



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

**DELHI AVIATION FUEL FACILITY PRIVATE LIMITED
AVIATION FUELLING STATION
SHAHBHAD MOHAMMADPUR
IGI AIRPORT
NEW DELHI-110061**



TENDER NO: DAFFPL/MOD/FF/2016-17/14

**INVITING TENDER FOR
MISCELLANEOUS ELECTRICAL WORKS**

BID DUE DATE & TIME: 1500 Hrs. IST on December 01st, 2016

OPENING OF TECHNICAL BIDS: 1100 Hrs. IST on December 02nd, 2016



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PRICE BID FORMAT

NOTE: BIDDERS ARE REQUESTED TO SIGN AND STAMP ALL THE PAGES OF THE TENDER DOCUMENT AND SEND THE SAME BACK IN THEIR OFFER AS A TOKEN OF UNCONDITIONAL ACCEPTANCE OF TENDER FIRMS.

THE DEVIATIONS, IF ANY, SHOULD BE MENTIONED SEPARATELY ON BIDDER’S LETTER HEAD IN TECHNICAL BID. THE DEVIATIONS MENTIONED ANYWHERE ELSE SHALL NOT BE CONSIDERED. IN ABSENCE OF DEVIATION SHEET IT WOULD BE CONCLUDED THAT BIDDER HAS ACCEPTED THE TENDER TERMS WITHOUT ANY DEVIATIONS. CORRECTIONS IN TENDER DOCUMENT WILL NOT BE ACCEPTED.



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TENDER NOTICE DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

INVITING TENDER FOR MISCELLANEOUS ELECTRICAL WORKS AS PER SPECIFICATION AS REQUIRED

TENDER NO: DAFFPL/MOD/FF/2016-17/14

Delhi Aviation Fuel Facility (P) Ltd (DAFFPL) invites sealed bids under single stage two bid system from eligible bidders for miscellaneous electrical works as per specification as required.

Brief Scope of work:

We intend to carry out miscellaneous electrical works complete as per specification as required. Scope of work includes Manufacturing/Supply, Transportation, Loading, Unloading, Installation, Testing, and Commissioning and to execute the job in all respect as per the detailed drawings & specifications at our DAFFPL office.

Bid Security (EMD):	As mentioned in the Tender document
Date, Time & Venue for Voluntary Pre-bid Meeting:	November 18 th , 2016; 14:30 HRS (IST) at DAFFPL, Aviation Fuelling Station, Shahabad Mohammadpur, New Delhi-110061
Bid Due Date, Time & Place of Submission:	Upto 15:00 HRS (IST) on December 01 st , 2016 at the office of the Chief Executive Officer, DAFFPL, Aviation Fuelling Station, Shahabad Mohammadpur,

Detailed Invitation for Bids (IFB) along with Pre-qualification Criteria, Bid Document Corrigenda can be viewed and downloaded from DAFFPL's website: <http://www.daffpl.in>

Chief Executive Officer
DAFFPL, New Delhi
8826120066



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CHAPTER 1: INTRODUCTION (COVERING NOTE)

TENDER FOR MISCELLANEOUS ELECTRICAL WORKS COMPLETE AS PER SPECIFICATION FOR OUR FUEL FACILITY IN SHAHBAD MOHAMADPUR, NEW DELHI, INDIA

We are pleased to invite your most competitive offer for the captioned work in complete accordance with the tender documents attached herewith.

Delhi Aviation Fuel Facility Private Limited (DAFFPL) is a Joint Venture comprising Indian Oil Corporation Ltd. (IOCL), Bharat Petroleum Corporation Ltd. (BPCL), and Delhi International Airport (P.) Ltd. (DIAL). We provides the infrastructure aimed at ensuring an uninterrupted flow of Aviation Turbine Fuel (ATF) to all type of aircrafts at the Indira Gandhi International Airport, New Delhi (IGI Airport) as per international benchmarking.

We intend to carry out Miscellaneous Electrical Works complete as per specification as required.

Material for Miscellaneous Electrical Works is required to be supplied as specified in the tender document, specifications / Bill of quantities.

The details of specifications for Miscellaneous Electrical Works are enclosed along with this tender document.

Delhi Aviation Fuel Facility Private Limited (DAFFPL) invites sealed tenders in prescribed tender form under two-bid system. For viewing details including EMD, BID QUALIFICATION CRITERIA etc. please visit our web site www.daffpl.in and go to tender section by clicking the link "Tenders". Tender documents are available on our website.

The bid documents can also be collected from our office and the bids are to be submitted in Physical form in the Tender Box kept at the office of the **Delhi Aviation Fuel Facility Private Limited (DAFFPL)** at Shahabad Mohammadpur, New Delhi-110061, India.



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1. The Tender is floated in Two Bid system consisting of Technical Bids (Bid Qualification Criteria - BQC, Technical plus Commercial) and Price Bids.

Part-I : Bid Security / EMD in accordance with tender document.

Part-II : BQC (Bid qualification criteria), Technical & commercial Bid, duly filled in & along with all supporting as requested to be submitted in Physical form in the Tender Box.

Part -III : Price Bid.

2. The bidder should be able to manufacture/supply the entire size/type/quantity bid by them. Bidders cannot bid for part items or part quantity of a lot.
3. Firstly the Technical bid (BQC & Techno commercial bids) shall be opened. The Bids shall be initially scrutinized by a team as per tender requirements of BQC (Bid qualification criteria). Technical cum commercial bids of only those vendors who qualify the BQC will be processed further. The price bids of only techno-commercially qualified bidders will be opened, evaluated and shortlisted for Placement of Purchase Order.
4. Each page of bid documents is to be duly signed & stamped by the bidder before submitting the Tender.
5. The bids submitted should be valid for **four months** from the due date of bid submission for Owners acceptance. Once accepted it will remain firm till completion of contracts/orders.
6. We request the bidder to carefully go through all tender documents before submitting the offer. Please note that any exceptions or deviations to the tender document are necessarily to be recorded in the attached deviation statement only. Any exceptions/deviations brought out elsewhere in the bid shall not be considered.
7. The bidders may be invited for a presentation to DAFFPL during Techno-commercial evaluation before price bid opening.
8. The bidders to provide their bank details/ PAN / Sales Tax /WCT Registration numbers/Service Tax Registration No. / VAT registration No., as applicable for updating vendor master file. You are also requested to keep us informed of any change in address / status of your business / contact details including email address etc.
9. Party can quote with the deviations as referred in Point No.6 above. Please refer query end date / time in tender calendar after which no query posted by bidder shall be considered. However DAFFPL reserves the right to respond the queries



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after cutoff date / time mentioned in tender calendar.

10. Please note that queries related to scope of job, tender specifications, terms & conditions etc., should be submitted by means of letter/E mail to reach the owner's office not later than one week before the meeting .It may not be practicable to answer queries received late, but queries and responses/clarifications will be posted in the form letter, E-mail within one week from the date of Pre Bid Meeting. Any modification in the bid document that may become necessary as a result of the Pre Bid meeting shall be made by the owner exclusively through the issues of corrigendum/ addendum posted at web site and not through the minutes of the pre bid meeting.
11. UNSOLICITED POST BID MODIFICATION
Bidders are advised to quote strictly as per terms and conditions of the Bidding Document. After tender submission due date & time/ extended due date & time (as the case may be) the bidders shall not make any subsequent price changes, whether resulting or arising out of any technical / commercial clarifications sought/allowed on any deviations or exceptions mentioned in the bid unless discussed and agreed by DAFFPL in writing.
12. EMD & Techno Commercial bid shall be opened on **December 02nd, 2016 at 11:00 Hrs (IST)** in the presence of authorized representative of bidders (Restricted to one [1] person per bidder only) at the office of DAFFPL. Price Bid of only those bidders whose offer is found meeting both PQC & techno-commercially acceptable, shall be opened on a later date as per convenience of DAFFPL after intimation to the qualified bidders.
13. DAFFPL reserves the right to accept any tender in whole or in part or reject any or all tenders without assigning any reason. DAFFPL reserves right to accept any or more tenders in part. Decision of DAFFPL in this regard shall be final and binding on the bidder.

QUERIES AND CLARIFICATIONS: Any query or clarification with regard to this tender may please be referred to below address & phone nos. on any working day during office working hours

Mr M Vishnu Vardhan Project Officer Vishnu.vardhan@daffpl.in , bksingh@daffpl.in 8826000228	Mr V S Thakur (Consultant) Project Manager Virender.Thakur@mottmac.com 91-120-3992308 9313834546
Mr Manish Kumar Project Coordinator consultant@daffpl.in 9810640818	



14. **GOVERNING LAWS:** The laws of Union of India shall govern all matters concerning the tender. Any issue arising related to the tender or the selection process shall be adjudged by the courts in Delhi alone.
15. A Pre-bid meeting is scheduled for **18/11/2016 at 14:30 hrs IST** at the office of DAFFPL, New Delhi. All prospective bidders can participate in the same. Any clarification with regard to tender shall be sorted out during the pre-bid meeting.
- The purpose of the pre-bid meeting is to clarify any doubts of the BIDDER on the interpretation of the provisions of tender.
 - Bidder(s) are requested to submit their queries, mentioning form name, clause no. & clause, by a letter / e-mail to our office as per schedule in order to have fruitful discussions during the meeting.
 - All the Bidder(s) are requested to attend the pre-bid meeting to be held at DAFFPL Office as per schedule.
16. **Tender document can be purchased from our office located at Shahabad Mohammadpur at a cost of Rs 1000/- and also can be downloaded from our website www.daffpl.in.**
- A bidder who downloads the document from website has to submit a separate DD for an amount of Rs.1000/- along with the EMD document.**
 - Bidders who purchase the document from our office have to submit a DD for an amount of Rs.1000/- at the time of purchase.**
17. **Earnest Money Deposit (EMD) (also referred to as Bid Security):** Bidder shall be required to submit the Earnest Money Deposit (EMD), either in the form of Bank guarantee as per format (provided as Annexure) or PAY ORDER or BANK DRAFT (in favour of Delhi Aviation Fuel Facility Private Limited, payable at New Delhi) at our office. The EMD in either form has to be submitted on or before the due date & due time of bid submission of this tender with a covering note mentioning the tender no.
- The bidders not submitting EMD by due time & date shall be rejected & their bids shall not be evaluated further.
 - The EMD amount shall be Sixty Thousand INR.**
 - Firms registered with National Small scale Industries (NSIC)/MSME of India are exempted from submission of bid security .Central Public Sector Enterprises of India and Firms registered with Nation Small Scale Industries Corporation (NSIC) of India are exempted from submission of Bid Security. Central Public Sector Enterprises are requested to give a self-declaration on their letter head to this effect. Bidders registered with NSIC of India are also requested to submit self-declaration on their letter head to this effect along with a copy of their Valid Registration certificate, specifying limit of volume and other details which should be submitted.



18. Site Restriction: The job has to be done in licensed/unlicensed area which is inside the premises of DAFFPL Fuel Facility. Successful bidder will have to follow all the security norms and procedures for entry and exit to the facility. The job timings will have to change as per the permissions obtained from Operation Dept. All the entry procedures for labors / machinery / raw materials as per the rules of the DAFFPL will have to be followed by the vendor. Contractor shall visit the site and ensure familiarity with the working condition / limitation at the site. Also the entire works are to be carried out in an operating Location. The contractor may have to follow the timings of the facility and have to work under restricted conditions. The normal working hours of plants is 0930 Hrs to 1800 Hrs on Monday to Saturday except holidays. Working beyond above normal working hours / holidays/ Sundays are to be with prior permission of Engineer in charge and relevant facility officers. Contractor is required to plan his work within the normal working hours and days and accordingly he has to mobilize the resources to complete the job within the scheduled time. However all efforts will be made by DAFFPL to give extended working time beyond normal working time in order to help the contractor for early completion of the job. No additional payment / charges shall be payable for such works. Not getting permission for working on holidays/ Sundays or beyond normal working hours will not be considered as reason for delay in work.

The tenderer must visit the site of the tender and familiarize himself with location, operating / working conditions as well as any other local factors which could influence the working before quoting for the job. His quote should take care of any such restrictions; conditions etc and any claim afterwards will not be entertained. **It is suggested that the Tenderer must visit the site in order to have a better idea of site conditions and factors**

19. Safety: The contractor and his personnel have to obey all rules and regulations of the plant. Trained and experienced supervisor/ engineer are required to be present at the work spot always. All tools, tackles, lifting appliances, material handling equipment, scaffolds, cradles, cages, safety nets, ladders, equipment, etc used by the contractor shall be of safe design and construction. These shall be tested for fitness before putting them to use and from time to time as instructed by authorized DAFFPL official who shall have the right to ban the use of any item found to be unsafe. All electrical equipment, connections and wiring shall conform to the requirements of Indian Electricity Act and Rules. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be earthed

The contractor shall adopt all fire safety measures as per relevant Indian Standards

The work is required to be done in a working/operating location, the party has to get necessary Hot/cold/height work permits from the concerned officer in plant as



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per OISD standards and all workmen should be provided with necessary safety helmet, safety belts, safety shoes and other standard safety equipment's. Any delay on account of non-adherence to safety norms, rules and regulations of plant as well as obtaining work permits from the plant shall not be accounted for the delay in completion of job.

The contractor shall be held responsible for any violation of statutory regulations (local, state or central) and DAFFPL instructions that may endanger safety of men, equipment, material and environment. Cost of damage, if any, to life and property arising out of such violation of statutory regulations and DAFFPL instructions shall be borne by the contractor.

20. **Completion Time:** Time is the essence of the contract. The time period of contract is **24 (Twenty Four) months** from the date of Letter of Intent. **The time includes necessary time required for mobilizations and demobilizations after the execution of work.** Successful bidder is required to provide a bar chart /schedule showing the activities/events with time along with the Technical bid to be scheduled accordingly. Also the jobs may get delayed due to monsoon. Any extra claims on account of the same will not be entertained.
21. **Receipt & storage of material at Site:** Contractor is required to make his own arrangement for unloading and storage of materials at site. Contractor is required to inform us prior to dispatch of materials and his representative required to be available for receipt and unloading of materials at site.
22. The successful vendor has to arrange and submit to fuel facility the proper **POLICE VERIFICATION DOCUMENTS** of all the labors, site in charges, supervisors, welders, grinders and all associated workmen who will be coming inside the terminal for carrying out related jobs.
23. All the debris, scrap, cut pieces, etc coming out of fabricated plates, excavated earth, area cleaning will have to be shifted by the vendor to a location inside or outside the terminal premises as per the instruction of DAFFPL site in-charge and no extra payment will be done for the same.



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THE FORMS /ATTACHMENTS TO THIS TENDER ARE AS UNDER:

1. Covering Note – CHAPTER: 1
2. Instructions To Bidders - CHAPTER: 2
3. Bid-Qualification Criteria - CHAPTER: 3
4. Performance of Work – CHAPTER: 4
5. General Terms & Conditions- CHAPTER: 5
6. Technical Specification Documents - **(Attached separately as Annexure I)**
7. Annexure attached are as follows:
 - Annexure II – DEVIATION SHEET
 - Annexure III – DECLARATION SHEET
 - Annexure IV – FORMAT FOR DRAFT BANK GUARANTEE IN LIEU OF BID SECURITY (EMD)
 - Annexure V - FORMAT DRAFT COMPOSITE BANK GUARANTEE FOR SECURITY DEPOSIT/PERFORMANCE GUARANTEE
 - Annexure VI – FORM OF LETTER OF UNDERTAKING
 - Annexure VII – DECLARATION TO BE SUBMITTED ALONGWITH Technical BID

Thanking you,
Yours faithfully,
For DELHI AVIATION FUEL FACILITY (P) LTD.

Chief Executive Officer
DAFFPL, New Delhi



CHAPTER 2: INSTRUCTIONS TO BIDDERS

1. The bidder shall bear all costs associated with the preparation and submission of the bid and Owner will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.
2.
 - Vendor is requested to submit their bids taking full notice of all the technical specifications, terms and conditions, forms & attachments to this tender. Bids must be submitted in Physical form only.
 - The authorized Indian representatives of foreign manufacturers submitting their offers shall ensure that the bids are submitted strictly as per the rules. Bids in Foreign Currency will not be accepted. If successful, order will be on Indian representative only. EMD shall also be submitted in Indian currency as per Clause mentioned above.
3. Owner reserves the right to accept / reject any or all bid qualification documents at their sole discretion without assigning any reason whatsoever.
4. Owner is not responsible for any delays from bidder end.
5. Owner reserves the right to make any changes in terms and conditions of purchase before due date of bid submission and to reject any or all bids received incomplete.
6. Undertaking by the bidder:
 - a. I/we hereby undertake that the statements made herein/information given in the bids through Physical Tendering system/annexure/forms referred are true in all respects and that in the event of any such statement or information being found to be incorrect in any particular, the same may be construed to be a misrepresentation entitling DAFFPL to avoid any resultant contract.
 - b. I/we further undertake as and when called upon by DAFFPL to produce, for its inspection, original(s) of the document(s) of which copies have been annexed hereto.
7. Owner, at its discretion reserves the right to verify information submitted by the bidders.
8. Bidder to submit documents/information to satisfy the bid qualification criteria. Bidders should also be in a position to produce further information as and when required by DAFFPL with in a time limit of 15 days.



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9. DAFFPL reserves their right to negotiate the quoted prices with lowest bidder.
10. Bidders would be qualified based on data and documents submitted by them.
11. Owner's decision on any matter regarding short listing of vendors shall be final and no corresponding in this regards will be entertained.
12. The vendors who are on IOCL/BPCL/DIAL holiday list or delisted will not be considered.
13. The bidder is expected to examine all instructions, forms, attachments, terms and specifications in the tender document. The entire tender document together with all its attachments thereto, shall be considered to be read, understood and accepted by the bidder, unless deviations are specifically stated seriatim by the bidder. Failure to furnish all information required in the tender document or submission of a bid not substantially responsive to the tender documents in every respect will be at bidder risk and may result in the rejection of his bid. The bidder scope of supplies as specified in the material requisition shall be in strict compliance with the scope detailed therein and in the bid document.
14. Bidders in their own interest shall ensure that they submit their bid, complete in all respects, well within the specified bid due date and time. No relaxation shall be given for delay due to any unforeseen event in submission of bid.
15. At any time prior to the bid due date, we may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bid document. The amendment will be notified through our portal www.daffpl.in to all prospective bidders and will be binding on them. In order to afford prospective bidder, reasonable time in which to take the amendment into account in preparing their bids, we may, at our discretion, extend the bid due date.
16. The bid prepared by the bidder and all correspondence/ drawings and documents relating to the bid exchanged by bidder and the owner shall be written in ENGLISH language, provided that any printed literature furnished by the bidder may be written in another language so long as accompanied by an ENGLISH translation, in which case, for the purpose of interpretation of the bid, the ENGLISH translation shall govern.
17. Declaration with the bid qualification criteria that bidder has not been banned or delisted by any Government or quasi Government agencies or Public Sector Undertaking (PSU) as per declaration format (provided as annexure) of the tender document should be submitted along with the bid.
18. Bidders are advised to submit bids based strictly on the terms & conditions and



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specifications contained in the tender document and not to stipulate any deviations. Each Bidder shall submit only one bid. A Bidder who submits more than one bid will be rejected. Alternative bids will not be accepted.

19. The Owner may, at its discretion, extend the bid due date, in which case all rights and obligations of the Owner and the Bidders, previously subject to the bid due date, shall thereafter be subject to the new bid due date as extended. The same will be hosted in the web site.
20. Bids shall be kept valid for 4 months from the bid due date. A bid valid for a shorter period shall be considered as non-responsive and rejected by the Owner. Notwithstanding above, the Owner may solicit the Bidder consent to an extension of the period of bid validity. The request and the responses thereto shall be made in writing. The EMD (bid security) shall also be accordingly extended.
21. Telex/ Telegraphic/ Telefax / E-mail offers will not be considered and shall be rejected.
22. No bid shall be modified subsequent to the due date & time or extension, if any, for submission of bids. Bidder(s) to note that Price changes after submission of bid shall not be allowed. In case any bidder gives revised prices/price implication, his bid shall be rejected. No bid shall be allowed to be withdrawn in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder. Withdrawal of a bid during this interval shall result in the forfeiture of Bidder s EMD.
23. Bids that do not meet the Bid qualification criteria as specified in the bid document shall be rejected. A bid with incomplete scope of work and/or which does not meet the technical requirements as specified in the bid document, shall be considered as non-responsive and rejected. Conditional bids will be liable for rejection.
24. The Owner will examine the bids to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed and whether the bids are generally in order.
25. The bids without requisite EMD and/or not in the prescribed Performa and the time limit will not be considered and bids of such bidder Bidder(s) shall be rejected.
26. **PRICE EVALUATION CRITERIA:** As award is on overall landed lowest basis, part offers will be rejected. Bidder has to quote for all items in a lot for us to consider them.
27. Prior to the expiration of period of bid validity, the owner will notify the successful



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bidder in writing or by e-mail, that his bid has been accepted. The Notification of Award will constitute the formation of the Contract. Delivery Period shall be counted from the date of notification of award (Letter/Fax/e-mail of Intent).

