INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE

TENDER NOTICE [Advt. No. CE/HPC/02/2010]

The Director, Indian Institute of Tropical Meteorology, Pune-411008 (India) invites Sealed tenders under **TWO BID SYSTEM**, i.e., separate sealed tenders (Part-I –Technical Bid, Part-II Commercial Bid) from reputed Indian/foreign manufacturers/ authorized dealers OR their authorized Indian agents for supply, installation, commissioning and Demonstration of following items:

Sl. No	Tender Reference No	Description of Items		EMD IN(Rs)	Cost of Tender in(Rs.)
1	CE/HPC/HTBP 01/2010/	22 kV HT Breaker Panels,	JOB	1,00,000	1,000
2	CE/HPC/TF/ 02/2010	22/0.433 kV, 1600 kVA Outdoor ONAN Transformer .	(2nos.)	90,000	1,000
3	CE/HPC/UPS/ 03/2010	1) 200kVA UPS (n+1) configuration	(4nos.)	3,50,000	2,000
		2) 200kVA UPS(n+1) configuration compatible with Existing UPS 2 No.	(2nos.)		
		3) 60kVA UPS	(1nos.)		
4	CE/HPC//DG/ 04/2010	Minimum rating 600 kVA DGSET	(3nos.)	3,30,000	2,000
		600 kVA Synchronizing Panel For 4 X 600 KVA DG set	(1 nos)		
		HSD Buffer Tank & Fuel Transfer system for 4 x 600 kVA DG sets & 1 x 250 kVA DG set	JOB		
5	CE/HPC/EE/ 05/2010	External Electrical Work	JOB	5,00,000	5,000

Last Date of Issue of Tender :22.04.2010,
Due Date for Receipt of Tender : 28/04/2010 up to 1500hrs,
Date of Opening of Technical Bid : 28/04/2010 16.00 hrs .

For details, please visit our website **http://www.tropmet.res.in .** Tender documents can be either obtained on payment in the form of Demand Draft from Nationalized Bank Drawn in favour of Director IITM payable at pune, from the Administrative Officer, or may be downloaded from our website. IITM will not be responsible for postal or any delay and reserves the right to reject any or all tenders without assigning any reasons.

Administrative Officer

TENDER DOCUMENTS

FOR

(TECHNICAL SPECIFICATIONS – PART 1)

FOR

EXTERNAL ELECTRICAL TENDER

AT

INDIAN INSTITUTE OF TROPICAL METEOROLOGY,PASHAN, PUNE.

INDEX

ISSUED TO.	: ON
CASH RECEIPT NO.	: DT

TENDER NOTICE

1. Sealed item rate quotations are invited from reputed electrical contractors with valid contractors' license who can carry out the work in state of MAHARASHTRA

Name of Owner	:	**INDIAN INSTITUTE OF TROPICAL METEOROLOGY PUNE.**
Name of Work	:	**EXTERNAL & SUBSTATION RELATED INTERNAL ELECTRICAL WORK FOR IITM, HPC**
Cost of Tender documents	:	**Rs. 5,000 /– (Non Refundale) in the form of Demand Draft from Natinalized Bank drawn in favour of "Director Indian Institute Of Tropical Meteorology, Pune".**
Earnest Money Deposits	:	**Rs 5,00,000 (Five Lakhs Only) in the form of Demand Draft/Bank Guarantee from Natinalized Bank drawn in favour of "Director Indian Institute Of Tropical Meteorology, Pune".**
Date of completion	:	**FOUR months from the date of LOI.**

2. The tender forms will be available on payment of costs of tender documents in the form of Demand Draft from Nationalised bank at the address given below upto **22/04/2010.**

Administrative officer's office
Indian Institute of Tropical Meteorology,
Dr. Homi Bhabha Road,
Pashan, Pune - 411008

3. Pre-bid meeting on – **23/04/2010(1100hrs)**
4. Duly completed tenders shall be submitted in sealed envelops at the office of owner on address given below on **28/04/2010 by 1500 hrs.**

Indian Institute of Tropical Meteorology
Dr. Homi Bhabha Road, Pashan, Pune - 411 008
Tel. No. 020 –25904200

Contact Person: -A.K.Saxena,Civil Engineer
Tel. No. 020 – 25904335

Due Date and Time: **28/04/2010,15.00hrs.and** opened at **1600hrs**.

5. The owner reserves right to accept or reject any or all the quotations without assigning any reasons and shall not be bound to accept lowest quotation.

6. This tender notice shall form part of contract / order.

INSTRUCTIONS TO THE TENDERERS.

1. The tender is to be filled properly and all relevant information asked for shall be provided for in due format.
2 Technical and commercial bids are to submit in separate envelop. Technical bid is the blank BOQ (without price schedule) along with specifications and highlighted with the makes and material considered; duly signed on each page, super scribing the envelop as technical bid
3 Commercial bid with price schedule only, super scribing the envelop as commercial bid.
4. The schedule of rates shall be returned in two sets.
5. All section wise total amounts shall be written in words also.
6. The tenderers are requested to furnish information about similar works handled, staff and infrastructure etc in technical bid.
7. All drawings and documents issued to the tenderers are confidential and shall be returned back with the tender.
8. EMD shall be in the form of cheque or as mentioned specifically in Tender Notice and shall be enclosed in a separate envelope along with the tender.
9. The duly completed tender shall be submitted at the following address in a sealed envelope before the time indicated.
10. Preliminary drawings, prints shall be available for reference & discussions at our office.
11. Time is essence of contract, hence contractor has to mobilize proper manpower & material in a short mobilizations period to site. No extension will be given for completion period, without proper and genuine reasons.
12. All bidders should visit site prior to giving quotes to get acquainted with site conditions. No demand shall later be entertained due to site conditions.
13. Pre-bid meeting for technical queries will be held on **23/04/2010, 1100Hrs** at I.I.T.M. Bidders are requested to be present in the meeting. All technical queries will be answered by I.I.T.M and consultants.
14. Bidders are requested to give deviations / comments / assumptions clearly in deviation pages based on the site observations.
15. Bidders are requested to highlight the makes of material considered while quoting in the list of approved makes.
16. Bidders are requested to quote value for supply & installation of material but client may provide some or all capital items free of cost. So while quoting labour / installation rates, material handling charges should be considered accordingly.
17. Client reserves the right to accept or reject any or all bids without assigning any reasons (N.A.).
18. Duly completed tenders shall be submitted to addressee to following address

Indian Institute of Tropical Meteorology
Dr. Homi Bhabha Road, Pashan, Pune - 411 008
Tel. No. 020 –25904200

Contact Person-A.K.Saxena, Civil Engineer
Tel. No. 020 – 25904335

Due Date and Time: **28/04/2010 at 1500Hrs.**

19. Soft copy of covering letter and priced BOQ shall be submitted along with tender in the CD provided. Bidders shall not change format of BOQ. VAT & service tax calculation / supporting shall be kept separate.

ARTICLES OF AGREEMENT

Articles of Agreement ---------- made on the ---------- day of ----------2010
Between:

(hereinafter called "The owner") of the part and ----------

Of (or whose registered office is situated at) ----------

(herein after called "The contractor") of the other part.
Where as the owner is desirous of awarding the External & Internal Electrical works for --------
----------. Drawing and bill of quantities showing and describing the work to be done prepared by under the direction of:

And where as the contractor has supplied the owner with a fully priced copy of the said bills of quantities (which copy herein after referred to as 'The Contract Bills'). And where as the said drawings (herein after referred to as "The Contract Drawings") and the contract bills have been signed by or on behalf of the parties here to and where to and where as the contract has deposited the sum of rupees ---------- with the OWNER for the due performance of this Agreement. Now it is hereby agreed as follows:

For the consideration herein after mentioned the contractor will upon and subject to the condition annexed, carry out and complete the work shown upon the contract drawings and described by or referred to in the Contract Bills and the said conditions.

The owner will pay the contractor the sum of Rs. ----------

(herein after referred to as "Contract sum") or each other sum as shall become payable here under at the time and in the manner specified in the said conditions.

2. The terms "The Consultant" in the said condition shall mean the said or in the event of his death or ceasing to be consultant for the purpose of this contract, such other persons as the owner shall nominate for that purpose provided always that no person subsequently appointed to be the consultant under this contract shall be entitled or over rule any certificate or decision or approval or instruction given or expressed by the earlier consultant.

3. The said condition and Appendix here to (Sections) Shall be read and construed as forming part of this Agreement, and the parties here to shall respectively abide by, submit

themselves to these Conditions and perform the agreements on their parts respectively in such Conditions contained.

As witness the hands of the said parties.

Signed by :
In the presence of :

Witness :
Name :
Address :

CONTRACTOR

SECTION –A

FORM OF TENDER

To,
M/s. Indian Institute of Tropical Meteorology
Dr. Homi Bhabha Road,
Pashan, Pune-411 008

Dear Sirs,

Having examined the drawings, specifications and schedule of quantities of work specified below and having visited and examined the site of works for acquiring requisite information, I/ We hereby offer to execute the works specified below in the specified time period at the rates quoted in the schedule of prices attached in accordance with the drawings, designs, specifications, conditions of contract and in all other respects with such conditions as applicable.

a)	Description of Work	:	EXTERNAL & SUBSTATION RELATED INTERNAL ELECTRICAL WORK IITM, HPC UPGRADATION.
b)	Earnest Money Deposit	:	**Rs 5,00,000 (Five Lakhs Only) in the form of Demand Draft/Bank Guarantee from Natinalized Bank drawn in favour of "Director Indian Institute Of Tropical Meteorology, Pune".**
c)	Completion Period	:	FOUR Months.

1. Should this tender be accepted, I/We hereby agree to abide by and fulfill all the terms and conditions of contract as they may be applicable and in the default there of to forfeit and pay to owner sum of money mentioned in the said conditions.
2. I/We agree that this offer shall remain open for acceptance for a minimum period of 60 days.
3. I/We hereby deposit a sum of Rs. ---------- as EMD which is not to bear any interest. Should I/we fail to execute the contract when called up to do so, this sum shall be forfeited by me/us.
4. Our Bankers are
5. Names of Owner/Partner of firm

   1)

   2)

   3)

Name of Partners/Director of
Firm Authorized to Sign.

Name of Person having Power of
Attorney to sign the contract:

PLACE :

DATE :

Signature & Seal of
Contractor

SIGNATURE, NAME & ADDRESSES OF WITNESSES:

1)

2)

SECTION –B

PROJECT INFORMATION:

OWNER	:	**M/S. INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE**
PROJECT	:	**IITM, HPC UPGRADATION.**
WORK	:	**EXTERNAL & SUBSTATION RELATED INTERNAL ELECTRICAL WORK IITM, HPC UPGRADATION.**
AVG. RAIN FALL	:	800 mm.
TEMPERATURES	:	42 ^{0} c Max. 8 ^{0} c Min.
INCOMING SUPPLY	:	22000V 3 Phase, 3 Wire.
DISTRIBUTION	:	415V 3Ph, 4Wire, 50HZ

B.1. DETAILED SCOPE OF WORK:

1. Supply, laying, testing and commissioning of 22 KV HT cable and jointing includes cable from MSEDCL express feeder supply point with necessary statutory approvals & Co-ordination with liasoning authorities.
2. Supply & Installation of M.V. Panel.
3. Supply & laying of 1.1KV Gr. Power & Control Cables in the readymade trenches/ Hume pipes/ on cable trays with end termination.
4. Supply & Installation of DB's power outlets, point wiring, conduits, junction boxes, TTB's etc.
5. Supply & laying of Hume pipes for HT and LT cable laying.
6. Supply & Installation of earthing system in substation area.
7. Supply & Installation Misc. Item like pipes, trays, steel fabrication etc.
8. Supply & Installation of fans (Ceiling and exhaust).
9. Supply and installation of cable trays.
10. Installation of 22/0.433 KV, 1600 KVA 2 No. ONAN Transformer substation,
11. Installation of 22 KV RMU units.
12. Installation of compact breaker & transformer feeder breaker panel.
13. Supply and installation of Lighting Fixtures.

B.2: CIVIL WORKS:

1. Major Civil works is excluded from the scope however necessary excavations for cables, supply of Hume pipe etc. are included in the scope.
   However scope of electrical contractor shall include coordination & follow up with civil contractor for getting civil works related to electrical works done correctly and in time.
2. All Civil works like chasing & making good the chases making pockets for grouting if necessary, grouting of panels DB's etc. is Included in scope.
3. Fabrication and fixing of supports, frames etc. are included in the scope.
4. Excavation & refilling of trenches in soil is included in scope.
5. Preparation of earthing station chambers is included in scope.

B.4: GENERAL:

Scope includes testing and commissioning of all items installed by contractor. Necessary support by manufacturer can / shall be provided.
Scope also includes unloading of free issue items at site, & storing of these items. Contractor's person can accompany client's representatives for shop inspection if necessary for above items.

Contractor has to carry out all works as per respective IS standards & I.E.C. All required tools & tackles, testing kits, measuring instruments, safety equipment's shall be provided by contractor with skilled manpower required.

B.5: LIST OF FREE ISSUE ITEMS:

Procurement of all items shall be included in the contractor scope.
Client reserves right to procure any other material if felt necessary by giving proper information to contractor.

2X1600 KVA ONAN Transformers
HT Breaker Panels,
D.G. Set & UPS System supply & installation will be dealt separately some related work
is included in scope.

B.6: POST COMPLETION HANDING OVER DOCUMENTS:

Contractor's scope of work also covers post completion handing over documents, which will cover.

a) As Built Drawings.
b) Installation & maintenance manuals of all equipment.
c) Test & warranty certificates of all bought out item.
d) Test certificates for all installations.
e) Statutory documents required for record.

SECTION –C
DEFINITION OF TERMS

C.1 'Owner/Purchaser' shall mean the client on whose behalf this enquiry is issued and his authorized representative.

C.2 **'Engineers'** shall mean Authorised person appointed by the Institute for the project.

C.3 'Bidder' shall mean party who quotes against this enquiry.

C.4 **'Contractor'** shall mean the successful `BIDDER' whose bid has been accepted by Owner and on whom Purchase/Work Order is placed.

C.5 **'PROJECT'** shall mean the project specified in Section - B.

C.6 'SITE' shall mean the actual place of work as detailed in specification / Section B.

C.7 **'SPECIFICATIONS'** shall mean collectively all the terms and stipulations contained in those portions of contract as general and special conditions, amendments, deletions, revisions as made in agreement or written agreements made pertaining to method of work.

C.8 **'Month'** shall mean calendar month.

C.9 **'Plant/Equipment'** and 'Works' shall mean respectively the goods to be supplied and services to be provided by contractor.

C.10 **'Contract/Work Order'** shall mean the order specifying works and associated specifications to be executed by "Owner and Contractor".

C.11 **'Contract Period'** shall mean the period during which "Owner" and "Contractor" shall execute the entire contract as agreed.

C.12 **'Guarantee Period'** / "Defect Liability Period" shall mean period during which the plant / equipment and installations shall give same and trouble free performance as guaranteed by contractor.

C.13 **'Engineer's Instructions'** shall mean instruction oral or written, drawings, direction, explanations issued by Consultant / Engineer / Architects on be-half of the owner from time to time during period of contract. (All 'oral' instructions shall be authenticated by written instructions immediately.)

C.14 **'Performance Tests'** shall mean all tests to be carried out by contractor as per specifications prior to installation being taken over by Owner under guarantee

C.15 **'Commissioning'** shall mean integrated activity of carrying out performance tests, initial and trial operations of system.

C.16 **'Drawings'** shall mean all drawings furnished by Engineer / Owner for basis of proposal or for carrying out works, from time to time; all drawing submitted by vendor provided such drawings are acceptable to Engineer/Owner.

C.17 'UR' means quote unit rate.

SECTION – D–I

GENERAL CONDITIONS

D.1 WORK ORDER:

The work order conveys final agreement between owner and contractor on terms and conditions and is exclusive statement of terms of their agreement. In case of discrepancy between general conditions and specifications, drawings furnished by owner, Owner's decision with consultant would be final

D.2 MODIFICATION AND VARIATION:

The order may be amended, modified or rescinded only in writing by both the parties and their duly authorized representatives pursuant to terms stated therein.

D.3 MATERIALS AND SERVICES:

D.3.1 LABOUR & TOOLS TACKLES:

The contractor shall provide at his cost, all necessary material, tools, tackles, skilled manpower for proper execution of works specified in the schedule of the quantities and as per drawings and specifications. Any discrepancy in schedule of quantities and drawings shall be brought to notice of engineer/owner for decision, immediately.

D.3.2 ACTIVITY CHART RELATED TO CIVIL WORK:

Contractor shall provide detailed Bar chart of activities based on completion period and civil work schedule made on MS project or similar software and get approval prior to starting the work. Mile stones for supply of important material & completion of specific jobs shall be indicated clearly.

D3.3 MAKE OF MATERIAL:

Contractor shall provide all material of specific makes accepted during discussion stage or from approved list of makes.
In case of any problem / difficulties in procurement of such items, alternative makes will be approved by Engineer & owner based on samples and specifications submitted by contractor.
Alternative material shall be procured only after written approval for makes.
Procurement and use of material of makes not in approved list shall be sole responsibility of the contractor. Contractor shall replace all such material at no additional cost within a stipulated period.

D.4 AUTHORITIES AND LAWS:

Contractor shall confirm to all provisions of any law pertaining to works and to the regulations and by laws of related authorities and for water/electricity supply. Contractor shall indemnify owner/Engineer from all conflicts arising out of provisions of regulations & laws.

D.5 MATERIAL AND WORKMENSHIP:

All the materials to be supplied for execution of works shall be of first quality, new and strictly as per specifications. In case employer procures such items and hands over the same for fixing to the contractor, the contractor will receive the goods, open the

crates and report any discrepancies, store it in his custody until required, install and commission it with necessary care and the best workmanship. The contractor shall be responsible for any loss or damages once the materials are supplied to him in good order and condition.

All the installation rates are deemed to include handling erection, fabrication services & erection hard ware required for all items

All the works shall be executed with highest quality of workmanship and as directed by owner/engineer. In case of mockups or approved samples, the quality of the same shall be adhered to for all works and any work quality & material below that standard will be rejected.

D.6 SUPERVISION:

A competent representative of contractor shall be available at work site for supervision of works and for co-coordinating, receiving instructions from owner/consultant during entire period of contract.

The supervisory staff required shall depend on value & complexity of job. The supervisory infrastructure planned shall be provided in writing along with a bar chart.

For all works up to 30 lacks at least one engineer with 4 to 6 years project execution experience shall be available for coordination.

For all works above 30 lack one engineer with 6-8 years experience in execution of similar projects will be available on site full time. He will be assisted by adequate supervisory staff.

For all projects of value 100 lacks & above, coordination & site activities shall be handled by a project manager with minimum 10 years project execution & planning experience. Adequate engineers & supervisory staff will assist him.

D.7 ACCESS TO WORK:

Owner / consultant or their authorized representative shall have access to works being carried out at all reasonable times. No person, not authorized by owner / consultant except representatives of public authorities shall be allowed at work site at any time.

D.8 SUB-CONTRACT:

The complete work included in the contract shall be executed by the contractor and the contractor shall not sub-contract/sub-let work or part thereof without prior written consent from owner/consultant. However, contractor shall not be relieved from the responsibility of execution of works as per contract under any circumstances.

D.9 SCHEDULE OF QUANTITIES AND DRAWINGS:

D9.1 SCHDULE OF WORK:

The schedule of quantities indicates nearest approximate quantities of the items works. There is a possibility of upward or downward variation of quantities due to site modifications. Any variation in quantities of the individual items as per schedule and overall cost variation of 10% and 25% of individual items shall be accepted by contractor without any financial implication. Contractor shall take exact measurements for items like cables, earth strips prior to bringing and cutting the same. If variation is beyond above stipulated limits, such items shall be carried out after written mutual agreement. However no excess payment claims for additional quantities shall be entertained if variation is established prior to deliveries of stipulated quantities.

