0	Supply & laying of pipes in ground including fixing of collars/ fixing of ready made bends/ sockets, excavation and refilling of earth.						
a)	Hume pipe 300 mm dia.			50	M		
b)	Hume pipe 200 mm dia.			50	M		
c)	HDPE pipe 150mm dia.			50	M		
7.0	Supply and fixing of 25mm dia MS conduit along with all accessories.			Q.R	M		
8.0	Supply and installation of 100 mm X 50mm , 2mm thick powder coated MS Channel			Q.R	M		
9.0	Supply and installation of 75mm X 35mm , 2mm thick powder coated MS Channel			Q.R	M		
10.0	Supply and installation of Local Start/Stop push button Station			Q.R.	No.		
11.0	Supply / installation / testing and commissioning of 24V, 200AH battery with float cum boost battery charger including all accessories and with DCDB consisting of 8 nos. 16A DP MCB.			1	No.		
12.0	Supply & Installation of Passive Fire Sealant			3	Nos.		

BILL OF QUANTITIES
SECTION - VII - MISCELLANEOUS ITEMS

SL No.	DESCRIPTION	SUPPLY	ERECTION	QTY	UNIT	TOTAL	
		UNIT RATE (Rs.)				SUPPLY (Rs.)	ERECTION (Rs.)
13.0	Supply, delivery, unloading, unpacking, installation, Testing and commissioning 10kVA, IGBT True "ONLINE" Double conversion UPS System (3 phase input and 3 phase output) with battery suitable for 15 Min. full load operation. **(For Plant Emergency Lighting & Power)** Input Voltage: 360-460V, 3phase, 4Wires, 50Hz. output Voltage: 400V ±1%, 3phase, 4Wires, 50Hz.			QR*	No.		
	TOTAL						

Note-
1) * Rating shall be decided during detailing.



TENDER DRAWING

NO.	DETAILS	DATE	BY	CHD	APP.
R1.	SECOND SUBMISSION	16.04.2021	VIVEK	MY	SCS.
R0.	FIRST SUBMISSION	06.04.2021	VIVEK	MY	SCS.

REVISIONS

SN CONSULTANTS
(ELECTRICAL ENGG.CONSULTANTS)
B–246A GREATER KAILASH PART–1,ND–110048
TEL: 011–2923 7746, 2923 3249

DRAWN:	VIVEK
CHECKED:	MANOJ
APPROVED:	SCS
DATE:	06.04.2021

PROJECT: ELECTRIC BUS CHARGING DEPOT

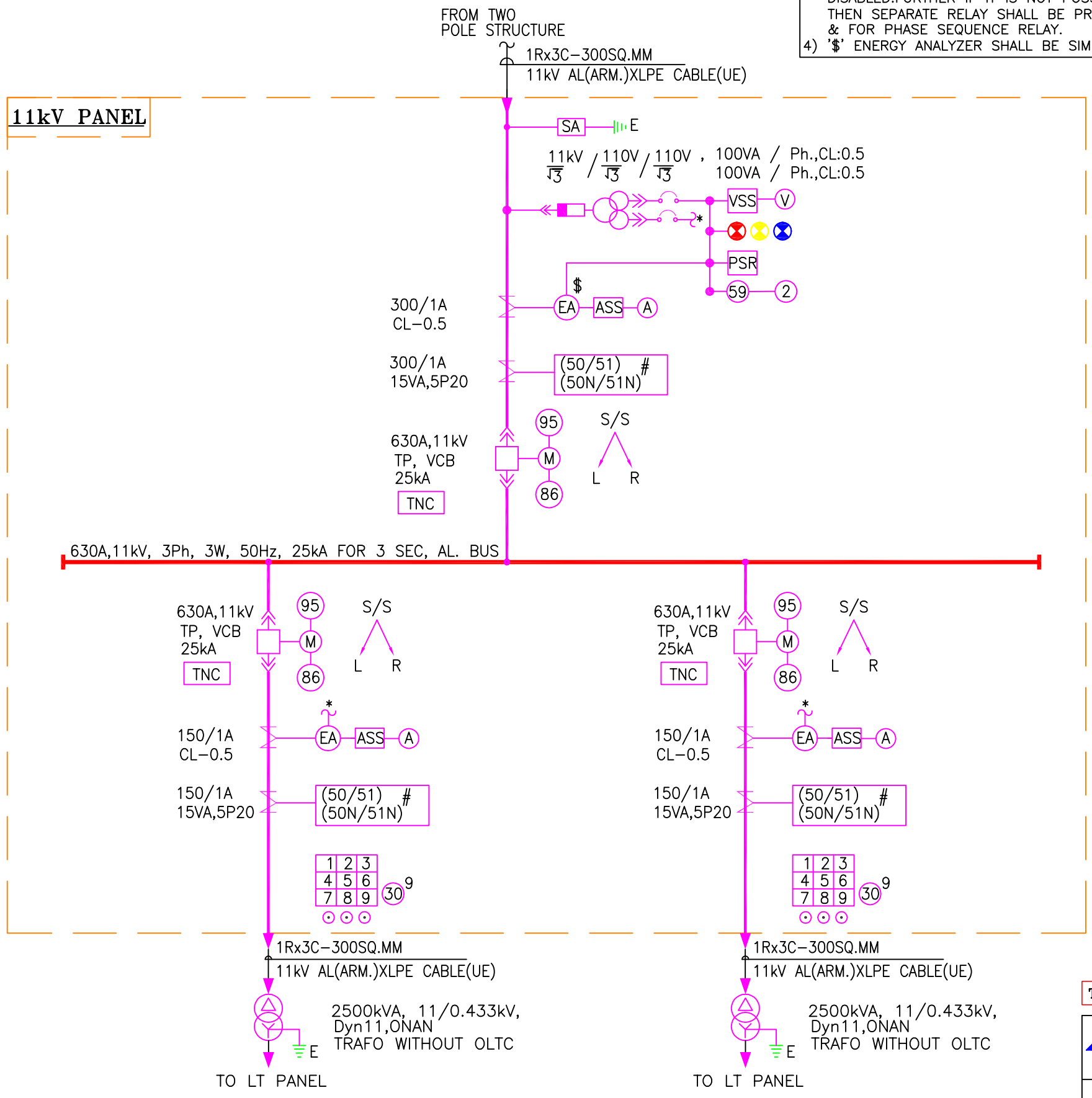
CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.

TITLE: 11kV SYSTEM SLD(DUBAGGA SUB–STATION)

DRG.NO.	SH.	OF	SCALE	REV.	SHEET
SNC–21/LUCKNOW–DUBAGGA/E101	1	2	1:2	01	A4

NOTES:

1) MAIN PROTECTION RELAY SHALL BE NUMERICAL TYPE (WITH RS485 PORT).
2) '#' NUMERICAL TYPE RELAY SIMILAR TO MICOM P111 OR EQUIVALENT.
3) PHASE SEQUENCE RELAY CAN BE PROVIDED WITH(OVER VOLTAGE + TIMER) FEATURE.HOWEVER UNDER VOLTAGE FEATURE IS NOT REQUIRED.IF THE RELAY OFFERED IS HAVING UNDER VOLTAGE FEATURE, IT SHALL BE DISABLED.FURTHER IF IT IS NOT POSSIBLE TO DISABLE THIS FEATURE, THEN SEPARATE RELAY SHALL BE PROVIDED FOR (OVER VOLTAGE + TIMER) & FOR PHASE SEQUENCE RELAY.
4) '$' ENERGY ANALYZER SHALL BE SIMILAR TO PM 8000, CL-0.5.