28. Any efforts by a bidder to influence the owner/ in the owner bid evaluation, bid comparison or contract award decisions may result in the rejection of their bid.
29. **ISSUE OF CONTRACT/ PURCHASE ORDER:** After the successful bidder has been notified that his bid has been accepted, DAFFPL will send to such bidder a detailed contract/purchase order incorporating all the terms and conditions agreed between the parties. Within 15 days of receipt of the detailed purchase order, the bidder shall sign and return to the owner the duplicate copy of the order as a token of their acknowledgement.
30. **Vigil Mechanism:** DAFFPL has developed the Vigil Mechanism to deal with references/ grievances, if any, that is received from bidders who participated / intends to participate in the tender. The details of the same are available on our website www.daffpl.in
31. **VERIFICATION BY OWNER:** All statements submitted by bidder regarding experience, manpower availability, equipment and machinery availability etc., are subject to verification by the owner either before placement of order or after placement of order. If any data submitted by the bidder at the bid stage is found to be incorrect, the offer is liable to be rejected or the contract/order is liable to be terminated.
32. **SEALING & MARKING OF BIDS**
- A. Bids shall be submitted separately in THREE SECTIONS in sealed envelopes superscribed with the Bid Document number, bid due date and time, item and nature of bid as under:
- **SECTION - I (Envelope No. 1): Bid Security / EMD:**
Bid security in accordance with tender document.
 - **SECTION - II (Envelope No. 2): Technical Bid:**
 - a. Information and documentary evidence establishing bidder's claim for meeting qualification criteria as stipulated in IFB. This section/envelope should necessarily contain all the required back-up documents for Bid Qualification.
 - b. Technical bid complete with all technical and commercial details, covering letter and un-priced copy of price Schedule with prices substituted with 'QUOTED' or 'NOT QUOTED' or 'NOT APPLICABLE'. **Deviation sheet duly filled with deviations, if any, shall form part**



of technical bid.

- **SECTION - III (Envelope No. 3): Price Bid:**
 - a. PRICE BID WITH FULL PRICE DETAILS. The price bid shall contain prices only in the prescribed price schedule formats, without any technical and commercial details. Technical specifications or commercial terms given in unpriced schedule will only be evaluated and the same will be binding on the Bidder. The bids shall be sealed and kept in a single envelope with marking as Section - III (Price Bid) / Envelope No. 3 : "Original"
 - b. The bidder shall quote the final prices (including taxes, Cess, duties and other levies etc) in the 'PRICE SCHEDULE FORMAT' of bid document ONLY. Prices quoted in any other format shall not be considered for evaluation.
 - c. The Price bid shall be kept in a larger envelope duly sealed and shall bear the name and address of the bidder.
- B. The envelopes containing Section -I, Section -II, Section -III of bid shall be enclosed in a larger envelope duly sealed and pasted and shall bear the name and address of the bidder.
- C. Bidder to note that if bid security / EMD (in the Proforma attached with these documents) in original and/or bid document fee (if the bid document is downloaded) is kept in any other envelope and not found in envelope no. 1, the offer of the bidder(s) will be REJECTED during opening.
- D. Bidder to note that prices are to be quoted in the format provided in the price schedule formats provided along with the tender without any conditions. Price bids submitted in any other format and conditional price bids will be liable to be rejected. Price bids received in open condition (not in sealed envelope) or kept in any other Section of the bid (i. e, Section - I or II) will also be liable for rejection.
- E. If the outer envelope is not sealed and not marked as required, then DAFFPL will assume no responsibility for the bid's misplacement or premature opening.
- F. Bidders in their own interest shall ensure that they send their bid complete in all respects well in time to reach the specified office within the specified bid due date and time. No relaxation shall be given for delay due to any unforeseen event in submission of bid.
- G. Central Public Sector Enterprises and Firms registered with NSIC are exempted from submission of Bid Security. Central Public Sector Enterprises are requested to give a self declaration on their letter head to this effect, which should be submitted in a sealed envelope marked as Bid Security.
- H. Bidders registered with NSIC are also requested to submit self declaration



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on their letter head to this effect along with a copy of their Valid Registration certificate, specifying limit of volume and other details which should be submitted in a separate sealed envelope no. 1 marked as Bid security.

- I. Bid Security strictly in the Proforma attached with these documents shall be submitted in Original along with the Bid. Bids received without original bid security, shall not be opened for evaluation.
- J. Tender document complete in all respects must be submitted in the tender box provided at the DAFFPL office before due date and time

33. DOCUMENTS COMPRISING THE BIDS

The bid prepared by the Bidder shall comprise the following components:

- I. **ORIGINAL BID SECURITY (Section - I):** Bidders are advised to instruct their banks not to post Bid Security directly to Owner as the same has to accompany with the bid.
- II. **TECHNICAL BID (Section -II):**
 - Documentary evidence establishing Bidder's claim for meeting qualification criteria as stipulated in the Bid Document.
 - Notarized Audited Annual Report of previous three financial years.
 - Documentary evidence establishing Bidder's eligibility to bid and that the offered Goods conform to the Bid Document.
 - Price Schedule (with Price figures blanked) completed in accordance with the requirements specified in the bid document.
 - Agreed Terms & Conditions duly filled-in.
 - Deviation Sheet, if any.
 - Declaration with the bid qualification criteria that bidder has not been banned or delisted by any Government or quasi Government agencies or PSU's.
 - Any other information/details/documents/data required as per Bid Document.
 - Parent Company Guarantee, if applicable
- III. **PRICE BID (Section -III):** Bid Form and Price Schedule (Both given along with tender) duly filled in.

34. BID FORM & PRICE SCHEDULE

The bidders shall complete the Bid Form and appropriate Price schedule furnished of Bid Document, indicating the required information for all quoted items.

35. FORMAT AND SIGNING OF BID

- a. The Bidder shall prepare required number of copies of the bid, clearly



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marking each 'Original Bid' and 'Copy of Bid' as appropriate. In the event of any discrepancy between them, the 'Original Bid' shall govern.

- b. The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the bidder on all pages of the bid. Such authorization shall be indicated by written Power of Attorney accompanying the bid. The name and position held by each person signing must be typed or printed below the signature. The person or persons signing the bid shall initial all pages of the bid, except for unamended printed literature.
- c. The complete bid shall be without alterations, interlineations or erasures, except as may be necessary to correct errors made by the Bidder, in which case such corrections shall be rewritten & initialed by the person or persons signing the bid.
- d. All the pages of the price bid shall be signed by the authorized signatory. In case all the pages of the price bid are not signed, the bid shall be rejected.

36. OPENING OF BIDS

Bids will be opened by Owner at DAFFPL Office, New Delhi, in the presence of bidders/bidders authorized representatives available on the opening date and time (duly authorized by a competent person and having the letter of authority).

a. **BID SECURITY / EMD (SECTION-I) AND TECHNICAL BID (SECTION-II):**

- I. On the day and time of bid opening, Bid security (Envelope 1) and Technical Bid (Envelope 2) shall be opened in presence of bidders.
- II. The Bidder's representatives, who are present, shall sign a register/attendance sheet evidencing their attendance.
- III. The Bidder(s) names, presence or absence of requisite bid security will be announced at the opening.
- IV. Bidder (s), whose bids are not opened for any reason, including non receipt of original bid security, will not be allowed to be present during bid opening.

b. **PRICE BID OPENING (SECTION -III):**

- I. Only those bidders whose bids meet the qualification criteria and are technically/commercially acceptable shall be called for opening of Price bid (Envelope 3) at a later date, informed in advance.
- II. The Bidder's representatives, who are present, shall sign a register/attendance sheet evidencing their attendance.
- III. Bidder(s), whose bids are not opened for any reason, will not be allowed to be present during bid opening.

37. EVALUATION OF BIDS

- a. Qualification of Bidder: The experience details and financial & technical



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capabilities of the bidder(s) shall be examined to determine whether the bidder(s) meet the Bid Qualification Criteria mentioned in the INVITATION FOR BIDS (IFB).

- b. The Owner will examine the bids to determine whether they are complete, any computational errors have been made, whether the documents have been properly signed and whether the bids are generally in order.
- c. The bids without requisite Bid Security and/or not in the prescribed performa will not be considered and bids of such bidder Bidder(s) shall be rejected.
- d. To assist in the examination, evaluation and comparison of technical bids, the owner/may, at its discretion, ask the Bidder clarifications on the bid. The request for such clarifications and the response thereto shall be in writing.
- e. Prior to the evaluation and comparison of the bid, the owner will determine the substantial responsiveness of each bid to the bidding documents. For the purpose of this Article, a substantially responsive bid is one, which conforms to all the terms and conditions of the bidding document without material deviations or reservations. A material deviation or reservation is one which affects in any substantial way the scope, quality, or performance of the works or which limits in any substantial way, inconsistent with the bidding document, the DAFFPL's rights or Bidder's obligation under the contract and retention of which deviation or reservation would affect unfairly the competitive position of other bidders presenting substantially responsive bids. The owner's determination of bid responsiveness is to be based on the contents of the bid itself without recourse to the extrinsic evidence.
- f. A bid determined as substantially non-responsive will be rejected by the Owner and shall not subsequently be allowed by the Owner to be made responsive by the Bidder by correction of the non-conformity.

Note:

- 1) The Bid Shall be submitted in English Language Only**
- 2) For any Document submitted in any language other than English, the translation copy in English language shall be submitted.**



CHAPTER 3: BID-QUALIFICATION CRITERIA:

Bidders need to meet following pre-qualification criteria to qualify for short-listing as a successful vendor, who would be considered for tendering process for the job of **“Miscellaneous Electrical Works at DAFFPL”**

➤ **Technical Criteria:-**

- **Past Experience:** Bidder shall have experience of having successfully completed similar works during last 07 (Seven) years ending last day of month previous to the one in which applications are invited for either of the following:
 - ✓ **Three completed similar works of total value not less than 20.0 Lakh**
 - Or**
 - ✓ **Two completed similar works of total value not less than 24.0 Lakh**
 - Or**
 - ✓ **One completed similar works of value not less than 36.0 Lakh**
- Bidder shall submit the following documents in support of full filling the above criteria:
 - ✓ PO/WO copy for the works done in the past, indicating value of work.
 - ✓ Completion Certificate indicating PO/WO No & Date from User.

➤ **Financial criteria for job:-**

- Bidder shall have minimum average annual turnover of Rs. 45 Lakh as per audited financial results in the preceding three financial/calendar years.

OTHER INFORMATION OF PQC

1. Parties who are affiliates of one another can decide which Affiliate will make a bid. Only one affiliate may submit a bid. Two or more affiliates are not permitted to make separate bids directly or indirectly. If 2 or more affiliates submit a bid, then any one or all of them are liable for disqualification. However up to 3 affiliates may make a joint bid as a consortium, and in which case the conditions applicable to a consortium shall apply to them.

“Affiliate” of a Party shall mean any company or legal entity which:

- a. Controls either directly or indirectly a Party, or
- b. Which is controlled directly or indirectly by a Party; or
- c. Is directly or indirectly controlled by a company, legal entity or Partnership which directly or indirectly controls a Party. “Control” means actual control or ownership of at least a 50% voting or other controlling interest that gives



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the power to direct, or cause the direction of, the management and material business decisions of the controlled entity.

2. Bids may be submitted by:
 - a. A single person/ entity (called sole bidder);
 - b. A newly formed incorporated joint venture (JV) which has not completed 3 financial years from the date of commencement of business;
 - c. A consortium (including an unincorporated JV) having a maximum of 3 (three) members;
 - d. An Indian arm of a foreign company.

3. Fulfillment of Eligibility criteria and certain additional conditions in respect of each of the above 4 types of bidders are stated below, respectively:
 - a. The sole bidder (including an incorporated JV which has completed 3 financial years after date of commencement of business) shall fulfill each eligibility criteria.
 - b. In case the bidder is a newly formed and incorporated joint venture and which has not completed three financial years from the date of commencement of business, then either the said JV shall fulfill each eligibility criteria or any one constituent member/ promoter of such a JV shall fulfill each eligibility criteria. If the bid is received with the proposal that one constituent member/ promoter fulfils each eligibility criteria, then this member/promoter shall be clearly identified and he/it shall assume all obligations under the contract and provide such comfort letter/guarantees as may be required by Owner. The guarantees shall cover inter alia the commitment of the member/ promoter to complete the entire work in all respects and in a timely fashion, being bound by all the obligations under the contract, an undertaking to provide all necessary technical and financial support to the JV to ensure completion of the contract when awarded, an undertaking not to withdraw from the JV till completion of the work, etc.
 - c. In case the bidder(s) is/are a consortium (including an unincorporated JV), then the following conditions shall apply:
 - I. Each member in a consortium may only be a legal entity and not an individual person;
 - II. The Bid shall specifically identify and describe each member of the consortium;
 - III. the consortium member descriptions shall indicate what type of legal entity the member is and its jurisdiction of incorporation (or of establishment as a legal entity other than as a corporation) and provide evidence by a copy of the articles of incorporation (or equivalent documents);
 - IV. One participant member of the consortium shall be identified as the "Prime member" and contracting entity for the consortium;
 - V. This prime member shall be solely responsible for all aspects of the



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- Bid/ Proposal including the execution of all tasks and performance of all consortium obligations;
- VI. The prime member shall fulfill each eligibility criteria;
 - VII. a commitment shall be given from each of the consortium members in the form of a letter signed by a duly authorized officer clearly identifying the role of the member in the Bid and the member's commitment to perform all relevant tasks and obligations in support of the
 - VIII. Prime/lead member of the Consortium and a commitment not to withdraw from the consortium;
 - IX. No change shall be permitted in the number, nature or share holding pattern of the Consortium members after pre-qualification, without the prior written permission of the Owner.
 - X. No change in project plans, timetables or pricing will be permitted as a consequence of any withdrawal or failure to perform by a consortium member;
 - XI. No consortium member shall hold less than 25% stake in a consortium;
 - XII. Entities which are affiliates of one another are allowed to bid either as a sole bidder or as a consortium only;
 - XIII. Any person or entity can bid either singly or as a member of only one consortium.
- d. In case the bidder is an Indian arm (subsidiary, authorized agent, branch office or affiliate) of a foreign bidder, then the foreign bidder shall have to full fill each eligibility criteria. If such foreign company desires that the contract be entered into with the Indian arm, then a proper back to back continuing (parent company) guarantee shall be provided by the foreign company clearly stating that in case of any failure of any supply or performance of the equipment, machinery, material or plant or completion of the work in all respects and as per the warranties/ guarantees that may have been given, then the foreign company shall assume all obligations under the contract. Towards this purpose, it shall provide such comfort letter/guarantees as may be required by Owner. The guarantees shall cover inter alia the commitment of the foreign company to complete the entire work in all respects and in a timely fashion, being bound by all the obligations under the contract, an undertaking to provide all necessary technical and financial support to the Indian arm or to render the same themselves so as to ensure completion of the contract when awarded, an undertaking not to withdraw from the contract till completion of the work, etc.



CHAPTER 4: PERFORMANCE OF WORK

1. EXECUTION OF WORKS:

- a. All the works shall be executed in strict conformity with the provisions of the contract documents and with such explanatory detailed drawings, specifications, and instructions as may be furnished from time to time to the contractor by the Engineer-in-Charge whether mentioned in the contract or not. The contractor shall be responsible for ensuring that works throughout are executed in the most substantial, proper and workman like manner with the quality of material and workmanship in strict accordance with the specifications following all safety requirements of DAFFPL and as stipulated in work permits as per the directions and to the entire satisfaction of the Engineer-in-Charge.
- b. Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities/materials, it is understood that the contractor shall do, so at his cost unless otherwise specified.
- c. The materials, design and workmanship shall satisfy the relevant Indian Standards, the Job specification contained herein and codes referred to. Where the job specification stipulate requirements in addition to those contained in the standards codes and specifications, these additional requirements shall also be satisfied.

2. COORDINATION AND INSPECTION OF WORK:

The written instructions regarding any particular job will be normally be passed by the Engineer-in-Charge or his authorized representative. A work order book / logbook will be maintained by the Contractor for each job in which the aforesaid written instructions will be entered. These will be signed by the contractor or his authorized representative by way of acknowledgment within 12 hours. The non-maintaining of the order book or non-signing by the contractor shall not preclude the contractor from complying with the instructions.

3. WORK IN MONSOON AND DEWATERING:

- a. The completion of the work may entail working in the monsoon also. The contractor must maintain a minimum labour force as may be required for the job and plan and execute the job according to the prescribed schedule. No extra rate will be considered for such work in monsoon.
- b. During monsoon and other period, it shall be the responsibility of the contractor to keep the work site free from water at his own cost.

4. WORK ON SUNDAYS AND HOLIDAYS:



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For carrying out work on Sundays and Holidays if needed, the contractor will approach the Engineer-in-Charge or his representative at least two days in advance and obtain permission in writing. No special compensation on this account will be payable.

5. GENERAL CONDITIONS FOR EXECUTION OF JOBS/WORK:

- a. **Place of Work:** The work has to be executed at specified premises as per the tender. Contractor should apprise himself of all the conditions prevailing in such location and the restrictions placed on movement of personnel and equipment, types of equipment and tools permitted, working methods allowed etc. in the light of security and safety regulations operative in the area. The safety regulations to be complied with, by the contractor will also be provided along with the tender. No idle time wages or compensation for temporary stoppage of work or restrictions would be paid, and the rate quoted for the various items of work should cover the cost of all such contingencies and eventualities. Substantial structures and utilities exist both above ground and underground, adjacent to the work site. (The activity gets restrained by the existence of such structures and utilities). Special care is necessary in transportation, storage, working on equipment's and other activities to protect the existing features and prevent damage to any facility. Necessary protective structures barricades etc. have to be erected at various places as directed by Engineer-in-Charge. No extra payment of such protective works will be made unless specially provided in the tender.
- b. The working time or the time of work is 48 hours per week normally. Overtime work is permitted in cases of need and the Owner will not compensate the same. Shift working at 2 or 3 shifts per day may become necessary and the contractor should take this aspect into consideration for formulating his rates for quotation. No extra claims will be entertained by the Owner on this account.
- c. The contractor must arrange for the placement of workers in such a way that the delayed completing of the work or any part thereof for any reasons whatsoever will not affect their proper employment. The Owner will not entertain any claim for idle time payment whatsoever.
- d. The contractor shall submit to the Owner reports at regular intervals regarding the state and progress of work. The details and Performa of the report will mutually be agreed after the award of contract.

6. DRAWINGS TO BE SUPPLIED BY THE OWNER:

- a. Where drawings are attached with tender, these shall be for the general guidance of the contractor to enable him to visualize the type of work contemplated and scope of work involved. The contractor will be deemed to have studied the drawings and formed an idea about the work involved.
- b. Detailed working drawings on the basis of which actual execution of the work is to proceed will be furnished from time to time during the progress of the



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work. The contractor shall be deemed to have gone through the drawings supplied to him thoroughly and carefully and in conjunction with all other connected drawings and bring to the notice of the Engineer-in-Charge, discrepancies, if any, therein before actually carrying out the work.

- c. Copies of all detailed working drawings relating to the works shall be kept at the contractor's office of the site and shall be made available to the Engineer-in-Charge at any time during the contract. The drawings and other documents issued by the Owner shall be returned to the Owner on completion of the works.

7. SETTING OUT WORKS:

- a. The Engineer-in-Charge shall furnish the contractor with only the four corners of the work site and a level bench mark and the contractor shall set out the works and shall provide efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.
- b. The contractor shall provide, fix and be responsible for the maintenance of all stacks, templates, level marks, profiles and other similar things and shall take all necessary precaution to prevent their removal or disturbance and shall be responsible for the consequence of such removal or disturbance should the same take place and for their efficient and timely reinstatement. The contractor shall also be responsible for the maintenance of all existing survey marks, boundary marks, distance marks and centre line marks, either existing or supplied and fixed by the contractor. The work shall be set out to the satisfaction of the Engineer-in-Charge. The approval thereof or joining in setting out the work shall not relieve the contractor of any of his responsibilities.