D9.2 GENERAL INFORMATION ON DRAWINGS:

Rates quoted for all 'Unit Rate' (UR) items shall be deemed as valid for any quantity as may be required for completion of work. The drawings enclosed indicate extent and general arrangement of various equipments. These are for guidance of contractor and exact locations, dimensions; clearance will be governed by site conditions, buildings and statutory rules. Contractor is required to go through the drawing and regulations prior to starting of works. Any discrepancy/changes required shall be reported to consultant and owner. Contractor shall prepare all `working drawings' and get them approved from consultants prior to starting the work.
The working drawing shall be submitted to consultant within a specific time frame from date of order as mutually decided.
Drawing for all bought out items / panels shall be submitted for consultant's approval within a specific time frame & prior to starting any work. All drawings shall be submitted in at least 3 sets.

D.9.3 PROCURMENT OF MATERIALS:

Contractor shall bring quantities of items like cables, earthing strips, trays etc. after specific measurement. Client will not take over excess quantities of any items unless it is specifically agreed. Contractor shall have to take back all such quantities without any financial burden on client.

D.10 SUFFICIENCE OF SCHEDULE:

The contractor shall be deemed to have satisfied himself before tendering as to correctness and sufficiency of his tender for works and prices quoted therein which shall cover all obligations under contract for satisfactory completion of works, and stipulated performance of system/equipment in his preview.

D.11 MEASUREMENTS & BILLS:

Measurements and billing shall be done by specific method detailed bellow.

1. Contractor shall maintain a proper measurement book (Triplicate) on site and take measurement from time to time.
2. Owners representative /consultant shall check these measurements from time to time. Coordination for checking will be contractor's responsibility.
3. Contractor shall make bills based on checked measurements only.
4. Bills shall be made in standard and cumulative formats only. Non cumulative Bill will not be accepted.
5. Contractor shall submit minimum 3 copies of bill with

a) Measurement sheets copies duly signed.
b) Copies of signed chalan
c) Summary sheet.
d) Site progress photographs.

Measurements will be certified within 7 days. Consultants will certify R.A. Bills within 10 days of submission of correct bills. Contractor will claim extra items vide separate bills only after rate approval of such items. For any additional item prior approval of the owner should be obtained with recommendation of the consultant.

D.12 REMOVAL OF WORKS:

The owner/consultant during the progress of work have power to order in writing removal from the works any material / installations which in their opinion are not as per specifications or instructions, and for carrying out rectification/rework within specified time and contractor shall carry out such removals / rework as per

specification at his own cost. The owner / consultant can get such rectifications / rework done from other agencies at the cost of contractor, if the same are not carried out by them in the stipulated and agreed period.

D.13 COMPLETION CERTIFICATE:

D13.1 COMMENCEMENT DEFECT LIABILTY PERIOD:

The work shall be deemed to have been completed on written certificate by Engineer that they have been virtually completed. The "Defect Liability Period" shall commence from the date of such certificate.

D13.2 COMPLETION DRAWINGS & DOCUMENTS:

On completion of works, prior to getting completion certificate contractor shall prepare as built drawings in association and to satisfaction of consultant/Engineer giving all particulars.

1. Exact dimensions and clearances.
2. Fuse & switchgear ratings, ratings of equipments.
3. Cable sizes, cable schedule.
4. Earthing details.

Contractor shall submit the as-built drawing in 3 sets of prints and one set of reproducible to the client.

Contractor shall also submit detail drawings, instruction & maintenance manuals & test certificates for all bought out items. Test certificates of all tests carried out certificates at site shall also form part of this.

One set of all handing over documents shall be given to Engineer / Consultant.

D.14 DEFECT LIABILITY PERIOD:

Any defects, faults, deterioration in performance of the material and installations which may appear; during the "Defect Liability Period" of twelve months or any period as agreed by both parties from virtual completion of contract shall be amended/made good by the contractor at his own cost within a reasonable time. In case of default, owner may employ and pay other person to make good the defects and deduct the expenses from the dues payable to contractor on certification from engineer. The defect liability period unless otherwise specifically agreed shall be twelve months.

D.15 CONTRACTOR'S RESPONSIBILITY:

Contractor shall be responsible for injury to person animal or things, for all damages caused to property from operations or negligence of himself or his employees/sub-contractors. The contractor shall indemnify owner / Engineer and their employees and hold them harmless in respect of any and all expenses arising from such injury or damage and claims arising there of.

The damages to the property, plant and equipment caused due to such negligence shall be made good by the contractor at his own cost to the satisfaction of the owner / engineer within a specific time. The owner in concurrence with engineer shall be entitled to deduct amount of damage, compensation for loss arising from such damages / injuries / accidents in case of default. All laws related to PF, ESI, Medical insurance etc. shall be adhered to by the contractor. No child labour shall be employed by contractor.

D.16 INSURANCE & INDEMNITY:

D16.1 LABOUR LAWS:

Contractor shall have valid PF, ESI registration. All laws related to Labour, PF, ESI, Medical insurance etc, shall be adhered to by contractor. No child Labour shall be employed by contractor.

D16.2 GENERAL INSURANCE:

Contractor shall provide necessary insurance cover for all equipment and material in his scope till the system is handed over. Necessary insurance cover shall also be provided for manpower employed on site. Contractor shall identify owner / consultant and their representative and their employees and hold them harmless in case of any damages, injuries /accident and any claims arising out of them.

D.17 DATE OF COMMENCEMENT:

The date of commencement of work shall be accounted from the 3rd day after receipt of LOI by contractor unless otherwise stated specifically. After submission of agreement within 15 days, final work order will be issued.

D.18 LIQUIDATED DAMAGES:

The contractor shall pay liquidated damages of 0.5% of the balance work value per week subject to a maximum of 5% of value of work order in case of delays beyond the accepted completion period for reasons solely attributed to him.

D.19 TIME EXTENTION:

If in the opinion of owner/consultant the work is delayed (a) by force mejoure, (b) by reasons beyond control of contract, extension of time for carrying out the works can be sanctioned by owner/consultant on written request from contractor with due reasoning / supporting.

Force Mejoure shall mean & include compliance with statutory laws & regulation, Government order or change in orders, war & war like conditions acts of civil & military authorities, fires, floods, earthquakes and other acts of God, sabotage, revolt, Strikes & lockout of more than 2 weeks. How ever contractor & owner in such case should devise means of expediting the progress for performance as per contract.

D.20 TERMINATION OF CONTRACT:

Owner shall be entitled to terminate the contract in case contractor fails to fulfill one or more conditions of contract, or if the consultant certify to the owner in writing that the contractor;

a) Has abandoned the work.
b) Has failed to commence the work or has without any lawful excuse under contract conditions suspended work progress for more than one week or,
c) Has failed to proceed with the works and failed to make such due progress for timely completion of works or.
d) Has failed persistently to observe and perform works as per specifications and contract conditions or.
e) Has employed services of sub-contractors/sub-let all or part of works without prior permission of owner/engineer.

Then and in any of the above said cases owner may, not with standing any previous waiver, can terminate the contract after giving seven days notice in writing to the contractor without affecting powers of engineer and obligation and liabilities of the contractor.

If the payment of the amount payable by the owner under certificate of consultant is unpaid for thirty days or if owner interferes or obstructs issue of such certificate or if the works of owner/engineer or by any injunction or other orders by court of law, then and in any of the said cases contractor shall be at liberty to terminate the contract by giving seven days notice to the owner and shall be entitled to recover payment from owner on account of work executed or any loss sustained. Owner shall also be entitled to recover any losses due to default of contractor, incurred by him for carrying out / completing works as certified by consultant.

D.21 CERTIFICATION AND PAYMENTS:

The contractor shall be paid by owner from time to time under interim measurements certified by engineer/consultant on account of work executed in accordance with contract & to satisfaction of Engineer with certain retention till the work is completely executed. On virtual completion of the works, contractor shall be paid final installment retaining certain fixed percentage over a period known as "Defect Liability Period" as security. The final balance shall be payable to the contractor after expiry of "Defect Liability Period" and after such certificate is issued by engineer / consultant. Engineer / Consultant shall have power to withhold payment against work or part thereof not carried out to his satisfaction.

D.22 The decisions, opinion, direction, certificates with respect to clauses 9,13,17,18 here of shall be final conclusive and binding on the parties without appeal. All other decisions, opinion, direction certificates etc. shall be subject to right of arbitration.

D.23 ARBITRATION:

All the disputes of any kind in connection with contract shall be referred to engineer / consultant and settled in writing by him. If any party is dissatisfied with such decision except for clauses indicated in clause 22they are entitled to bring such disputes for arbitration.

Both parties shall appoint Arbitrator/s and his/their decision shall be final and binding on both parties.

Consultant/Engineer if necessary will represent the client in case of arbitration.

D.24 TECHNICAL SCRUTINY OF FINAL BILL:

The owner shall have right to get works and bills technically scrutinized at the time of payment of final bill. Owner shall be entitled to recover any money found to be over paid or over certified during such scrutiny.

D.25 CO-ORDINATION:

Contractor or his authorised representative shall be responsible for co-ordination with all other agencies working at site for smooth functioning and timely completion of works.

The Contractor shall arrange his work program to suit the building progress and priorities given by Owner/Consultancy.

Site meeting: Qualified/responsible representative shall attend necessary site meeting from contractor's side to take site instruction/decision in view of trouble shooting and progress review of works. Consultant/his representative shall attend the meetings as required.

D.26 PRICES:

The prices quoted in the schedule of works shall remain firm during the period of contract. Bidder shall be clearly state taxes, statutory duties and levies which he is required to pay. The rates quoted by Bidder for the items in schedule of rates shall inclusive of all taxes, duties etc. No separate amounts shall be payable to contractor on this account. Any upward statutory duty / tax variation shall be payable on production of proof and necessary reduction shall be effected for downward variation.

D.27 EXTRA ITEMS:

Contractor may be required to carry out extra items due to site requirements or changes. All such items shall be carried out by contractor after written consent from client. Contractor shall submit a rate analysis of these items based on market rates. A margin of 10% shall be allowed over and above the expenses incurred. Escalation shall not be allowed on the extra items.

D.28 SECURITY DEPOSIT:

Successful bidder shall have to pay an amount of 5% of the order value at the time of starting the work in terms of bank guarantee of equal amounts in favor of the owner for entire period of contract up to virtual completion period.

D.29 PERFORMANCE GUARANTEES:

The contractor shall guarantee performance of plant and equipment and workmanship against fault for a period of 12 (twelve) months called as "Defect Liability Period".
A certain percentage of work value 5% or as per payment terms shall be retained for the entire "Defect Liability Period" as security. Such retention can be released on furnishing a performance bond in form of bank guarantee of equal amounts for 12 month in favour of owner.

D.30 PAYMENT TERMS:

Contractor shall be paid 10% interest free mobilization advance after detailed bar chart is approved. Advance shall be paid against BG from acceptable bank.
60% of supply value against supply of material at site.
15% of supply value & 75% of labour value on installation
10% against testing and commissioning
5% Retention for period of 12 months
Balace 5% can be released against performance B.G. of equal amount of 12 months from the date of virtual completion certificate. Minimum amount of the bills shall be 10% of the order value.

CONTRACTOR

SECTION-D-II
SPECIAL CONDITIONS OF CONTRACT

D.1. STORAGE AND OFFICE SHED:

The contractor has to prepare his own store and office shed. The owner at site will provide the suitable space. The contractor will be responsible for safety of his materials stored on site. The contractor shall make his own arrangements for housing of his staff. The CONTRACTOR will not be given space to put up labour camps. CONTRACTOR shall make his own arrangement outside the premises without causing any hindrances to the OWNER. The cost of putting up the labour camps will be borne by the CONTRACTOR. After completion of work the shed shall be dismantled / removed by the contractor at his own cost.

D.2. ELECTRICITY, WATER AND TELEPHONE :

Indian Institute of Tropical Meteorology, Pune. Will not provide any of these facilities on chargeable basis at any place. Contractor shall make his own arrangements for any of the above facility. Unavailability of power & water cannot be deemed as reasons for delay.

D.3. MAINTENANCE OF SITE:

Contractor should keep the site, building office clean of debris wood pieces etc. during the period of contract & work will not be considered as complete till last particle of debris is disposed off to the satisfaction of the Engineer / owner.

D.4. SECURITY RULES:

The contractor shall strictly follow all security rules of M/S. INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE particularly bearing upon the inward & outward movements of his trucks/vehicle, people and equipment and shall also execute the work in such a manner so as to cause the minimum disturbance to the working of the owner.

D.5. DISPLAY OF DRAWINGS AT SITE:

The drawings maintained on the site shall be carefully displayed on boards of appropriate size. They shall be protected from rain, ants or other insects. The contractor shall provide at his own cost a display board for showing the details of work as directed and instructed by the Engineer.

D.6. EXAMINATION OF DRAWINGS:

Contractor shall examine the relevant drawings, specifications of work which shall be available at the architect's / consultant's office. No claims shall be entertained for the assumptions made by tenderer, if any. Contractor shall not write any comments / conditions / figures or change the tender by writing on the same in any manner. The tender drawings are meant for guidance only.

D.7 BAR-CHART:

Contractor shall prepare bar chart and finalize the same in consultation with project consultants before mobilization advance is paid to the contractor. This bar chart will also indicate inputs from Project Consultants & Clients. Links with other works. Following items shall be included;

a. Time required for each activity and their relationship.
b. Quantities in each activity.
c. Resource planning such as equipment and tools and manpower to be employed for each activity.
d. Cost of each activity.
e. Schedule of drawings required by him for completing the project as per chart.

Bar charts shall be done in M.S. Project or equivalent software and shall be available on CD's. The Bar chart shall be reviewed in every site meeting.

CONTRACTOR will be bound to provide the minimum resources shown in the bar chart. In case it is found at any interim stage that the PROGRESS OF WORK is slow and completion time of any activity is likely to extend beyond the target dates the CONTRACTOR will have to increase the planned resources.

Provision of time will be made by the CONTRACTOR for other agencies to carry out their part of the work and such lapse of time will be considered by the CONTRACTOR in the planning schedule. No compensation will be paid for idle labour due to work of other contractors.

D.8. REQUIREMENT OF DRAWINGS :

Contractor shall indicate the dates on which drawings are required by him before starting the work. Contractor shall give a notice of 15 days to architect / consultant about the requirement of the drawing / decisions required by him to complete the project as per schedule. It is understood that all the drawings are not required at the beginning of the project for completing the project within time.

D.9. WORK-PROGRESS :

Contractor shall submit progress report for every site meeting with updated bar-chart marking up to date. Progress up to previous day compared to planned bar chart and % comparison (lag/lead) with approved bar chart.

Monthly progress reports shall accompany 'selective photographs' of works carried out at site and showing the progress (postcard size.)

D.10 CIVIL - WORK :

Contractor & his site engineers will be responsible for monitoring correctness civil works required for electrical works being executed by civil contractor. Necessary follow up for such work will also be done in view of expediting the works.

D.11 SHOP-DRAWING:

Contactor shall prepare his own shop drawing for substation layout as required by Statutory Agencies for submission & approval. Calculation if required for such application shall also be provided. Soft copies of consultant's drawings can be provided.

D.12 PAINT & FLOORING:

Contractor should take care of paint & flooring, in case of dame to paint or floor, contractor shall reimburse the amount for required specification need to be done.

Work sequence should be as detailed below.

a) Conduiting.

b) Painting.
c) Fixture installation.

D.13. APPROVAL OF DRAWINGS:

As per scope of work contractor shall submit 3 sets of shop / working drawings for approval with softcopy before commencement of work, which includes

a) Shop drawing for M.V Panels (as per the scope of work),
b) Conduit layout & switch board schedule,
c) Detailed cable tray route layout with support details
d) Cable schedule.
e) Standard installation details.

Contractor's senior engineer / representative shall be made available at consultant's office for any discussion on above as required.

D.14 TENDER DRAWING:

The tender drawings are meant for guidance only & may not represent exact size & shape of the building. However they will give a fair idea of the work involved. Complete set of tender drawings is given along with the tender for the purpose of study and quoting,

Contractor shall examine the tender drawings (which are issued along with the tender documents) & specifications of work. No claim shall be entertained for the assumption made by the CONTRACTOR, IF ANY CONTRACTOR, shall not write any comments / conditions / figures on the tender.

In case price of item quoted is lump sum, the battery limit of the work will be complete work as per drawing and no extra payment will be entertained for the work shown in tender drawing.

D.15 PRECEDENCE ORDER:

1. Articles of agreement of IIA
2. Drawings
3. Bill of Quantities
4. Special conditions of contract
5. General specification
6. General condition of contract

D.16 VARIATION IN THE CONTRACT SUM:

Rates of contractor shall be valid for 25% increase or decrease of value of the contract. CONTRACTOR shall not refuse to carry out any work at the rates mentioned in the tender for the reason of change in the quantity of any item.

D.17 DRAWINGS & DOCUMENTS:

The contractor shall, upon receipt of drawings and documents, study and examine them thoroughly and bring to the notice of the Architect / Consultant any discrepancy found therein before commencement of work. Failure to do so will be at the risk & responsibility of the contractor and any additional expenses incurred will be bared by the contractor.

D.18 INSURANCE:

Contractor shall insure all the equipment and work in his scope including necessary transit insurance.

D.19 QUANTITIES:

Contractor shall, based on shop drawings check the quantities and bring in required quantities after establishing the same.

Abnormal increase or decrease of any quantities compared to BOQ shall be brought to notice of consultant for verification and shall be ordered after verification.
Balance material will not be taken over by client unless mutually agreed at the time of order finalization or acceptance of order and recorded in the discussion.

SECTION – E

SAFETY REGULATIONS

E.1 Readily accessible **First Aid Kit** including adequate sterilized cotton and dressing shall be provided on site.

E.2 Any injured person shall be taken to nearest public hospital without delay.

E.3 All workmen working at heights shall be provided with **safety belts**.

E.4 Portable ladders shall be of heights less than 8 meters. In case of ladders above 8 meters additional man shall be provided for holding the ladders.

E.5 Workers engaged in welding and related works shall be provided with protective eye shields and gloves.

E.6 The excavations, trenches etc. shall be provided with necessary **signals, barricades, obstacles** etc.

E.7 All the electrical connections taken for construction purpose shall have earthings wires provided for equipment earthings.

E.8 **Open/temporary jointing of the cables** shall be avoided and all connections shall be taken through proper sockets & plug tops, Insulated joints and switches etc.

E.9 **Live wires** shall not be laid on ground / road or taken on surface without protective cover.

E.10 All water sumps shall be underground or otherwise shall have covers.

E.11 **All workmen and supervisors** shall be provided with **helmets / safety caps**. **All visitors /Engineers** shall also **wear helmets** when moving on sites.

E.12 Safety apparatus like hand gloves of appropriate class shall be used for all testing commissioning activities. Proper care through danger notice boards, personal vigil shall be taken during such operation to avoid Injury and damage.

E.13 **Protective switchgear** shall also be used for **all temporary works**.

SECTION –F

TECHNICAL SPECIFICATIONS

F.1 GENERAL:

F.1.1 The entire electrical installation shall be carried out in accordance with latest Indian Electricity Code and relevant IS Standards up to date. The work shall also comply with all statutory regulations of supply agencies, state inspection authorities and fire regulations.

F.1.2 Contractor shall be responsible for obtaining all necessary statutory approvals, clearances, sanctions, drawing approvals and getting actual connections.

F.1.3 Definition of terms pertaining to all technical requirements as per IEC / IS shall apply

F.1.4 Contractor shall submit all necessary drawings for scrutiny and approval by Engineer / Consultant prior to commencement of work. Contractor shall immediately bring out the difficulties faced in execution of works to the notice of Engineer / owner / consultant.

F.1.5 All material, equipment, fittings used in the installation shall be of approved quality conforming to relevant IS specifications.

F.1.6 On completion of works contractor shall carry out all necessary tests including but not limited to pressure test, insulation resistance test, continuity of conductors and earth resistance and functional tests along with commissioning checks to the satisfaction of Consultant / Engineer. Contractor shall employ services of specialist agency for testing of substation equipment, H. T. Cables & H. T. Joints, relays & for harmonic analysis.