SYMBOLS	DESCRIPTION
	HRC FUSE
	POTENTIAL TRANSFORMER
	CURRENT TRANSFORMER
M	11kV DRAW OUT TYPE MOTORISED VACCUM CIRCUIT BREAKER
	DISTRIBUTION TRANSFORMER (WITH ON LOAD TAP CHANGER)
ASS	AMMETER SELECTOR SWITCH
SA	SURGE ARRESTOR WITH COUNTER
VSS	VOLTMETER SELECTOR SWITCH
PSR	PHASE SEQUENCE RELAY
V	VOLTMETER
59	OVER VOLTAGE RELAY
2	TIMER
EA	ENERGY ANALYSER CONSISTING OF I,V,kW,kWH,kVA,pf & Hz WITH RS485 PORT
A	AMMETER
50	INSTANTANEOUS OVERCURRENT RELAY
51	IDMT OVER CURRENT RELAY
50N	NEUTRAL INSTANTANEOUS OVERCURRENT RELAY
51N	IDMT EARTH FAULT RELAY
95	TRIP CIRCUIT SUPERVISION RELAY (VAX-31 OF GE)
86	MASTER TRIP RELAY (VAJH 13/23 OF GE)
30	AUX. RELAY FOR ALARM/TRIP ON TRANSFORMER FAULT WITH(9)ELEMENT
S/S L R	SELECTOR SWITCH(LOCAL/REMOTE)
TNC	TRIP/NORMAL/CLOSE SWITCH WITH LOST MOTION DEVICE
	INDICATING LAMP
1 2 3 / 4 5 6 / 7 8 9	ANUNCIATION WINDOW
	MINIATURE CIRCUIT BREAKER

TENDER DRAWING

SN CONSULTANTS
(ELECTRICAL ENGG.CONSULTANTS)
B-246A GREATER KAILASH PART-1,ND-110048
TEL: 011-2923 7746, 2923 3249

DRAWN:	VIVEK
CHECKED:	MANOJ
APPROVED:	SCS
DATE:	06.04.2021

NO.	DETAILS	DATE	BY	CHKD	APPD.
R1.	SECOND SUBMISSION	16.04.2021	VIVEK	MY	SCS.
R0.	FIRST SUBMISSION	06.04.2021	VIVEK	MY	SCS.

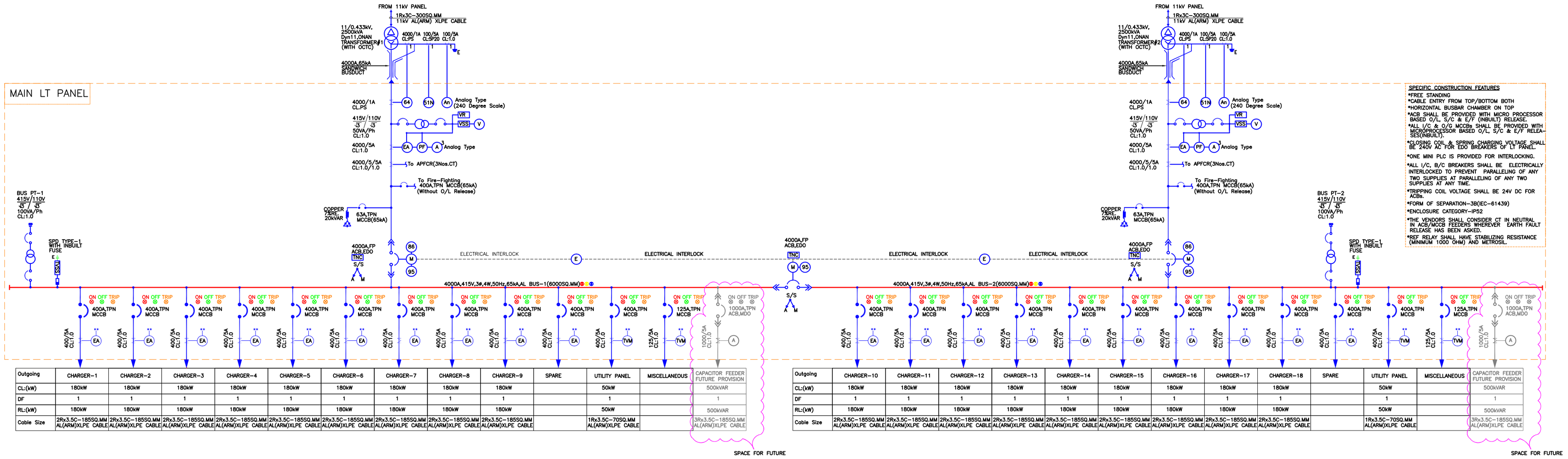
REVISIONS

PROJECT: ELECTRIC BUS CHARGING DEPOT

CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.

TITLE: 11KV PANEL SLD(DUBAGGA SUB-STATION)

DRG.NO.	SH.	OF	SCALE	REV.	SHEET
SNC-21/LUCKNOW-DUBAGGA/E102	2	2	1:2	01	A3



Outgoing	CHARGER-1	CHARGER-2	CHARGER-3	CHARGER-4	CHARGER-5	CHARGER-6	CHARGER-7	CHARGER-8	CHARGER-9	SPARE	UTILITY PANEL	MISCELLANEOUS	CAPACITOR FEEDER FUTURE PROVISION
CL:(kW)	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW		50kW		500kVAR
DF	1	1	1	1	1	1	1	1	1		1		1
RL:(kW)	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW		50kW		500kVAR
Cable Size	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE		1Rx3.5C-70SQ.MM AL(ARM)XLPE CABLE		3Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE

Outgoing	CHARGER-10	CHARGER-11	CHARGER-12	CHARGER-13	CHARGER-14	CHARGER-15	CHARGER-16	CHARGER-17	CHARGER-18	SPARE	UTILITY PANEL	MISCELLANEOUS	CAPACITOR FEEDER FUTURE PROVISION
CL:(kW)	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW		50kW		500kVAR
DF	1	1	1	1	1	1	1	1	1		1		1
RL:(kW)	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW	180kW		50kW		500kVAR
Cable Size	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE	2Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE		1Rx3.5C-70SQ.MM AL(ARM)XLPE CABLE		3Rx3.5C-185SQ.MM AL(ARM)XLPE CABLE

SPECIFIC CONSTRUCTION FEATURES

- *FREE STANDING
- *CABLE ENTRY FROM TOP/BOTTOM BOTH
- *HORIZONTAL BUSBAR CHAMBER ON TOP
- *ACB SHALL BE PROVIDED WITH MICRO PROCESSOR BASED O/L, S/C & E/F (INBUILT) RELEASE.
- *ALL I/C & O/G MCCBs SHALL BE PROVIDED WITH MICROPROCESSOR BASED O/L, S/C & E/F RELEASES(INBUILT).
- *CLOSING COIL & SPRING CHARGING VOLTAGE SHALL BE 240V AC FOR EDO BREAKERS OF LT PANEL.
- *ONE MINI PLC IS PROVIDED FOR INTERLOCKING.
- *ALL I/C, B/C BREAKERS SHALL BE ELECTRICALLY INTERLOCKED TO PREVENT PARALLELING OF ANY TWO SUPPLIES AT PARALLELING OF ANY TWO SUPPLIES AT ANY TIME.
- *TRIPPING COIL VOLTAGE SHALL BE 24V DC FOR ACBs.
- *FORM OF SEPARATION-3B(IEC-61439)
- *ENCLOSURE CATEGORY-IP52
- *THE VENDORS SHALL CONSIDER CT IN NEUTRAL IN ACB/MCCB FEEDERS WHEREVER EARTH FAULT RELEASE HAS BEEN ASKED.
- *REF RELAY SHALL HAVE STABILIZING RESISTANCE (MINIMUM 1000 OHM) AND METROSIL.