8. MATERIALS TO BE SUPPLIED BY CONTRACTOR:

- a. The contractor shall procure/supply and provide the whole of the materials required for executing jobs including tools, tackles and equipment for the completion of the works except the materials which will be issued by Owner and shall make his own arrangement for procuring such materials and for the transport thereof. The materials procured by the contractor shall be DAFFPL approved/specified quality.
- b. All materials procured/supplied should meet the specifications given in the tender document. The Engineer-in-Charge may, at his discretion, ask for samples and test certificates for any batch of any material procured/supplied. Before procuring, the contractor should get the approval of Engineer-in-Charge for any material to be used for the works.
- c. Manufacturer's certificate shall be submitted for all materials supplied by the contractor. If, however, in the opinion of the Engineer-in-Charge any tests are required to be conducted on the materials supplied by the contractor, these will be arranged by the contractor promptly at his own cost.



9. MATERIALS SUPPLIED BY OWNER:

- a. If the specifications of the work provides for the use of any materials of special description to be supplied from the Owner's stores, price for such material to be charged therefore as herein after mentioned being so far as practicable for the convenience of the contractor but not so as in any way to control the meaning or effect of the contract. The contractor shall be bound to purchase and shall be supplied such materials as are from time to time required to be used by him for the purpose of the contract only. The sums due from the contractor for the value of the actual materials supplied by the Owner will be recovered from the running account bill on the basis of the actual consumption of materials in the work covered and for which the running account bill has been prepared. After the completion of the works, however, the contractor has to account for the full quantity of materials supplied to him as per relevant clauses in this document.
- b. The value of the materials as may be supplied to the contractor by the Owner will be debited to the contractor's account at the rates shown in the schedule of chargeable materials and if they are not entered in the schedule, they will be debited at cost price, which for the purpose of the contract shall include the cost of carriage and all other expenses whatsoever such as normal storage supervision charges which shall have been incurred in obtaining the same at the Owner's stores. All materials so supplied to the contractor shall remain the absolute property of the Owner and shall not be removed on any account from the site of the work, and shall be at all times open for inspection to the Engineer-in-Charge. Any such materials remaining unused at the time of completion or termination of the contract shall be returned to the Owner's stores or at a place as directed by the Engineer-in- Charge in perfectly good condition, at contractor's cost.

10. CONDITIONS FOR ISSUE OF MATERIALS:

- a. Materials specified to be issued by the Owner will be supplied to the contractor by the Owner from his stores/location. It shall be the responsibility of the contractor to take delivery of the materials and arrange for its loading, transport and unloading at the site of work at his own cost. The materials shall be issued between the working hours and as per the rules of the Owner framed from time to time.
- b. The contractor shall bear all incidental charges for the storage and safe custody of materials at site after these have been issued to him.
- c. Materials specified to be issued by the Owner shall be issued in standard sizes as obtained from the manufacturer.
- d. The contractor shall construct suitable godown at the site of work for storing the materials safe against damage by rain, dampness, fire, theft etc. He shall also employ necessary watch and ward establishment for the purpose.



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- e. It shall be duty of the contractor to inspect the material supplied to him at the time of taking delivery and satisfy himself that they are in good condition. After the materials have been delivered by the Owner, it shall be the responsibility of the contractor to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/ or replaced by him at his own cost, according to the directions of the Engineer-in-Charge.
- f. The Owner shall not be liable for delay in supply or non-supply of any materials which the Owner has undertaken to supply where such failure or delay is due to natural calamities, act of enemies, transport and procurement difficulties and any circumstances beyond the control of the Owner. In no case, the contractor shall be entitled to claim any compensation or loss suffered by him on this account.
- g. It shall be the responsibility of the contractor to arrange in time all materials required for the works other than those to be supplied by the Owner. If, however, in the opinion of the Engineer-in-Charge the execution of the work is likely to be delayed due to the contractor's inability to make arrangements for supply of materials which normally he has to arrange for, the Engineer-in-Charge shall have the right, at his own discretion, to Issue such materials If available with the Owner or procure the materials from the market or elsewhere and the contractor will be bound to take such materials at the rates decided by the Engineer-in-Charge. This, however, does not in any way absolve the contractor from responsibility of making arrangements for the supply of such materials in part or in full, should such a situation occur, nor shall this, constitute a reason for the delay in the execution of the work.
- h. None of the materials supplied to the contractor will be utilized by the contractor for manufacturing item, which can be obtained from standard manufacturer in finished form.
- i. The contractor shall, if desired by the Engineer-in-Charge, be required to execute an indemnity bond for safe custody and accounting of all materials issued by the Owner.
- j. The contractor shall furnish to the Engineer-in-Charge sufficiently in advance a statement showing his requirements of the quantities of the materials to be supplied by the Owner and the time when the same will be required by him for the works, so as to enable the Engineer-in-Charge to make necessary arrangement for procurement and supply of the material.
- k. A daily account of the materials issued by the Owner shall be maintained by the contractor indicating the daily receipt, consumption and balance in hand. This account shall be maintained in a manner prescribed by the Engineer-in-Charge along with all connected papers viz. requisition, issues etc. and shall be always available for inspection in the contractor's office at site.
- l. The contractor should see that only the required quantities of materials are got issued. The contractor shall not be entitled to cartage and incidental charges for returning the surplus materials, if any, to the stores/location



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where from they were issued or to the place as directed by the Engineer-in-Charge.

- m. Materials/ Equipment supplied by Owner shall not be utilized for any other purpose(s) than issued for.

11. MATERIALS OBTAINED FROM DISMANTLING:

If the contractor in the course of execution of the work is called upon to dismantle any part for reasons, the materials obtained in the work of dismantling etc. will be considered as the Owner's property and will be disposed off to the best advantage of the Owner.

12. ARTICLES OF VALUE FOUND:

All gold, silver and other materials, of any description and all precious stones, coins, treasure relics, antiquities and other similar things which shall be found in, under or upon the site, shall be property of the Owner and the contractor shall duly preserve the same to the satisfaction of the Engineer-in-Charge and shall from time to time deliver the same to such person or person indicated by the Owner.

13. DISCREPANCIES BETWEEN INSTRUCTIONS:

Should any discrepancy occur between the various instructions furnished to the contractor, his agents or staff or any doubt, arise as to the meaning of any such instructions or should there be any misunderstanding between the contractor's staff and the Engineer-in-Charge's staff, the contractor shall refer the matter immediately in writing to the Engineer-in-Charge whose decision thereon shall be final and conclusive and no claim for losses alleged to have been caused by such discrepancies between instructions, or doubts, or misunderstanding shall in any event be admissible.

14. ACTION WHERE NO SPECIFICATIONS ISSUED:

In case of any class of work for which there is no such specification given by the Owner in the tender documents, such work shall be carried out in accordance with Indian Standard Specifications and if the Indian Standard Specifications do not cover the same the work should be carried out as per standard Engineering Practice subject to the approval of the Engineer-in-Charge.

15. ABNORMAL RATES:

The contractor is expected to quote rate for each item after analysis of cost involved for the completion of item/work, considering all specifications and conditions of contract. This will avoid loss of profit or gain, in case of curtailment or change of specification for any item. In case it is noticed that the rates for any item, quoted by the tenderer unusually are high or unusually low it will be sufficient cause for the rejection of the tender unless the Owner is convinced about the reasonableness of the rates on scrutiny of the analysis for such rate to be furnished by the tenderer on demand.



16. INSPECTION OF WORK:

- a. The Engineer-in-Charge / Project Management Consultant will have full power and authority to inspect the works at any time wherever in progress either on the Site or at the contractor's premises / workshop where situated premises /workshops of any person, firm or corporation where work in connect with the contract may be in hand or where materials are being or are to be supplied, and the contractor shall afford or procure for the Engineer-in-Charge every facility and assistance to carry out such Inspection. The contractor shall at all time during the usual working hours and at all other time for which reasonable notice of the intention of the Engineer in-Charge or his representative to visit the works have been given to the contractor, either himself be present to receive order and instructions or post a responsible agent duly accredited in writing for the purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself. The contractor shall give not less than seven days, notice in writing to the Engineer-in-Charge before covering up or placing any work beyond reach of inspection and measurement any work in order that the same may be inspected and measured. In the event of breach of above the same shall be uncovered at contractor's expense carrying out such measurement or inspection.
- b. No materials shall be dispatched by the contractor before obtaining the approval of Engineer-in-Charge in writing. The contractor is to provide at all times during the progress of the work and the maintenance period, proper means of access with ladders, gangways, etc. and the necessary attendance to move and adopt as directed for inspection or measurement of the works by the Engine in-Charge.

17. ASSISTANCE TO THE ENGINEERS:

The contractor shall make available to the Engineer-in-Charge, free of cost necessary instruments and assistance in checking of setting out of works and taking measurement of work.

18. TESTS FOR QUALITY OF WORKS:

- a. All workmanship shall be of the respective kinds described in the contract documents and in accordance with the instructions of the Engineer-in-Charge and shall be subjected from time to time to such test at contractor's cost as the Engineer-in-Charge may direct at place of manufacture or fabrication or on the site or at all or any such places. The contractor shall provide assistance, instruments, labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required the Engineer-in-Charge.
- b. All the tests necessary in connection with the execution of the work as decided by Engineer-in-Charge shall be carried out at the field testing



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laboratory of the Owner by paying the charges as decided by the Owner from time to time. In case of non-availability of test facility with the Owner, the required test shall be carried out at the cost of contractor at government or any other testing laboratory as directed by Engineer-in-Charge.

- c. If any tests are required to be carried out in connection with the work or materials workmanship not supplied by the contractor, such tests shall be carried out by the contractor as per the instructions of Engineer-in-Charge and cost of such tests shall be reimbursed by the Owner.

19. ACTION AND COMPENSATION IN CASE OF BAD WORK:

If it shall appear to the Engineer-in-Charge that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of any inferior description, or that any materials or articles provided by the contractor for the execution of the work are unsound or of a quality inferior to that contracted for, or otherwise not in accordance with the contract, the contractor shall on demand in writing from the Engineer-in-Charge or his authorized representative, specifying the work, materials or articles complained of, notwithstanding that the same have been inadvertently passed, certified and paid for forthwith shall rectify or remove and reconstruct the works specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of failure to do so within a period to be specified by the Engineer-in-Charge in his demand aforesaid, the contractor shall be liable to pay compensation at the rate of 0.5% of the estimated cost of the whole work, for every week limited to a maximum of 10% of the estimated cost of the whole work, while his failure to do so shall continue and in the case of any such failure the Engineer-in-Charge may on expiry of notice period rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expenses of the contractors in all respects. The decision of the Engineer-in-Charge as to any question arising under this clause shall be final and conclusive.

20. SUSPENSION OF WORKS:

The contractor shall, if ordered in writing by the Engineer-in-Charge or his representative, temporarily suspend the works or any part thereof for such period and such time as so ordered and shall not, after receiving such written order, proceed with the work therein ordered to be suspended, until he shall have received a written order to proceed therewith. The contractor shall not be entitled to claim/compensation for any loss or damage sustained by him by reason of temporary suspension of the works aforesaid. An extension of time for completion, corresponding with the delay caused by any such suspension of the works as aforesaid will be granted to the contractor, should he apply for the same, provided that suspension was not consequent to any default or failure on the part of the contractor.

21. OWNER MAY DO PART OF WORK:



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Upon failure of the contractor to comply with any instructions given in accordance with the provisions of the contract, the owner has the alternative right, instead of assuming charge for entire work to place additional labour force, tools, equipments and materials on such parts of the work, as the owner may designate or also engage another contractor to carry out the work. In such cases, the owner shall deduct from the amount which otherwise might become due to the contractor, the cost of such work and materials with ten percent added to cover all departmental charges and should the total amount thereof exceed the amount due to the contractor, the contractor shall pay the difference to the owner.



CHAPTER 5: GENERAL TERMS & CONDITIONS:

1. DAFFPL reserves the right to accept any tender in whole and reject any or all tenders without assigning any reason. DAFFPL also reserves the right to allow public enterprises (Central/State) Price / purchase /contract / service preference as admissible under the Indian Government Policy.
2. BID PRICES:
 - a) Prices shall be furnished strictly in the Price Bid format of the tender document.
 - b) Bidder should quote their lowest and best offered price. Prices so quoted will remain firm till satisfactory completion of order. The price will not be subjected to escalation for any reason whatsoever.
 - c) Bidders quoted prices shall be deemed to include entire Specification for miscellaneous electrical works and responsibilities to be carried out / executed by the Bidder as per terms of tender document. It is clearly understood by the Vendor that it is for the Vendor to ascertain and assess the applicable Acts/ Regulations/ Laws etc., entirely of their own. It is also for the Vendor to ascertain and assess the applicability of taxes, duties, levies etc. In case of any difference of opinion between Vendors proposal and interpretation by any tax/assessing (or similar) authorities, on the rate or terms and conditions related to taxes and duties etc., owners liability shall be strictly as per terms/provisions of the contract based on tender document and Vendors offer.
 - d) No other charges accept those mentioned in the tender document will be payable to vendor.
3. The materials should be properly packed so as to withstand all transit hazards. Materials are required to be dispatched by the vendor to the locations, on freight paid DOOR- DELIVERY CONSIGNEE COPY ATTACHED basis along with copies of Inspection release note & internal test certificates & other documents as mentioned elsewhere in this tender document.
4. All shipment shall be under deck unless carriage on deck is unavoidable.
5. Bidder to note that Special Packaging Requirement as in technical specifications of this tender. The materials should be properly packed so as to withstand all transit hazards (both ocean & inland transit).
6. Indian agent Commission will not be paid by the owner.
7. TAXES & DUTIES:
 - a) Bidder(s) quoted prices shall be inclusive of all taxes, duties, cess, levies etc., paid or payable on the raw material/components incorporated or to be



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incorporated in the offered finished goods.

- b) The invoice should clearly mentioned that applicable Excise Duty, Education Cess or any other taxes charged and paid / payable on quoted item to enable the owner to claim MODVAT / Input credit.
- c) The statutory variation in Excise duty, Education Cess and Sales tax / VAT on finished goods and introduction of new tax, from bid due date till the contractual completion period shall be to owner account against submission of the documentary evidence. However, any increase in the rate of these taxes and duties beyond the contractual delivery period shall be to Seller account. Any decrease in the rate of these taxes and duties shall be passed on to the owner. Any additional excise duty due to increase in turn-over would be to seller account.
- d) It is for the Bidder to assess and ascertain the rate of excise duty, education Cess and sales tax/VAT applicable on quoted items. It is clearly understood that Owner will not have any additional liability towards payment of Excise Duty, Education Cess and Sales Tax/VAT which is based on Bidders wrong assessment / interpretation of applicability of such Excise Duty and/or education cess and / or Sales Tax/VAT.
- e) Successful bidder shall carry out its obligations towards services at site as mentioned in technical specifications without any extra charges.
- f) Octroi/Entry tax, if any, in the any state of India shall be directly paid by the vendor, if applicable.
- g) DAFFPL shall not be liable, in case the tax authorities assess the tax elements in a different way on account of any reason, whatsoever.
- h) Taxes and duties other than those specified in this document, if any, shall be included in the quoted prices and no separate reimbursement shall be made by DAFFPL.

8. Income Tax / Corporate Tax :

- a) As regards Income Tax, Surcharge on Income Tax or any other Corporate Tax payable by the Bidder for reason of the contract awarded, and / or on their expatriate personal, the Owner shall not bear any Tax liability whatsoever, irrespective of the mode of construction of contract / order. The Bidder shall be liable and responsible for payment of such tax, if attracted under the provision of Indian Income Tax Act.
- b) Bidder may note that if any tax is deductible at source as per Indian Income Tax Law, the same will be so deducted before releasing any payment to the Bidder and a TDS (Tax deducted at source) certificate will be furnished to the Bidder.
- c) In case of delay in delivery due to reasons attributable to Bidder, any new or additional taxes or duties levied by Statutory authorities during this period shall be borne by the Bidder.

9. EMD / BID SECURITY



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- a) The bidder shall furnish, as part of his bid, a bid security in original for the amount specified in the tender document by way of pay order, bank guarantee on Rs.100/-value non-judicial stamp paper or demand draft.
- b) The bid security is required to protect the Owner against the risk of Bidders conduct, which would warrant the security forfeiture.
- c) If bid Security / EMD is in the form of bank guarantee, it shall be in the form of irrevocable bank guarantee (in the format attached) issued by any Indian Scheduled Bank (other than Co-operative Bank) will be accepted.
- d) Bid Security / EMD shall be issued in favour of M/s Delhi Aviation Fuel Facility (P) Limited, New Delhi. .
- e) Unsuccessful bidders bid security without any interest will be discharged/ returned as promptly as possible, but not later than 60 days after the expiry of the period of bid validity prescribed by the Owner.
- f) The successful bidder bid security without any interest will be discharged, upon the Bidder accepting the Contract/ Purchase Order and furnishing the Contract performance bank guarantee to DAFFPL.
- g) The bid security may be forfeited:
 - i. If a bidder withdraws his bid during the period of bid validity or
 - ii. In the case of a successful bidder, if the bidder fails or refuses to:
 - Accept the Purchase Order in accordance with agreed terms and conditions.
 - Furnish Contract performance bank guarantee as per bid document/ Purchase Order.
 - iii. Detection of submission of false / forged documents and fraud.
- h) Bid Security / EMD should be in favour of “Delhi Aviation Fuel Facility Private Limited”, payable at New Delhi and submitted to the relevant office of DAFFPL as mentioned in covering note of the tender document. Covering letter to bid Security / EMD must indicate the tender number. This is essential to have proper co-relation at a later date. The bid security / EMD shall be strictly in the form provided in the bid document before the due date & time of bid submission.
- i) Central Public Sector Undertaking of Govt. Of India are exempted from furnishing the bid security. Firms registered with NSIC/ MSME are also exempted from furnishing bid security, provided they are registered for the tendered items and up to the monetary limit they intend to quote. Provided further that they submit a copy of the current and valid registration certificate for the quoted item and monetary value along with their bid(s). Owner reserves right to verify the registration certificate provided, with relevant authorities.

10. CONTRACT PERFORMANCE BANK GUARANTEE [CPBG]

- a) As a Performance security, the successful Bidder, to whom the work is



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awarded by, shall be required to furnish within 30 days of notification of award of contract (Letter/ Fax/e-mail of Intent) a Performance Bank Guarantee on RS.100/- VALUE non-judicial stamp paper in favour of the Owner (M/S DAFFPL).

- b) The Bank Guarantee amount shall be equal to TEN PERCENT (10%) of the Total Order Value and it shall guarantee the faithful performance of the Order in accordance with the Terms and conditions specified in the documents and specifications.
- c) CPBG shall be in the form of an irrevocable Bank Guarantee (in the format attached) issued by any Indian Scheduled Bank (other than Co-operative Bank).
- d) The Bank Guarantee shall be valid for the entire period of the Contract, namely, till the end of the guarantee / warranty period. The guarantee amount shall be payable on demand to the Owner.
- e) In case, the Contract Performance Bank Guarantee stated above gets reduced/ deducted for reasons of non-fulfillment of any Contractual obligations upto the completion of guarantee period, the bidder shall immediately take action to increase the value of Bank Guarantee to TEN PERCENT (10%) of the Contract price, to cover his guarantee/warranty obligations.
- f) The Performance Guarantee will be returned to the bidder without any interest at the end of the warranty / guarantee period subject to fulfillment of all contractual obligations by the Bidder. The bank guarantee shall have a claim period of 3 months beyond the contractual guarantee period.
- g) The proceeds of performance security shall be appropriated by the owner as compensation for any loss resulting from vendor's failure to complete his obligations under the contract to the prejudice to any of the rights or remedies the owner may be entitled to as per terms and conditions of contract. The proceeds of this performance security shall also govern the successful performance of goods and services and vendors all obligations during the entire period of contractual warranty / guarantee.

11. PENALTY FOR DELAYED COMPLETION:

Penalty / Liquidated Damages shall be charged @0.5% of the contract value per week subject to maximum of 10% of total order value, in case of delay beyond the stipulated time period.

12. INSURANCE

Supplier shall carry and maintain any and all statutory insurance(s) required under Indian Laws and Regulations, including Workmen compensation Act/ESI/Third party liabilities etc. and insurances for their personnel engaged in performance of the work at their own cost.