F.1.7 Contractor shall furnish necessary test certificates as required by authorities and consultant.

F.1.8 List of standards relevant to the works is enclosed.

F.1.9 Installation of equipment shall include all necessary works and fixing accessories like hardware, clamps, round blocks supports boxes etc. required for completing installation satisfactorily.

F.1.10 Complete location/room wise technical and functional testing will be done for equipments & installation before handing over and a consolidated acceptance test report shall be prepared by contractor based on standard formats along with test certificates of bought out items, certificates of testing carried out at site. All equipment & installation test will be done jointly with representatives of client, consultant and signed jointly for the acceptance with remarks if any.

F.1.11 MODE OF MEASUREMENT

1.11.1 Excavations, refilling, reinstating, removing excess soil etc. in all types of strata except Hard rock for laying cables, pipes and earthing conductor will not be measured separately and will be included in respective items. Only excavation in hard rock will be measured separately.

1.11.2 Civil works like Brick / Concrete pedestals, foundations and coping for poles, earth pits and chambers, chasing for conduits and making good chases up to wall level etc. shall be included in respective items.

1.11.3 End termination of YY cables (Cu un-armored) & flexible cables will not be measured separately.

1.11.4 Cost of street light poles includes, cost of pole pit, pole foundation, coping, 2nos of 40mm dia. GI pipes for cables, cable loop box, wiring up to streetlight fittings from looping box with MCB and loop earthing of pole with 8 SWG GI wire painting etc.

1.11.5 Cost of control panels or Distribution boards includes, all base frames required for erection, foundation bolts or anchor fasteners, nut bolts, earth points etc. complete.

All structural steel supports over trench for panel, wall mounting brackets for DB's sockets, cable trays will be measured separately.

1.11.6 No extra charges will be paid towards testing to be done at site after installation as per the IS standards, specifications, manufacturers recommendations, statutory requirements etc.

F.2 SUBSTATION AND H.T. INSTALLATION:

The H.T. installation shall confirm to IEE regulation and regulation of local electricity supply authority and inspecting authority. The drawings provided are generally as per requirements and for guidance only. Exact dimensions, locations, clearances etc. shall be governed by statutory regulations. These specifications and drawings does not relieve contractor from the statutory regulations and sanction procedures.

F.2.1 OUTDOOR SUBSTATIONS:

F.2.1.1 STRUCTURE

The structure shall possess sufficient mechanical strength to withstand all atmospheric conditions. Bracing's supports with suitable sections shall be considered if felt necessary. The entire steel structure shall be painted with 2 coats of anticorrosive red oxide/zinc chromate primer and 2 coats of silver paint after proper scraping and cleaning of surface. The horizontal member shall be fixed by means of suitable clamps and hardware. Appropriate stay sets shall be provided wherever required. The appropriate concrete foundations based on the strata shall be provided for the structure. All parts of structure enclosed in foundation & coping shall be painted with bitumen paint.

F.2.1.2 EQUIPMENT:

1. The metering instruments shall be as per supply agencies requirements and are to be approved by the supply authority. The CT's shall be dual ratio as far as possible and shall be class 1.0 accuracy.

2. The outdoor Air break (GOD) switch / isolator shall be vertical mounted 3 insulators pole type with operating mechanism, down rod, handles confirming to IS 9921 and 9921 unless, specifically called for supply of Horizontal isolator with / without earth blades. All Horizontal isolators shall be center rotating double break type.
3. The operating mechanism shall be easy to operate during both make & break operations. Complete care shall be taken during assembly & installation at site for proper contacts of moving & fixed contacts in 'ON' condition.
4. All conducting metal parts shall be non-corrosive.

5. The Dropout fuses shall be vertical mounted with appropriate insulators, base channel, fiberglass fuse carrier expulsion type unit with fuse links, terminal connectors confirming to IS 9385. Each DO fuse set shall be supplied with 3 sets of fuse links of appropriate rating.

6. The lightening arrestors shall be appropriate voltage grade gapless type 9KA rating with brass hardware. The lightening arrestors shall be fixed with suitable clamps on the supply side with proper jumper connections on the top. Separate earth strip shall be run isolated from structure by SMC insulators to two distinct earth stations.

7. The inter connections shall be done with the suitable ACSR conductors/bare solid hard drawn copper conductor with alkthyne pipe/PVC sleeves, as protective cover. For specified substation copper tube bus bars can also be used.

8. The transformers with external bushings on HT side shall be plinth mounted and minimum clearance of bushings from ground level shall be 2.8 mtrs. For 11 KV & 3.8 mtrs. For voltage 22 KV & above.

9. All metering structures, and out door substations shall be provided with 2.4 mtr. Light chain link fencing with suitable gate.

10. Separate earthing stations shall be provided for
    a) HT Body earth
    b) LT Body earth
    c) Lightening arrestors
    d) Transformer Neutrals
    e) D. G. Set Neutrals
    f) Metering

11. All earth stations in substation except D.G. set Neutral shall be connected to each other by separate strip forming grid.

12. All bought out equipment shall be of approved makes and shall be as per specifications and data sheets for the respective equipment enclosed separately with these general specifications.

13. For protective relays in the substation, functional test, voltage injection test settings etc. shall be carried out through a specialist agency approved by owner & consultant. It will be advisable to get entire substation equipment tested through such agency.

14. Out door breakers when used shall be provided as per data sheets & specification separately provided in the tender document. The clearance of the lower most connection at these breaks shall be 2.8 meters for 11 KV and 3.8 meters for voltages 22 KV & above.

F.2.2 INDOOR SUBSTATIONS:

In case of indoor substations the statutory clearances shall be monitored not only in view of approval of drawings but also in view of safely and ease of operation.

All Indoor stations shall have appropriate & segregated trenches for H.T. & L.T. Cables.

F.2.2.1 EQUIPMENT:

1. Indoor metering equipment CT / PT units shall be as required by the supply agency with necessary supports structures.

2. Breakers shall be of appropriate capacities / ratings as specified in Breaker data sheet and shall be VCB / SF6 unless otherwise specified.

3. The indoor breakers shall be cubicle type breakers with relay and control panel built in with the breakers.

4. Transformers shall be with Boxes on H.T. & L.T. side and shall be mounted on plinth as specified. No specific vertical Clearances for joints / Boxes are necessary. Horizontal clearances as per IS standards IE Rules shall be maintained.

5. All other specifications about earthing, equipment as above shall be adhered to.

6. Proper ventilation shall be provided for all equipment rooms.

7. The equipment specifications and data sheets shall be provided separately.

8.Separate earthing stations shall be provided for

a. HT Body earth
b. LT Body earth
c. Lightening arrestors
d. Transformer Neutrals
e. D. G. Set Neutrals
f. Metering

9. All earth stations in substation except D.G. set Neutral shall be connected to each other by separate strip forming grid.

10. All bought out equipment shall be approved makes and shall be as per specifications and data sheets for the respective equipment enclosed separately with this general specifications.

11. For protective relays in the substation functional test, voltage injection test settings etc. shall be carried out through a specialist agency approved by owner & consultant. It will be advisable to get entire substation equipment tested through such agency.

F.3 M.V. PANELS & DISTRIBUTION BOARDS

F. 3.1 CONSTRUCTION:

The panels shall be free standing, floor mounting compartmentalized cubicle type panels with framed structure and bottom channel frame of suitable section. The frame structure shall be rolled/folded sheet section of 2.0 mm thick sheet. Partitions shall be 1.6mm thick. Doors and gland plates shall be 2.0 mm thick. The panel shall be dust and vermin proof with neoprene gasketing. All doors shall be provided with concealed hinges, necessary Earthing arrangement and shall be provided with bracings wherever required to avoid deformation. Easily openable door locks with common key shall be provided for all doors including alleys. Bolts should not be provided for fixing doors except for busbar chambers.

Following minimum clearances shall be adhered to while such designs.

1.	Between phases	:	35 mm
2.	Between phase & neutral	:	25 mm
3.	Between phase & earth	:	25 mm
4.	Between neutral & earth	:	25 mm

All installation materials used for supports shall be non-hygroscopic duly treated to withstand high humidity, tropical conditions and stresses due to temperature variations, and fault currents.

The panels shall be so designed to provide sufficient space for cable alleys for incoming and outgoing cables. Removable gland plates shall be provided at bottom or

as required & top covers of panel shall accommodate BUSDUCTS. All live parts shall be shrouded with insulating Board covers. Compartment sizes shall be adequate for easy maintenance. All terminations & joints shall be easily accessible. The operating heights of switchgear shall not be less than 400 mm and shall not exceed 1800 mm.

20% spare terminals shall be provided in both power, cable and control terminal blocks. The panel design and construction shall be suitable for extension on both sides.

Degree of protection unless otherwise specified shall be IP 52. Floor mounted panels will be provided with 75 mm channel frame with panel finish.

Adequate care shall be taken in panel design for heat dissipation.

F.3.2 CLEANING AND PAINTING:

The fabricated sections shall be thoroughly cleaned by 7-tank process, which include alkaline degreasing, cold water rinsing, acid pickling, water rinsing, phosphate and pacivation. Panels shall then be powder coated unless other wise specified including corrosion resistance treatment. No alternative treatment or part treatment other than 7-tank process is acceptable.

In case enamel painting is to be done corrosion resistance treatment shall be done under controlled conditions and then two coats of stoving enamel paint of approved shades shall be given. The paint / powder coating shade shall be RAL 7032 unless otherwise specified.

F.3.3 BUSBARS & INTERCONNECTIONS:

The bus bars unless otherwise specified shall be of high conductivity aluminum alloy of grade E 91 E as per IS 5082. The busbars shall be provided with suitable SMC bus bar support suitable for withstanding required fault levels. The bus bar shall also withstand above fault level without permanent deterioration for all main panels. The connections shall be securely done with adequate size of plated hardware, plane and spring washer sets. The inter connections shall be made with solid busbars as far as possible. Busbars shall be provided with colour coded Heat shrinkable PVC sleeves. Arrangement of Busbars and busbar alley shall be such that busbar can be easily maintained without disturbing the assembly.

In case interconnections are done with wires, all wires shall be 1100V grade and shall be terminated with suitable lugs. Suitable heavy-duty terminals shall be provided for all such incoming & outgoing connections. Al earthing bus bar generally 25x6 mm strip minimum and shall be provided at appropriate location through out length of panel extending out for external earth connection. All non-live metal parts shall be properly earthed.

Busbar Design Parameter

a) Current Density: Aluminum 1.0 Amp/Sq.mm
Copper: 1.5 Amps/ Sq.mm

b) Temperature rise Limit 85^0C

F.3.4 SWITCHGEAR:

The switchgear used in panels shall be pertaining to relevant IS standards and shall be from the approval list. The terminals shall be suitable for accepting Al busbars and Al cables of relevant sizes suiting the switchgear rating. The metal parts other than live contacts shall be treated against corrosion. All switches shall be with door interlocking provision. All switchgear shall be type tested for sequence 2 & sequence 3.

F.3.4.1 Air Circuit Breakers:

All ACB's unless other wise specified shall be draw out type. All ACB with same ratings / frame sizes shall be interred changeable. All ACB's unless otherwise specified shall be provided with built in microprocessor based EF / OC with variable settings and fault indications shunt release, Auxiliary contact block, manual operating handle, Positive position indication on facial. All incomer ACB's on Main panel unless otherwise specified shall be 4 poles & All Breaker's in Main Panel Should be Provided with Microprocessor Based EF/OC Relay, with LSIG protection. All other panel ACB's should be with microprocessor based protection release. Basic Display and communication provision should be possible to add on and shall be provided only if specifically asked for. All CB's shall have position micro switches, ready to close contact provision as standard & as per attached chart.

F.3.4.2 MCCB:

All MCCB's shall be universal mounting line load interchangeable and with door interlock & handle. All MCCB's shall be provided with variable setting Thermo magnetic release. Door handles will be provided with pod locking arrangement. All MCCB's on main panel shall be provided with shunt release and Auxiliary contact block. All MCCB's shall be provided with suitable spreader links on both sided for bus bar and cable connections.

All MCCB's used, as incomers to PDB's and PSDB's shall be provided with shunt release & Anx contact Block. MCCB's should have on, off, and trip position.

F.3.4.3 SWITCH DISCONNECTOR FUSES:

These will be used only if specified and shall be with Door inter lock, handle with ped locking arrangement. Phase separators shall be provided on both sides. Clear OFF / ON position indicators shall be provide on handle. Fuses used shall be HRC only and shall be with 80 KA breaking capacity. HRC fuses shall have indication for healthy / blown fuse.

F.3.4.4 MCB's:

All MCB's used in panels & DB's shall be din rail mounted, 10 KA Breaking capacity, 'C' characteristic unless others wise specified. Terminals of MCB's shall be suitable for connecting proper size Cu / Al cables with lugs. Multiple MCB's shall be provided with common fixed operating handle.

F.3.4.5 PROTECTION

Specific External protection relays shall be provided if required by statutory requirements, approvals or functional requirements. Necessary CT's /PT's etc shall also be included in the scope

F.3.4.6 MEASURING INSTRUMENTS AND INSTRUMENT TRANSFORMER:

All meters on panels unless other wise specified shall be digital meters either individual or combined with minimum class 1 accuracy and will be calibrated. These will be flush mounting type. Direct reading instruments shall be in confirmation with IS 1248 and of accuracy class 1.0. All analog meters wherever used shall be flushed mounting type with minimum 96 x 96mm size and in dust proof enclosures. The meters shall have white dials with black scales. All meters shall have sealing

arrangement and zero adjustment screw from outside. Voltmeters and ammeters shall be moving iron type with suitable selector switches and protective MCB's for potential circuits.

The current transformers shall be single pole wire wound resin cast accuracy class 1.0 for metering and 5p for protection. Separate CT's shall be provided for metering and protection. The polarities shall be prominently marked CT circuits shall be wired with 2.5 sq. mm. multistoried copper wires. CT's shall not be kept open and terminal-shorting arrangement shall be provided.

PT's wherever specified shall be of appropriate voltage class and 100 VA Burden.

All Main & DG incomers shall be provided with Digital LOAD MANAGERS unless otherwise specified instead of regular meters. LOAD MANAGERS shall provide minimum voltages, currents, KW, KVA, KWH, KVA Rh, frequency, cos Ø % harmonics, Maximum demands KVA reading with scrolling. These will be with RS 485 port for down loading data. LOAD MANAGER should be able to store last 8 days data, which can be downloaded. Necessary software for Load Manager shall be provided.

F.3.4.7 INDICATION AND CONTROL:

The control switches shall be rotary type with suitable isolation transformer provided for control supply. Control supply bus shall be provided wherever necessary. Indicating lamps shall be LED Type only with translucent lamp covers. Push buttons shall be momentary contact type with suitable colour code and shall be fitted with integral marker plate. The control wiring shall be with 1.5 sq.mm. multistrand 1100V gr copper wire except CT Circuit which shall be with 2.5 sq. mm. wires. Identification ferules and colour coding shall be used for all wire. MCB's for protection shall be provided wherever required. The control wires shall be bunched and dressed properly and shall not be left hanging. Control MCB's shall be provided in all potential circuits.

F.3.4.8 DISTRIBUTION BOARDS :

The distribution boards shall generally be as per panel specifications above. All DB's shall be MCB type suitable for concealed/surface installation. DB's shall be ready-made vertical type with hinged secured front covers, with double door arrangement top and bottom knockouts, earthing studs & circuit marking provisions. Top & bottom plates shall be removable as far as possible.

F.3.4.9 INSPECTION AND TESTING :

Inspection and shop testing for all panels as per IS Standard shall be offered to consultant/owner's representatives. The tests to be done shall include:

a) Physical checking.
b) Megger/insulation resistance, (1000V Megger).
c) H.V. test.
d) Functional tests including control and interlock functions, Automatic operation simulation etc.
e) Any such tests required by local authorities, Electricity Boards and for complying statutory requirements.

F.3.4.10 APFC Panel & Relay :

APFC panel shall be so designed to accommodate all components including capacitors. Adequate ventilation provision shall be made in panel design. Forced ventilation shall be considered for capacitor compartment if necessary.

RELAY : Relay forms important component of APFC system. Relay shall be microprocessor based, self-diagnostic with capacity to function properly at low loads up to 10% of the rated loads and should be reliable & fail safe.

Relay shall have digital power factor indicator and facility to set target P.F. Relay should be able to use and select different ratings of capacitors steps connected to achieve target power factor. Relay should be able to identify & isolate faulty capacitor feeder.

Relay shall have clear indication on its function for

a) Control Power availability
b) Lag / Lead power factor.
c) No of ways utilized at any particular moment.

Relay shall also have facility for manual operation and Auto / Manual delay function for each way.

F.3.4.11 CAPACITOR :

Capacitor shall be 3 Phase Delta connected capacitor banks of appropriate ratings either APP or Mix-dielectric type only. Individual capacitor shall have protection and shall have provision for proper connector box & connector for connecting external cable.

Capacitors should be suitable to any kind of loads and load variation & should be able to sustain high harmonic distortion.

Capacitors shall be of low loss design with watt loss less than 0.5 W / KVAR and guarantee capacitance loss of less than 10% over life period. Inrush current limiting arrangement shall be provided to limit inrush current to 1.7 line current (In).

Capacitors when provided with series reactors to provide filters shall be of appropriate higher withstand voltage depending on % reactance. Also the KVAR indicated in the panel SLD shall be effective KVAR at 415 volts.

F.4 CABLES & CABLE LAYING

F.4.1 H.T. CABLES:

1. The H.T. cables shall be XLPE insulated of appropriate voltage class sheathed, armored multistoried aluminum conductor manufactured in accordance with IS 7098 part II
2. The cables shall be supplied with non-returnable wooden drums in appropriate lengths and shall be free from twists and surface damages.
3. The ends of the cables shall be properly sealed and secured so as to avoid water seepage during transit and storage.
4. The cables shall be laid at a depth of 1000mm minimum and shall have 75mm sand bedding; sand cushion brick box and top RCC protective tile marked "H.T. Cable" of size 600 x 225 mm.
5. Cables shall be laid with the help of jacks and rollers to avoid dragging and twisting. Sufficient loops shall be provided at ends and in center. Bending radius of at least 15D shall be provided.

6. Cables shall be supported with protective pipes and clamps on vertical runs and shall be laid through appropriate RCC Hume pipes for road and gutter crossings.
7. Heat shrinkable jointing kits of reputed makes shall be used for indoor/outdoor end terminations. Heat shrinkable boots shall be provided for bushing connections.
8. Routine tests inspection as per IS standard shall be offered for clients representative for cables if specifically asked for and shop inspection shall be done for cable lengths 250 mtrs. & above for all H.T. Cables.
9. HT Cable needs to be tasted for HIGH VOLTAGE TEST & MEGGER after Completion of joint or before charging.

F.4.2 L. T. CABLES:

All power and distribution cables shall be 1100V grade, PVC / XLPE insulated and sheathed, armoured, multistrand aluminium conductor cables unless otherwise specified. All control cables shall be 1100V grade PVC insulated and sheathed armoured multi-strand copper conductor cables unless otherwise specified. The cables shall confirm to IS 1554-1988 & IS 7098:1988 with up to date amendments. Type test certificates of the cables from manufacturers for the particular drums shall be provided.

Shop inspection shall be offered for routine tests if specifically asked for.

F.4.3 LAYING:

1. The cables shall be thoroughly inspected for transit damage and irregularity in sheath etc.
2. Sufficient manpower with necessary equipment like jacks, rollers shall be provided for unwinding and laying the cables and dragging and twisting shall be avoided. Proper unwinding methods shall be used to avoid twists & cable should be meggered before starting laying.
3. Cables shall be laid at a depth of at least 750mm from ground level with 50mm sand bedding, brick box with cushion for protection. Bending radius provision of at least 12 D shall be kept while laying. The trenches shall be filled and reinstated layer by layer leaving a crown on top.
4. H.T. and L.T. cables shall not be laid in same trench. When more than one cable is laid in same trench a gap of at least 150mm shall be kept between the cables.
5. Cables laid on walls; trenches shall be supported at every 600mm for vertical run and every 450mm for horizontal run. Suitable clamps shall be provided for fixing and support. Vertical runs near ground level shall be protected by GI Pipes of suitable size up to the height of at least 1200 mm.
6. The length of the cables in schedule will be approximate and actual site measurements shall be taken by contractor prior to cutting any cable.
7. Cable identification tags shall be provided at appropriate location throughout length of cables and at both ends.