SYMBOLS	DESCRIPTION	SYMBOLS	DESCRIPTION
	POWER TRANSFORMER WITHOUT OLTC	TNC	TRIP/NORMAL/CLOSE SWITCH WITH LOST MOTION DEVICE
	POTENTIAL TRANSFORMER	SA	SURGE ARRESTER
	MINIATURE CIRCUIT BREAKER (MCB)	TVSS	TVSS/SPD
	MOULDED CASE CIRCUIT BREAKER (MCCB)	APFCR	AUTOMATIC POWER FACTOR CORRECTION RELAY
	MOTOR PROTECTION CIRCUIT BREAKER (MPCB)	EA	ENERGY ANALYZER WITH RS485 PORT
	11 KV DRAW OUT TYPE VACCUM CIRCUIT BREAKER	A	AMMETER
	AIR CIRCUIT BREAKER (MOTORIZED DRAWOUT TYPE)	An	NEUTRAL AMMETER ANALOG TYPE(240 Degree)
	AIR CIRCUIT BREAKER (NON MOTORIZED DRAWOUT TYPE)	V	VOLTMETER
	DG SET	AS	AUTO SYNCHRONISER
	HRC FUSE	E	ELECTRICAL INTERLOCK
	CAPACITOR BANK	PF	POWER FACTOR METER
	CURRENT TRANSFORMER	M	MOTOR
S/S A M	SELECTOR SWITCH(LOCAL/REMOTE)	51N	IDMT EARTH FAULT RELAY
S/S L R		64	RESTRICTRD EARTH FAULT RELAY
S/S A/T/M	SELECTOR SWITCH(AUTO/TEST/MANUAL)	86	MASTER TRIP RELAY (VAJH 13/23 OF GE)
ASS	AMMETER SELECTOR SWITCH	95	TRIP CIRCUIT SUPERVISION RELAY (VAX 31 OF GE)
VSS	VOLTMETER SELECTOR SWITCH		PUSH BUTTON
TVM	TRIVECTOR METER		INDICATING LAMP

NOTE:
1)THIS CABLE SIZE IS FOR TERMINATION PURPOSE ONLY, ACTUAL SIZE MAY VARY DEPENDING UPON THE LENGTH & VOLTAGE DROP.

TENDER DRAWING

NO.	DETAILS	DATE	BY	CHKD	APPD.
R2.	THIRD SUBMISSION	23.04.21	VIVEK	MY	SCS.
R1.	SECOND SUBMISSION	16.04.21	VIVEK	MY	SCS.
R0.	FIRST SUBMISSION	06.04.21	VIVEK	MY	SCS.

REVISIONS

SN CONSULTANTS
(ELECTRICAL ENGG.CONSULTANTS)
B-246A GREATER KAILASH PART-1,ND-110048
TEL: 011-2923 7746, 9810026553

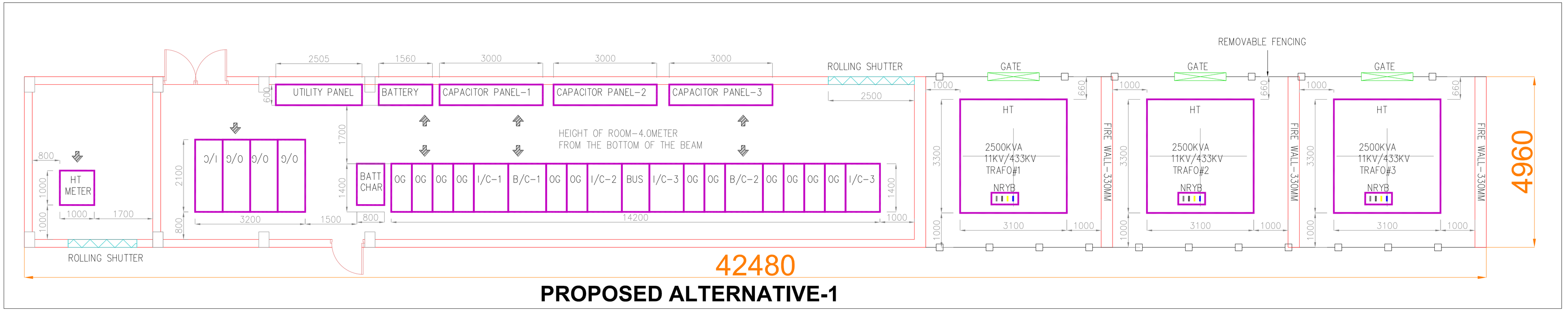
DRAWN:	VIVEK
CHECKED:	MANOJ
APPROVED:	SCS
DATE:	06.04.21

PROJECT: ELECTRIC BUS CHARGING DEPOT

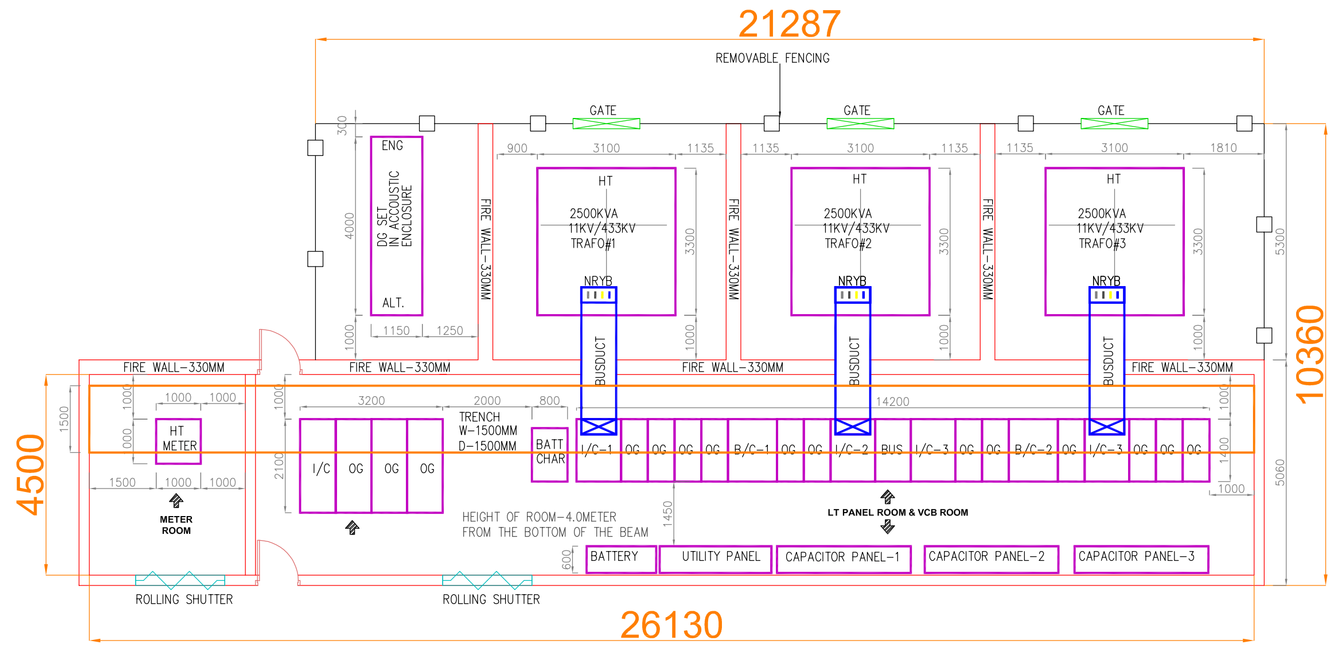
CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.