13. INSPECTION:

- a) Material shall be inspected by owner or its representative before dispatch of material from bidder works. Charges other than third party inspection, however, arranging & providing inspection facilities is entirely vendor responsibility and in no way should affect the delivery schedule.
- b) OWNER may, at its own expense, witness any test or inspection. In order to enable OWNER to witness the tests/inspections OWNER will advise the bidder in advance whether it intends to be present at any of the inspections.
- c) Even if the inspection and tests are fully carried out, the Vendor shall not be absolved from its responsibilities to ensure that the Material(s), raw materials, components and other inputs are supplied strictly to conform and comply with all the requirements of the Contract at all stages, whether during manufacture and fabrication, or at the time of Delivery as on arrival at site and after its erection or start up or consumption, and during the defect liability period. The inspections and tests are merely intended to prima-facie satisfy OWNER that the Material(s) and the parts and components comply with the requirements of the Contract. The Vendor's responsibility shall also not be anywise reduced or discharged because OWNER or OWNER's representative(s) or Inspector(s) shall have examined, commented on the Vendor's drawings or specifications or shall have witnessed the tests or required any chemical or physical or other tests or shall have stamped or approved or certified any Material(s).
- d) Although material approved by the Inspector(s), if on testing and inspection after receipt of the Material(s) at the location, any Material(s) are found not to be in strict conformity with the contractual requirements or specifications, OWNER shall have the right to reject the same and hold the Vendor liable for non-performance of the Contract.

14. Water and Electricity:

- Electricity will be provided by DAFFPL @ Rs. 14.50 per unit. Bidder has to make own arrangement for sub meter and further power distribution.
- Water for construction will not be provided by DAFFPL.

15. PAYMENT TERMS

- a) Bidders to note that Advance Payment is not permissible in the contract.
- b) Payment will be released within 30 days from the receipt of invoice.
- c) The following payment terms shall be applicable :
 - Supply Part:
 - 70% payment will be released after supply and acceptance of materials at site adjusting deductible if any
 - 30% after completion of its Installation, Testing and Commissioning along with necessary documents.



- Services/Installation Part:
 - 100% after completion of Installation, Testing and Commissioning of individual work with necessary documents.

The payment will be made on actual measurements, quantity supplied and work completed.

16. GUARANTEE/WARRANTY:

- a) Materials shall be guaranteed against manufacturing defects, materials, workmanship and design for a period of 12 months from the date of commissioning or 24 months from the date of dispatch whichever is later. Warranty for replacement of material / accessories should be provided free of charges at our premises. The above guarantee/warranty will be without prejudice to the certificate of inspection or material receipt note issued by us in respect of the materials.
- b) All the materials including components and sub contracted items should be guaranteed by the vendor within the warranty period mentioned above. In the event of any defect in the material, the vendor will replace / repair the material at DAFFPL concerned location at vendor risk and cost on due notice.
- c) Alternatively, DAFFPL reserves the right to have the material repaired / replaced at the locations concerned, at the vendors risk, cost and responsibility, in case, vendor does not replace / repair the material.
- d) The Vendor shall provide similar warrantee on the parts, components, fittings, accessories etc. so repaired and / or replaced.
- e) Vendor shall guarantee that the performance of the EQUIPMENT supplied under the CONTRACT shall be strictly in conformity with the specifications and shall perform the duties specified under the CONTRACT.
- f) The contractor shall guarantee the installation/site work for a period of 12 (twelve) Months from the date of completion of work, unless otherwise specified. Any damage that may lie undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by him or in the workmanship shall be rectified or replaced by the contractor at his own expense as deemed necessary by the Engineer-in-Charge or in default, the Engineer-in-Charge may cause the same made good by other workmen and deduct expenses (for which the certificate of Engineer-in-Charge shall be final) from any sums that may be then or at any time thereafter, become due to the contractor or from his security deposit.
- g) If the contractor feels that any variation in work or in quality of materials or proportions would be beneficial or necessary to fulfill the guarantee called for, he shall bring this to the notice of the Engineer-in-Charge in writing. The work will not be considered as complete and taken over by the Owner until all the temporary works etc., constructed by the contractor is removed and work site cleaned to the satisfaction of Engineer-in-Charge.



h) Care of Works:

From the commencement to completion of works, the contractor shall take full responsibility for the care of all works including all temporary works, and in case any damage, loss or injury happens to the works or to any part thereof or to any temporary work, from any cause whatsoever, he shall at own cost repair and make good the same, so that at completion, the work shall be in good order and in conformity in every respect with the requirements of the contract and the Engineer-in-Charge's instructions.

i) Effects prior to taking over: If at any time, before the work is taken over, the Engineer-in-Charge shall

- Decide that any work done or materials used by the contractor or any sub-contractor is defective or not in accordance with the contract or that the works or any portion thereof are defective or do not fulfill the requirements of contract (all such matters being herein after called 'Defects' in this clause) and
- As soon as reasonably practicable, notice given to the contractor in writing of the said decisions specifying particulars of the defects alleged to exist or to have occurred, then the contractor shall at his own expenses and with all speed make good the defects so specified. In the case contractor shall fail to do so, the Owner may take, at the cost of the contractor, such steps as may in all circumstances, be reasonable to make good such defects. The expenditure, so incurred by the Owner shall be recovered from the amount due to the contractor. The decision of the Engineer-in-Charge with regard to the amount be recovered from the contractor will be final and binding on the contractor. As soon as the works have been completed in accordance with the contract and have passed the tests on completion, the Engineer-in-Charge shall issue a certificate (hereinafter called completion certificate) in which he shall certify the date on which the work have been so completed and have passed the said tests and the Owner shall be deemed to have taken over the works on the date so certified. If the works have been divided into various groups in the contract, the Owner shall be entitled to take over any group or groups before the other or others and thereupon the Engineer-in-Charge shall issue a completion certificate which will however, be for such group or groups as taken over only.

j) Defects after taking over: In order that the contractor could obtain a completion certificate, he shall make good with all possible speed, any defect arising from the defective materials supplied by the Contractor or workmanship or any act of omission of the contract that may have been noticed or developed after the works or group of the works has been taken over. The period allowed for carrying out such work will be normally one month. If any defect be not remedied within a reasonable time, the Owner may proceed to do the work at the contractor's risk and expense and deduct



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from the final bill such amount as may be decided by the Owner. If by reason of any default on the part of the contractor a completion certificate has not been issued in respect of every portion of the work within one month after the date fixed by the contract for the completion of the works, the Owner shall be at his liberty to use the works or any portion thereof in respect of which a completion certificate has been issued provided that the works or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completing these works for the issue of completion certificate.

- k) The Security Deposit/retention money deducted / furnished shall be retained for the period of liability as given in clause above. This Retention amount or Bank Guarantee furnished against Security Deposit/retention money shall be released only on expiry of the period of liability and also based on the certification of the Engineer-in-charge that no defect/damage has been reported / observed during the stipulated period of liability for the contract.
- l) Performance of contractor shall be evaluated on each job by Engineer-in-Charge and recorded. Review of performance will be carried out at appropriate intervals by DAFFPL.
- m) RISK PURCHASE CLAUSE: We reserve the right to curtail or cancel the order either in full or part thereof if bidder fails to comply with delivery schedule and other terms & conditions of the order. DAFFPL also reserves the right to procure same or similar materials/equipment through other sources at vendor's entire risk, cost and consequences.

- 17. TEST & PERFORMANCE CERTIFICATES: Bidder shall furnish Material test and Performance Certificates for the materials along with the challans and invoice.
- 18. Only in the event of causes of Force Majeure occurring within the contractual delivery period and if they impede the performance of contract, the delivery dates shall be extended on receipt of application from the bidder / Owner without imposition of penalty. Only those causes which depend on natural calamities, civil wars, fire and national strikes which have duration of more than seven consecutive calendar days are considered the causes of force Majeure. The decision of Owner shall be final and binding on vendor.
- 19. The Vendor must advise the Owner by a registered letter duly certified by Local Chamber of Commerce or statutory authorities and Owner must advise the Vendor by a letter, the beginning and the end of the delay immediately, but in no case later than within 10 days of the beginning and end of such causes of Force Majeure condition as defined above. Provided further that if the performance in whole or part of any obligation under this contract is prevented or delayed by reason of any such event for period exceeding 60 days either party may at its option terminate the contract.



20. Repeat Order: DAFFPL reserves the right to place repeat order up to the order quantity within SIX MONTHS from the date of original order on mutual agreement basis.
21. Any reference to the Govt. Acts /Regulations etc. in the Bid Document is only indicative, and it is entirely for the bidder to ascertain the applicable Acts/Regulations.
22. Rejected material lying in Owner premises must be replaced within 60 days from date of final report on rejection of material.
23. RECOVERY OF SUMS DUE: Whenever, any claim against bidder for payment of a sum of money arises out of or under the contract or in any other form, the owner shall be entitled to recover such sums from any sum then due or when at any time thereafter may become due from the vendor under this or any other form and should this sum be not sufficient to cover the recoverable amount of claim(s), the vendor shall pay to DAFFPL on demand the balance remaining due.
24. PATENTS & ROYALTIES: The vendor shall fully indemnify owner and users of materials specified herein/supplied at all times, against any action, claim or demand, costs and expenses, arising from or incurred by reasons of any infringement or alleged infringement of any patent, registered design, trademark or name, copy right or any other protected rights in respect of any materials supplied or any arrangement, system or method of using, fixing or working used by the vendor. In the event of any claim or demand being made or action sought against Owner in respect of any of the aforesaid matter, the vendor shall be notified thereof immediately and the vendor shall at his/its own expense with (if necessary) the assistance of Owner (whose all expense shall be reimbursed by the vendor) conduct all negotiations for the settlement of the same and/or litigation which may arise thereof.
25. LIABILITY CLAUSE: In case where it is necessary for employees or representatives of the Vendor to go upon the premises of owner, vendor agrees to assume the responsibility for the proper conduct of such employees/representatives while on said premises and to comply with all applicable Workmen s Compensation Law and other applicable Government Regulations and Ordinances and all plant rules and regulations particularly in regard to safety precautions and fire hazards. If this order requires vendor to furnish labour at site, such vendors workmen or employees shall under NO circumstances be deemed to be in owner s employment and vendor shall hold himself responsible for any claim or claims which they or their heirs, dependent or personal representatives, may have or make, for damages or



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compensation for anything done or committed to be done, in the course of carrying out the work covered by the purchase order, whether arising at owner s premises or elsewhere and agrees to indemnify the owner against any such claims, if made against the owner and all costs of proceedings, suit or actions which owner may incur or sustain in respect of the same.

26. **COMPLIANCE OF REGULATIONS:** Vendor warrants that all goods/Materials covered by this order have been produced, sold, dispatched, delivered and furnished in strict compliance with all applicable laws, regulations, labour agreement, working condition and technical codes and statutory requirements as applicable from time to time. The vendor shall ensure compliance with the above and shall indemnify owner against any actions, damages, costs and expenses of any failure to comply as aforesaid.
27. **REJECTION, REMOVAL OF REJECTED GOODS AND REPLACEMENT:** In case the testing and inspection at any stage by inspectors reveal that the equipment, materials and workmanship do not comply with specification and requirements, the same shall be removed by the vendor at his/its own expense and risk, within the time allowed by the owner. The owner shall be at liberty to dispose off such rejected goods in such manner as he may think appropriate. In the event the vendor fails to remove the rejected goods within the period as aforesaid, all expenses incurred by the owner for such disposal shall be to the account of the vendor. The freight paid by the owner, if any, on the inward journey of the rejected materials shall be reimbursed by the vendor to the owner before the rejected materials are removed by the vendor. The vendor will have to proceed with the replacement of the equipment or part of equipment without claiming any extra payment if so required by the owner. The time taken for replacement in such event will not be added to the contractual delivery period.
28. **NON-WAIVER :** Failure of the Owner to insist upon any of the terms or conditions incorporated in the Purchase Order or failure or delay to exercise any rights or remedies herein, or by law or failure to properly notify Vendor in the event of breach, or the acceptance of or payment of any goods hereunder or approval of design shall not release the Vendor and shall not be deemed a waiver of any right of the Owner to insist upon the strict performance thereof or of any of its or their rights or remedies as to any such goods regardless of when such goods are shipped, received or accepted nor shall any purported oral modification or revision of the order by DAFFPL act as waiver of the terms hereof. Any waiver to be effective must be in writing. Any lone incident of waiver of the any condition of this agreement by DAFFPL shall not be considered as a continuous waiver or waiver for other condition by DAFFPL.
29. **NEW & UNUSED MATERIAL:** All the material supplied by the vendor shall be branded new, unused and of recent manufacture.



30. CANCELLATION:

- a) DAFFPL reserves the right to cancel the contract/purchase order or any part thereof through a written notice to the vendor if –
 - i. The vendor fails to comply with the terms of this purchase order/contract.
 - ii. The vendor becomes bankrupt or goes into liquidation.
 - iii. The vendor fails to deliver the goods on time and/or replace the rejected goods promptly.
 - iv. The vendor makes a general assignment for the benefit of creditors.
 - v. A receiver is appointed for any of the property owned by the vendor.
 - vi. Any other conditions where owners commercial interest get affected.
- b) Upon receipt of the said cancellation notice, the vendor shall discontinue all work on the purchase order matters connected with it. DAFFPL in that event will be entitled to procure the requirement in the open market and recover excess payment over the vendor s agreed price if any, from the vendor and also reserving to itself the right to forfeit the security deposit if any, made by the vendor against the contract. The vendor is aware that the said goods are required by DAFFPL for the ultimate purpose of materials production and that non-delivery may cause loss of production and consequently loss of profit to the DAFFPL. In this-event of DAFFPL exercising the option to claim damages for non delivery other than by way of difference between the market price and the contract price, the vendor shall pay to DAFFPL, fair compensation to be agreed upon between DAFFPL and the vendor. The provision of this clause shall not prejudice the right of DAFFPL from invoking the provisions of price reduction clause mentioned aforesaid.

31. ANTI –COMPETITIVE AGREEMENTS/ABUSE OF DOMINANT POSITION : The Competition Act, 2002 as amended by the Competition (Amendment) Act, 2007 (the Act), prohibits anti- competitive laws and aims at fostering competition and at protecting Indian markets against anti- competitive practices by enterprises. The Act prohibits anti- competitive agreements, abuse of dominant position by enterprises, and regulates combinations (consisting of acquisition, acquiring of control and M&A) wherever such agreements, abuse or combination causes, or is likely to cause, appreciable adverse effect on competition in markets in India. DAFFPL reserves the right to approach the Competition Commission established under the Act of Parliament and file information relating to anti-competitive agreements and abuse of dominant position. If such a situation arises, then Vendors are bound by the decision of the Competitive Commission and also subject to penalty and other provisions of the Competition Act.

32. ASSIGNMENT: The Vendor can / does not have any right to assign his rights and obligations under these general purchase conditions without the prior written approval of DAFFPL.



33. **GOVERNING LAW:** These General Purchase Conditions shall be governed by the Laws of India.
34. **AMENDMENT:** Any amendment to these General Purchase Conditions can be made only in writing and with the mutual consent of the parties to these conditions.
35. The following expressions used in these terms and conditions and in the purchase order shall have the meaning indicated against each of these:
- OWNER,** Client, Purchaser, buyer : means DAFFPL
 - VENDOR,** tenderer, Bidder, Contractor, Seller, Supplier, manufacturer stated anywhere in the tender document carry the same meaning: It means the person, firm or the Company / Corporation to bidding and shall include its successors and assigns.
 - INSPECTOR/ TPIA:** Person/agency deputed by Owner for carrying out inspection, checking/testing of items ordered and for certifying the items conforming to the purchase order specifications..
 - GOODS / MATERIALS:** means any of the articles, materials, machinery, equipments, supplies, drawing, data and other property and all services including but not limited to design, delivery, installation, inspection, testing and commissioning specified or required to complete the order.
 - SITE / LOCATION:** means any Site where DAFFPL desires to receive materials anywhere in India as mentioned in tender
 - CONTRACT,** Order or Purchase Order/CALL-OFF means the agreement for supply of goods/ materials for required quantity between Owner and Vendor, for a fixed period of time on mutually agreed terms and conditions.
 - The term MR means Material Requisition containing technical requirements and scope of work (technical), GPC means General Purchase Conditions containing commercial terms & conditions, PO means Purchase order issued after award of contract incorporating agreed deviations in MR, ATC means Agreed Terms & Conditions , RFQ means Request For Quotation.
 - For the purpose of contract, the trade terms FOB, CFR and CIF, DAP shall have the meanings as assigned to them by INCOTERMS 2010 published by ICC, Paris.

36. **REFERENCE FOR DOCUMENTATION :**

The number and date of Collective Request for Quotation (CRFQ) must appear on all correspondence before finalization of Contract / Purchase Order.

After finalization of Contract / Purchase Order: The number and date of Contract /Purchase Order must appear on all correspondence, drawings, invoices, dispatch advices, (including shipping documents if applicable) packing list and on any documents or papers connected with this order.

37. **ARBITRATION**



- a) Any 'dispute or difference of any nature whatsoever, any claim, cross-claim, counterclaim or set off of the Owner against the Consultant or regarding any right, liability, act, omission or account of any of the parties hereto arising out of or in relation to this agreement shall be referred to the Sole Arbitration of the nominated Director of the Owner or of some Officer of the Owner who may be nominated by the nominated Director. The consultant will not be entitled to raise any objection to any such arbitrator on the ground that the arbitrator is an officer of the Owner or that he has dealt with the matters to which the contract relates or that in the course of his duties as an Officer of the Owner, he had expressed view on all or any other matters in dispute or difference. In the event of the arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, the nominated Director as aforesaid at the time of such transfer, vacation of office or inability to act may in the discretion of the nominated Director designate another person to act as arbitrator in accordance with the terms of the agreement to the end and intent that the original Arbitrator shall be entitled to continue the arbitration proceedings notwithstanding his transfer or vacation of office as an officer of the Owner if the nominated Director does not designate another person to act as arbitrator on such transfer, vacation of office or inability of original arbitrator. Such person shall be entitled to proceed with the reference from the point at which it was left by his predecessor. It is also a term of this contract that no person other than the nominated Director of the Owner or a person nominated by such nominated Director as aforesaid shall act as arbitrator hereunder. The award of the arbitrator so appointed shall be final, conclusive and binding on all parties to the agreement subject to the provisions of the Arbitration & Conciliation Act, 1996 or any statutory modification or reenactment thereof and the rules made there under for the time being in force shall apply to the arbitration proceedings under this clause.
- b) The arbitrator shall have power to order and direct either of the parties to abide by, observe and perform all such directions as the arbitrator may think fit having regard to the matters in difference i.e. dispute, before him. The arbitrator shall have all summary powers and may take such evidence oral and/or documentary, as the arbitrator in his absolute discretion thinks fit and shall be entitled to exercise all powers under the Indian Arbitration & Conciliation Act 1996 including admission of any affidavit as evidence concerning the matter in difference i.e. dispute before him.
- c) The parties against whom the arbitration proceedings have been initiated, that is to say, the Respondents in the proceeding, shall be entitled to prefer a cross claim, counter claim or set off before the Arbitrator in respect of any matter in issue arising out of or in relation to the Agreement without seeking a formal reference of arbitration to the nominated Director/officer for such counter-claim, or set off and the Arbitrator shall be entitled to consider and



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deal with the same as if the matters arising therefore has been referred to him originally and deemed to form part of the reference made by the nominated Director/officer.

- d) The arbitrator shall be at liberty to appoint, if necessary any accountant or engineering or other technical person to assist him, and to act by the opinion so taken.
- e) The arbitrator shall have power to make one or more awards whether interim or otherwise in respect of the dispute and difference and in particular will be entitled to make separate awards in respect of claims of cross claims of the parties.
- f) The arbitrator shall be entitled to direct any one of parties to pay the costs to the other party in such manner and to such extent as the arbitrator may in his discretion determine and shall also be entitled to require one or both the parties to deposit funds in such proportion to meet the arbitrators expenses whenever called upon to do so.
- g) The parties hereby agree that the courts in the city of Delhi alone shall have jurisdiction to entertain any application or other proceedings in respect of anything arising under this agreement and any award or awards made by the Sole Arbitration hereunder shall be filed (if so required) in the concerned courts in the city of Delhi only.