F.4.4 JOINTING:

Jointing or end termination of cables shall be done by skilled person only. Straight through joints shall be avoided as far as possible. Heavy-duty compression type brass glands shall be used for all connections. Crimping type lugs with suitable brass/Chrome Plated hardware shall be provided for connections.

The cables on panel side are connected to bus bars Cu or Al, Care should be taken to avoid heating & corrosion at the joints.

All LT cable joints in outdoor and humid atmospheres shall be done with double compression glands only / if done by Single compression Gland should be accommodated by PVC HOOD Of Appropriate size.

F.4.5 TESTING:

Cables shall be meggered as soon as they are brought to site. Insulation resistance shall also be tested.

a) After cutting.
b) After laying and preparing the joint.

Following test shall be taken after completing the installation.

a) Cable continuity.
b) Earth continuity.
c) Insulation resistance.

1000V megger shall be used for testing 3 phase 415 Volt systems.
All HT cables shall be pressure tested after making the end joints at site. Insulation resistance tests shall be done by 5000V megger for all H.T. Cables.

F.4.6 CABLE ROUTE MARKER

Cable route marker shall oval shaped cast iron of minimum 150 mm length. The voltage levels shall be specifically marked on cable route markers. The cable route marker shall have 20 mm GI pipe or 20 x 20 x 3 mm MS angle support of suitable length grouted in 150 x 150 x 150 mm 1:3:6 concrete block buried in ground.

F.5 POINT WIRING

F.5.1 CONDUITS; ACCESSORIES & JOINTS:

All conduits unless otherwise specified shall be hot dip galvanized ERW steel conduits 16SWG up to 25mm dia and 14SWG above 25mm dia size. All conduit accessories shall be screwed type and conduits shall be joined by means of threaded couplings only. Check nuts shall be provided at all joints for tightening and sealing. Ends of conduits shall be free from burs sharp edges. All threaded portions shall be cleaned of any oil and shall be coated with plastic adhesive. All M.S conduits and accessories if used shall be painted with 2 coats of Red Oxide before installation and accessible parts of conducting after installation shall be painted with enamel paint to match the wall paint. Capacity of conduits is separately given. In case of rigid PVC conduits, the conduits shall be at least 2.0mm thick. The accessories shall be similar quality. The joints shall be made using special adhesives used for pressure pipe joints.

F.5.2 SURFACE CONDUITING:

The surface conduits shall be fixed with help of 20 SWG saddles on spacers at every 600mm for vertical run and every 450 mm for horizontal run. The runs shall be straight with pull boxes and inspection type bends as required. Contractors are required to provide suitable sleeves for structural member crossing at the time of casting. No elbows shall be allowed.

In case of false ceilings the conduits shall run on walls/trusses/slabs above false ceiling level as far as possible. The connections between such runs and fixtures shall be made with flexible conduits.

F.5.3 CONCEALED CONDUITING:

The concealed conduit work shall be carried out along with construction of walls prior to plaster. The work covers chasing walls with wall cutters only if necessary fixing the conduits, boxes, and accessories, redoing the damaged surface using chicken mesh. All horizontal conduit runs shall be straight at wall point light level to necessary junction/pull boxes and then straight vertical drop to switch box if necessary.

The conduits shall be laid such that they are little below the brick level to avoid cracks. Elbow shall not be used and bends shall be avoided as far as possible using offsets. Pull boxes shall be provided at suitable locations. All necessary sleeves shall be provided in beams, columns, prior to casting. Deep junction boxes only shall be used in slabs.

The pull and junction boxes shall not be clustered at one place and shall be so arranged that they should not be easily seen from heavy movement areas. All cases shall be taken to secure joints and boxes in place. All vertical runs shall be sealed at top, while masonry civil works going on. Conduit with 25mm dia. minimum shall be used be used for all concealed work.

Generally in areas with false ceiling conduits will not be concealed in slab but will be concealed bellow false ceiling area. Conduits above false ceiling in such cases shall run with proper supports / suspenders. Conduits shall not be rested on false ceiling grid in any case.

F.5.4 SWITCH BOARDS:

The switchboards shall be readymade modular type metal boxes of approved makes with all sides except top. Top plate fixing arrangement shall be provided at all corners with tapped holes. At least 1 No. earth stud shall be provided. Switchboard shall be at-least 50mm deep. M.S. Switch board shall be painted with 2coats of Red Oxide primer from inside and outside if not plated or galvanized. In case of surface mounted boards switchboards shall be powder coated with necessary treatment. The switch plate shall be 2mm thick while phenol-bonded sheet unless specified and shall be fixed with chrome-plated screws with cap washers. For modular switch range switch boxes shall be of same make. Metal boxes shall be used for concealed wiring where as ABS plastic / Polyurethane boxes shall be used for surface mounting. Suitable readymade boxes & plates only shall be used.

F.5.5 SWITCHES & SOCKETS:

All 5/15 A switches shall be modular/fancy type 240 V grade of approved colour and of same shade throughout. 5A Sockets shall be 3pin & 15AMP Sockets shall be 5 pin (Universal).

All switches shall be provided on phase wires only. For power points more than 20AMP capacity 20/30AMP flush type DP Switches shall be provided, unless other wise specified.

All multifunction sockets shall be universal multifunction.

F.5.6 WIRES & WIRING INSTALLATION:

All wiring shall be carried out with non PVC insulated ZHLS 1100V grade multistrand copper conductor wires of specified sizes. The conduits shall be ventilated and drained before drawing the wires. The circuit wires shall be laid in looped formation with suitable termination arrangement in junction boxes. T joints shall be used. No

joints shall be allowed in drawn lengths. Crimping type lugs shall be used for switch interconnections. Colour codes shall be followed. Separate earth wire of same class and suitable size shall be drawn along with other wires. Mains and sub-mains shall be drawn in separate conduit of adequate capacities with separate earth wires. All circuit wires shall be meggered for continuity and insulation resistance.

F.5.7 WIRING CLASSIFICATION:

General wiring requirement for points unless otherwise specified in BOQ / Drawing shall be as listed below:

Lighting Sub mains	2 x 2.5 + 1 x 1.5 sq. mm wires
Light / Fan / 5A / Ex Fan Pts.	2 x 1.5 + 1 x 1.5 sq. mm wires
Call Bell.	
15A Point	2 x 2.5 + 1 x 1.5 sq. mm wires
As above but Looped	2 x 4.0 + 1 x 2.5 sq. mm up to1st Point. 2 x 2. 5 + 1 x 1.5 sq. mm for Looped point.
1.5 Tonne window A/c & 20A Power Point	2 x 4.0 + 1 x 2.5 sq. mm wires
Window A/c 2.0 Tonne, Geyser & 30 AMP Pts.	2 x 6.0 + 1 x 2.5 sq. mm wires

F.5.8 CONDUIT CAPACITIES:

WIRE SIZE	1.5	2.5	4.0	6.0	10.0
CONDUIT SIZE (GI ERW)					
19/20 mm	7	4	3	----	----
25 mm	10	8	6	5	----
32 mm	18	14	12	8	4
40 mm	---	---	---	10	8

No. of wires in respective size of conduits shall not exceed capacities given.
Capacities as given for conduit runs with pull boxes at not more than 4.25 mtrs. and deflection not more than 15^0. 20% reduction shall be applied for conduit runs with deflection more than 15^0.

20% additional wires shall be allowed in the same size PVC conduits.

F.5.9 MOUNTING HEIGHTS (ABOVE FFL):

The general recommended heights for Points as given below:

a)	Light Points on Walls	2250 mm. (Center)
b)	Switch boards DB's	1200 mm. (Bottom)
c)	Socket outlets	1200 mm / 300 mm. (Bottom) / 800 mm at Work Station
d)	Telephone Sockets	300 mm. (Bottom) / 800 mm (bottom) at work stations
e)	Geyser outlets	1800 mm. (Bottom) / Switch on Nearest switch Board.
f)	Exhaust fan outlet	Switch at 1200 mm Socket near Ex fan,
g)	A/c Point	Below window seal/Near A/c Equipment.

Contractor shall refer specific point schedules and architects drawings for exact lights of points.

F.5.10 POINT DEFINITIONS:

1. All points shall include necessary circuit mains from distribution boards up to switch boards as specified, point wiring up to points locations from switchboard, switch, switch sockets & boxes with switch plates as specified, Connector, ceiling rose or brass light holder as required at point location.
   The circuit mains will not be separately measured in any case.
2. The points will not be distinguished as primary / secondary or short / long points. Generally 2 ceiling light points will be controlled by one switch in open areas and one light point will be controlled by individual switch in small rooms, cabins, toilets unless otherwise specified. Individual switches will control all wall light points.
3. Points controlled directly from the MCB DB by MCB shall be identified separately.
4. Call bell points shall include call bell either dual tone or musical.
5. A/C points unless otherwise specified shall be with 20 A Industrial sockets & SPMCB in readymade box near the A/C location on left side.
6. Fan point unless otherwise specified shall include electronic step control regulator with RF filter and fan box / fan fixing arrangement.
7. Any socket outlet separated by minimum 1.0 mtrs. From the nearest switchboard shall be considered independent socket outlet.
8. All power / A/C, Geyser points shall include wiring from the MCB DB's and no separate mains shall be measured for these points.
9. In case of multiple sockets on an independent socket board one socket point will be considered as independent points and other sockets as points on switchboard.

F. 6 EARTHING AND LIGHTENING PROTECTION:

F.6.1 GENERAL:

All non-live metal parts of the electrical system and equipment shall be earthed with suitable size of earth conductors. 2 distinct earthing shall be provided for all 3-phase equipment.

Earthing shall be in confirming with IS 3043 and Lightning protection shall be with IS 2309. Earth resistance of individual earth station shall not exceed 5 Ωand overall resistance shall be less than 1 Ωat all times. Earth resistance shall be taken with earth

meggers for all earth points. All earth points shall be located 2.0mtrs away from the building and there will be a minimum distance of 3.0 meters between 2 earth points. All earth stations shall be identified with number and using painted board.

F.6.2 EARTH STATION:

Pipe Electrode Earthing: 50 mm dia. Class B GI Pipe 3.0 mtrs long tapered at bottom and 12mm dia holes at 75mm c/c on all sides for bottom 2.0mtrs with top watering arrangement shall form earth electrode. The electrode has to be buried vertical in ground.

Plate Earthing: 600 x 600 x 6mm GI or 600 x 600 x 3mm Copper Plate with 50 mm dia. GI watering pipe with funnel at top. The construction shall be as per details given in the Latest edition of IS 3043.

Incase of rocky strata, Bore earthing stations with 150mm bore and 100mm class B GI pipe shall be done. Depth of bore earthing shall be 15-mtr minimum. Soil resistivity test shall be done for deciding depth if necessary.
Bentonite or earth powder slurry shall be put along with pipe in the bore.

F.6.3 MAINTENANCE FREE EARTHING

Generally pipe-in-pipe technology shall be used with inner pipe and outer pipe of different sizes and lengths as mentioned below. These pipe electrodes shall be hot dip galvanized to enhance life.
The annular space between these pipes & inner pipe shall be filled with adequate special crystalline compound material which shall resists the corrosion of inner pipe electrode. Area surrounding outer pipe shall be filled with back fill compound mixed with the soil. Depth & size of pit shall suit to the electrode length. Soil resistivity test shall be done if necessary for deciding depth.

	Pipe Electrode Details.			Galvonising (Micron)min.
Category	Inner pipe dia (min)	Outer pipe dia (min)	Length	
T39	40mm dia	80mm dia	3000 mm or as specified	80 – 100
T19	25mm dia	50mm dia	3000 mm or as specified	80 - 100

F.6.3 MASONRY CHAMBER:

Brick masonry chamber of size 450 x 450 x 450mm minimum (internal clear dimensions) with cast iron cover and frame with top finished at ground level shall be provided for watering and test link access.

F.6.4 ARTIFICIAL TREATMENT:

In case of rocky soil, hard murum soil resistance is very high. For getting proper earthing alternate layers of charcoal and salt are to be provided, for entire height of earth electrode with 300mm over all cover. Black cotton soil can be used for refilling the earth points in rocky strata.

F.6.5 EARTHING CONDUCTORS:

Earthing conductor size shall depend on the loads and defined fault conditions. The general guide lines are as listed below –

a)	Main H.T. & L.T. earth conductor, Transformer 2000 KVA and above.	:	75 x 10 MM GI strip.
	up to 1600 KVA	:	50 x 6 mm GI Strip
b)	D. G. set neutral 1500 KVA and above up to 1250 KVA	:	75 x 10 mm Cu Str 75 x 6 MM Cu. strip.
b)	Grid earth conductors	:	50 x 6 mm GI strip.
c)	Main Switch boards/Power Distribution boards	:	50 x 6 mm GI strip.
d)	Other switch board & Motors including & above 50 HP / 100 Amps up to 400 Amps	:	25 x 6 mm GI strip.
e)	Motors from 20HP to 50 HP	:	25 x 6 mm GI strip.
	Motors above 10 HP upto 20 HP Local PDB's	:	25 x 3 mm GI strip.
f)	Power Points 63A, LDB'S	:	8 SWG GI Wire / 10 SWG Cu. wire.
g)	Lightening conductors	:	25 x 3 mm GI strip.
h)	Motors below 10 HP & Power points upto 32A	:	10 SWG GI Wire / 12 SWG Cu Wire.
i)	Metering Kiosk	:	25 x 3 mm Cu strip
j)	UPS earthing	:	Cu. Flexible wire as per rating.

The earthing conductors shall be connected with either rewetted or bolted joints with at least 2 rivets/bolts. The joints shall be painted with bitumen paint.
Earthing strips for lightening protection shall be run on parapet walls of outer periphery of building and outer periphery of highest structure for horizontal runs and on unapproachable vertical walls up to disconnecting box fixed at 1.0 mtr height above ground level. Lightening conductor shall be connected to earth station directly and separate 25x6 mm strip from earth station is to be connected to grid earthing. The lightening conductor/s shall be fixed at appropriate highest location on the building / structure. Separate earth pit shall be provided for each lightening conductor.

F.7 TECHNICAL SPECIFICATIONS FOR HV METAL ENCLOSED SWITCHGEAR UPTO 33 KV

Deleted

F.8 LIGHTING FIXTURES

All lighting fixtures shall be specified in items with specific cat., ref., and number. Same or exact equivalent fixtures of other makes shall only be considered. Samples and catalogue references Nos. will have to be approved for alternate make. All fixtures shall be with high power factor, low harmonic, and warm start electronic

ballast of approved makes. Push on lamp holders VS or equivalent shall be provided for Flu. Lamps. Fluorescent lamps unless otherwise specified shall be triphospher colour 86 (cool day light). CFL lamps shall be "Bright white" unless other wise specified. Light colour shall be got approved when lamps are being used in office areas. MID / High bay fixtures and streetlights shall be integral and floodlights shall be non-integral unless other wise specified.
All housings shall be cast aluminums only. Sheet metal housing are not acceptable for outdoors luminaries. Fixtures construction shall be suitable for maintenance from bottom unless otherwise specified and shall be screw less press fit as far as possible. Lamp replacement shall be possible without removing fixtures. Tie arrangement shall be provided for covers, louvers etc. which need to be removed for lamp / ballast replacement. Provision shall be given for mounting the fixtures from ceiling (suspended)

Installation of fixtures shall be suitable type suspension arrangement using Ball & socket joints / conduits or chrome plated chains with adjustable I bolts at the bottom. The weight of fixtures shall not be transferred on false ceiling members unless special frame for fixing fixtures are provided in ceiling.
Plate room / plate store fixtures are same mirror optics but with yellow acrylic cover in place louvers.

9.0 TECHNICAL SPECIFICATION FOR BUS-DUCT FROM TRANSFORMER TO MAIN LT PANEL

General Specification:

A) Scope:

This specification covers the technical requirements of design, manufacture, supply and testing of metal enclosed Bus Duct.

B) Codes & Standards:

a) The design, manufacture and performance of Bus Duct shall comply with all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed.

b) Unless otherwise specified the equipment shall confirm to the standards, wherever applicable.

C) Ratings:

The Rating shall be as per data sheet.

a) General:

Vertical and horizontal feeder bus-bars and horizontal and vertical plug-in type bus-bars trunking shall be supplied and installed in accordance with the standard approved by the Employer and Local Authority. The bus-bars trunking shall be suitable for 415 volt, 3 phase, 4 wire (full neutral), 50 Hz., A.C. capable of carrying the rated current as indicated. It shall be a low impedance, totally enclosed for protection against mechanical damage and dust accumulation and of indoor slim design occupying a minimum of space. Perforated ventilating type is not acceptable. It shall be capable of mounting in any position without any derating. The complete installation shall be co-ordinated throughout the whole length of the trunking. Site

measurements shall be made by the Design and Build Contractor prior to fabrication of bus-bars trunkings.

b) Approval:

All materials and installation shall comply with relevant standards of IEC, Underwriter's Laboratory and the requirements of PRC.

c) Bus-Bars:

The bus bars shall be constructed of high strength 98% pure copper and suitably plated. Each bus-bar of rounded or rectangular section shall be insulated with high temperature polyester film and fibre glass tape throughout its length except and joints and contact surfaces. The temperature rise at any point in the bus- bar shall not exceed 55 degrees rise above the ambient temperature of 40 degrees when operated at the rated current.

d) Bus-Bar Joints:

The bus-bar section joint shall permit safe, practical testing of its tightness without de-energising the run. The joint shall be single bolt pressure design providing optimum electrical contact and mechanical strength. For tightening and inspection of the joint, access need only be made to one side of the trunking. Any section of the trunking can be removed without disturbing the adjacent trunkings.

e) Voltage Drop:

The line to line voltage drop in the feeder bus- bar trunking for concentrated load at the end and at the rated current shall not exceed 2.4 volt per 30m at unity power factor which produces maximum voltage drop in the bus-bar. The voltage drop for plug-in type bus bar shall not exceed 2.0 volts per 30m at 0.85 power factor.

f) Short Circuit Rating:

The short circuit rating of the feeder bus bar to and from the main switchboard shall be 43 kA RMS symmetrical. Short circuit rating for plug-in bus-bar trunking shall be 30 kA RMS symmetrical. Both the feeder and plug-in type bus bar shall be braced to withstand the maximum available short circuit current.

g) Bus-Bar Mounting:

Horizontal bus-bar shall be rigidly supported in accordance to manufacturer's recommendation with a maximum spacing of not more than 3 meters between supports whichever is less. Vertical bus-bar trunking shall be provided with supports for each floor as indicated on the drawings or as recommended by the manufacturer.

h) Fire Barriers:

Fire Department type approved fire barriers of minimum four hour rating shall be installed in trunking passing through floors and fire walls.

i) Expansion Joint:

Adequate flexible expansion joint shall be provided to all trunking to allow for expansion and contraction. For trunkings traversing through the podium floating floor slabs special flexible joints shall be used to allow for section of bus trunking to move due to floor settlement in relation to the fixed portion of the trunking.

j) Plug-In Openings:

For horizontal and vertical bus-bar trunking, there shall be a minimum of five tap-off openings every 3 metres. Unused tap-off openings shall be covered and locked with special locking device.

k) Plug-In Tap-Off Unit:

Where indicated, supply and install plug-in tap-off unit of the required rating suitable for the type of bus trunking offered.

The plug-in unit shall consist of moulded case circuit breaker mounted in a box with individual spring loaded jaws for each phase protruding from the back of the enclosure for plug-in into the bus trunking. Proper contact pressure is maintained by the connection.

The unit is mechanically interlocked with the bus trunking to prevent their installation or removal of the plug-in unit while the switch is in the 'ON' position so as to prevent accidental closing of the switch while the cover is in the open position.