TITLE: LT SINGLE LINE DIAGRAM

DRG.NO.	SH.	OF	SCALE	REV.	SHEET
SNC-21/LUCKNOW-DUBAGGA/E103	1	1	1:2	02	A1



PROPOSED ALTERNATIVE-1



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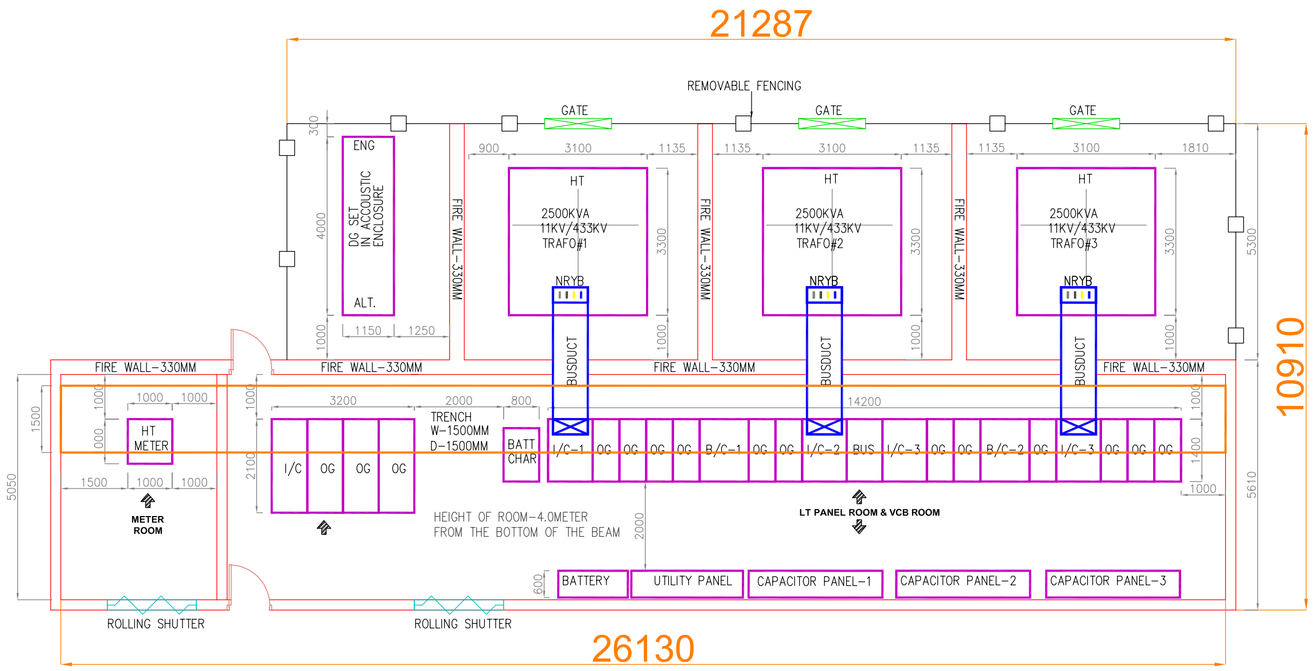
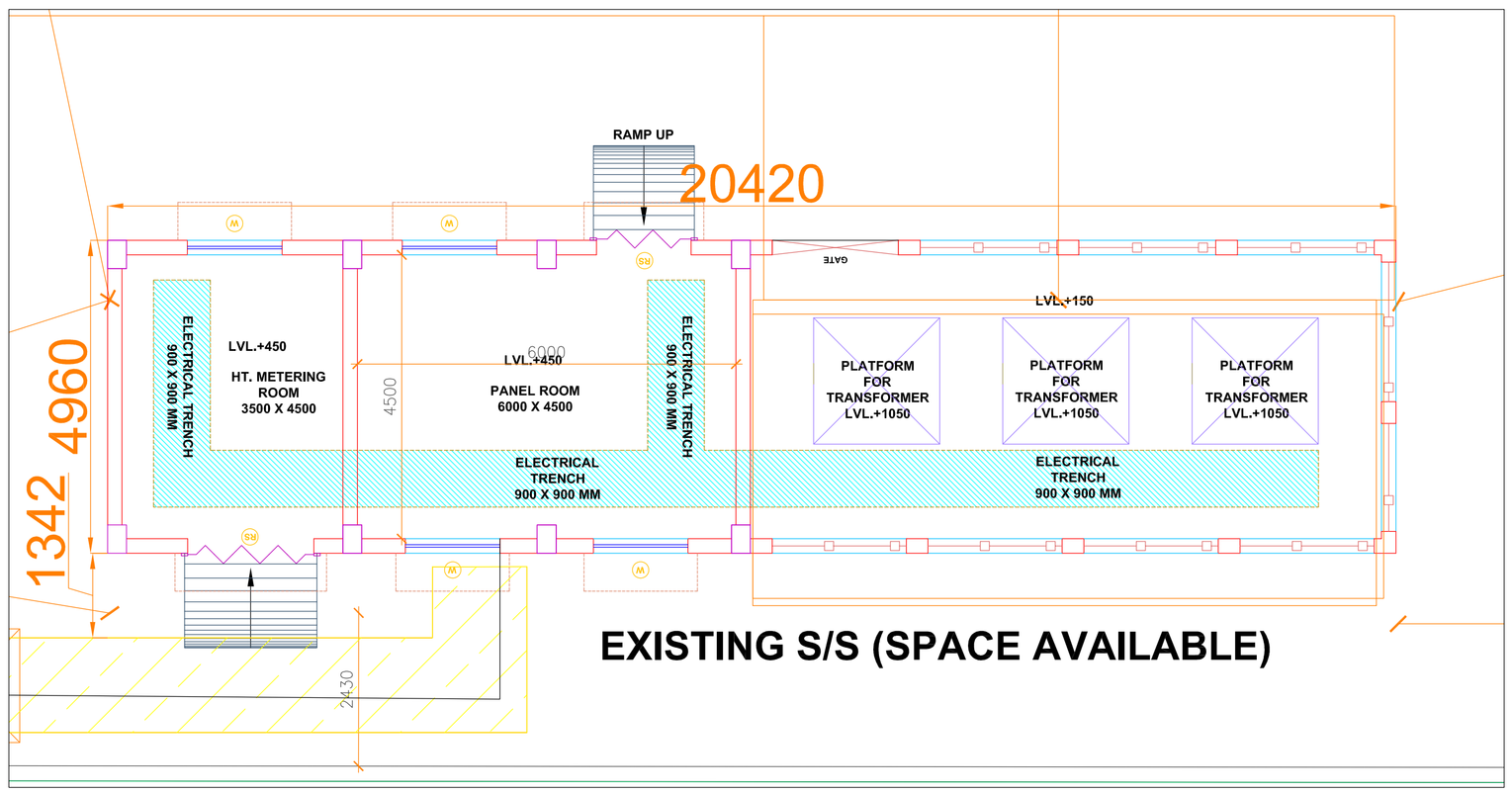