Tender for Electrical Work Technical Specifications

Modernisation of Fuel Farm-IGI Airport,
Shahbad Mohammadpur, New Delhi

Sep 2015

Delhi Aviation Fuel Facility Private Limited



Tender for Electrical Work Technical Specifications

Modernisation of Fuel Farm-IGI Airport,
Shahbad Mohammadpur, New Delhi

Sep 2015

Delhi Aviation Fuel Facility Private Limited

Aviation Fuelling Station, Shahbad Mohammadpur, IGI Airport New Delhi-110061

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
00	14.12.2015	SK	PPP	VST	Issued for Bidding
01	19.02.2016	SK	PPP	VST	Re-Issued for Bidding

Information Class:

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Standard

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This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Modernization Of Fuel Farm of Delhi Aviation Fuel Facility Pvt. Ltd. IGI Airport, New Delhi

Tender Electrical Work Technical Specifications	Project No.:322538
	Reference: Tank Farm Area (ATF)
	No. of Sheets:72

Job Number	Facility Location Code	Document Number
322538	Shahbad Mohammadpur, IGI Airport-New Delhi	322538-EET-0001

- Code 1:** Approved and Work may Proceed.
- Code 2:** Revise & Re-submit. Work may Proceed subject to incorporation of comments.
- Code 3:** Revise & Re-Submit. Work should Not Proceed.
- Code 4:** Review Not Required. Work may Proceed.

Approval to proceed shall not be deemed as Acceptance or Clearance of Design, Calculations, Analyses, Test Procedures/Methods, or Selection of Materials by the Contractor. The Contractor shall Not be relieved from full compliance of Contract Requirements and Technical Specifications.

Dated: **Delhi Aviation Fuel Facility Pvt. Ltd.**

Document No.

01	19.02.16	Bidding	SK	PPP	VST	
00	14.12.15	Bidding	SK	PPP	VST	
Rev	Date	Issued For	Prepared By:	Checked By:	Approved By:	Approved By:
			Mott MacDonald Pvt. Ltd.			

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1 Scope of work Electrical installation

1.1 Introduction

M/s Delhi Aviation Fuel Facility Private Limited (DAFFPL) is a joint venture between Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL) & Delhi International Airport Limited (DIAL). M/s Indian Oil Sky Tanking Limited (IOSL) is responsible for running day to day operations of receiving the Jet fuel, storing the same in Fuel Farm and refuelling the Air Crafts.

DAFFPL has avail design, engineering, procurement assistance and construction management services from Mott MacDonald which has been retained to provide consultancy services for the same.

Existing Fuelling System i.e. Fuel Farm of Delhi Aviation Fuel Facility Pvt. Ltd. (DAFFPL) for refueling the aircrafts at IGI Airport, New Delhi is slated for modernization and up-gradation so as to conform to International Standards for receipt, storage and dispensing of Jet A1 fuel.

Mott MacDonald has been commissioned to provide engineering consultancy services for the project.

At DAFFPL fuel farm, Jet A1 fuel is brought aboveground/underground pipe from Oil Terminals of IOCL and BPCL and also by road tanker. This fuel is stored in the Cone Roof Vertical Tanks installed in the fuel farm. Presently, the aircrafts are being refuelled by hydrant pumps through fuel underground Jet A1 fuel hydrant pipe line.

DAFFPL has a setup of 33kV supply from BSCS-T2 (STP) as one main source of power. Another setup of 11 kV supply from VSCS-AGL as second main source of power. As a standby power source DAFFPL has installed 2X1010 kVA rated diesel generator set as required for plant operation. At present plant is in operation with available supply sources as mentioned above.

One transformer rated 1600kVA, oil filled 33/.433 kV connected to one section of existing LT panel & VFD panel through bus duct for plant operation as one source.

Another Transformer 2500kVA, Dry type 11 /.433 kV connected to another section of existing LT panel and VFD panel through bus duct for plant operation as second source.

Since the 33KV HT panel and Transformer are old, DAFFPL have planned to replace the Existing 33kV HT panel & 1600 kVA, 33/.433 kV Transformer with New 33kV SIOG HT panel and 2000kVA, 33/0.433KV, Dry type resin cast Transformer.

33kV HT Panel with Single Incomer & Outgoing to be installed in respective HT Room in electrical substation building. 33KV power through 33kV HT cable on rack/underground cable will then be connected to 33/0.433 KV Distribution transformers installed near substation area for catering plant load.

LT electrical power at 433V from transformer is connected to incomer breakers of Power Control Centres (hereinafter referred to as "PCCs") Power from transformers to PCC are connected through TPN, Al. air insulated bus duct.

At LT panel and VFD panel there are incomer breakers in both sections for DG set power connection.

Further power distribution including power for motors and for lighting have been provided from respective PCCs feeders to various load Centres, other distribution boards and switchboards etc. installed in respective load centre in the premises.

1.2 Definitions

For the purposes of this document the following definitions shall be used.

- Must/Shall the word 'shall' is to be understood as mandatory.
- Should the word 'should' is to be understood as strongly recommended.
- May the word 'may' is to be understood as indicating a possible course of action.
- Purchaser Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport, New Delhi.
- Consultant Mott MacDonald Pvt. Ltd
- Mfg / Supplier/vendor The party responsible for manufacture or supply of equipment and services to perform the duties specified by the Consultant or company

1.3 Scope of work

The scope of work under this scheme includes supply, transportation, unloading, loading, erection, testing and commissioning of the following items. It is contractor's responsibility to execute the job in all respect as per the detailed drawings / specifications supplied by the consultant / owner.

Any other equipment's/services which are not explicitly mentioned above or in the price bid but deemed necessary for the successful operation of the system complete in all respects shall be in contractor's scope.

It is assumed that, before tendering, the Contractor visited and examined the Site and satisfied himself as to the nature of the existing roads or other means of communication and the character of the soil and of the excavations, the correct dimensions of the work and the facilities for obtaining any special articles called for in the Contract Documents and shall have obtained generally his own information on all matters affecting the Site and local conditions. Installation and commissioning in Contractor's scope for the followings items

Contractor shall arrange temporary power requirement for the job work, Cranes, transportation of material or any other requirement shall be fulfilled by contractor.

Contractor shall be responsible for the compliance of OSID norms, safety norms and other Indian norms during execution of the job.

1.3.1 Category – I (Work including supply)

The scope of work for this category is outlined as per following:

- Supply, Installation, connection, testing & commissioning of MCCs, LDBs, PDBs and all other distribution boards.
- Supply, Installation and Erection of Ladder / Perforated type cable trays of various sizes with all the accessories like bends, tees, reducers, elbows, joints etc.,
- Supply, laying and termination of 1100 V grade power and control cables with aluminium / copper conductor XLPE insulated, extruded PVC sheathed, armoured power cable with cable glands, lugs, straight through joints etc. for all cabling up to the loads. The cabling system comprises of above ground or underground cables. The cables shall be laid either on cable trays or through GI pipes / concealed conduits or underground trenches or through RCC pipes at road / drain crossings.
- Supply, installation of safety equipment such as insulating mats of suitable voltage grade for all switchboards, safety hand gloves, warning and danger boards first aid kits, fire extinguishers in panel rooms, etc.
- Any other power & control cable required for the satisfactory operation of the plant.
- Emergency Stop Push Button as per Specification & Layout.
- Statutory approval from Fire Inspector for the scope of supply
- Supply, installation of lighting fixtures (Flameproof and Non Flameproof).
- Supply and installation of Anchor fasteners required for erection work of any particular item shall be in scope of Contractor.
- Energising, testing and commissioning of complete electrical system.
- Minor civil works like concrete chipping, wall breaking etc., shall be in scope of Contractor.
- Obtaining statutory approvals from Electrical Inspectorate's office for the drawing approval as well as clearance for energizing Transformers & associated equipment shall be in scope of Contractor. Owner shall pay the statutory fees for the same on furnishing of relevant documents/receipts. Drawings & test certificates preparation & submission, arrangement of Inspectorate's visit to site for inspection & obtaining clearance for energizing shall be in scope of Contractor
- Supply and installation of earthing system of the plant including earthing of equipment at plant buildings including supply and installation of earthing material such as earth electrodes, earth strip, all accessories for pits etc., hook-up to the existing plant earth grid as per layout drawings and OSID norms.
- Supply and Installation of cable markers and earth electrode markers / identification tags, GI saddles, saddle bars and associated accessories.
- Supply of Consumable items like welding rods, electrode, Teflon tape, glands, lugs, ferrule with proper identification of tags.
- Supply and installation of cable glands (double compression type), junction boxes, hardware items, etc.
- Supply and installation of Fire sealing compound is to be used at cable cellar / gland plate area so that fire in cellar is not extended to panel room area and vice versa.

The scope of work also includes supply of any other material to complete the work in all respects. The completion work includes all the items (free issue and Contractor supply) and related work including testing and assistance in pre- commissioning, commissioning and trial runs. It is Contractor's responsibility to execute the job in all respect as per the detailed drawings / specifications supplied by the Consultant / Owner.

1.3.2 Category – II (General)

The work under this category is general and applicable to all the items as mentioned in above Category-I. Unless otherwise specified in above categories the scope of work includes following items but not limited to them. It is Contractor's responsibility to execute the job in all respect as per the detailed drawings supplied progressively and to the satisfaction of engineer-in-charge and prices there of shall be deemed to have included in above categories only.

- Supply of all supervisory staff, skilled and unskilled labor as required for timely completion of the entire job. One safety Engineer to be provided for every 50 no. of manpower for monitoring which is mandatory. No substitution or reduction of staff shall be accepted without prior approval of Owner / Consultant. The Contractor must deploy sufficient number of personnel of different categories at site for timely completion of the project irrespective of number of personnel proposed to be deployed at site in their tender.
- Maintaining records of all work reports as per the advice of Owner / Consultant.
- Arrangement for distribution of electricity and water from supply point to work spots.
- Co-ordination with other Contractor's works as required by Owner / Consultants.
- Security arrangement for Contractor's office and stores to ensure safety of all equipment's and of all free issue materials supplied by the Owner / Consultant.
- Clearing of site after completion of work.
- The Contractor shall make his own arrangement for necessary flood lights and other facilities for working on round the clock basis.

1.3.3 Others

- Minor civil works like chipping and grouting of panels/supports including supply of material.
- Provision for earthing strips / GI wires to junction boxes and grounding of the same to the electrical ground bus.
- The scope of work shall also include providing support for the following engineering activities to be worked out by the Consultant. The Contractor shall include but not be limited to the following as relevant to the scope of work included in the project specifications:
 - Preparation of shop inspection and testing procedures.
 - Preparation of Field testing and commissioning procedures.
 - Preparation of 'As-built' drawings as per installation.
 - Other activities listed in data sheet.
 - Any other work/activity which is not specifically listed but is necessary for completeness of electrical system.
- All work to be performed and supplies to be effected as a part of contract shall require specific review and approval of Owner or his authorized representative as per vendor data requirement.
- Obtaining clearance for energizing the complete electrical facilities covered under this tender and approval of installation / drawings and documents from Central Electrical Authority / Inspectorate and any other concerned approving authority.
 - Contractor shall include the liaison work for getting approval and permissions of necessary documents and drawings from Electrical inspector office, Electricity board and any other Statutory Authorities for the entire electrical installation and following up with Electricity board for getting power as per the schedule given by Owner. Owner shall pay all statutory fees towards these works.
 - Drawings pertaining to the installation shall also be got approved by the Contractor from the Licensing Authorities / Electrical Inspector as a part of the scope of work.
 - Any other requirements as necessary by the statutory regulations which are not shown in typical installation shall be complied by the Contractor.
- Commissioning spares as required shall be included and supplied.

- The Owner will provide construction power to the Contractor. However, further distribution of power as required shall be arranged by the Contractor. Area lighting as required during construction phase of the contract shall also be included in the scope of work of the Contractor.
- Any work not explicitly mentioned but nevertheless required to fulfil the following minimum requirements shall be deemed to be included in the scope of the Contractor with no additional cost/time implication to the Owner:
 - To meet the requirements of statutory approving authority
 - To ensure equipment and personnel safety
 - To suit site facilities and environmental conditions
 - To co-ordinate with other Contractors / agencies involved at site for other activities/site works.
- Contractor shall include in the price, cost of supply and installation, testing and commissioning of the entire system, including materials and labour, within his scope. Contractor will not ask for any extra cost from the Owner at later date in respect of such items implicitly covered in the scope of work. Contractor will raised bill on actual measurement/numbers. Not the material he has ordered / Inwarded in his store.
- The provision of all testing instruments / kits for testing and commissioning of the system shall be arranged by the Contractor as a part of his scope of work.
- In case of any conflict amongst various documents attached with the tender, the order of priority shall be as follows:
 - Execution Drawings
 - Specific requirements vide bill of materials
 - Contractor's scope of work
 - Consultant's specifications for relevant equipment / packages

1.4 Contractor's scope of supply

As per Category- I and II and also as stated in the bill of material and the schedule of rates.

1.5 Deviations

The Contractor shall indicate in his bid any deviation from these specifications while quoting his price. Otherwise, it will be considered that the specifications have been accepted by the Contractor in total.

1.6 Changes in scope of work

Owner shall be free to alter, add to or delete any part of the job without any compensation to the Contractor, in case the Contractor fails to provide sufficient labour / materials under his scope for the execution and completion of the work on schedule as per Owner's assessment.

1.7 Set of documents / information to be provided by Contractor

1.7.1 Information to be provided along with the Contract

- Photo copy of valid electrical Contractor's license for the area / State of the Project.
- List of qualified engineers with designation and work experience.
- List of electrical tools, testing equipment / instruments in possession.
- List of the years, clients and capacities of the electrical systems installed in MVA.

1.7.2 Documents to be submitted immediately after the date of award of contract

- Field quality assurance plan with time schedule with start and completion date for each activity of electrical installation work.
- Samples / technical details of equipment / materials to be supplied by the Contractor.
- Detailed Site organisation chart showing the information of the personnel to be proposed to deploy at site along with their detailed bio-data.

2 Environmental Conditions

2.1 Location

The site is located at Shahbad Mohammadpur adjoining to Indira Gandhi International Airport, New Delhi. The site is approachable by road.

2.2 Topography

The whole Site is levelled surface, with a nominal gradual slope.

2.3 Environmental Design Parameters

Elevation above M. S. L. : 237 metres. Above Sea level

Metrological data (Based on climatologically data of Delhi)

- a) Ambient temperature
 - (max.) : (+) 48.4°C
 - (min.) : (-) 2.2°C
- b) Relative humidity, % : Max: 100%; Min 25%
- c) Rainfall intensity : 20-30mm in one hr intensity in Delhi
- d) Design Wind speed : 47 m/s
- e) Area Classification : Non Hazardous – Admin. & Pump House
: Hazardous –Tank Farm & Product Pump House
- f) Earthquake Zone : Zone IV (as per IS:1893)
- g) Site Access : By Road, By Rail, By Air (Nearest Airport – Delhi)
- h) Unit Installed : Outdoor / Indoor

3 Supply/ work matrix

Sr. No	Description	Client	Bidder	Remarks
1.0	LV Switchgear Panels (MCCs, VFD Panels, MLDB, MPDB, LDBs, all PDBs and lighting panels)	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
2.0	Non Flameproof Pushbutton station	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
3.0	Steel for fabrication	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
4.0	LT Cables	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
5.0	LV Cable end termination and jointing kit	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
6.0	Cable trays	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
7.0	Light Fixtures(FLP and Non FLP)	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
8.0	Non Flameproof Local Distribution Panels	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
9.0	Flameproof Local Distribution Panels	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
10.0	Fans and Exhaust fans (FLP and NFLP)	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
11.0	Internal Point wiring	-	-	-
	Supply, Installation, testing and commissioning with necessary site requirement	-	X	-
12.0	Earthing system	-	-	-
	Supply, Installation, modification, testing and commissioning with necessary site requirement	-	X	-
13.0	Fire Alarm & Detection system	-	-	-
	Supply, Installation, modification, testing and commissioning with necessary site requirement	-	X	-
14.0	Supply, Installation, testing and commissioning or providing - Cable Markers, Anchor fasteners, GI pipes, Heavy duty PVC pipes, Soil Excavation, fine river sand, fire bricks or concrete tiles, hardware items as mentioned in bill of quantities, Man power supply, chain for support of lighting fixture, Liaison work	-	-	X

Note: - Supply and installation for items covered in this tender in the contractor scope,

There is no any free issue material to contractor, all part supply and installation in the scope of contractor.

Followings all attachment are part of these tender documents, vendor to provide “data required from vendor” which all are provided in electrical equipment specification.

Table 3.1: Attached Reference Documents/Drawings list

Sr.No	Item description	Ref Documents Number
1	Specifications for L.V Switchgear Panel	322538-ETD-01
2	LDB & ELDB Distribution Schedule	322538-ESD-01 322538-ESD-02
3	New MCC for MOV	322538-EIB-0003-01
4	Modification of Existing lighting feeder panel with Photocell & timer	322538-EIB-0004-01
5	LV Cable Schedule	322538-ELS-0001-01
6	Layout & Detail of lighting layout FWPH	322538-ELA-0001-01
7	Power & Earthing Layout, section & Detail FWPH	322538-ELA-0002-01
8	Layout & Detail of Conduit FWPH	322538-ELA-0003-01
9	HT & LT Substation MOV panel Layout	322538-ELC-0001-04

4 Safety regulation for the temporary electrical installation activity at site

It will be the responsibility of the Contractor to provide and maintain any temporary electrical installation he may intend to execute with due regard of safety at site.

All switchgears, cabling, wiring, equipment, installations, etc. shall comply in all respects with the latest statutory requirements and safety provisions, i.e. as per The Indian Electricity Act, The Indian Electricity Rule, Guide lines laid down in respective Indian Standards, National Electricity Codes.

The Contractor shall ensure that all his equipment and electrical wiring, etc. for any construction activity is installed, modified, maintained by a licensed Electrician / Supervisor. A test certificate shall be produced to the Owner / their Representative for his approval before charging the electrical system.

At all the times, the above regulations shall be followed by the Contractor, failing which the Owner has a right to disconnect the power supply without any prior notice to the Contractor. No claim shall be entertained for such dis-connection by the Owner / their representative. Power supply will be reconnected only after production of fresh certificate from authorised electrical supervisor.

The Owner is not liable for any loss or damage to the Contractor's equipment as a result of variation in voltage, frequency or any interruption in power supply or other loss to the Contractor arising there from.

The Contractor shall ensure that the electrical equipment installed by him are such that the average power factor does not fall below 0.90 at his supply point. In case power factor falls below 0.90 in any month, he will reimburse to the Owner at the panel rate determined by the Owner for all units consumed during that month.

The Contractor will have to provide and install his own light and power meters which will be governed as per the rules laid down by the respective power supply authority. The meters shall be sealed by the Owner / their representative.

In case of damage of any of the Owner's / other Contractor's equipment on account of fault, intentional or unintentional on the part of the Contractor, the Owner reserves the right to recover the cost of such damage from the Contractor's bill. Cost of any repair or maintenance at the Owner's / other Contractor's end due to any fault in the Contractor's installation shall be to Contractor's account at the rate decided by the Owner / their representative.

The Contractor shall indicate the total requirement of construction power as single point power supply in his tender.

The Contractor should strictly follow the guide lines mentioned as below: -

All panel boards, cabling, wiring, motors, lighting, hoisting equipment and other dangerous installations should be provided with efficient safeguards and protections. Adequate precautions should be taken to reduce / minimize the risk of any hazard or accident.

All the Switchgears, Protective devices should be sized properly to feed the required load as well as to provide the perfect over current, short circuit and earth leakage protection. All the power and lighting

distribution feeders shall be provided with either earth leakage relay (ELR) or with earth leakage circuit breaker (ELCB) with maximum leakage sensitivity of 100mA.

All the cables and wires laid shall be mechanically protected and shall be laid in a manner to avoid any accidental hazard. The cables and wires shall have damage and puncture free insulation and conductor size should be properly selected to feed the required load current without causing any damage to the switches and cable insulation. There should not be any loose, unprotected joints (by means of PVC tape, connector strips, etc.) on the cables / wires.

All the panel boards, power switch sockets should be of metal clad type and weatherproof type (if located outside) and shall be installed at a min. height of 1.5 mtr. from the floor level. The doors of all the panel boards, switches, and plug sockets should be always kept in closed condition to avoid any accidental access to the live terminals.

Power sockets should have interlock facility in such a manner that the insertion or removal of plug cannot be possible when switch is 'ON' condition.