The plug-in enclosure shall make positive contact with the earth-bar before the joint make contact with the bus-bar to ensure proper earthing of the bus trunking.

An operation handle is fixed on the outside of the enclosure for the switching operation. There shall be provision for padlocking the unit in the 'OFF' and 'ON' position. The enclosure shall also be capable of being sealed to prevent tampering of the unmetered supply.

l) Earth Bars:

An internal earth bar shall be integral with bus-bar trunkings and if internal earth-bars are not available, an earth tape shall be run throughout the length of the trunking.

m) Auxiliary Relay:

For vertical riser bus-bar, each tap-off unit shall be equipped with an auxiliary relay with 2 N/O and 2 N/C for signal and alarm indication and provision of shunt trip where indicated. All control and signal wiring shall be wired from each tap-off unit to a terminal box every 5 floor for connection to the monitoring device.

n) Stop-End:

All feeder and plug-in busbar trunkings shall be terminated in a stop-end unit, which shall be of same metal and finished as the busbar trunking casing. The unit shall contain an insulating support to enable the ends of the busbars to be properly supported and a copper earth continuity bar shall be connected between

SECTION G

APPROVED LIST OF MATERIAL

NOTE: CLIENT RESERVES RIGHT TO ASK FOR ANY OF THE FOLLOWING APPROVED MAKES TO BE USED DURING DISCUSSIONS.
CONTRACTOR SHALL INDICATE WHICH MAKE HAS BEEN CONSIDERED WHILE QUOTING THE RATES.

A. OUTDOOR HT WORK		
KIOSK METERING (CT / PT)	:	HUPHEN / EQUIV
T.V. METER / T.O.D. METER	:	ABB / L&T / SEB APPROVED.
B. SUBSTATION		
H.T. CABLES	:	GLOSTER / POLYCAB / UNIVERSAL/FINOLEX
H.T. CABLES JOINTS	:	RAYCHEM / M-SEAL / EKEBANA
BATTERY CHARGER CUM POWER PACK		HANSA/NANA BATTERIES
C. EARTHING & LA		
MAINTENANCE FREE EARTHING.	:	ASHLOK OR EQUIVALENT / JMV.
EARLY STREAMER LIGHTNING ARRESTOR	:	INDELEC / PHONIX / LPI
D. PANELS		
FABRICATED PANELS	:	ACCUSONIC / ASIAN POWER / PCE / ANTIA
APFC STANDARD	:	ACCUSONIC / ASIAN POWER / PCE / ANTIA
CAPACITORS	:	SIEMENS / L&T / SUBODHAN / VISA
ACB	:	SCHNEIDER / ABB / SIEMENS / L&T
MCCB	:	SCHNEIDER / ABB / SIEMENS / L&T
RCCB	:	LEGRAND / SCHNEIDER / L&T HAGER / INDO ASIAN
MCB	:	LEGRAND / SCHNEIDER / L&T HAGER / INDO ASIAN
MCB DB	:	LEGRAND / SCHNEIDER / L&T HAGER / INDO ASIAN
LOAD MANGER / DIGITAL METER	:	ENERCON / HPL / SECURE / ELECTREX
APFC RELAY	:	BELUK / L&T / SYCON / ELECTRONICOM
CONTACTOR	:	MG – TELE / SCHNEIDER / L&T / SIEMENS
FUSES	:	MG / SCHNEIDER / L&T / SIEMENS

PUSH BUTTONS	:	L&T / RASS / TEKNIK
PILOT LAMPS (INDICATIONS) LED	:	ALTOS / TEKNIK / RASS
PLC	:	ALLEN BRADLY / MESSUNG
ANNUNCIATOR	:	MINILEC / EQUIV
TERMINALS	:	WAGO / ELMEX / CONNECTWELL
RELAYS (PROTECTIONS)	:	ALSTHOM / AVKS SEGC / L&T / ABB.
AUXILIARY RELAY	:	OEN / EQUIV
INDUSTRIAL SOCKETS	:	BCH / HANSEL / MENNEKES / ELCON
MOTORS	:	KIRLOSKAR / CROMPTON / ABB
MOTOR STARTER	:	L&T / SIEMENS
TVSS	:	OBO BETTERMAN / PHOENIX / EMERSON
RTPFC WITH / WITHOUT REACTOR	:	L&T / CLARITAS / DATAR / VISA
METER (ANALOG)	:	RISHAB / L&T / AE / SECURE
SANDWICH BUSDUCT / BUSBAR	:	SCHNEIDER / L & T / C&S / SIEMENS.
UPS	:	DB POWER / MG-APC / ETON / SOCOMEC
CTS' / PT	:	AE / Kappa / C & S
E. CABLES		
AL. / CU. CONDUCTOR CABLES XLPE / PVC	:	FINOLEX / PRIMCAB / GLOSTER / RPG / POLYCAB /HAVELS
AL. / CU. CONDUCTOR UNARMOURED CABLES	:	FINOLEX / RR / LAPP
HEAVY DUTY BRASS CABLE GLAND	:	HMI / BRACO / JAINSON
TELEPHONE CABLE / WIRE	:	FINOLEX / RR
TV CABLE	:	FINOLEX / POLYCAB
DATA CABLES	:	SYSTEMAX / FINOLEX
CU. LUGS	:	DOWELL'S / ATLAS
AL. LUGS	:	DOWELL'S / ATLAS
CABLE TRAYS & ACCESSORIES	:	ELECON/VISHWACHAYA OR EQUIVALENT LOCAL
F. POINT WIRING & LIGHTING		
FR PVC CONDUIT	:	PRECISION / ASIAN / DIAMOND

GI CONDUIT	:	BEC / VEMCO
CASING CAPING	:	MODI / PRECISION / PRESTO PLAST
TRUNKING PVC	:	MK / LEGRAND
CU. WIRE (ZHLS)	:	RR / LAPP / L&T/ ECOTEK
SWITCH / SOCKET / DIMMER	:	MOSAIC / CLIPSAL / NORTHWEST
FAN REGULATOR	:	MOSAIC / CLIPSAL / NORTHWEST
CEILING ROSE, HOLDERS	:	MK / ANCHOR
CEILING FAN	:	CROMPTON / ORIENT
EX. FAN	:	ALMONARD / NUTECH / CIRACO / CROMPTON
LIGHTING FIXTURE (INTERNAL)	:	WIPRO / PHILIPS / TULIP / ERCO / PIERLITE
EMERGENCY LIGHT	:	PRESTO LIGHT / BPL OR EQUIVALENT.
G. EXTERNAL LIGHTING		
HIGH MAST	:	PHILIPS / BAJAJ
POLES	:	S P POLES / BOMBAY TUBES
STREET LIGHT FIXTURES	:	WIPRO / CROMPTON / CASELEC
FLOOD LIGHT	:	WIPRO / CROMPTON / CASELEC / DELTA
DECORATIVE / LANDSCAPE LIGHTING FIXTURE	:	K-LITE / THORN / GEMINI

SECTION –H

LIST OF IS STANDARD

Sr. No.	IS No. /Year	Description
		A – H. T.
1	IS :3427-1997	AC metal enclosed switchgear and controgear for rated voltages above 1 kV upto and including 52kV.
2	IS : 14659-1999	AC metal enclosed switchgear and controgear for rated voltages above 1 kV upto and including 38kV.
3	IS : 10601-1983	Dimensions of terminals of high voltage switchgear and controlgear.
4	IS : 5613-1985	Code of practice for design, installation and maintenance of O.H. power lines.
5	IS : 2705-1992	Current transformer
6	IS : 3156-1992	Voltage transformers
7	IS :5819-1970	Recommended short circuit ratings of high voltage PVC cable
8	IS :13118-1991	General requirements for circuit breakers for voltages above 1000V
9	IS :9920-1982	Switches and switch isolators for voltages above 1000V
10	IS:7098-1988	Cross linked polyethylene insulated PVC sheathed cables
11	IS : 3231-1986	Electrical relays for power system protection.
12	IS : 3961 - 1967	Recommended current ratings for cables.
		B – TRANSFORMER
13	IS : 3347 - 1979	Dimensions for porcelain transformer bushings for use in normal and lightly polluted atmosphere
14	IS : 1271 – 1985	Thermal evaluation and classification of electrical insulation.
15	IS : 10028 – 1985	Code of practice for selection, installation and maintenance of transformers.
16	IS : 2026 - 1994	Power transformer.
17	IS : 1180 - 1989	Outdoor type three phase distribution transformers upto and including 100 kVA 11KV.
18	IS : 10561-1983	Application guide for power transformers.
19	IS : 11171 -1985	Dry type power transformers.
20	IS : 8468-1977	On load tap changers.
21	IS : 3637 – 1966	Specification for gas operated relays (Buchholz's).
22	IS : 335 – 1993	Specification for new insulating oils.
		C – EARTHING & LIGHTNING PROTECTION

23	IS : 3043 – 1987	Code of practice for earthing.
24	IS : 2309 – 1989	Code of practice for Protection of buildings and allied structures against lightning.
		D – LOW VOLTAGE SWITCHGEAR & PANELS
25	IS : 8623 – 1993	Specification for low voltage switchgear and control gear assemblies
26	IS : 10118-1982	Code of practices for selection, installation and maintenance of switchgear and control gear.
27	IS : 12063-1987	Classification of degrees of protection provided by enclosures of electrical equipment.
28	IS :7752-1975	Guide for improvement of power factor in consumer installation
29	IS : 12360-1988	Voltage bands for electrical installations including preferred voltages and frequency.
30	IS : 2147 – 1962	Degrees of Protection provided by enclosures for low voltage switchgear and control gear.
31	IS : 3070-1993	Metal oxide surge arrestors with gaps for AC system.
32	IS :13947-1993	L.V. Switchgears and controlgears
33	IS:13032-1991	Miniature circuit breaker boards for voltage upto and including 1000 volts A.C.
34	IS:13925-1998	Shunt capacitors for ac power systems having a rated voltage above 1000V.
35	IS:12729-2004	Common specification for high voltage switchgear & controlgear standards.
36	IS:1293-2005	Plug & socket outlets for house hold & similar purposes.
37	IS:4160-2005	Interlocking switch socket outlets -specification
38	IS:60309-2002	Plug socket – outlets & couplers industrial purposes.
		E –CABLE
39	IS:12943-1990	Brass glands for PVC cables.
40	IS:1255-1983	Code practice for installation and maintenance of power cables upto and including 33kV rating.
41	IS:10418-1982	Drums for electric cables.
42	IS:7098-1988	Cross linked polyethylene insulated PVC sheathed cables.
43	IS:1554-1988	PVC insulated (heavy duty) electric cables.
44	IS:694-1990	PVC insulated (heavy duty) electric cables
		F – INTERNAL (POINT WIRING, FAN, FIXTURES)
45	IS : 4648 – 1968	Guide for electrical layout in Residential buildings.
46	IS : 732 - 1989	Code of practice for electrical wiring installations.
47	IS:6665-1972	Code of practice for industrial lighting

48	IS : 2268 – 1994	Electrical appliances electrical call bells and buzzers for indoor use.
49	IS : 3646-1992 1994	Code of Practice for interior illumination
50	IS :11037-1984	Electronic type fan regulators.
51	IS:9537-1980	Conduits for electrical installation
52	IS:14768-2000	Conduits fittings for electrical installations general requirements.
53	IS: 14927-2001	Cable trunking & ducting systems for electrical installations
54	IS : 1913 - 1978	General and safety requirement for luminaries
55	IS:3528-1966	Water proof electric lighting fitting
56	IS:1944-1970	Code of practice for lighting of public thorough fare
		G – OTHER CODES
57	SP30-1985	National Electrical code (Fourth Reprint 1998)
58	NBC-2008	National Building Code First Reprint 2006
59	ECBC 2007	Energy Conservation Building Code
		H–General
60	SP : 31-1986	Chart and treatment for electrical wiring installations.
61	IS : 2551 – 1982	Danger notice plates.
62	IS : 5216 - 1982	Guide for safety procedures and practices in Electrical work

SECTION –I

DEVIATIONS FROM GENERAL CONDITIONS OF CONTRACT

All deviations from general condition of contract shall be filled in hereby the bidder.

SECTION	CLAUSE NO.	DEVIATION

The bidder hereby certificates that the above mentioned are only deviations from general conditions of contract of enquiry.

DATE Signature And Seal of Bidder

SECTION –J

DEVIATIONS FROM TECHNICAL SPECIFICATIONS

All deviations from specification shall be filled in hereby the bidder.

SECTION	CLAUSE NO.	DEVIATION SPEC. NO.

The bidder hereby certificates that the above mentioned are only deviations from technical specifications of this enquiry.

DATE Signature And Seal of Bidder

SECTION -K

LIST OF DRAWINGS

Sr. No.	Title	Drawing No.
1	5MVA, 22 /0.433 KV SUBSTATION LAYOUT DRAWING	810A/EL/1.1
2	SUBSTATION LIGHTING & POWER LAYOUT	810A/EL/1.2
3	MAIN SINGLE LINE DIAGRAM	810A/EL/02
4	EXTERNAL LAYOUT DRAWING	810A /EL/03

Note: The List of Drawings given shall change as per change in architectural Drawings.

SECTION –L
DETAILS OF CONTRACTORS

1.	Name & Address	:	
2.	Banker	:	
3.	Solvency	:	
4.	Turn over of last Three Years	a)	
		b)	
		c)	
5.	Type of Firm	:	Proprietor / Partnership / Pvt. Ltd. / Ltd.
6.	No. of Employees		
i)	Directors / Partners	:	
ii)	Managers	:	
iii)	Sr. Engineer	:	
iv)	Jr. Engineer	:	
v)	Supervisors	:	
vi)	Skilled Technicians	:	
vii)	Unskilled Workers	:	
7.	Panel Manufacturing facility as per specifications required	:	Own / Outside
8.	Facilities: Fabrication	:	
	Painting / Powder coating	:	
	Testing	:	
9.	Testing Equipment available		
i)	500 / 1000 V Megger	:	
ii)	5000 V Megger	:	
iii)	Earth tester	:	
iv)	H.V. Test set	:	
v)	Oil Test Set	:	
vi)	Multimeter	:	
vii)	Continuity tester	:	
viii)	Tong Tester	:	
10.	H.V. Testing Name of Separate Testing Party	:	
11.	Tentative site infrastructure proposed	:	

SECTION –M

DATA SHEETS TO BE FILLED BY BIDDER

TECHNICAL SPECIFICATIONS FOR LV SWITCHGEAR

A. AIR CIRCUIT BREAKERS:

Sr.No.	LV Switchgear Requirements		Confirmation by the Panel Manufacturer –Yes `or No			
1	Circuit Breakers shall confirm to Electrical Standards	IEC60947-I & II, IS 13947	YES		NO	
2	Rated Operational Voltage: Ue	433V, +10%	YES		NO	
3	Current Rating(In) of Circuit Breaker shall be declared at	$50^{O}C$	YES		NO	
4	**Current Rating Guideline for the Use of ACB**	**Above 800A & Above**	YES		NO	
5	Utilisation Category	Class B	YES		NO	
6	Suitable for Isolation	Yes	YES		NO	
7	Method of Installation	Draw-out	YES		NO	
8	No. Of Poles	As mentioned in SLD	YES		NO	
9	Type of Release	Microprocessor Based	YES		NO	
10	Rated Insulation Voltage: Ui at 50 Hz	Microprocessor Based	YES		NO	
11	Rated Impulse withstand Voltage at Main Circuits	8KV	YES		NO	
12	Rated Impulse withstand Voltage at Aux.Circuits	8KV	YES		NO	
13	Short Circuit Making Capacity-Max. Prospective Peak Current	Shall be equal to (Icu X 2.2)	YES		NO	
14	Rated Ultimate Short Circuit Breaking Capacity-Icu at Ue	As mentioned in SLD	YES		NO	
15	Rated Service Short Circuit Breaking Capacity- Ics at Ue	Ics = Icu	YES		NO	
16	Short Time Withstand Current-Icw	Icw = Icu	YES		NO	
17	**Mechanical Features:**					
a)	ON/OFF Indication on ACB	Required	YES		NO	
b)	Spring Charge Indication on ACB	Required	YES		NO	
c)	Ready to Close Interlock on ACB	Required	YES		NO	
d)	Contact Erosion Indicator on ACB	Required	YES		NO	
e)	Position Indicators-Connected, Test,Isolated on ACB	Required	YES		NO	
f)	Safety Shutters	Required	YES		NO	
g)	Door Interlock	Required	YES		NO	
18	**Electrical Indications:**					

a)	ON/OFF(With Red & Green LED Lamp on Panel Door)	Required	YES		NO	
b)	Trip Signalling (With Amber LED Lamp on Panel Door)	Required	YES		NO	
c)	Ready to Close Signalling (With LED Lamp on Panel Door)	Required	YES		NO	
d)	Spring Charge Indication (already Featured in 17b)	Not Required.	YES		NO	
19	**Microprocessor Based Release Functions**					
a)	True RMS Sensing	Required	YES		NO	
b)	Overload(L)Protection With Setting	Ir =(0.4-1) X In	YES		NO	
c)	Short Circuit (S) with Time Delay setting	Isd=(1.25-12) X Ir and tsd=(0-4)sec.	YES		NO	
d)	Instantaneous Protection (I)	Ii=Minimum 12In.	YES		NO	
e)	Ground Fault (G) Protection with Alarm/Trip	Ig=(0.2-1) X In and tg=(0.1-0.5)sec.	YES		NO	
f)	Separate Fault Indication on Release	Required for L,S,I,G and Neutral	YES		NO	
g)	Neutral Protection in 3Pole ACBs	Required with the help of neutral CT.	YES		NO	
h)	Neutral Protection in 4Pole ACBs	Required with the help of neutral CT.	YES		NO	
i)	Integral Test facility for testing healthiness of Release	Required	YES		NO	
j)	LED Indication to show healthiness of Release	Required	YES		NO	
k)	In Case of Failure of Release	LED Indication	YES		NO	
l)	Bypass circuit with Short Circuit protection in Case of release failure	Required	YES		NO	
20	Castell (Mechanical) Interlock	As specified in SLD	YES		NO	
21	Under Voltage Coil with Continuous Rating and front Accessible	As specified in SLD	YES		NO	
22	Shunt trip Coil with Continuous Rating and front Accessible	As specified in SLD	YES		NO	
23	Closing Coil, front Accessible	In Case of EDO ACBs.	YES		NO	

B. MOULDED CASE CIRCUIT BREAKER

Sr.No.	LV Switchgear Requirements		Confirmation by the Panel Manufacturer –Yes `or No			
1	Circuit Breakers shall confirm to Electrical Standards	IEC60947-I & II, IS 13947	YES		NO	
2	Rated Operational Voltage: Ue	433V, +10%	YES		NO	
3	Current Rating(In) of Circuit Breaker shall be declared at	$50^{O}C$	YES		NO	
4	**Current Rating Guideline for the Use of MCCB**	**Maximum Upto 800A**	YES		NO	
5	Utilisation Category	Class A	YES		NO	
6	Suitable for Isolation	Yes	YES		NO	
7	Operating Principle	Current Limiting	YES		NO	
8	Method of Installation	Fixed	YES		NO	
9	No.Of Poles	As mentioned in SLD	YES		NO	
10	Type of Release	Upto 160A-TM, 200A and Above- Microprocessor Based	YES		NO	
11	Rated Insulation Voltage: Ui at 50 Hz	690V	YES		NO	
12	Rated Impulse withstand Voltage at Main Circuits	8KV	YES		NO	
13	Rated Impulse withstand Voltage at Aux.Circuits	4kV	YES		NO	
14	Short Circuit Making Capacity-Max. Prospective Peak Current	Shall be equal to (Icu X 2.1)	YES		NO	
15	Rated Ultimate Short Circuit Breaking Capacity-Icu at Ue	As mentioned in SLD	YES		NO	
16	Rated Service Short Circuit Breaking Capacity- Ics at Ue	Ics=Icu	YES		NO	
17	**Mechanical Features:**					
a)	Three Disctinct Positions ON/OFF/TRIP on MCCB	Required	YES		NO	
b)	Flexibility of Connecting load either on TOP or BOTTOM	Required	YES		NO	
c)	Possibility of Interchanging the protection release of MCCB on site	Required	YES		NO	
d)	Extended Rotary Handle with Padlocking Facility	Required	YES		NO	
e)	Door Interlock	Required	YES		NO	
18	**Electrical Indications:**					
a)	ON/OFF(With Red & Green LED Lamp on Panel Door)	Required	YES		NO	

b)	Trip Signalling (With Amber LED Lamp on Panel Door)	Required	YES		NO	
19	**Release Functions**		YES		NO	
a)	True RMS Sensing	Required	YES		NO	
b)	Overload(L)Protection With Setting	Ir =Adjustable	YES		NO	
c)	Instantaneous Protection (I)	Ir =Adjustable	YES		NO	
d)	Integral Test facility for testing healthiness of Release	Required	YES		NO	
e)	LED Indication to show % Loading of the release	Required	YES		NO	
f)	Thermal Memory	Required	YES		NO	
					NO	
20	Castell(Mechanical) Interlock	As specified in SLD	YES		NO	
21	UnderVoltage Coil with Continuous Rating and front Accessible	As specified in SLD	YES		NO	
22	Shunt trip Coil with Continuous Rating and front Accessible	As specified in SLD	YES		NO	