PROPOSED ALTERNATIVE-2B



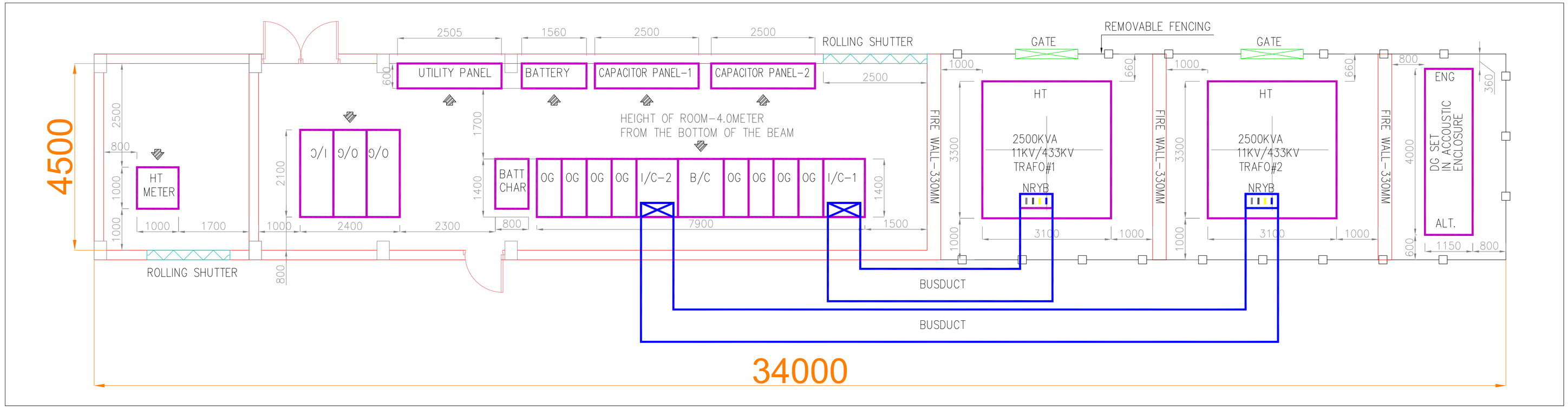
EXISTING S/S (SPACE AVAILABLE)

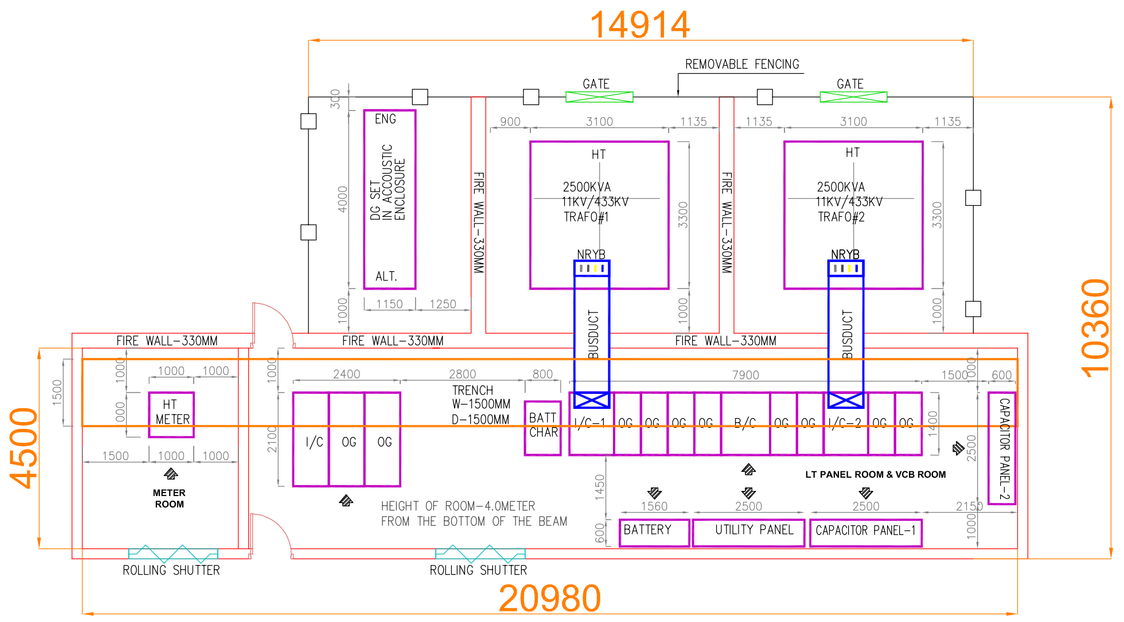
TENDER DRAWING

SN CONSULTANTS (ELECTRICAL ENGG.CONSULTANTS) B-246A GREATER KAILASH PART-1,ND-110048 TEL: 011-2923 7746, 9810026553	PROJECT: ELECTRIC BUS CHARGING DEPOT-10ONOS OF BUSES
WE RESERVE ALL RIGHTS IN CONNECTION WITH THIS DOCUMENTS ©	CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.
DRAWN: VIVEK	TITLE: SUB-STATION LAYOUT (DUBAGGA)
CHECKED: MANOJ	DRG.NO. SNC-21/LUCKNOW-DUBAGGA/E201
APPROVED: SCS	SH. 01 OF 02 · SCALE 1:2 · REV. 00 · SHEET A1
DATE: 06.04.21	

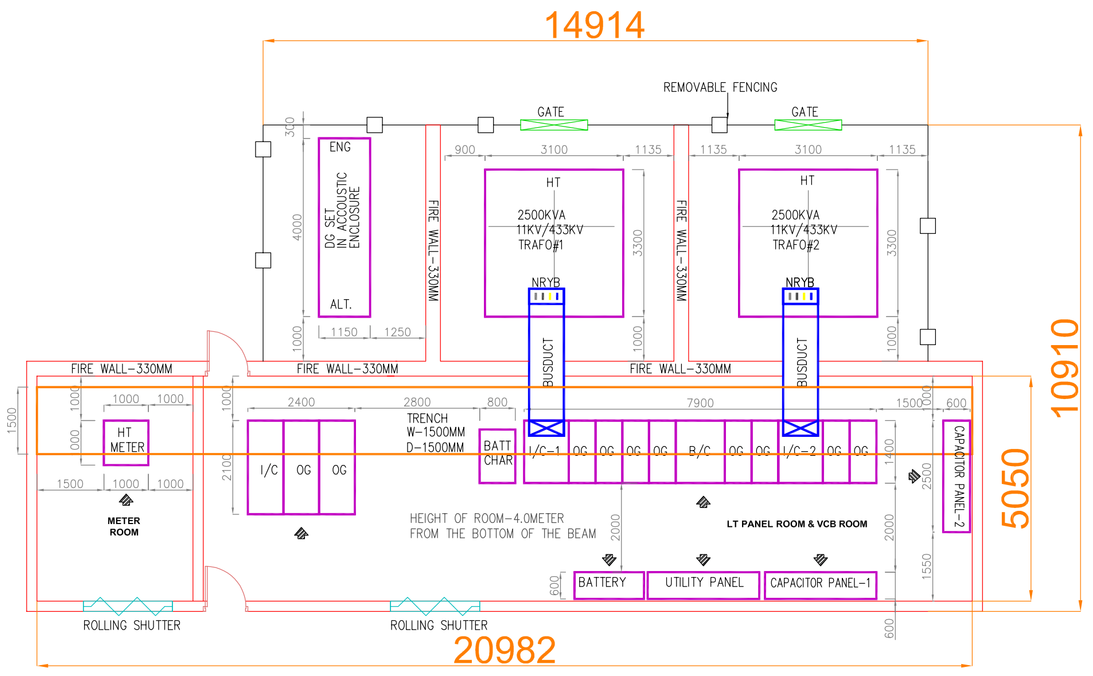
NO.	DETAILS	DATE	BY	CHD	APP.
R0.	FIRST SUBMISSION	06.04.21	VIVEK	MY	SCS.