5 General specifications for electrical materials for electrical installation work

5.1 General

- All materials covered in these specifications shall be of heavy duty rigid type, neat in appearance and suitable for the purpose specified.
- The materials shall be of standard and reputed makes and shall conform to the requirements/approval of:
 - Fire Insurance Association.
 - Indian Electricity Rules & Relevant Indian Standard Codes
 - Electrical Inspector
 - Owner and Engineer-in-charge.
- Any materials not approved by any of the above mentioned authorities, shall be replaced by suitable approved materials free of cost. Routine and type test certificates and technical literature shall be furnished for all items.
- Relevant drawings and technical data, where applicable, shall be furnished to Owner for his approval, before supply of the items.

5.2 Power, lighting and control cables

5.2.1 General

- All conductors shall be either copper or aluminium stranded and as specified on the drawings. Sizes and types specified on the drawings shall not be changed without prior approval of the Engineer-in-charge.
- Ends of cables shall be properly sealed to prevent ingress of moisture.
- Wherever specified as half core in multi core cables, the half core shall be a neutral conductor having reduced section in relation to the main conductor size.
- The insulation of conductors in the multi core cables shall be colour-coded to facilitate identification. The colours shall be red, yellow and blue for phases, black for neutral and green for earthing.
- All single core copper or aluminium cables shall preferably have stranded conductors unless otherwise specified.
- The insulation shall be suitable for operation in an ambient temperature of 50 Degree C with a maximum conductor temperature of 90 Degree C without any harmful effects.

5.2.2 Specifications

- 1100 Volts multi core armoured cables with FRLS PVC/XLPE insulation and extruded PVC inner and extruded FRLS outer sheath shall conform to I.S.S 1554 (for PVC) and I.S.S. 7098 (for XLPE).
- 660 Volts single core unarmoured wires and cables with PVC / XLPE insulation shall conform to I.S.S. 694.

5.2.3 Multi core power cables

Multi core power cables shall be of 1100 Volts grade, PVC/XLPE insulated and extruded PVC inner and extruded FRLS outer sheath and armoured type, of make as approved by Owner / Consultant.

During the installation vendor to install proper Cable dressing with material like Nylon cable ties & Al cable clamping/tag requirements and it is applicable to all type of cables.

5.2.4 Wires and cables

Single conductor wires for lighting shall be of minimum FRLS 2.5 sq. mm. Copper as indicated in applicable drawings.

All wires for lighting and power plug points shall be 660 Volts / 1100 Volts multi stranded, flexible, FRLS PVC/XLPE insulated un armoured type of make as approved by Owner / Consultant.

Single core for power receptacles shall be of minimum 4 sq. mm. Copper unless otherwise indicated on applicable drawings. Flexible PVC FRLS cable required for hand lamp.

5.2.5 Multi core control cables

- Multi core control cable shall be 660 / 1100 Volts PVC/XLPE insulated and extruded PVC inner and extruded FRLS PVC outer sheath armoured type of make as approved by Owner / Consultant.
- Each core shall be of 2.5 sq mm. Copper as indicated in applicable drawings.
- The size and number of cores shall be as indicated in the drawings.
- Flexible wires
- Minimum sizes of flexible stranded wires shall be of 2.5 sq. mm. Copper conductor.
- Voltage grade of the flexible wires shall be not less the 660 Volts.
- Insulation shall be of XLPE and outer sheath FRLS unless otherwise specified in the drawings.
- Flexible PVC FRLS cable required for hand lamp.

5.3 Conduits

5.3.1 General

- All Conduits shall be of heavy duty FRLS PVC type. (Where ever required) The conduits shall be of make as approved by Owner / Consultant. In all hazardous area FRLS cable to be use.
- All conduits shall have a smooth interior, free from burrs and sharp edges.
- The sizes of the conduits shall be as indicated in the applicable drawings.
- Flexible conduits shall be of steel reinforced PVC type and of make as approved by Owner / Consultant.

5.3.2 Specifications

- All rigid PVC conduits shall conform to I.S. Specifications 9537.
- All flexible conduits shall conform to I.S.3480

5.4 Conduit fittings

- All conduit fittings shall have a smooth interior free from burrs and sharp edges.
- All conduit fittings shall be of heavy duty PVC type as specified in the schedule of quantities.
- Each conduit fitting shall have a gasket and screwed on rigid covered for hazardous areas. The gasket shall be of neoprene make. Gaskets need not be provided for conduit fittings for non-hazardous area conduit fittings.

5.5 Earthing system

5.5.1 Materials

- Earthing electrodes (maintenance free), buses, strips and wires shall be of galvanised steel / copper as per relevant drawings and I.S. specifications.
- Sizes of the earth electrodes, the main Earthing bus and the Earth wires shall be as mentioned in applicable drawings / specifications.
- Earthing clamps, nuts, bolts, etc. shall be of copper or galvanised steel as shown on the drawings.
- Lightning finials shall be of G.I. / Copper (as per the schedule of rates and drawings) as per I.S. Specification 3070 and / or the type as indicated in the applicable drawings.

5.6 Lighting fixtures and lamps - flameproof and weatherproof

5.6.1 Specifications

Relevant Indian Standard Codes and Specifications shall be applicable for lighting fixtures and their components wherever such specifications and standards exist. Lighting fixtures shall also have the approval of the Fire Insurance Association.

5.6.2 Type of fixtures

- Fluorescent Fixtures
- Compact fluorescent Fixtures
- Sodium Vapour Fixtures
- Metal Halide Fixtures
- CFL lamps
- LED Fixtures

5.6.3 General requirements for all fixtures

- All fixtures shall be suitable for 240 Volt, single phase, 50 Hz supply.
- Fixtures of each type shall be of one make and identical with one another.
- All incandescent and mercury vapour lamp fixtures shall have porcelain lamp holders of suitable type and size for the wattage of lamp specified.
- All fixtures shall be supplied complete with all necessary accessories and lamps.
- All fixture components shall be flameproof and weatherproof type, suitable to withstand a high humid atmosphere so that any damage due to corrosion, distortion etc. can be avoided.
- All fluorescent fixtures shall have detachable reflectors with easy access for maintenance purpose.
- Fluorescent and mercury vapour fixtures shall have super low loss ballasts, noiseless in operation similar to Super Low Loss type or Electronic type as approved by Owner / Consultant and also suitable condensers for high power factor. Chokes shall be suitable for a range of voltage of 210-240V. If necessary, tapping shall be provided for 210,220,230 and 240V.
- All fluorescent fixtures shall have rotary lamp holders with cadmium plated spring loaded contacts.
- All fixtures shall also have earthing provision made as per Indian Electricity Rules.

5.6.4 Lamps

- All lamps shall be rated for 240V and Wattage shall be as indicated in the Schedule of Quantities.
- All incandescent lamps of 70watts or above shall preferably be screw type ES for medium base and GES for goliath base and all incandescent lamps shall be frosted type and glare-free.
- All fluorescent lamp / tubes shall be white type, shall have high lumen output (3250 lumens) and of make as approved by Owner / Consultants.

- All mercury vapour lamps shall be colour corrected, avoiding glare and distortion.

5.7 Lighting panels – for hazardous areas

5.7.1 Specifications

Relevant Indian Standard Specifications and Codes shall apply for Lighting Panel Boards and their components wherever such Standard Specifications exist. The panel shall be approved by the Fire Insurance Association.

5.7.2 General requirements

- Lighting panels shall be made of 14 SWG sheet steel and painted with powder spray to prevent corrosion.
- Lighting panels shall be suitable for Single Phase, 3Wire, 240 Volts as per the distribution schemes indicated in the relevant drawings.
- The lighting panels shall be completely dust and vermin proof, double door type and provided with neoprene gaskets and free of mechanical and electrical defects. The degree of protection for the panel enclosure shall be IP54.
- Knockouts for branch circuit conduits or cables shall be provided on the top and bottom as required.
- Tinned copper sockets shall be provided for the main connections to the panel.
- All panels shall be self-supporting, wall mounting type unless otherwise specified in the schedule of quantities
- All the lighting panels shall be provided with two external Earthing terminals and suitable tinned copper lugs for connection to the Earthing system
- The neutral terminal block shall have sufficient number of terminals for all single phase outgoing branch circuits.
- Means for easy identification of each and every branch circuit shall be provided.

5.8 Miscellaneous accessories

5.8.1 Switch fuse units (If applicable)

- Switches shall have H.R.C. fuses for each phase as indicated in the drawings.
- The switches shall be load breaking type suitable for breaking circuits on full load.
- All switches shall be rated for 500 Volts and shall be metal clad heavy duty type and shall have neutral links. The sizes shall be as specified and indicated in the applicable drawings.
- For exposed and outdoor locations, the switches shall be weather-proof type i.e. IP55.
- Nameplates of adequate size shall be provided to indicate the name of the equipment and / or the circuit number controlled by the switch fuse unit.
- A nameplate and / or designation number shall also be provided approximately on the top middle portion of the complete assembled unit, as mentioned in the drawings, for identification.

5.8.2 Switches – single pole

- Single pole general purpose switches shall be of minimum 5 amperes rating, 250Volts, conforming to I.S. specifications. Switches above 5A shall be of rotary type.
- Each 5A switch shall have a porcelain base mounted in a sheet steel box with the operating knob projecting out of the box and held in position by a threaded tightening ring from the outside. The rotary switches shall be as approved by the Engineer-in-charge.
- Unless otherwise specified switch housing shall have threaded hub for heavy wall rigid conduit as approved by the Owner / Consultant.

- Switch housing shall be provided with earthing screw.

5.8.3 Socket outlets and plugs – single phase metal clad type (flameproof and weatherproof)

- Single phase socket outlets, receptacles and plugs shall be 3 pin, 240Volts, conforming to I.S.1293. Ratings shall be as specified in drawings.
- Each socket outlet unit shall be provided with a single pole Industrial rotary switch of suitable rating unless otherwise indicated.
- The socket outlet and switch shall be encased in a suitable metal box. The metal box shall be provided with earthing screw. Approval from Engineer-in-charge is essential before taking up fabrication.
- The socket outlets shall have suitable Porcelain bases and metal cover.
- The unit (of socket outlet and switch) shall be complete with necessary integral wiring and / or interlocking.
- Each socket outlet shall be provided with an attached metal cap to cover the outlet when not in use to make the receptacle safe and weatherproof.
- The earthing pin of the plug shall be the one to contact first and break contact last at the time of inserting or removing the plug as the case may be.
- The earthing terminal shall be connected to the encasing metal body of the unit.

5.8.4 Three phase receptacles – metal clad type (flameproof and weatherproof)

- These receptacles and plugs shall be 5 Pole (3P + N + E), 500 Volts and of current rating as indicated on the applicable drawings.
- Each receptacle and plug shall be coupled to a 3-pole & neutral switch to form a complete unit.
- An interlock shall be provided to prevent the insertion or withdrawal of the plug with the switch ON.
- This unit of switch with interlocked plug and socket shall be of a make being approved by Owner / Consultant.
- The socket shall be suitable for surface or flush mounting as indicated in the drawings.
- A nameplate of adequate size shall be provided to indicate the name of the equipment connected.
- For flush mounting, the switch shall be of the rotary type of approved make and the combination of socket and switch shall be mounted in a M.S. sheet metal box suitable for conduit/cable entry. The M.S. sheet metal box shall be provided with duplicate external Earthing terminals and tinned copper lugs for connection to the Earthing system.

5.8.5 Push button stations (flameproof and weatherproof)

- Metal clad start-stop push button stations shall be of momentary contact type with provision for locking in 'OFF' position. The boxes shall be supplied with necessary cable / conduit entry at the bottom.
- All contacts shall be silver tipped and be capable of interrupting minimum 10Amperes at 250Volts without damage to the contacts.
- Push button stations shall be provided with mounting holes for mounting on the wall or on a steel frame as shown the drawings.
- A nameplate of adequate size shall be provided to indicate the name of the equipment and / or circuit number controlled by the push-button station.
- The degree of protection for the push button enclosure shall be IP 55 and the unit shall be provided with suitable rain hood and made weatherproof type is to be installed in outdoor area.
- The push button stations shall be provided an Ammeter wherever mentioned in the drawings.
- The push button stations shall be supplied with blind plugs.

5.8.6 Flameproof materials / accessories

All flame proof materials / accessories shall be of cast iron or LM-6 or suitable alloy metal. The enclosure shall conform to the requirements of IS: 2148 or IS: 6381 as indicated. Further, flameproof accessories shall meet all requirements of Indian Electricity rules, Fire Insurance Association of India, Electrical Inspector, CMRS Dhanbad, Chief Inspector of Explosives (Nagpur), Director General (Factory safety), Service and Labour Institute (Bombay), etc.

5.9 Cable gland and cable terminating accessories

- All cable glands shall be of brass metal and screwed type and double compression type for indoor / outdoor application.
- Cable glands for Hazardous area shall be of flame proof, double compression type.
- All cable sockets for cable termination shall be of tinned copper only.
- Cable identification tags shall be of 6 mm thick Aluminium flat of suitable size with neatly engraved marking. Cable tags with wire for tagging.
- Cable trays shall be G.I. Perforated or M.S. painted site fabricated Ladder type as indicated on the drawings and the schedule of quantities.

5.10 Hardware and structural steel

- All hardware and structural steel being used for the various installations, Cable trays, supports, frames, etc. shall be as per relevant I.S. The sizes of the sockets shall be as per the approved drawings.
- All nuts, bolts, washers, spring washers, etc. shall be of SS and shall be SS316 only.

5.11 Cable Trays

5.11.1 Scope of work

- This specification covers general and technical requirements for installation of cable tray
- Any deviation from the specification must be stated clearly in the proposal. In the absence of such a statement, it will be considered that the requirements of specification are met without any deviation.
- Installation shall be in accordance with equipment manufacturer's instructions, and with recognized industry practices to ensure that cable tray equipment comply with requirements of NEMA VE-2 for general cable tray installations and cable tray. The following specifications, standards, codes of practices, and documents referred to therein.

5.11.2 Technical Standard Specifications

- ANSI/NFP 70 – National Electrical code
- NEMA FG-1 – 2002 _ Nonmetallic cable tray systems
- NEMA VE-2-2002 – Cable Tray Installation Guidelines

5.11.3 General requirements

- The contractor shall co-ordinate cable tray work with other mechanical/electrical work as necessary, to properly integrate installation of cable tray work with others.
- He shall provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.

- Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections and offsets. Installed cable supports and fixtures shall be as per the manufacturer's guidelines and in conjunction with these documents.
- Where conflict exists between various specifications, standards and codes of practice the most stringent requirement shall apply. All such conflicts shall be brought to the attention of the client's representative. The client's representative shall make the final decision on all matters of a technical nature.
- The types of trays shall be dependent on the type of cables ran, segregation route and quantity, in all cases the size of each tray selected shall allow for 20% additional cable space for future use.

5.11.4 Loading capacities

- Cable trays shall meet NEMA class designation: 8C.
- Cable tray shall be capable of carrying a uniformly distributed load of 95kg/m on a 3m maximum support span with a safety factor of 1.5 when supporting a continuous beam installation and tested per NEMA VE-1 section 5.2.
- The supplier shall ensure that the de-rating factor due to site maximum temperatures shall not have an effect on the load carrying properties of the cable tray and shall take cognisance of Table .1

Temperature in degrees Celsius	Percent of strength
24	100
38	90
51	78
65	68
80	60
93	52

5.11.5 Technical requirements

- The technical requirements of the installation shall be broken down into the following groups and explained in detail, these methods have to be followed rigidly.
 - Type of trays to be used
 - Supports and spacing
 - Installation methods
 - Accessories

5.11.6 Type of trays

5.11.6.1 Cable Ladder,

- Standard length 3 m varying widths for ladder between 150 & 900mm classed as heavy duty. The ladder side wall height shall not be less than 100 mm and section thickness of not less than 6mm. Ladder width 300mm and below shall have 100mm side walls.

5.11.6.2 Cable channel U type

- Designated for instrument cables/air lines, standard length 3m; varying widths from 50 – 300mm and shall have a section thickness of 4 mm as a minimum. Side walls for above 75mm width and above shall be 50mm and below 75mm shall have 25mm side walls.

NOTE - Under no circumstances shall employees walk or use cable ladder as a ladder or work platform.

5.11.7 Supports and spacing

- All offsets / bends irrespective of format or orientation shall be fully supported with additional support brackets as per the manufacturer's recommendation.
- In general support must be located such that the coupling plates are at 25% of the span. For example, if the support span is 3m, the 25% point is 750mm from the support. In a continuous beam configuration, the bending moment in the tray side rail is minimal at points located approximately 25% of the span from each tray support. Thus there will be minimum stress on the coupling plates if the joint is located at 25% of the span. In the case of bends and other fittings, the supports should be within 610mm of each fitting extremity.

5.11.8 Cable ladder and U type channel

- Cable ladder shall be supported not more than 1.5m in all orientations. Offset bends, fixings, splices etc shall be covered in accessories

5.11.9 Permissible cable tray installations

- Horizontal installations with cable tray orientation 180 degrees (flat) shall only be permissible under suspended floors, trenches and or under RCC roofs such as but not limited to substations, fixing method described in 4.11.15.
- All plant outdoor mounted trays shall be mounted at 0 degrees in relation to the ground (on their edge), no exceptions to this point will be accepted with exception to under structures. This is to prevent additional load from spilled product. In all other areas horizontal orientation is permissible.
- Modifications either cutting or drilling holes, when this is done the cable tray shall be treated with the recommended "paint on resin" to protect the tray from ingress.
- Cable trays shall be complete in every aspect; cables shall not run from one tray to another unsupported.
- Once the cable trays are installed they shall be inspected by the clients representative and signed off as fit for purpose, if defect free. Any defects shall have to be rectified, re-inspected by the client. Once the installation is found satisfactory only then shall cable installations take place.
- Cables ran in the cable trays shall be straight and uniform, crossing, twisting over shall not be accepted.

5.11.10 Securing cables

- Cables shall be individually secured using stainless steel cable ties at every 1m, no exceptions.

5.11.11 Accessories

Cable tray and channel off set accessories available and used where required

5.11.11.1 Offsets and Bends

- 45 degree horizontal bends
- 45 degree vertical internal / external bends
- 90 degree horizontal bends
- 90 degree vertical internal / external bends
- 90 degree TEE

- Vertical TEE (U type only)
- 90 degree equal / unequal TEE
- Cross equal / unequal
- Straight reducer
- Concentric reducer
- LH/RH reducer

NOTE - All cable bends / offsets shall be sized in accordance to the largest cable minimum bending radius on a given tray.

5.11.12 Connectors /splices for Cable tray and channel

- Horizontal hinge
- Vertical hinge
- Coupler/splice plate x 2 per joint 4 in total
- Divider strip

5.11.13 Mounting Brackets

Illustrative example only

Fig.1 Z Clamp cable ladder

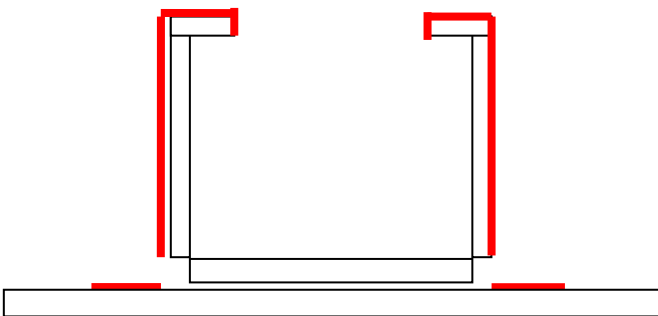
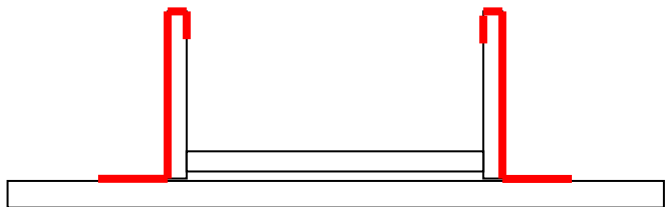


Fig. 2 Z Clamp cable tray/channel



5.11.14 Fasteners Grade S/S 316

- Stainless steel M8 Hexagonal machined bolt, suitably sized to accommodate 3 full threads protruding from the nylock nut when tight.
- M8 Stainless steel nylock nut.
- Stainless steel square flat washers to suit fastener

5.11.15 Roof hangers / supports

- Spacing shall comply with point 5.11.7 above.
- Roof hangers shall be manufactured from suitably sized angle iron. Over and above the designed bracket at least one additional area shall be fabricated into the design for future use.
- The area between rungs shall not be less than 300 mm.
- The unit shall be corrosion protected.

- In all cases where welding takes place the area shall be swept blasted and corrosion protected..