C. MINIATURE CIRCUIT BREAKER

Sr.No.	**LV Switchgear Requirements**		**Confirmation by the Panel Manufacturer – Yes `or No**			
1	Circuit Breakers shall confirm to Electrical Standards	IEC60898, IS8828	YES		NO	
2	Rated Operational Voltage: Ue (AC)	240/415V, 50/60Hz	YES		NO	
3	Current Rating Guideline for the Use of MCB-	Maximum Upto 63A.	YES		NO	
4	Suitable for Isolation	Yes	YES		NO	
5	Operating Principle	Current Limiting	YES		NO	
6	Method of Installation	On 35 mm DIN Rail.	YES		NO	
7	No.Of Poles	As mentioned in SLD	YES		NO	
8	Type of Release	thermo magnetic	YES		NO	
9	Rated Insulation Voltage: Ui at 50 Hz	250/440V AC	YES		NO	
10	Tripping Characteristics	C or D as specified in SLD	YES		NO	
11	Two Distinct Positions ON/OFF on MCB	Required	YES		NO	
12	Flexibility of Connecting load either on TOP or BOTTOM	Required	YES		NO	

Summary Sheet

PROJECT : –IITM HPC Upgradation
CLIENT : –Indian Institute of Tropical Meteorology
WORK : –Internal & External Electrical Work

DESCRIPTION		Supply AMOUNT Rs. Ps.	Installation AMOUNT Rs. Ps.
SECTION - 'I'	: RS.		
HT Work & Substation			
SECTION - 'II'	: RS.		
Earthing & Lightning Protection			
SECTION - 'III'	: RS.		
M. V. Panels and Distribution Boards.			
SECTION - 'IV'	: RS.		
M.V. Cables			
SECTION - 'V'	: RS.		
Point Wiring, Mains & Fixtures			
SECTION - 'VI'	: RS.		
External & Landscape Lighting			
TOTAL	: RS.		

PROJECT : – IITM HPC Upgradation
CLIENT : –Indian Institute of Tropical Meteorology
WORK : –Internal & External Electrical Work

Bill of Quantity

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
	SECTION –I						
	HT Work & Substation						
1.0	Supply, testing, tagging, laying, & commissioning of following 22 kV grade XLPE cable including excavation of in all types of strata upto 1000mm deep except hard rock, sand cushioning of 75mm, laying bricks on both sides of cable & covering with RCC / PCC tiles or half round hume pipe of 200 mm dia and refilling of cable trench, leveling of cable trench etc. as required. (Note: Quantity is tentative as MSEDCL / SEB tap of point is not decided). (Only Hard rock excavation shall be measured separately).						
1.1	3C x 240 Sq.mm. HT XPLE Cable.	Rmt	UR				
2.0	As above but in readymade trenches / RCC pipes / trays..						
2.1	3C X 240 Sq.mm. HT XPLE Cable.	Rmt	840				
3.0	Supply, installation, testing & commissioning of heat shrink jointing for 22kV cables of following sizes including necessary accessories, spider supports, plated hardware like lugs / ferrules, Insulation tapes etc. complete "Raychem" make or similar equivalent make. Scope also includes making suitable cutouts in gland plate & sealing them after connections.						
3.1	3C X 240 Sq.mm. HT XPLE Cable.						
3.1.1	Straight through Joints	Set	UR				
3.1.2	Outdoor End Termination.	Set	2				
3.1.3	Indoor End Termination.	Set	12				
4.0	Dismantaling, Removing ,Shifting & handing over of Existing 11KV 3C X 120 Sq.mm. HT XPLE Cable.Approx. distance(265 mtrs.) (Location: Metering Room To Substation) to the store department of IITM	Job	1				

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
5.0	Supply and Installation, testing and commissioning of 22 kV compact indoor type metering Kiosk mounted on plinth with necessary supporting structure consisting of CT/PT units with Provision for installation of Electronic Time of Day metering system as per MSEDCL / SEB requirements, metering instruments, CTPT units should be duly tested for calibration and Class 1 accuracy of suitable ratio.	No.	UR				
5.1	Supply, Installation, testing & commissioning of MSEDCL / SEB approved and duly tested Electronic TOD meter of appropriate class and accuracy (As far as possible the meter should be obtained from MSEDCL / Local power supply company.)	No.	UR				
6.0	Removing of Existing 11KV compact indoor type metering / Kiosk mounted on plinth with necessary supporting structure withTVM / TOD meter along with CT/PT unit as per MSEDCL requirements (Location: Metering Room Near Entrance Gate) scope shall include handing over the said equipment to the store department of client	Job	UR				
	OR						
7.0	Supply and Installation, testing and commissioning of 22 kV compact indoor type metering Kiosk (1 Set) mounted on plinth with necessary supporting structure consisting of CT/PT units with Provision for installation of Electronic Time of Day metering system as per MSEDCL / SEB requirements, metering instruments, CTPT units should be duly tested for calibration and Class 1 accuracy of suitable ratio. **ON REPLACEMENT WITH** Existing 11KV compact indoor type metering / Kiosk mounted on plinth with necessary supporting structure withTVM / TOD meter along with CT/PT unit as per MSEDCL requirements (Scope shall Include Buy Back & Removal of kiosk Location: Metering Room Near Entrance Gate)	Job	1				
7.1	Supply, Installation, testing & commissioning of MSEDCL / SEB approved and duly tested Electronic TOD meter of appropriate class and accuracy (As far as possible the meter should be obtained from MSEDCL / Local power supply company.)	No.	1				

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
8.0	Installation, testing & commissioning of 22 kV, free standing dust and verminproof metal enclosed, breaker panel SF6 / VCB, necessary CT / PT units, Digital meters, indications and protection system consisting of EF & OC relays, Aux. relays, master trip relay, antipumping relay trip circuit supervision relay and any such relays, required for protection functions, window annunciation etc. as per specifications.						
8.1	1 Incomer 630 A VCB/SF6 Breaker, 25kA and 4 No.Outgoings 630 A VCB/SF6 Breaker, 25 kA transformer feeder panel as per SLD drawing No. 810A/EL/2.1	No.	1				
9.0	Installation, Testing & Commissioning of 22kV indoor type **Compact type RMU**, 2 Nos 630 A, 25 kA Load Break switch as incomer with mechanical interlock & 1 No. 630A, 25 kA VCB/SF6 Compact Breaker as outgoing with Earth Switch with connection facility suitable for termination of HT XLPE Cables of size 3C x 240 sq.mm. with necessary sleeves & boots complete as per SLD & Specification.	No.	1				
10.0	Installation Testing & Commissioning of Indoor type 22kV, 25 kA, 630A VCB/SF6, Single feeder Compact Breaker, floor mounting cubical type manufactured as per 22 kV switchgears requirements, specifications and I.S. standards connection facility for incoming 3C x 240 sq.mm. 22 kV XLPE cable complete as per set SLD & specification.(Equivalent to Make: Merlin Gerin (Schneider Electric RM6 24 kV)	No.	1				
11.0	Supply, installation, testing & commissioning of 110V DC control supply arrangement for 1 Incoming & 4 Outgoing breaker panel with 1 ph 230 V low input battery charger cum supply and low maintenance 60AH battery backup with outgoing MCB's 3 Nos. complete.	No.	1				
12.0	Installation, Testing & Commissioning of outdoor type 1600kVA, 22000V/433Volt, Dyn11, Oil cooled ONAN type Distribution Transformer with accessories like Conservator tank, Bucholz's relay, PRV, OSR, Oil temp Indicator With OLTC/ RTCC panel, and cable End Box on HT side, Busduct termination On LT side.	Nos.	2				
13.0	Supply, installation, of material equipment required as per statutorial provision & safety.						
13.1	22 KV class Handgloves.	Set	2				

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
13.2	Laminated First aid chart with frame.	No.	2				
13.3	First aid box.	No.	2				
13.4	3 Nos. of Fire buckets with stand.	Set	2				
13.5	4.5 Kg. Co2 fire extinguisher mounted on wall with stand.	Set	2				
13.6	22 KV grade Rubber matting 1000 mm width.	Rmt	40				
13.7	22 KV Dangerboards of appropriate size & marking.	No.	10				
14.0	Third party testing of entire HT installation from approved testing vendor which will include pressure testing of all cables after jointing, testing and setting of relays including secondary injection, polarity, metering & indication earth station, megger testing and overall precommissioning checking of HT installation.	Job	1				
15.0	Excavation of road for cables upto a depth of 1200mm maximum and refilling with excavated material after cable laying, reinstating etc. complete.	M^3	UR				
	TOTAL OF SECTION –I						

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
	SECTION –II						
	Earthing & Lightning Protection						
1.0	Supply & making following Earthing station as per IS 3043 by using GI plate / Cu. plate / Pipe earthing as electrode complete with watering pipe, 50 x 6 mm connecting GI strip up to chamber, soil treatment with charcoal & salt / bentonite powder brick inspection chamber of suitable size with 400 x 400 mm, CI cover, disconnecting link complete including excavation of earth pit in all type of strata, refilling as detailed below.						
1.1	Earthing station as above but using 600mm X 600mm X 6mm GI. Plate as electrode complete.	Set	UR				
1.2	Earthing station as above but using 600mm X 600mm X 3mm thick Cu. plate as electrode complete.	Set	UR				
1.3	As above but bore earthing with 6.5 mtr. long 100mm dia GI pipe earth electrode treatment with bentonite as earth powder complete including 150 mm dia boring.	Set	UR				
1.4	Earthing as above but using maintenance free earth electrode with chemical treatment 3mtr long Ashlok CAT NO. T39 / Alltec / UES make or equivalent. Including boring of hole upto 6.5 mtrs in all types of strata as required.	Set	18				
2.0	Supply, installation, testing of brass 5 spike Lightning arrester with stem and fixing arrangement with accessories.	Set	1				
2.1	Supply, installation, testing of disconnecting link box for Lightning down conductor at 1mtr. from GL with SMC insulator & Gunmetal disconnecting link of 6mm size width equal to down conductor and 250mm long with bolting arrangement for brass bolts & nuts of 12mm Ø complete as required.	Set	1				
3.0	Supply, tagging, laying, or fixing, testing of GI / CU earthing strip / wire in ground at a depth of 600mm including excavation in all type of strata except hard rock or in readymade trenches with necessary clamps, revette jointing as per specification complete as required.						
3.1	75mm x 6mm thick GI strip.	Rmt	300				
3.2	50mm x 6mm thick GI strip.	Rmt	100				
3.3	25mm x 6 mm thick GI strip.	Rmt	200				
3.4	25mm x 3 mm thick Cu. strip.	Rmt	20				

				Supply		Installation	
Item. No.	Description	Unit	Qty.	Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
3.5	25mm x 3 mm thick Cu. Strip with Heat shrink PVC sleeve for UPS Earthing.(For 60 kVA UPS)	Rmt	120				
3.6	25mm x 3 mm Cu. Strip down conductor mounted on SMC insulator for Lightning Arrestor.	Rmt	60.0				
3.7	8 SWG GI wire.	Rmt	100.0				
3.8	12 SWG GI wire .	Rmt	150.0				
4.0	Supply and installation of earth busbar box consisting of 50 x 6 mm size, 300mm long GI. Strip with multiple tapping and nut bolt arrangements etc. mounted on SMC insulators.	Nos.	2				
	TOTAL OF SECTION -II						

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
	SECTION –III						
	M. V. Panels and Distribution Boards.						
1.0	Supply, installation, testing & commissioning of MV panel boards compartmental cubicle type freestanding with appropriate cable entries, front operating, front maintained wherever required complete with base frame etc. as required and as per IS 8623 specifications. Panel has to be fabricated out of 14 / 16 SWG CRCA sheet, and surface treated with phosphating seven tank process and duly powder coated with RAL 7032 or any approved color. (Refer Single Line Diagram vide drg. no 810A/EL/2.1 for Switchgear and other details).						
1.1	Main LT Panel.	No.	1				
1.2	RTPFC with reactors. 600 kVAR (550V Grade capacitors.)	No.	2				
1.3	UPS Outgoing Panel -1	No.	1				
1.4	UPS Outgoing Panel -2	No.	1				
1.5	UPS Panel (60 kVA Outgoing Panel)	No.	1				
1.6	AC Panel HPC 68 TF	No.	1				
1.7	Substation DB	No.	1				
1.8	Chiller Motor DB	No.	1				
1.9	DB	No.	UR				
2.0	Engineering, Shop drawing, Supply, installation, testing & commissioning of Indoor/ Outdoor Al., conductor sandwitch type busducts from transformer / D.G. Sets to panels including necessary accessories, bends, phase crossover, flexible busbar connections & flange arrangement at both ends with earthing as required. Each length is partially outdoor & partially indoor.						
2.1	2000 Amp 3Ø+N. AL. Busduct (Indoor)	Rmt.	18				
2.2	2500 Amp 3Ø+N. AL. Busduct (Outdoor)	Rmt.	16				
3.0	Supply, installation, testing, tagging, (Circuit numbering) and commissioning of following double door readymade recessed type MCB, DB, fabricated out of CRCA sheet and painted with powdercoating process OR made out of scratch proof polycarbonate body, and concealed in wall, or on surface with necessary frame complete as required.						
3.1	2 Way TPN DB with25 A 4P RCCB 100mA Incomer and 10/20 A SP MCB as outgoing (as per SLD).(Substation Lighting DB)	No.	1				
3.2	6 Way TPN DB with 40 A 3P MCB as I/C and 10 A & 20 A SP/TP MCB as outgoing Complete as PSDB (as per SLD).	No.	UR				

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
4.0	Removal of Existing ATS 400A from Existing Main LT Panel 8.4 TF & Shifting to AC Panel HPC 68.4 TF as per Diagram vide drg. no 810A/EL/2.1	Job	1				
5.0	Supply, fixing, testing of good quality following readymade modular Power sockets with switch, in readymade modular box with switch plate. Box should be suitable to terminate cables / wires easily, complete as required.						
5.1	1no. 6 / 16A, 3pin round pin socket with shutter & switch.	No.	UR				
5.2	1no. 13A, 3pin Flat pin socket with shutter & switch.	No.	UR				
5.3	1no. 6A, 3pin round pin socket with shutter & switch.	No.	UR				
6.0	Supply, fixing, testing, of good quality industrial sockets with MCB's / MCB isolators MCCB's of different ratings in readymade **IP 20** metal enclosure. Box should be suitable to terminate cables / wires easily, complete as required.						
6.1	20A 1Ø Socket with 20A SP MCB in a Readymade Box.	No.	2				
6.2	32A, 3Ø Socket outlet with 32A TPMCB in readymade metal enclosure.	No.	2				
6.3	160 A TP MCCB in a Readymade box.	No.	1				
6.4	250 A TP MCCB in a Readymade box.	No.	UR				
6.5	400 A TP MCCB in in sheet steel enclosure with 'ON' indication lamp & necessary control MCB. Including cable termination provision.	No.	6				
6.6	DOL starter suitable for 5 - 7.5 Hp motors.	No.	UR				
	TOTAL OF SECTION –III						

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
	SECTION –IV						
	M.V. Cables						
1.0	Supply, testing, tagging, laying and commissioning following sizes of 1100 Volt grade, XLPE / PVC insulated multistrand Al. / Cu. Conductor armoured / unarmoured cables (As Per IS 1554 & IS 7098) in readymade RCC trench, in provided PVC pipe, RCC pipe hume pipe, on cable trays / ladders etc. as. required complete with clamps for fixing tagging etc.						
1.1	3.5C x 300 Sq.mm. A2XFY cable.	Rmt	3200				
1.2	3.5C x 240 Sq.mm. A2XFY cable.	Rmt	2380				
1.3	3.5C x 150 Sq.mm A2XFY cable.	Rmt	320				
1.4	3.5C x 120 Sq.mm. A2XFY cable.	Rmt	5000				
1.5	3.5C x 70 Sq.mm. A2XFY cable.	Rmt	80				
1.6	3.5C x 35 Sq.mm A2XFY cable.	Rmt	UR				
1.7	4C x 16 Sq.mm. AYFY cable.	Rmt	40				
1.8	4C x 10 Sq.mm. YWY cable.	Rmt	240				
1.9	4C x 6 Sq.mm. AYFY cable.	Rmt	300				
1.10	4C x 6 Sq.mm. YWY cable.	Rmt	UR				
1.11	4C x 4 Sq.mm. YWY cable.	Rmt	120				
1.12	4C x 2.5 Sq.mm. YWY cable.	Rmt	300				
1.13	12C x 2.5 Sq.mm. YWY cable.	Rmt	UR				
1.14	10C x 2.5 Sq.mm. YWY cable.	Rmt	150				
1.15	1C x 50 Sq.mm. YY cable.	Rmt	250				
1.16	1C x 185 Sq.mm. YY cable.	Rmt	1500				
2.0	End termination for above cables including glands Brass heavy duty, lugs, consumable etc. (End terminations for flexible cables will not be considered separately).						
2.1	3.5C x 300 Sq.mm. A2XFY cable.	Nos.	32				
2.2	3.5C x 240 Sq.mm. A2XFY cable.	Nos.	52				
2.3	3.5C x 150 Sq.mm A2XFY cable.	Nos.	2				
2.4	3.5C x 120 Sq.mm. A2XFY cable.	Nos.	36				
2.5	3.5C x 70 Sq.mm. A2XFY cable.	Nos.	2				
2.6	3.5C x 35 Sq.mm A2XFY cable.	Nos.	UR				
2.7	4C x 16 Sq.mm. AYFY cable.	Nos.	2				
2.8	4C x 10 Sq.mm. YWY cable.	Nos.	4				
2.9	4C x 6 Sq.mm. AYFY cable.	Nos.	30				
2.10	4C x 6 Sq.mm. YWY cable.	Nos.	UR				
2.11	4C x 4 Sq.mm. YWY cable.	Nos.	6				
2.12	4C x 2.5 Sq.mm. YWY cable.	Nos.	12				
2.13	12C x 2.5 Sq.mm. YWY cable.	Nos.	UR				
2.14	10C x 2.5 Sq.mm. YWY cable.	Nos.	8				

				Supply		Installation	
Item. No.	Description	Unit	Qty.	Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
3.0	Excavation of cable trenches upto a depth of 1200 mm maximum and refilling, reinstating the material after cable laying complete including providing crown and disposing spreading material within 500 mtrs.						