REVISIONS

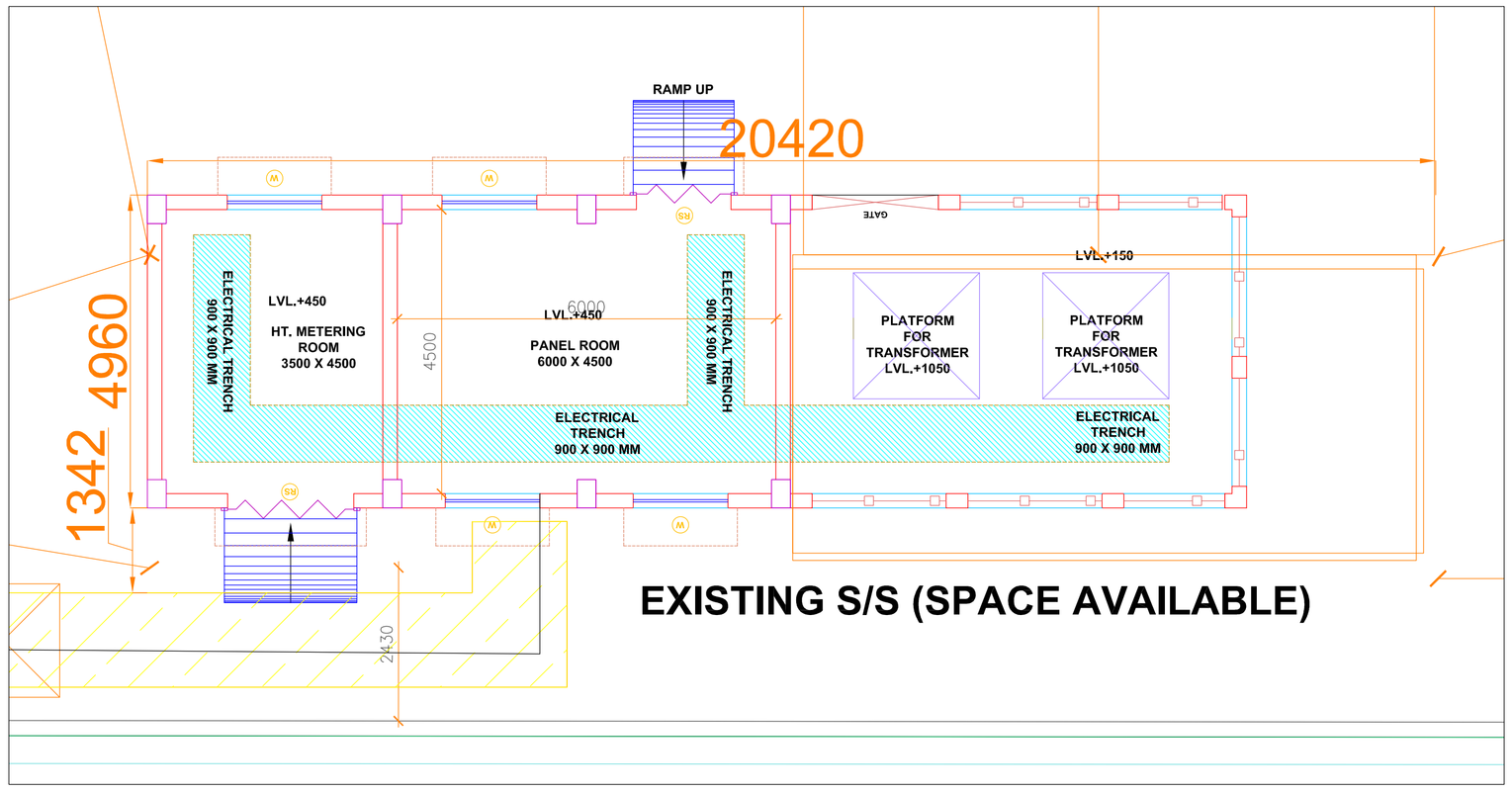




PROPOSED ALTERNATIVE-2A



PROPOSED ALTERNATIVE-2B



EXISTING S/S (SPACE AVAILABLE)

TENDER DRAWING

SN CONSULTANTS
(ELECTRICAL ENGG.CONSULTANTS)
B-246A GREATER KAILASH PART-1,ND-110048
TEL: 011-2923 7746, 9810026553

NO.	REVISIONS	DATE	BY	CHD	APP.
R0.	FIRST SUBMISSION	24.04.21	AMRIT	MY	SCS.
NO.	DETAILS	DATE	BY	CHD	APP.

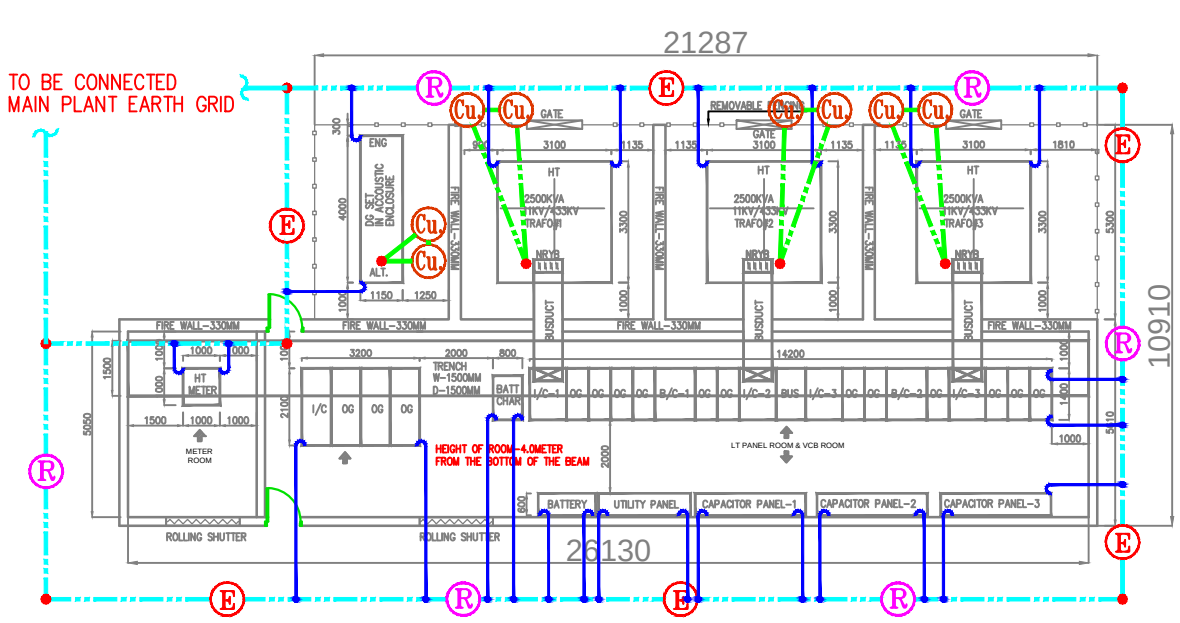
DRAWN:	AMRIT
CHECKED:	MANOJ
APPROVED:	SCS
DATE:	24.04.21

PROJECT: ELECTRIC BUS CHARGING DEPOT-10ONOS OF BUSES

CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.