5.11.16 Trench mounted trays

- Spacing shall comply with point 5.11.7 above.
- 90 degree brackets shall be manufactured from suitably sized steel corrosion protected.
- The brackets would be cast into the trench wall.

5.11.17 Floor supports vertical / cable Trestle

- Spacing shall comply with point 5.11.7 above.
- Shall be manufactured from angle iron and weld assembled. All assemblies shall be standard in a size and allow for one complete additional tray run. The height between horizontal members shall not be less than 300 mm. The assemblies shall be corrosion protected.
- In all cases where welding takes place the area shall be swept blasted and corrosion protected.

5.11.18 Plant equipment Installations

Cable tray orientation shall be installed as per point 5.11.9 and shall be fixed at intervals 1.5m, irrespective whether it is cable ladder or channel. The fixing brackets used shall be “Z” (Fig.1 & 2) clamp, hooked onto the tray and bolted to the support.

5.11.19 Cable ladder

The brackets used shall be “Z” clamp (Fig.1) fixed to both tray and bolted to the support, manufactured from stainless steel, grade 316.

5.11.20 Instrument cable channel

The brackets used shall be “Z” (Fig.2) clamp specifically for cable channel and bolted to the support

5.12 Installation Horizontal overhead / wall mounted cable tray supports

In general all supports are suspended in substations, the cable tray supports shall be fitted vertically hanging and shall follow the guidelines as laid out in this document in above sections. In trench installations the 90 degree brackets would be cast into the wall after the brackets being corrosion protected. Once this primary Installation is complete the trays would be installed and coupling plates fitted. The position of the splice must conform to item mentioned above with no exceptions.

At every splice two splice plates would be used, one internal one external. The splice plates would then be fastened with stainless steel fasteners. Bolt and square flat washer assembly would be pushed through from the inside of the tray to the outside, thereafter a square washer and nylock nut would be fitted to the bolt threaded section outside of the tray, three full threads shall protrude from the nut after final tightening.

The tray would be fastened using its respective Z brackets to the supports using stainless steel fasteners, Hex bolt, flat washers and nylock nuts.

Where structural members are only available, then suitable brackets would have to be fabricated to accommodate as described above. When any welding is required the area after installation shall be shot blasted and corrosion protected back to specification P001 before cable installation using the prescribed steps, therein.

5.12.1 Plant installations

- In all cases the trays shall run horizontally.
- The structural supports shall be drilled to accommodate the fixing brackets and securely fixed using appropriately sized bolts, at least three threads shall protrude from the nylock nut. Once all brackets are fitted then the cable trays shall be mounted.
- They shall be fixed “Z” brackets at every support.
- Once this primary installation is complete the trays would be installed and coupling plates fitted. The position of the splice must conform to item mentioned above with no exceptions.
- At every splice two splice plates would be used, one internal one external. The splice plates would then be fastened with stainless steel fasteners, Bolt and square flat washer pushed through from the inside of the tray to the outside, thereafter a square washer and nylock nut would be fitted to the bolt threaded section outside of the tray, three full threads shall protrude from the nut after final tightening.
- The tray would be fastened using its respective Z brackets to the supports using stainless steel fasteners, Hex bolt, flat washers and nylock nuts.

5.12.1.1 Environmental conditions

The equipment to be used will be installed as per Conditions specified under point 2.

5.12.1.2 Inspection

The owner/ consultant or his authorized representative reserves the right to witness any point during the installation to conduct quality tests and check the compliance.

5.12.1.3 Guarantees and warranties

Vendor shall guarantee design materials/workmanship for a period of twenty four (24) months from the date of Handing over of the installation. (After commissioning, about 6 months required for handing over.)

5.12.1.4 Non-material requirements (drawings and documents)

- Drawings and instruction manuals
 - After the order is placed, vendor shall submit, following drawings for approval:
 - Typical general arrangement drawing, showing plan, elevation and side view, preference would be 3D.
 - Route drawings
 - All the above drawings shall contain following data for reference:
 - Owner P.O. / contract reference no & date.
 - Plant and location of plant
 - One print of each drawing will be returned to vendor after marking all the necessary corrections, changes and required clarifications. Vendor shall incorporate these and send within fifteen days, four (4) prints of each drawing marked "Certified for Record and Use".
 - Vendor shall submit seven (3) copies of instruction manuals on installation, maintenance and operation manual

- The vendor shall supply linked to his drawings a BOM which shall be linked by item numbers to his drawings.

5.12.1.5 Packing and dispatch

Special handling, packaging and storage instructions shall be provided on the external face of the crate as per the suppliers requirement.

6 Electrical installation standard and specifications

6.1 General

6.1.1 Scope of work

The scope of work shall include the furnishing of all labour, materials, appliances, superintendence and services required to construct and install a complete and operable electrical system as herein specified and covered by the accompanying drawings. The items of work include, but are not limited to, the following:

- Complete electrical power and lighting systems, covering LT Switchgear, switches, starters, lighting installation, cabling and other equipment including all outside cables/conduits, wiring and incidentals as required.
- Complete branch circuit wiring installation for lighting receptacles and miscellaneous items.
- Installing and connecting all lighting luminaires complete with lamps, unless otherwise specified.
- Supply and installing complete earthing system and test thereof.
- Installing and connecting motor starters where specified.
- Temporary electric lights and powers facilities, if required on the instruction of Engineer-in-Charge.
- Complete cables/conduit and wiring system including supply of plugs and sockets for telephones.
- Materials or appliances, general purpose / weatherproof / flameproof as required, forming part of the electrical system and necessary for its operation, though not specifically mentioned, shall also be furnished and installed without additional charges.

6.1.2 Drawings

- The work covered by these specifications is shown on the drawings, which constitute an integral part of the specifications.
- The electrical Contractor shall work in close co-ordination with the architectural, structural, HVAC, plumbing and piping contracting sections, to avert possible installation conflicts.
- Discrepancies if any on different plans, or between plans and actual field conditions or between plans and specifications shall be promptly brought to the attention of the Engineer-in-Charge at site for a decision before proceeding with the work.
- The drawings and specifications shall be considered complementary so that anything or any matter shown upon one or described by the other or fairly implied by either or both shall be done and performed as if shown upon and described by both.
- One set of drawings shall be kept as record drawings. All deviations of the actual proposed installations as shown on the drawings should be marked in red on these drawings. On completion of the project, as-built drawings shall be prepared by the electrical Contractor incorporating these changes and four sets of such drawings shall be handed over to the Engineer-in-Charge at the time of final handing over.

6.1.3 Personnel

All work shall be performed by Contractor under the direct supervision of a qualified person appointed by him and regularly engaged in the installation of electrical equipment. The Contractor shall place in charge of the work at all the times during the construction. A qualified and experienced electrical engineer who shall be responsible for keeping liaison and co-ordination between Employer's personnel and his own

men at site. He shall also submit progress reports every fifteen days. Anyone not deemed capable by the Owner shall be replaced immediately upon such advice.

6.1.4 Tools and testing equipment

The work shall be performed using tools and testing equipment designed and approved for the purpose.

The following tools and testing equipment are recommended for carrying out the electrical installation work. The electrical Contractor shall bring tools and equipment which may be necessary to carry out / complete the work, in addition to the tools and equipment suggested hereunder, if asked for by Engineer-in-Charge.

- 5000 volts constant pressure type motorised insulation tester (megger)
- 1000 volts constant pressure type insulation tester (megger)
- 500 volts constant pressure type insulation tester (megger)
- Universal Earth Tester
- Welding Sets
- Cutting Tools
- Derricks, if required
- Jacks
- Electric Blower
- Drilling Machines (different sizes)
- Grinding Machine
- Cable Crimping Tool
- HV and LV Cable termination and jointing kits.
- Relay testing kit
- Tong Tester
- Portable Voltmeter
- Pipe bending machine
- Phase sequence indicator
- Portable test lamps with prongs
- Tachometer (0-3000 r.p.m.)
- Constant pressure type continuity tester
- Wiremen kits
- Fitter's tools
- Vices
- Die sets with difference dies
- Ladders (different sizes)
- Cable laying tools

6.1.5 Materials and equipment

The materials and equipment to be installed as indicated on the electrical drawings and materials and equipment specifications, shall conform to the applicable codes and specifications. The materials and equipment wherever specified and / or indicated as supplied by others shall be installed by the Contractor as recommended and advised by the manufacturers of such equipment. Care shall be taken in handling the materials to properly protect them from damage during transport and installation. All electrical materials supplied by the Contractor shall be new, unless agreed otherwise in writing by Engineer-in-Charge. The Contractor shall obtain the approval of Engineer-in-Charge for all the materials to be used by him prior to installing them. Equipment damaged by the Contractor in the course of handling, installation

or test shall be replaced or repaired by him without any additional charges and subject to the approval of the Owner / engineer-in-charge.

6.1.6 Codes and specifications

All materials and equipment shall be installed in accordance with the latest Indian Electrical Codes and Standards. Installation shall be approved by the Chief Electrical Inspector. It will be the Contractor's responsibility to obtain the approval of the electrical installation work from all Statutory Authorities.

6.1.7 Cutting, patching and excavation

The Contractor shall do all excavation and cutting required for the installation work and shall be responsible for any damage that may be caused to the work of others. He shall, where possible, keep the excavation, cutting and patching to a minimum. If the electrical Contractor fails to perform his work in the proper manner or at proper time and due to this, additional excavation, cutting and patching is required, the Contractor shall do such additional cutting and patching without any extra cost to employer.

6.1.8 System of working

The work shall be carried out in a systematic way in proper sequence and order. Priorities of work shall be fixed by the Engineer-in-Charge at site. All these priorities shall be strictly adhered to. Until the particular part of the work is approved or certified complete by the Engineer-in-Charge at site; the Contractor shall not take up the consequent work connected with the part work completed but uncertified as completed.

6.1.9 Protection

The Contractor shall furnish and place proper guards for prevention of accidents. He shall provide and maintain any other necessary constructions required to ensure safety of life and property involved in his work.

6.2 L. T. switchgear

- Inspect the switchgear thoroughly and check during unpacking that all the items stated in the packing list are included and no damage has occurred to any part including all instruments, relays, etc. It is particularly important to be thorough in inspecting the moving mechanism parts as well as items of insulating material of the breakers.
- If the switchgear/panel is supplied in sections, assembly of the same will be of electrical Contractor's responsibility. Relays and instruments, if received separately, will also be installed by the electrical Contractor.
- During installation, the L.T. circuit breakers and the operating mechanism must be in the open position. The closing springs should not be charged.
- The circuit breakers are required to fit their foundations without any discrepancies. All deviations must be adjusted with shims or spacers in order to avoid any stress.
- Installation of all parts should be carried out as per the instructions manual supplied by the manufacturer.
- Lubricate the circuit breaker gears and other sliding surfaces, shaft, etc. with lubricating oil.
- The spring-closing mechanism must not be subject to any distortion. the springs should not be altered without consulting with the manufacturer.

6.3 L.T. switchboard

- These shall be installed with utmost care as per the recommendations of the manufacturer and the drawings. The electrical Contractor shall be responsible to replace or repair any part, free of cost, if it gets damaged during the installation or due to mishandling of equipment.
- All connections shall be made as per vendor's drawings and before commissioning, over load and relay settings shall be adjusted as directed by the equipment supplier / Engineer-in-Charge.
- If any switch bends is supplied in sections, assembly of the same will be the electrical Contractor's responsibility. Relays and instruments, if received separately, will be installed and connected by the electrical Contractor.
- Installation of all switchgear shall conform to IS - 10118.
- After the installation, assembly and connection, the tightness of all connections shall be checked. All panels and modules shall be cleaned by blower before energising.

6.4 Wires and cables

6.4.1 General

- Installation of wires and cables shall be in accordance with I.S. 732. All wires/cables shall run from box to box without splices. Sharp bends shall be avoided. They shall be pulled in or laid in such a manner that the insulation is not damaged at the time of installation or in service. Care shall be exercised to ensure avoidance of any moisture in terminations. The wire / cable being laid shall be in one length, and straight joints shall be avoided as far as possible.
- Insulation shall be removed for making terminations in such a manner that the conductor is not damaged. Conductors shall be clean and free from burrs.
- The current carrying ability of the terminations shall be equal to or greater than the wire / cable being terminated, without dependence on the solder. The termination shall be mechanically secure, without dependence on the crimping. Solder and soldering flux, if used, shall be non-corrosive and of a make approved by the cable or wire manufacturer.
- Minimum wire size shall be 2.5 sq. mm. copper. Above 10 sq. mm. size, all wires shall be stranded. All wire and cable runs under (1) poured concrete or road beds and (2) passing through walls shall be in (i) RCC pipes and (ii) conduit sleeves respectively.
- No wire or cable shall be run through any equipment foundation unless specifically indicated in the drawings, or directed in writing by Engineer-in-Charge. Cables shall be kept at least 300 mm away from steam or other hot lines. Where closer than this, asbestos barrier shall be used between pipe and cables. The armouring of all armoured cables shall be electrically continuous from Switchgear to equipment and shall be terminated by an appropriate gland fitting and grounded at both ends. Minimum bending radius shall be 12 to 15 times the outside diameter of the cables as recommended by the cable manufacturer.
- The colour code of wires shall be same throughout the installations and shall be approved by the Engineer-in-Charge. (Where more than one neutral is carried in the same conduit, the neutral conductors shall be identified.)
- Where colour coding is not practicable or possible, the above scheme shall be achieved by the use of colour bands provided by the electrical Contractor.
- No oil, grease or compound other than powdered soap stone shall be used to facilitate the pulling of wires. Buried cable shall be installed with sufficient slack in the trench along the cable length.
- The electrical Contractor shall arrange all cables and wires in neat formations along the wall or in suitable cable trays as shown and indicated in the drawings, including supply and installation of all supporting steel work like angles, channels, etc. and painting of the same.

6.4.2 415 / 240V System

- Wires drawn in conduit will be un armoured. Cables laid in trays or buried in the ground shall be armoured.
- The number of cables / wires and conduit sizes indicated for the various circuits (control, alarm and signal) were decided for a general scheme of wiring. The actual number of wires installed for each circuit and the required size of conduit shall, however, be as required to accomplish the specified results as required by the manufacturer of the said control equipment.
- Wires connected to the same phase and for the required neutral only can be grouped in one conduit, for lighting installation.
- No single core wire alone shall run in any conduit unless clearly shown in the drawings.
- This part of the specifications cover the responsibility of selecting the proper branch circuit designation in the panel boards and to install the branch circuit wiring in accordance with the phasing sequence as shown on the drawings, so that the loads are balanced across all the phases as closely as possible and to cause minimum unbalance in the panel board neutral wires. If any changes are to be made, approval of the Engineer-in-Charge is essential.
- No wire shall be pulled until the complete conduit is installed. No splices or joints shall be permitted in either feeders or branches except at the outlet of accessible junction boxes.
- Termination of wires and cables at main boards, M.C.Cs lighting / power panels, fixtures, etc. is to be done preferably with solder less tinned copper terminal lugs duly crimped and using petroleum jelly at all connections. Special permission shall be taken from the Engineer-in-charge for termination with soldering method.

6.4.3 Buried cables – If applicable

- Only armoured cables shall be buried directly in the ground. Trench for L.T. cables and other lower voltage cables shall be minimum 600 mm deep or as specified in the drawings. Where both H.T. and L.T. cables follow the same route, one trench may be used. In that case, the higher voltage cables shall be installed at 900 mm and then the trench shall be filled to 600 mm with sand and pebbles and the low voltage cables shall be then installed. High voltage cables shall be spaced minimum 75 mm on centres.
- When it is necessary to pull the cable into the trench, rollers or a greased wooden trough should be used to reduce friction. A series of sleeves may be necessary to guide the cable around corners. Care should be exercised to avoid contact with sharp stones and other heavy objects in the trench. A two-inch layer of sand or clean earth shall be placed at the bottom of trench to avoid sharp objects coming in contact with the cables.
- After the cables are installed, cover the cables with 150 mm of rock-free earth or sand, place a layer of bricks or concrete tiles over that and backfill to grade. Concrete markers shall be placed at each bend and at an approximately 15 meters' intervals along straight runs to show the location of the cables. These markers shall extend above the grade by 25 mm.
- Cables shall be laid with slight slack in the trench to allow for the settlement of earth.
- After confirming with the Engineer-in-Charge, necessary loops shall be made at the locations indicated by him.
- Concrete-lined cable trenches for cables inside buildings, if shown on the drawings, shall be provided by others.

6.5 Lighting

- The lighting system will operate from 415 / 240 V, 3 phase, 4 wire, 50 Hz A.C. supply. Lighting branch circuits will be supplied from miniature circuit breakers in the lighting panel as indicated in the applicable drawings. All branch circuits shall be operated on single phase 240 V supply.
- Lighting panels and lighting fixtures shall be installed as shown in the applicable drawings.

- All lighting circuits will run in rigid PVC heavy duty conduits and PVC FRLS cables shall be used for Hazardous area unless otherwise indicated on the drawings.
- Any lighting fixtures so located that the light from them would be obstructed by pipes or other objects shall be brought to the attention of the Engineer-in-Charge or his authorised representative for necessary correction or change in location as may be desired.
- The street light fixtures shall be installed on R.C.C. / steel tubular poles as per details in the drawings. The tubular poles and cable box shall have a primer coating and two final coats of Al. paint.

6.6 Conduit

- All conduits shall be heavy duty, PVC as specified in the schedule of quantities. Minimum size shall be 19 mm unless specifically stated otherwise. Conduits and fitting shall be cleaned to remove sludge, dirt or trash from the inside, prior to installation.
- The conduits shall be securely fastened by means of straps and hangers designed for the purpose. Conduit runs on walls, columns or partitions shall be secured with hot dip galvanised C-Clamps or saddles and back spacers. These straps and hangers shall be fastened at each 400 mm length. Where supported on masonry walls, the conduit shall be spaced at a minimum of 6 mm from the wall using galvanised mild steel spacers. Conduit half straps (C-Clamps) attached to masonry or concrete walls, floors screw anchors or lead anchors. A maximum of four 90° bends only shall be used from pull point to pull point. The maximum distance between pull points shall be 90 metres but this shall be reduced by 15 metres for each 90° bend. Screws used for fixing C-Clamps on to spacers shall be of brass only. Special permission shall be taken from the Engineer-in-Charge for using hot dip galvanised screws.
- All conduit bends shall be made with conduit benders designed for the purpose. Bends shall not be less than 6 times the nominal size of the conduit. They shall be free from creeps and flattening. In general, exposed conduit runs shall be in straight lines parallel to or 90° to the building or pipe racks in which they are running. Each conduit run shall be completed before the wire or cable is pulled in. Whenever conduit enters outlet boxes, panels, pull boxes, switches or conduit fittings, an offset shall be formed on the conduit as close to the fittings as possible.
- In no case shall conduits be fastened to other pipes or installed in such a manner as to obstruct the ready removal of pipes for repair or replacement.
- All conduit openings shall be capped with steel / PVC caps (conduit plugs) during or immediately after installation. Before wires are drawn into conduits, the conduits shall be thoroughly cleaned by use of a swab or blown out with compressed air.
- All outdoor conduit fittings shall be provided with neoprene gaskets.
- Conduit installation should conform to I.S. 732.
- In concealed conduit system, grooving in the wall shall be neatly carried out by electrically driven cutter only and be of ample dimensions to permit the conduits to be fixed in the manner desired. Chases in the wall shall be done before the plaster work is done by civil section, and after laying of conduit in wall, the chased portion should be filled in by electrical Contractor with suitable material and to the satisfaction of the Engineer-in-Charge.
- Fixing of conduit pipes in chase should be done by means of staples or saddles not more than 400 mm apart.
- Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires when necessary.
- Positions of lighting panels, switches, sockets etc. shown in drawings shall be adhered to. If desired by the Engineer-in-Charge, the positions of these shall be changed without any extra cost.
- The heights for switches and receptacles are as indicated on the respective drawings / standard notes.

- All conduit drops from ceiling to the wall must be nearly in the centre of the wall. Conduit drops going out of the wall will have to be made good by the Contractor at his cost without damaging / weakening the building structure.