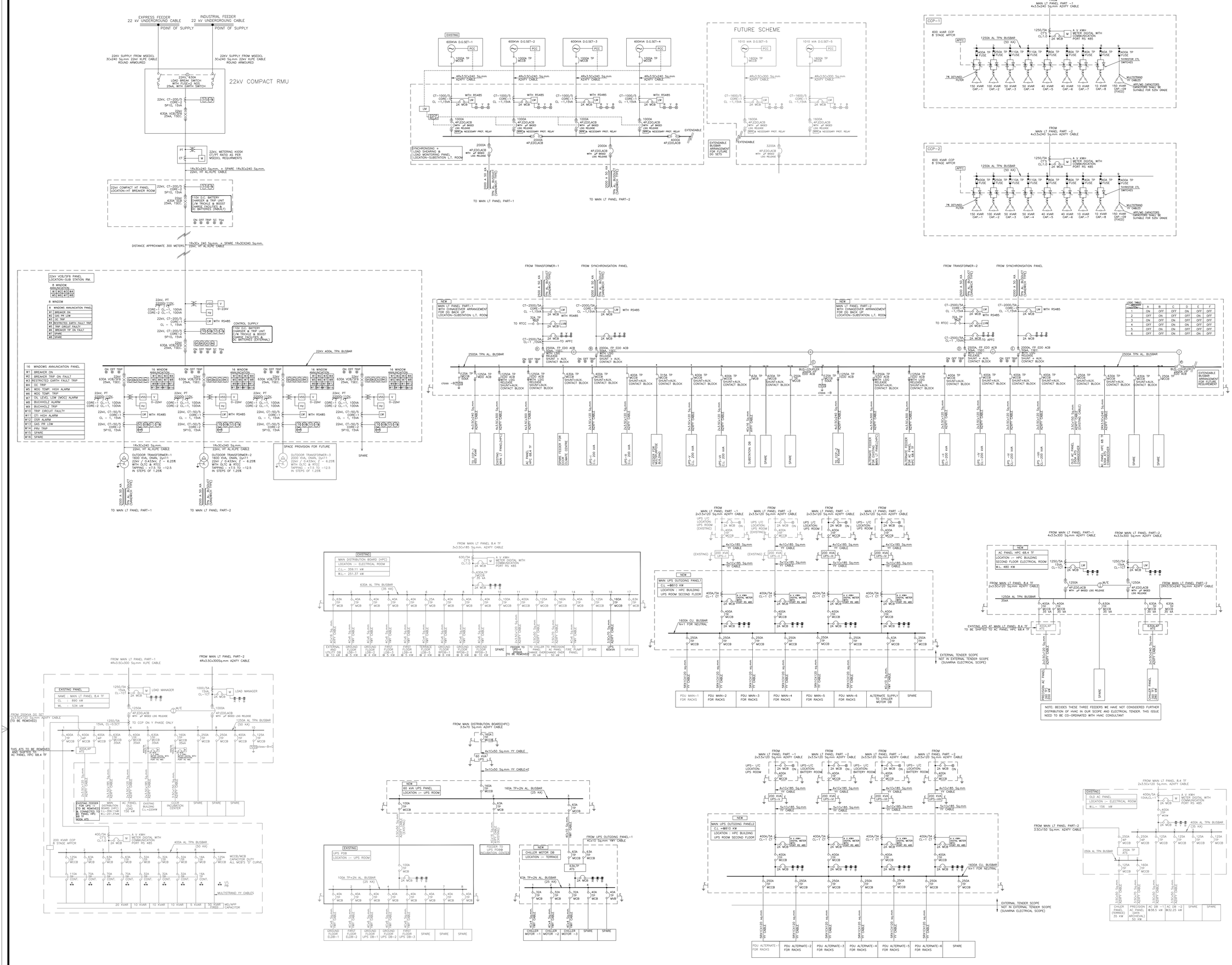
Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
3.1	Excavation in Hard Rock / Road.	M^3	50				
4.0	Supply, laying of following different types of pipes in trenches for road crossing, telephone cables etc. complete as required including excavation of trench in all types of strata except hard rock and refilling, leveling of trench, shifting of extra earth or debris to dump yard complete as required.						
4.1	300 mm RCC Pipe.	Rmt.	800.0				
4.2	200 mm RCC Pipe.	Rmt.	UR				
4.3	200 mm PVC Pipe.	Rmt.	UR				
4.4	50 mm HDPE Pipes with concrete encasing.	Rmt.	UR				
4.5	110 mm HDPE Pipes with concrete encasing.	Rmt.	200.0				
5.0	Supply & installation of readymade hot dip GI. Ladder type tray, shall have 50mm "C" shape channel and rungs at 200 mm CC including readymade accessories e.g. vertical & horizontal bends, Tee's, rightangles etc..						
5.1	300 mm ladder tray 14 SWG.	Rmt	200				
5.2	450 mm ladder tray 14 SWG.	Rmt	450				
5.3	600 mm ladder tray 14 SWG.	Rmt	UR				
6.0	Supply and installation of readymade hot dip GI perforated trays of following size with 50 mm depth unless otherwise specified including readymade accessories e.g. Vertical, horizontal bends, tee's, rightangles etc.						
6.1	50 mm perforated tray 16 SWG.	Rmt	UR				
6.2	150 mm perforated tray 16 SWG.	Rmt	50				
6.3	300 mm perforated tray 14 SWG.	Rmt	UR				
6.4	450 mm perforated tray 14 SWG.	Rmt	UR				
7.0	Supply and installation of readymade hot dip GI tray covers 16/18 SWG including readymade shape of Vertical & Horizontal Bend, Tee's, Rightangles etc. to suit tray for all vertical runs.						
7.1	50 mm tray cover (18 SWG).	Rmt	UR				
7.2	150 mm tray cover (18 SWG).	Rmt	30				
7.3	300 mm tray cover(18 SWG).	Rmt	UR				
7.4	450 mm tray cover (16 SWG).	Rmt	UR				
8.0	Supply and fabrication of M.S. angle / channel supports for trays, DB panels, frames etc. including necessary painting with 2 coats of primer & 2 coats of enamel paint, & required hardware for fixing of supports etc. complete.	Kg.	2400				

				Supply		Installation	
Item. No.	Description	Unit	Qty.	Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
9.0	Supply and installation route markers oval cast iron with 350 mm, 20 mm Ø G.I. pin support cast in 150 x 150 x 150 PCC block.	No.	20				
	TOTAL OF SECTION –IV						

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
	SECTION –V						
	Point Wiring, Mains & Fixtures						
1.0	Surface / concealed point wiring for light / fan / call bell / 5A points with 2 x 2.5 + 1 x 1.5 Sq.mm. multistrand ZHLS Cu. conductor wires 1100 V gr. in suitable GI ERW conduits as submains and 2 x 1.5 + 1 x 1.5 Sq.mm. wires for each point each point complete (submains will not be measured separately) with necessary modular switch board, switch plates & accessories complete with testing. Note: All conduit in area with false ceiling shall be concealed below false ceiing. (Substation rooms)						
1.1	Point wiring for light points with necessary 5A SP switch, ceiling rose / Holders complete. (Maximum 2 points controlled by one switch).	Pt.	33				
1.2	Point wiring for light points with ceiling rose complete with MCB (Switching will be from respective lighting DB).	Pt.	10				
1.3	Fan point with 5A SP Switch, Ceiling Rose, with electronic step Regulator (modular).	Pt.	UR				
1.4	Ex. Fan point with 5A SP Switch.	Pt.	4				
1.5	5A 3 pin socket outlets on board (Modular).	Pt.	2				
1.6	Point wiring as above but for 5A + 15 A socket with 2 x 2.5 Sq.mm. + 1 x 1.5 Sq.mm. Cu. wires from DB including socket & switch . In case 2 points looped on one circuit 2 x 4.0 + 1 x 2.5 Sq.mm. Cu. wiring shall be done upto 1st point.	Pt.	2				
2.0	Supply & Installation of suitable guage GI / 2 mm thick FR PVC conduit of following sizes including all accessories e.g. deep junction box, bends etc. for concealing in slab / wall & spacer saddles for open on slab / wall.						
2.1	32 mm dia FRPVC.	Rmt	UR				
2.2	25 mm dia GI.	Rmt	300				
3.0	Supply, installation, testing & commissioning of lighting fixtures (with suitable controlgear, electronic controlgear for fluorescent) / fans / Ex. Fans etc. including necessary accessories, lamps, wiring connection chain, down drops, supports etc.						
3.1	1 x 40 Watt Industrial type suspended fixtures Complete as required (Wipro Cat. No. Optima WIF14140 or equivalent.) with electronic controlgear.	No.	UR				
3.2	2 x 40 Watt Industrial type suspended fixtures. (Wipro Cat. No. Optima WIF14240 or equiv.) with electronic controlgear.	No.	33				

				Supply		Installation	
Item. No.	Description	Unit	Qty.	Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
3.3	70 W HPSV integral well glass fixture (Wipro Cat. No WWS 62070 or Equivalent)	No.	10				
4.0	Supply, installation, testing & commissioning of 305 mm exhuast fan with frame and protection louvers including all hardware etc complete as required.	No.	4				
5.0	Supply, installation, testing & commissioning of 1200 mm sweep ceiling fan & upto 600mm length down rod with canopies.	No.	UR				
	TOTAL OF SECTION -V						

Item. No.	Description	Unit	Qty.	Supply		Installation	
				Rate	Amount Rs. Ps.	Rate	Amount Rs. Ps.
	SECTION VI						
	External & Landscape Lighting						
1.0	Supply, Installation of 8.5 mtr. tubular poles SP 22 or equivalent complete including excavation of pole pit in all types of strata except hard rock & 1000 x 450 x 450 mm foundation, couping 2 Nos. 40 mm dia 1500 mm long GI. pipes bend to shape in foundation for cable entry, cable loop box with 15 A 4 way connector, 15 A SP MCB, earthing of pole with 8 SWG wire, painting with 2 coats of primer & bottom with black paint & balance with silver paint.						
1.1	Poles with single bracket.	No.	8				
1.2	Poles with double bracket.	No.	UR				
1.3	Same as above but 10 mtr. Tubular pole SP-42 & fixing arrangement / bracket for 3 Nos. flood lights.	No.	UR				
2.0	Supply, installation, testing & commissioning of street / flood light fixture on above poles with necessary controlgear, lamp, hardware etc. including cable connection box.						
2.1	250 W HPSV weatherproof street light luminaire on above pole with toughened glass cover complete. Wipro Cat. No. WST25250 or equivalent.	No.	UR				
2.2	150 W HPSV weatherproof street light luminaire on above pole with toughened glass cover complete. Wipro Cat. No. WST25150 or equivalent.	No.	8				
3.0	70 MH Integral walkover / drive over fixture including necessary civil enclosure weather proof Junction box / cable loop box (Ref. Wipro Cat. FAD 31070 or equiv.)	Set	UR				
4.0	1 x 13 Watt Fantasy Step light in high resistance thermoplastic with tempered and satin glass diffuser and thermoplastic grill Wipro Cat. No. FSP 42113 or equivalent.	Set	12				
5.0	Supply, Installation, testing & commissioning of Bollard fixture 1 x 18 W CFL lamp and control gear with necessary pedestals for mounting K-Lite make Cat. Ref. No. KLBRPRSLIGCFLC 281 or equivalent.	Set	12				
	TOTAL SECTION –VI						



NORTH

KEY PLAN

LEGEND	
	TRANSFORMER
	VACCUM CIRCUIT BREAKER
	AIR CIRCUIT BREAKER
	MCCB/MCB
	CURRENT TRANSFORMER
	VOLTAGE TRANSFORMER
R Y B C A S A	STATUS INDICATING LAMP SC :- SPRING CHARGE TSH :- TRIP SUPPLY HEALTHY
R Y B	PHASE INDICATING LAMP
VSS	VOLTMETER SELECTOR SWITCH
Hz	FREQUENCY METER
V	VOLT METER
LM	LOAD MANAGER WITH RS485 PORT
KWH	KILO WATT HOUR METER
ASS	AMMETER SELECTOR SWITCH
A	AMMETER
MFM	MULTI FUNCTION METER
50	INSTANTENEOUS O/C RELAY
50N	INSTANTENEOUS E/F RELAY
51	IDMT O/C RELAY
51N	IDMT E/F RELAY
95	TRIP LOCK SUPERVISON RELAY
80	DC SUPERVISON RELAY
30	AUX. RELAY
27	UNDER VOLTAGE RELAY
59	OVER VOLTAGE RELAY
64R	RESTRICATED E/F RELAY
86	LOCK OUT RELAY

NOTE :

1. ALL METERS AT MAIN PANEL AND INCOMING OF MAIN DISTRIBUTION BOARD AND AC PANEL SHALL BE WITH RS485 PORT
2. AUXILARY CONTACT BLOCK SHALL BE PROVIDED FOR ALL SWITCHGEAR IN MAIN LT PANELS AND INCOMING SWITCHGEAR OF MAIN DISTRIBUTION BOARD AND AC PANEL.
3. ALL RELEASES FOR SWITCHGEARS MENTIONED IN NOTE-II ABOVE SHALL BE COMMUNICATION CAPABLE.

SUFFIX	DATE	REVISIONS

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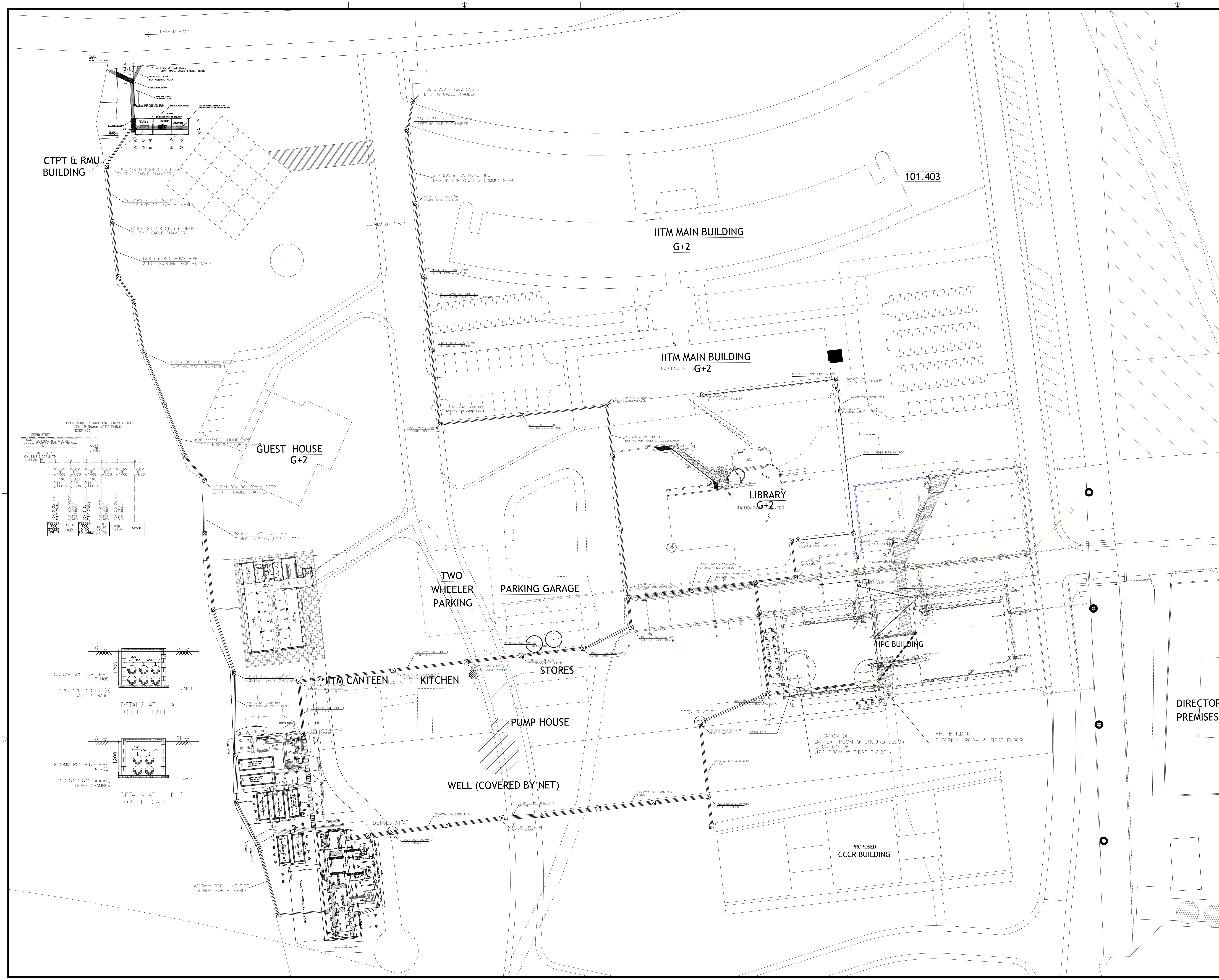
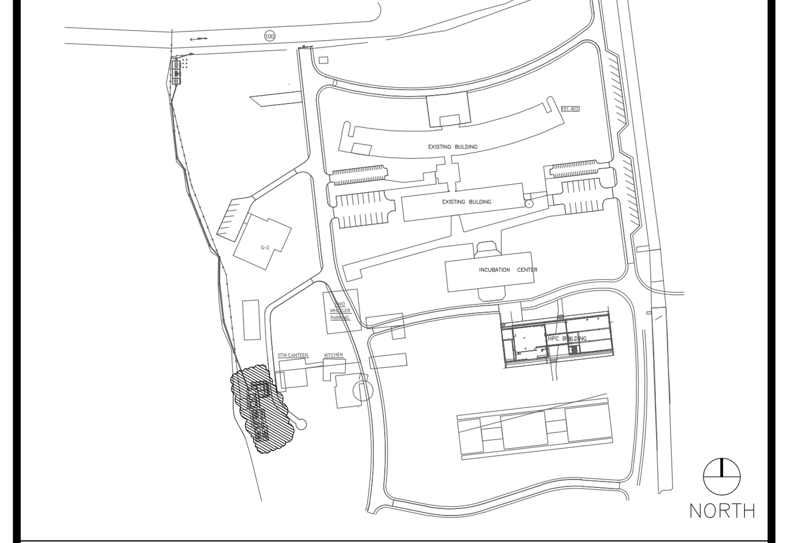
PROJECT
IITM HPC UPGRADATION

TITLE
MAIN SINGLE LINE DIAGRAM

SCALE : NTS	DATE : 29/03/2010	DRAWN NILESH
DWG.NO. 810A/EL/02	SUFFIX 0	CHECKED MUKUND
		APPROVED VAV
REF. DWG SERVER/2008/B10/810A/DRAWING/ELECTRICAL		
ARCH DWG REF:		





KEY PLAN

LEGEND

EXISTING EARTHING DETAILS (RMU AND KIOSK)

E01, E02	: HT BODY EARTHING (KIOSK AND RMU +COMPACT BREAKER)
E03, E04	: CT EARTHING
E05, E06	: PT EARTHING
E07, E08	: METER EARTHING
E09, E10	:OLD TRANSFORMER NEUTRAL EARTHING
E11,E12	:OLD HT BODY EARTHING(HT BREAKER) (SUBSTATION AREA, USS)
E13, E14	: OLD TRANSFORMER BODY EARTHING
E15, E16	: LT BODY EARTHING (USS)
E17, E18	: MAIN LT PANEL BODY EARTHING
E19, E20	: DG SET-1 NEUTRAL EARTHING
E21, E22	: DG SET-1 BODY EARTHING
E24 - E40	: EARTHINGS AT HPC BUILDING

EARTHING IN SCOPE OF EXTERNAL TENDER

E41, E42	: HT PANEL BODY EARTHING
E43, E44	: 1600 KVA TRANSFORMER-1 NEUTRAL EARTHING
E45, E46	: 1600 KVA TRANSFORMER-1 BODY EARTHING
E47, E48	: 1600 KVA TRANSFORMER-2 NEUTRAL EARTHING
E49, E50	: 1600 KVA TRANSFORMER-2 NEUTRAL EARTHING
E51, E52	: MAIN LT PANEL BODY EARTHING

EARTHING IN SCOPE OF DG VENDOR

E53, E54	: DG SET-2 BODY EARTHING
E55, E56	: DG SET-2 NEUTRAL EARTHING
E57, E58	: DG SET-3 BODY EARTHING
E59, E60	: DG SET-3 NEUTRAL EARTHING
E61, E62	: DG SET-4 BODY EARTHING
E63, E64	: DG SET-4 NEUTRAL EARTHING
E65, E66	: DG SYNCHRONISATION PANEL BODY EARTHING