TITLE: SUB-STATION LAYOUT (DUBAGGA)

DRG.NO.	SH.	OF	SCALE	REV.	SHEET
SNC-21/LUCKNOW-DUBAGGA/E201	02	02	1:2	00	A1



PROPOSED ALTERNATIVE-2B

LEGEND		QTY.
Cu.	Cu. EARTH PIT	08 NOS.
E	G.I PIPE EARTH PIT	06 NOS.
R	3 M, 32 MM DIA MS ROD EARTH PIT	06 NOS.
	75X10MM GI EARTH STRIP	120METER
	50X6MM CU INSULATED EARTH STRIP	50METER
	50MM x 10MM GI STRIP FOR PIG TAIL	90METER

TENDER DRAWING

NO.	DETAILS	DATE	BY	CHD	APP.
REVISIONS					

SN CONSULTANTS
(ELECTRICAL ENGG.CONSULTANTS)
B-246A GREATER KAILASH PART-1,ND-110048
TEL: 011-2923 7746, MOB:-9810026553

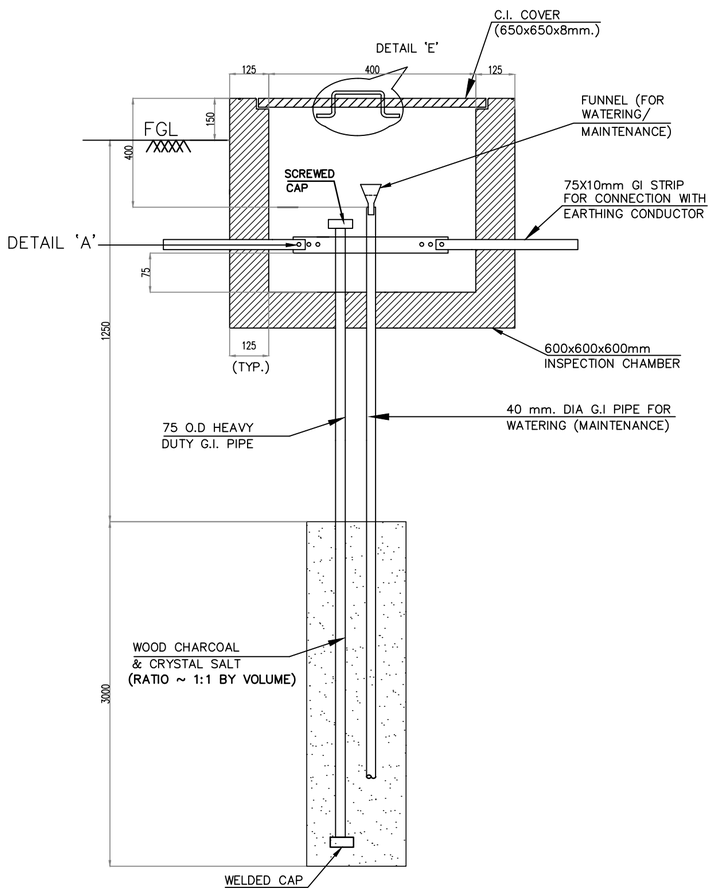
DRAWN:	AMRIT
CHECKED:	MANOJ
APPROVED:	SCS
DATE:	10.04.2021

PROJECT: ELECTRIC BUS CHARGING DEPOT-100NOS OF BUSES

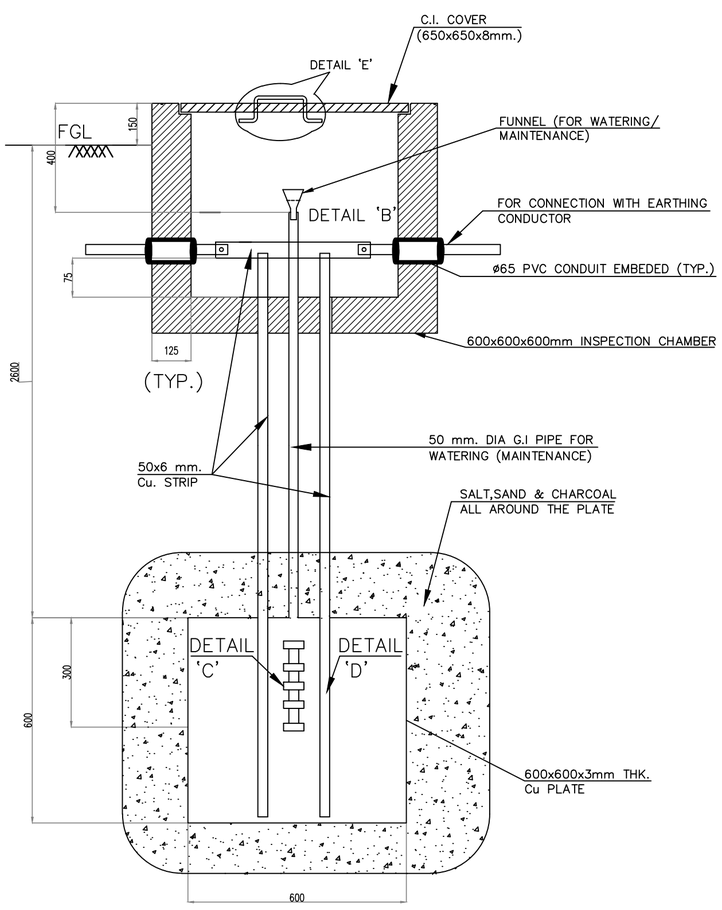
CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.

TITLE: TYPICAL EARTHING DETAIL

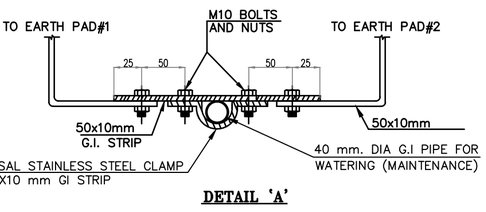
DRG.NO.	SH.	OF	SCALE	REV.	SHEET
SNC-21/LUCKNOW-DUBAGGA/E401	01	03	NTS	00	A3



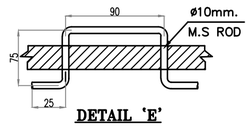
GI PIPE ELECTRODE
EARTH PIT DETAIL



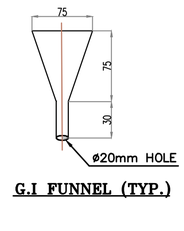
COPPER PLATE EARTH PIT DETAIL



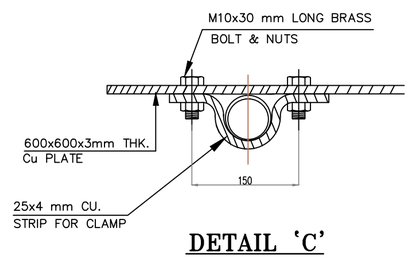
DETAIL 'A'



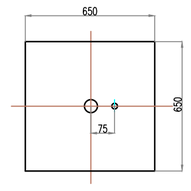
DETAIL 'E'



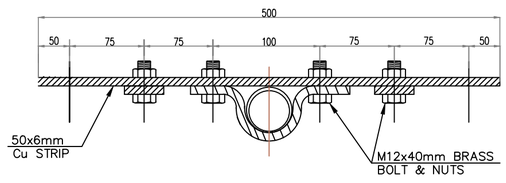
G.I FUNNEL (TYP.)