NOTE :

1. THIS DRAWING SHALL BE READ WITH DRAWING NO. 810A/EL/01 & 810A/EL/02

SUFFIX	DATE	REVISIONS

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PROJECT

IITM HPC UPGRADATION

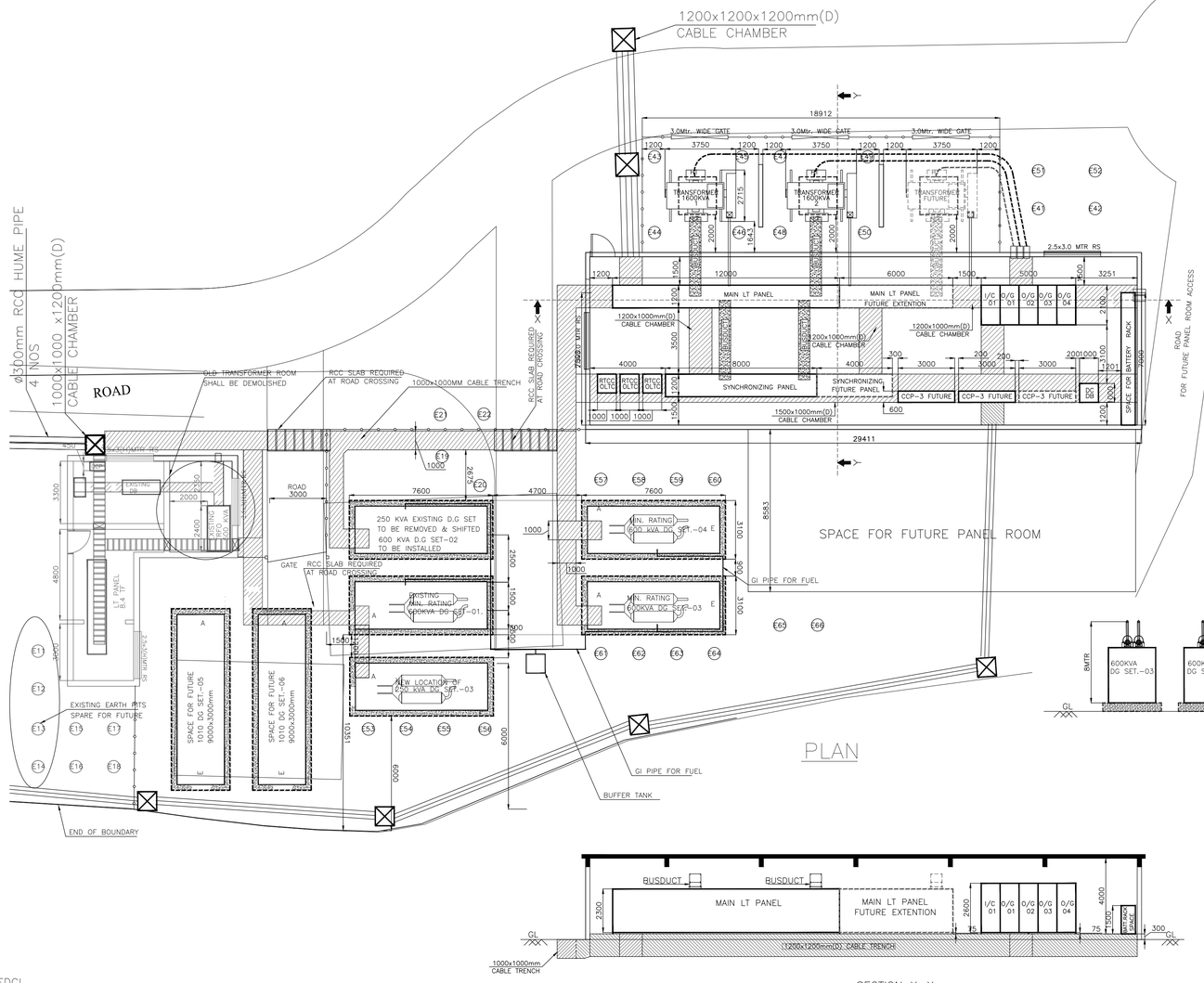
TITLE

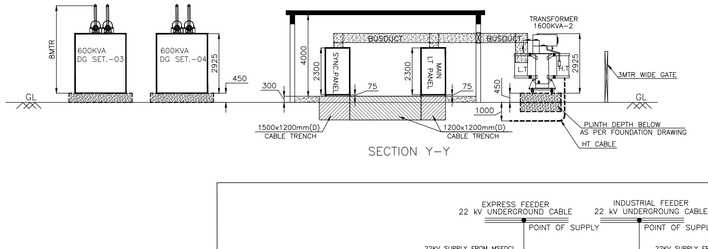
EXTERNAL ELECTRICAL LAYOUT

SCALE : NTS	DATE : 29-03-2010	DRAWN NILESH
DWG.NO. 0810A/EL/03	SUFFIX 0	CHECKED S.DESHPANDE
		APPROVED V.A.V

REF. DWG SERVER/2008/810/810A/DRAWING/ELECTRICAL

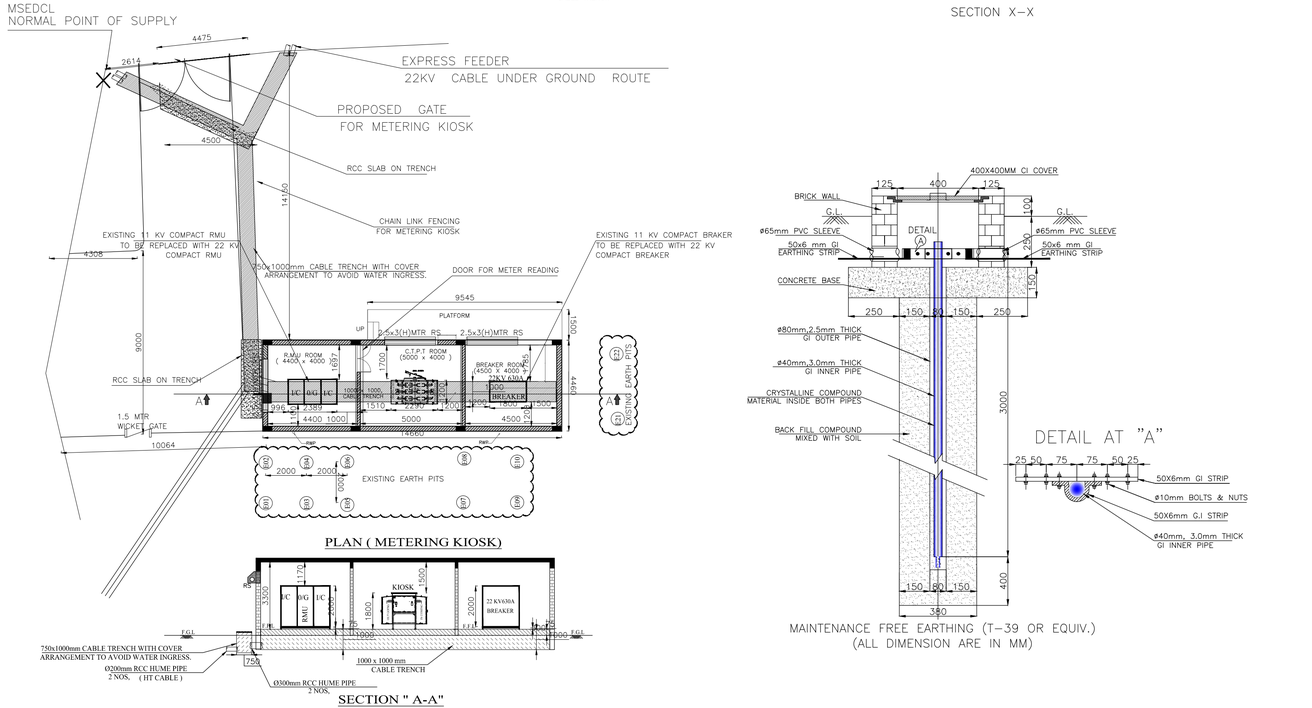
ARCH DWG REF: MASTERPLAN/C1/28-11-09



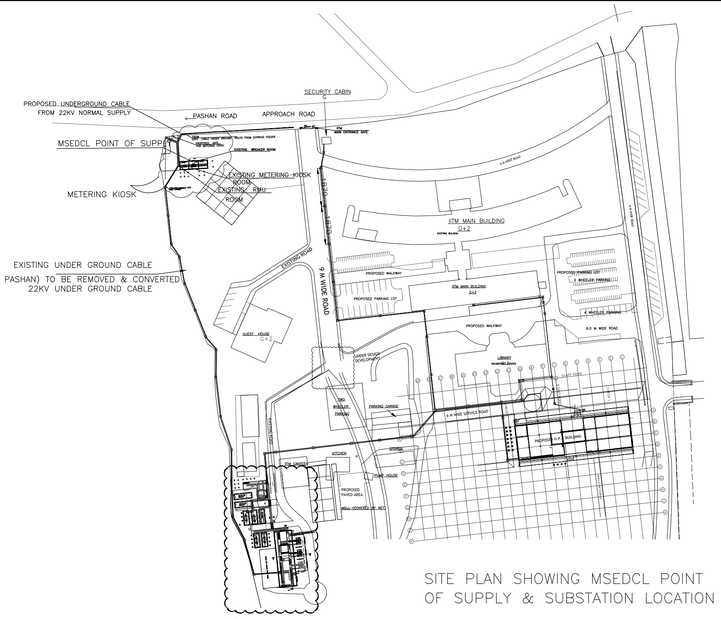


SECTION Y–Y

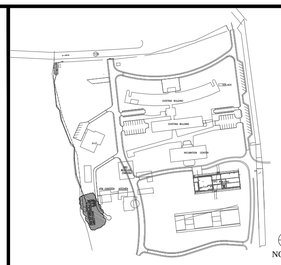
SECTION X–X



MAINTENANCE FREE EARTHING (T–39 OR EQUIV.)
(ALL DIMENSION ARE IN MM)



SITE PLAN SHOWING MSEDCL POINT OF SUPPLY & SUBSTATION LOCATION



KEY PLAN

LEGEND

EXISTING EARTHING DETAILS (RMU AND KIOSK)	
E01, E02	: HT BODY EARTHING (KIOSK AND RMU +COMPACT BREAKER)
E03, E04	: CT EARTHING
E05, E06	: PT EARTHING
E07, E08	: METER EARTHING
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E24 - E40	: EARTHINGS AT HPC BUILDING
EARTHING IN SCOPE OF EXTERNAL TENDER	
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E49, E50	: 1600 KVA TRANSFORMER-2 NEUTRAL EARTHING
E51, E52	: MAIN LT PANEL BODY EARTHING
EARTHING IN SCOPE OF DG VENDOR	
E53, E54	: DG SET-2 BODY EARTHING
E55, E56	: DG SET-2 NEUTRAL EARTHING
E57, E58	: DG SET-3 BODY EARTHING
E59, E60	: DG SET-3 NEUTRAL EARTHING
E61, E62	: DG SET-4 BODY EARTHING
E63, E64	: DG SET-4 NEUTRAL EARTHING
E65, E66	: DG SYNCHRONISATION PANEL BODY EARTHING

NOTE :

1. FOR 22 KV RMU, METERING, COMPACT BREAKER EXISTING EARTH PITS & STRIPS SHALL BE USED.
2. THIS DRAWING SHALL BE READ WITH 810A/EL/03 & 810A/EL/1.2

SUFFIX	DATE	REVISIONS

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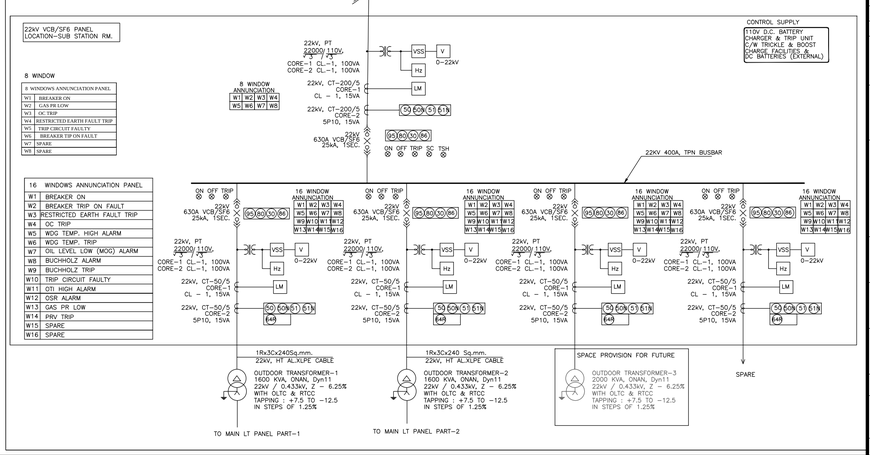
PROJECT
IITM HPC UPGRADATION

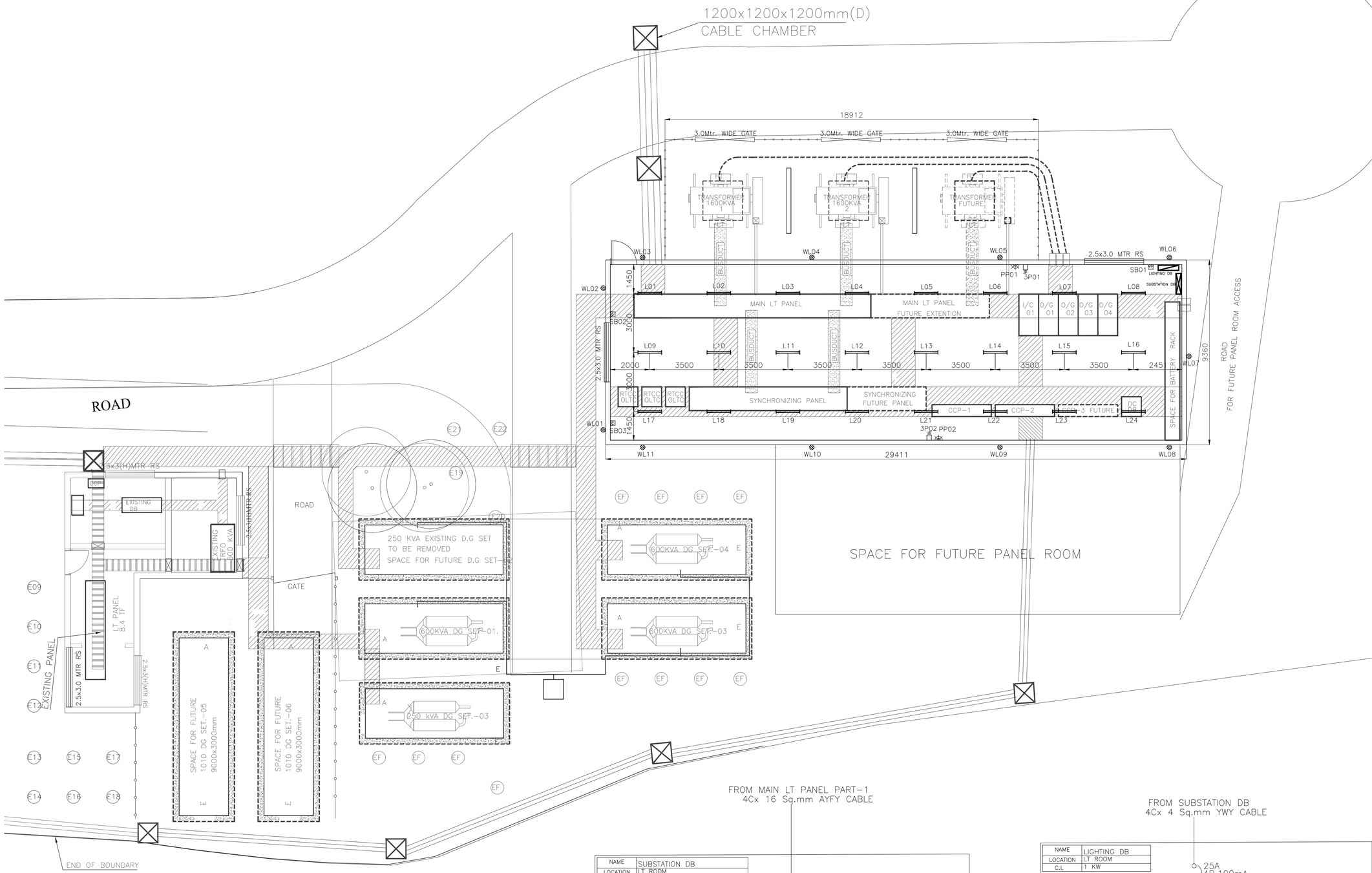
TITLE
5 MVA, 22/433 kV OUTDOOR SUBSTATION

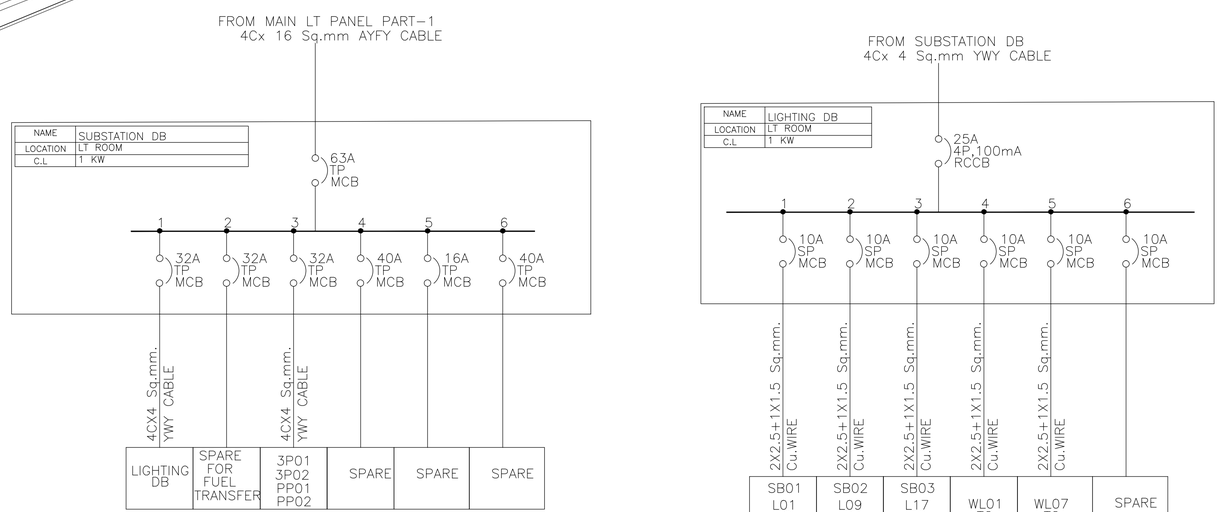
SCALE : NTS	DATE : 29/3/2010		DRAWN
DWG.NO.		SUFFIX	CHECKED
0810A/EL/1.1		0	S.Deshpande
			APPROVED
			VAV

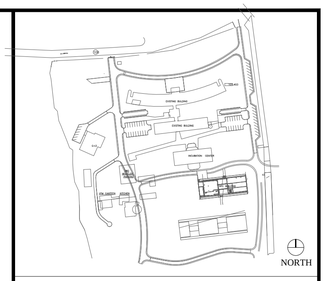
REF. DWG SERVER/2008/810/810A/DRAWING/ELECTRICAL

ARCH DWG REF: MASTERPLAN/C1/28-11-09









KEY PLAN

LEGEND

	2x40W FTL INDUSTRIAL RAIL
	SWITCH BOARD WITH LIGHT SWITCHES
	32A 3Φ SOCKET OUTLET+TP MCB
	5A/15A SOCKET WITH SWITCH.
	70W HPSV WELL GLASS FIXTURE.
	SUBSTATION DB
	LIGHTING DB

NOTE :

1.THIS DRAWING SHALL BE READ WITH 810A/EL/02 & 810A/EL/1.1

SUFFIX	DATE	REVISIONS

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TITLE
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