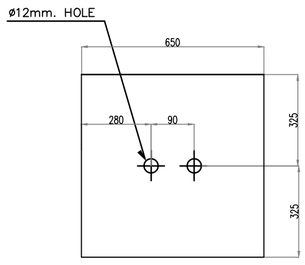
DETAIL 'C'



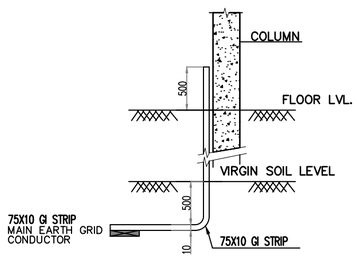
PLAN OF EARTH PIT



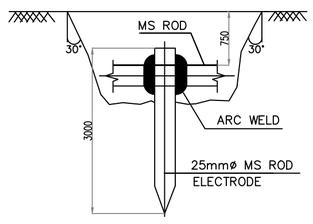
DETAIL 'B'



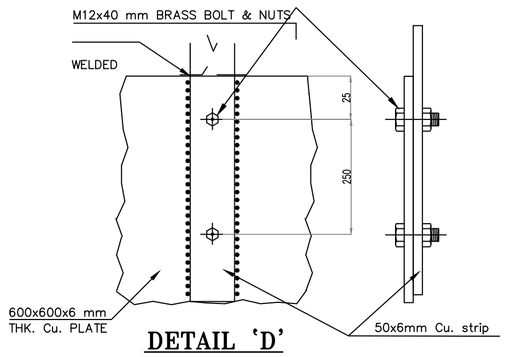
C.I COVER PLATE



PIGTAIL CONNECTION DETAILS



MS ROD EARTH PIT
(GROUND ELECTRODE)



DETAIL 'D'

NOTES:-

1. EARTHING FOR THE PLANT SHALL BE CARRIED OUT GENERALLY IN ACCORDANCE WITH IS:3043.
2. FOR EFFECTIVE PROTECTION AGAINST SHOCK TO PERSONNEL, THE FENCE AND GATE WILL BE BONDED TO MAIN EARTH GRID.
3. ALL THE WELDED JOINTS WILL BE PAINTED IN BLACK BITUMINIOUS PAINT TO PROTECT AGAINST CHEMICAL CORROSION.
4. CONDUCTING PETROLEUM JELLY SHALL BE APPLIED TO CONTACT SURFACE OF ALL BOLTED JOINTS.
5. EARTH PIT WILL BE LOCATED AT LEAST 1.5M. (PREFERABLY) FROM BUILDING FOUNDATION OR FOOTING. PREFFERED DISTANCE BETWEEN TWO ADJACENT ELECTRODE IS 3.0M MINIMUM. EXACT LOCATION AFTER INTERFERENCE CHECKS TO BE DECIDED AT SITE.
6. THE LOCATION OF EARTH STRIP & EARTH PIT IS TENTATIVE. EXACT LOCATION SHALL BE DECIDED AT SITE.
7. RESISTANCE OF EARTHING STATION SHALL BE MEASURED AFTER INSTALLATION OF ELECTRODE AS SHOWN, BY MEANS OF AN EARTH MEGGER AND SHALL BE WITHIN ONE OHM (WHOLE EARTHING SYSTEM) BY ADDITION OF EARTH ELECTRODE IN PARALLEL IF NECESSARY.
8. 75X10mm. GI STRIP SHALL BURRIED 1M BELOW THE NGL.
9. PIG TAIL 50X10mm. GI STRIP SHALL BE TAKE OUT ABOVE THE GROUND LEVEL/ ABOVE FILLED UP SOIL.

TENDER DRAWING

NO.	DETAILS	DATE	BY	CHD	APPD.
	REVISIONS				

SN CONSULTANTS
(ELECTRICAL ENGG.CONSULTANTS)
B-246A GREATER KAILASH PART-1,ND-110048
TEL: 011-2923 7746, MOB:-9810026553

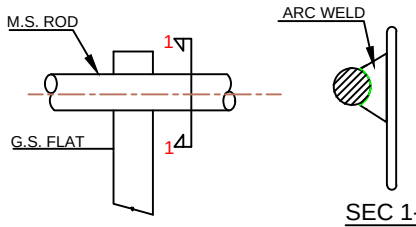
DRAWN:	AMRIT
CHECKED:	MANOJ
APPROVED:	SCS
DATE:	10.04.2021

PROJECT: ELECTRIC BUS CHARGING DEPOT-100NOS OF BUSES

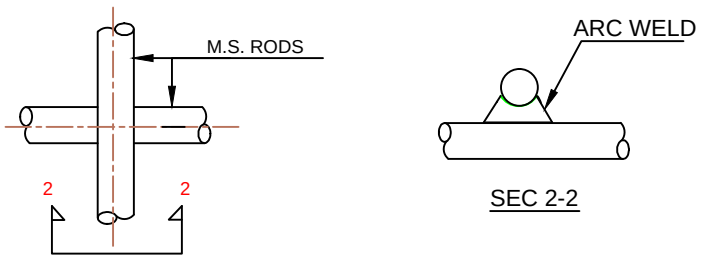
CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.

TITLE: TYPICAL EARTHING DETAIL

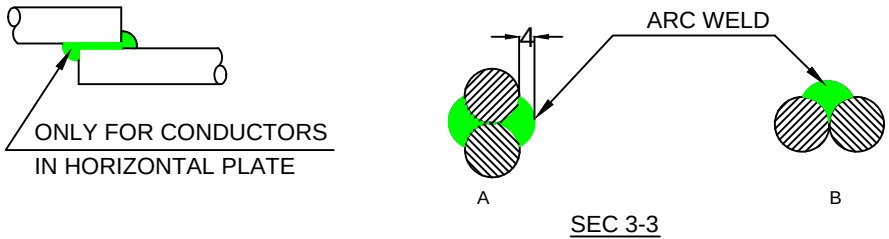
DRG.NO.	SH.	OF	SCALE	REV.	SHEET
SNC-21/LUCKNOW-DUBAGGA/E401	02	03	NTS	00	A1



CROSS JOINT BETWEEN M.S. ROAD & FLAT

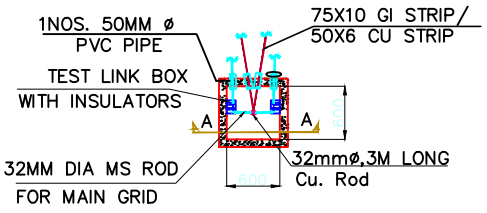


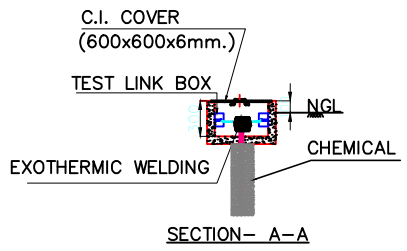
CROSS JOINT BETWEEN TWO RODS



(A) IN VERTICAL PLANE
(b) IN HORIZONTAL PLANE

TYP. OVERLAPING JOINT OF TWO CONDUCTORS.





TYPICAL EARTH ELECTRODE FOR CHEMICAL EARTHING WITH TEST LINK DETAIL

TENDER DRAWING

SN CONSULTANTS (ELECTRICAL ENGG.CONSULTANTS) B-246A GREATER KAILASH PART-1,ND-110048 TEL: 011-2923 7746, MOB: -9810026553	PROJECT: ELECTRIC BUS CHARGING DEPOT-10ONOS OF BUSES
	CLIENT: PMI ELECTRO MOBILITY SOLUTIONS PRIVATE LTD.
DRAWN: AMRIT	TITLE: TYPICAL EARTHING DETAIL
CHECKED: MANOJ	DRG.NO. SNC-21/LUCKNOW-DUBAGGA/E401
APPROVED: SCS	SH. OF: 03 03
DATE: 10.04.2021	SCALE: NTS
	REV.: 00
	SHEET: A3

NO.	DETAILS	DATE	BY	CHD	APPD.
REVISIONS					