6.7 Earthing

6.7.1 General

- Earthing work shall be carried out in accordance with IS 3043 – Code of practice for Earthing.
- All electrical equipment shall be earthed as per details on applicable drawings.
- All metal vessels, process pipe lines, tanks, buildings and other metal structures that may receive lightning stroke or develop a static charge shall be earthed, as per details on applicable drawings.
- All equipment to be earthed shall be cleaned down to bare metal before attaching the ground wire.
- NEUTRAL CONDUCTORS SHALL NOT BE USED FOR EQUIPMENT EARTHING.
- All earthing connections shall be carried out in an approved manner and with specified materials. Typical methods of earthing as per standard drawings, will be adopted for the earthing, as indicated in the applicable drawings.
- The entire plant shall be earthed by a series of ground loops. The loops will be effectively earthed by means of earthed electrodes.
- All earth connections shall be applied bitumen compound if welded with the system earthing grid / equipment. However, welding should be avoided as far as possible.
- Sizes of the earth wires shall be as shown in the applicable standard drawings.
- Copper strip if used shall be tinned at the joints.
- Armouring of cables shall be earthed at both ends through suitable cable glands.
- Earthing wires and cables shall be terminated on the earth bus with solder less cable sockets with silicon bronze / G.I. bolts.
- Each earthing wire shall be in one length from the equipment to the earth bus.
- Pipe electrodes in earth pit as per standard drawing shall be provided unless otherwise indicated in the relevant drawings. The earthing electrode and pits shall be in accordance with IS: 3043.
- The earth pit centre shall be at a minimum of 2.5 metres distance from the nearest building. Distance of not less than 3 meters shall be maintained between centres of two earth pits.
- The neutrals of transformers shall be connected to separate earth electrodes.
- Specialised Earthing shall be provided to the sensitive equipment by means of dedicated Cu. earthing pits, Cu. earthing conductor and Cu. earth bus bar mounted on the insulators.
- Test links are required for testing of earth pit.

6.7.2 240 V Equipment

- All 240 V equipment shall be earthed with minimum one number of 1.5sqmm flexible, stranded copper wire unless stated otherwise on the relevant drawing.
- For lighting circuits in conduits, one number 1.5sqmm flexible, stranded copper wire shall run inside the conduit for earthing.
- Fluorescent fixtures and all other fixtures provided with earthing terminals shall be earthed by 1.5sqmm flexible copper wire.
- Switch and single phase lighting receptacle housings shall be earthed with 1.5sqmm flexible, stranded copper wire. The earthing wire shall be connected to the earthing screw on the switch or receptacles by a solder less cable socket duly crimped.
- All street lighting poles shall be earthed as indicated in the drawings.

6.7.3 415 V Equipment

All 415 V equipment shall be earthed by 2 independent paths to earth through earth wires. The earthing conductors shall be of the sizes as specified on the drawings and be of G.I., aluminium or bare copper where buried. Outside the building, a minimum of 350 mm of cover shall be provided.

- All motor frames, hoist rails, pipe racks, etc. shall be effectively earthed, as shown on the applicable drawing.
- Earth strip extending above the floor shall be protected from mechanical injury by running it through GI pipe sleeve to at least 300 mm height.
- The entire conduit system, supports, cabinets, transformers, motor control centres and equipments shall be effectively earthed as shown on the drawings and in accordance with the latest Indian Codes.
- All three phase receptacles shall be earthed with 8 SWG G.I. wire or as specified in the drawing.

6.7.4 Connection

The Earthing system connections shall generally cover the following:

All the Earthing system connections shall generally cover the following:

- Equipment earthing for personnel safety
- System neutral earthing
- Static and lightning protection

The following shall be earthed:

- System neutral
- Current and potential transformer secondary neutral
- Metallic non current carrying parts of all electrical apparatus such as transformers, HV / MV and LV switchgears, bus ducts, motors, neutral earthing resistors, capacitors, battery charger panels, welding receptacles, power sockets, lighting / power panels, distribution boards, control stations, lighting fixtures, etc.
- Steel structures / columns, rail loading platforms, etc.
- Cable trays and racks, lighting masts and poles.
- Storage tanks, spheres, vessels, columns and all other process equipments.
- Fence and gate for electrical equipment (e.g. HV switchyard, transformer yard, etc.)
- Cable shields and armour.
- Flexible earth provision for wagon, truck. Shield wire etc.

6.8 Receptacles and switches—comm. type conforming to IS3854, IS1293, IS2500

All single pole switches shall be commercial modular type and shall be connected to phase wire only.

The switches shall be mounted in such a way that circuit is ON when the knob is pressed in at the bottom.

All three phase receptacles shall be wired with the same sequence of rotation of phases.

The electrical Contractor shall consult the architectural plans to check for door swings. Where switches are located near doors, they shall be located “on the lock side” ensuring that the switch board is not covered or hidden by the door.

In general, all receptacles and switches shall be mounted at a height of 1200 mm from the finished floor level unless otherwise shown in the drawings.

Where more than one switch of the same phase is shown at one place, then these should be all mounted in a common hot dip galvanised M.S. box. Switches of different phases shall be mounted in different boxes.

Switches proposed to operate on emergency power (i.e. DG set, etc.) should have an indicator for the separate identification.

6.9 Push button stations

The Contractor shall check the actual location of the push-button stations in the field so that the mounting channel does not interfere with the removal and maintenance of the motor or equipment.

6.10 Embedded or recessed equipment

The electrical Contractor shall take special care to co-ordinate this work with the civil Contractor.

If recess or opening is not provided where it is required, the electrical Contractor shall draw the attention of the Engineer-in-Charge at site to this fact. But, the electrical Contractor may have to provide such recess or opening, if it is called for, without any additional cost.

6.11 Battery and battery charger

Inspect battery and battery charger thoroughly for any damage to meters, push buttons or to the panel and report to Engineer-in-Charge.

Check whether all parts and accessories are supplied by the manufacturer, as per the packing list and purchase order and report to the Engineer-in-Charge. Check that the electrolyte (acid) is supplied in a separate container by the manufacturer.

7 Inspection and field tests of electrical installations

The work to be performed under these guidelines cover the quality assurance plan for the inspection and testing of electrical installations.

7.1 General requirements

The electrical Contractor shall furnish necessary meters, instruments, temporary wiring and labour to perform all required tests, adjustments and wiring of all equipment installed and/ or connected under the contract including electrical equipment supplied by others, if any, to determine proper polarity, phasing, freedom from grounds and shorts and the proper operation of the equipment, meters, relays, etc. All testing instruments shall be calibrated and certified for accuracy by competent authority.

Inspection and testing shall be carried out to ensure that all equipment and materials have been installed as required and as per the relevant International Standard Specifications and Codes, Local Rules and Regulations, requirements of Fire Insurance, Chief Electrical Inspector and any other authorities having jurisdiction. The installation must pass all inspection and will be subject to the approval of the Engineer-in-charge and the concerned local authorities.

Before the electrical facilities are placed in operation, the Contractor shall make suitable tests to establish to the satisfaction of the Engineer-in-charge that all equipment, devices and wiring have been correctly installed, are in satisfactory condition and will operate as intended.

All tests shall be performed by or under the direct supervision of men qualified for carrying out inspection and testing.

Engineer-in-charge reserves the right to witness all tests, and he shall be informed in this regard two weeks before the tests are to take place. Engineer-in-charge reserves the right to approve the test results before circuits or equipment will be energised for the first time.

If motors record low insulation resistance, then they must be dried to obtain the required insulation resistance values. Approval of the drying methods shall be obtained from Engineer-in-charge before applying heat.

All results of the tests shall be recorded on prescribed test data sheets. All tests described herein shall be recorded on forms provided or agreed upon by Engineer-in-charge. Test reports shall include, for each test, the date of performance and name of the person in charge of the test.

Before starting the tests, a visual inspection of the material / equipment is to be made to determine that all components are installed as per drawings and in a neat and workman-like manner and that, in general, the equipment is ready for testing.

In case of fault, the Contractor shall isolate the fault and shall take necessary steps to eliminate the fault to the satisfaction of Engineer-in-charge. All defects through faulty workmanship of Contractor or of equipment and material supplied by him shall be corrected or replaced at his own expense.

Before commencement of any test, all equipment shall be thoroughly cleaned by blower and checked for proper and rigid connection of termination, fixing of foundation bolts, etc.

Contractor shall submit all formats for tests to be conducted on each equipment/system in accordance with these specifications for approval to the Engineer-in-charge / Consultant before entering the test readings.

7.2 Test procedures

7.2.1 Medium voltage switchgear

Before switchgear is energised, the insulation resistance of each bus shall be measured from phase to phase and from phase to earth. Measurements shall be repeated with circuit breakers in operating position and contacts open. Each test shall be held until constant reading is obtained. Minimum time shall be ten seconds. Minimum megger reading shall be 10 Mega ohms.

Before switchgear is energised, the insulation resistance of all D.C. control circuits shall be measured from phase to earth. Minimum acceptable value shall be 1 Mega ohm.

Each adjustable protective relay shall be set, calibrated and tested by using a cycle counter, load box, ammeter and voltmeter as required or by using a suitable relay test set having good wave form. Settings, calibration points and test points shall be in accordance with values given for the approved relay settings for the job.

Test all current transformer secondary circuit by applying current (thro secondary injection test) to transformer secondary windings and verifying that relay(s) and/or meter(s) operate properly.

Test all the relevant circuit breakers for proper interlocking operation. The sequence of interlocking is as indicated on single line diagram.

Test the operation of tie breakers / bus couplers.

The following tests shall be performed on all circuit breakers before they are operated:-

- Contact alignment shall be checked and adjusted where necessary in accordance with manufacturer's instructions.
- Each circuit breaker shall be drawn out of its cubicle and shall be closed manually, and then its insulation resistance shall be measured from phase to phase and from phase to earth.
- All adjustable direct acting trip devices shall be set using values given in the approved relay settings for the job.
- Before switchgear is energised, the following tests shall be performed on each circuit breaker in its 'test' position:-
 - Close and trip circuit breaker from its control switch, push button or operating handle.
 - Test operation of circuit breaker latch and check switch, where provided.
 - Test proper operation of lockout device in the closing circuit, where provided, by simulating conditions, which would cause a lockout to occur.
 - Trip breaker by manual operation or by applying current or voltage to each of its associated protective relays.
 - All automatic control operations and interlocks shall be tested for correct operation.

After completion of tests, all test results shall be recorded in standard format approved by Engineer-in-charge, witnessing site engineer and Contractor's representative.

All test reports shall indicate the details of the instruments used for test with date and time of test.

After commissioning of the equipments, all measuring and indicating instruments to be checked properly for operation. Any improper operation of these indicating lamps / instruments shall be corrected by checking fuse / connections, polarity, etc. If still these are found to be not in working condition, the supplier should report the same to the Engineer-in-charge for suitable action for replacement.

7.2.2 RTCC, motor control centre, DCDB

Before energising, the insulation resistance of each bus shall be measured from phase to phase and from phase to earth with disconnecting devices. Repeat measurements with devices closed but with contactors open. Minimum acceptable value shall be 10 Mega ohms.

Contact alignment of each contactor shall be checked and adjusted where necessary in accordance with manufacturer's instructions.

Before energising, the insulation resistance on both the "line side" and "load side" of each contactor shall be measured separately from phase to phase and from phase to earth. Minimum acceptable value shall be 10 Mega ohms.

Set each adjustable relay and direct acting trip device in accordance with values given in the approved relay setting record.

Each contactor shall be closed and tripped from its control switch and/or push button station to test proper operation.

7.2.3 Other distribution boards

Before energising, the insulation resistance of each bus shall be measured from phase to phase and from phase to earth with circuit breakers / isolating switch open. Measurements shall be repeated with circuit breakers / isolating switch closed.

The distribution boards shall be checked for rigid mounting, earthing connections, proper rating and size of components, interlocking and overload settings.

7.2.4 L. T. cable

- A megger test shall be made for continuity and proper end-to-end connection and correct termination after installation, on all feeder cables including motor feeder cables.
- Record test data between phase to phase and phase to earth.
- The test voltage, duration of test and test procedure shall be in accordance with IS: 4288.

7.2.5 Wiring

- Before energising, the insulation resistance of every circuit shall be measured from phase to phase, from phase to neutral and phase to earth.
- The insulation resistance of the circuits noted below shall be measured as follows:-

- Motor feeders: with motors disconnected, measure insulation resistance from load side of circuit breakers or contactors.
- Motor control circuits: With push buttons and over current devices connected, measure insulation resistance from phase to earth.
- Lighting feeders: Measure insulation resistance with circuit breakers or switch-fuse units on panel boards connected but with lighting branch circuit breakers or switches open.
- Lighting branch circuits: Measure insulation resistance after all lamp holders, receptacles, fixtures, etc. are connected but before fixing of lamps.
- Where splices or terminations are required in circuits rated above 600 Volts, measure insulation resistance of each length of cable before splicing and/or terminating. Repeat measurements, after splices and/or terminations are complete.
- Measure the insulation resistance of buried cable circuits before cable trenches are backfilled. Repeat measurements after backfilling.
- Test light intensity of each room by light intensity meter at working height and record the same.
- All receptacles shall be tested for correct phase sequence and by test lamp for operation of switch and continuity of earthing.

7.2.6 Alarms

All electrical alarms shall be tested for proper operation by causing alarm to sound under simulated abnormal conditions.

7.2.7 Earthing

Earthing shall be carried out as per IS Code of Practice: 3043 and as shown in the relevant drawings.

7.2.7.1 Specifications

- Check that earthing system is installed as per drawings.
- Check that all connections are tight and connections are protected from mechanical injury.

7.2.7.2 Testing

- The resistance to ground shall be measured at the following locations:
 - The resistance of the system/neutral earthing should be maintained preferably at less than 1 Ohm.
 - At each earthing point provided for lightning protection, the earth resistance shall preferably not exceed 1 Ohm.
 - At any one point of each system used to provide earthing to electrical equipment enclosures, resistance shall not preferably exceed 1 Ohm.
- Measurements shall be done before connection is made between the earth and the object to be earthed.

7.2.8 Batteries

All substation batteries shall be given a booster charge in accordance with manufacturers' instructions and adjusted for float operation before being placed in regular service.

7.2.9 Battery chargers

Battery charger shall be tested for proper operation and to verify that chargers deliver their maximum rated output.

7.2.10 Insulating liquid dielectric test

For test of the dielectric strength of insulating liquid or oil in transformer or reactor, test sample of liquid shall be drawn from equipment after filling. In some cases, a test also shall be made with samples drawn from the liquid container before the equipment is filled. Tests shall be carried as per IS: 335.

8 General notes for power and earthing

- All dimensions are in millimetres, unless otherwise mentioned.
- For cable sizes and details of circuit numbers, refer respective Electrical single line diagrams indicated in the layout drawing.
- All L.T. Power and control cables shall be 1.1 KV grade, aluminium / copper stranded conductor, PVC / XLPE insulated, Extruded PVC inner sheathed and extruded FRLS PVC outer sheathed, flat / round wire armoured.
- Wherever cables cross roads or drains, cables shall be laid in stranded RCC pipes (provided by civil Contractor). The RCC pipes shall be sealed by electrical Contractor with jute, felt, etc. in an approved manner after laying of cables.
- Cable trench shall be sealed with water-proofing compound at the entry to the building after laying of all cables by electrical Contractor.
- Cables shall be laid in G.I. pipe sleeves wherever they cross walls, beams, etc.
- Cables running along wall, beam, column, etc. shall be installed with G.I. spacers and saddles at an interval of 400 mm. Cables on trays shall be clamped with common saddle.
- Wherever cables are to be embedded directly in the floor, they shall be embedded with their top at least 40 mm below finished floor level.
- Minimum bending radius for cables shall be as under:

1.1 KV grade single core cable	15 times d
1.1 KV PVC/XLPE arm. Multi core cable	12 times d
11 KV XLPE cable	15 times d
- Cables buried in the ground shall have slight slack to allow for settling of the earth.
- For cables buried in ground, cable route markers shall be provided on the surface of the ground along the cable route at every 15 Mtrs. Interval, at every bend and where change of level takes place.
- All cables shall be provided with suitable aluminium tag, indicating circuit description and size of cable at both the ends and also at every bend.
- Pipe sleeves provided in fire walls, including spare sleeves, shall be sealed by electrical Contractor with bitumen-based cold-setting compound.
- The main earthing strip outside the building shall be laid at a minimum depth of 350 mm below finished grade level.
- No earthing strips for system / equipment earthing shall be connected to the earthing strip provided for lightning protection system.
- Test point shall be provided in lightning down conductor on insulator mounted on column / wall at 1500 mm above finished grade level.
- All earthing joints and connections shall be carried out as per enclosed standards with duplicate conductors for systems of 415 V, 3 phase & above and single conductor for 240V, 1 phase system.
- Isolators, plug receptacles, starters, push button stations, distribution boards, etc. shall be installed with their bottom side at 1200 mm above finished floor level.
- Location of isolators, starters, push button stations, etc. shall be finally checked in the field by electrical Contractor to ensure ease of removal and maintenance of motors and other equipment.
- Push button stations located in out-door areas shall be provided with M.S. canopy duly painted with primer and finishing coats.
- Main earth grid, all switchgear panels, isolators, push button stations, motors, equipment, vessels, etc. shall be earthed with wire / strip as per following list for G.I. conductor and for copper conductor, as applicable connected to the nearest earth bus.

– Main Earth Grid Conductor	75 x 6 mm GI. Strip
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- For PCCs	75 x 6 mm GI. Strip
- For MCCs, MPDB, MLDB, APFCRs	50 x 6 mm GI. Strip
- For LDBs, Process equipments	25 x 6 mm GI. Strip
- For Neutral earthing	50 x 6 mm G.I. Strip
- For Lighting Panels, Power DBs	25 x 3 mm GI. Strip
- For Push Button Stations	4.0 sq. mm Cu. FRLS wire
- For 1-Phase Power Sockets	4.0 sq. mm Cu. FRLS wire
- For Storage Tanks, Vessels, etc.	25 x 6 mm G.I. Strip

All the equipments (i.e. three phase equipments, storage vessels) shall have two earthing connections. Al. earth bus bar shall be used for connecting copper earthing wires using tinned copper lugs of suitable sizes. Bus bar shall be installed near the equipment on wall structures.

9 General notes for lighting

- All dimensions are in millimetres, unless noted otherwise.
- Wiring for non-flameproof type lighting fixtures and 6/16A, 1 phase, receptacles shall be carried out with 250 V grade, stranded, 2.5 / 4 sq. mm copper FRLS PVC insulated flexible wires in heavy gauge PVC conduit. For flameproof type light fixtures and power sockets and for non – flameproof type fixtures wherever asked for, 3C x 1.5/2.5/4 sq. mm armoured copper FRLS PVC cable of 1.1 KV grade shall be used.
- Lighting fixtures, switch boxes and receptacles shall be earthed by 12 SWG G.I / 14 SWG Cu. wires running all along the conduit / cable, connected to the nearest earth bus.
- Switches and receptacles of same phase located closed to each other shall be housed in a common 14 SWG MS enclosure.
- A maximum of following nos. and size of the wires can be taken through conduits of the sizes indicated. (Conduit of less than 19 mm dia shall not be used).

Conduit size	maximum nos. of wires in a conduit		
	mm	2.5 sq. mm	4 sq. mm
19	4	2	2
25	6	5	4
38	12	10	9

- Conduits and cables shall be supported at every 400 mm interval respectively with GI. Spacers and clamps.
- Threaded conduit terminating on flameproof equipment shall be made of minimum 25 mm length of engaged threads.
- Conduits shall be sealed properly at entry to flame proof switchgear and also wherever passing from non-hazardous area to hazardous area.
- Switches, switch boxes, receptacles, etc. shall be mounted in such a manner that their bottom side shall remain at a height of 1200 mm from the finished floor level. Lighting Panels shall be mounted at 1500mm height from FFL.
- Looping of wires / cables should be made from fixture to fixture.
- Casings / battens shall be fixed by means of screws and PVC wall plugs at intervals of 400 mm.
- Conduits and conduit fittings shall be of heavy duty PVC type.
- Conduits / cable runs shown on drawings are for guidance. Exact locations shall be determined at site by the Electrical Contractor.
- Lighting fixtures, switches, receptacles, junction boxes, etc. located in hazardous areas shall be of flameproof construction as per IS: 2148.
- Conduits / cables for lighting fixtures located outside the building shall come out from inside near the location of the lighting fixtures.
- Wiring shall be colour coded and wires of the same phase only shall run in the same conduit.
- Three phase lighting distribution board/ lighting panels shall be earthed with two independent earth strips / wires connected to the nearest earth bus, as per std. drawing. Single phase lighting distribution board / lighting panel shall be earthed with one earth wire.
- All emergency lighting units shall be mounted at 2500 mm height from F.F.L. However, receptacles for the same shall be mounted at locations which shall be determined at site by the electrical Contractor.

- All runners, G.I. Pipe sleeves, tray buckets, cleats, supports, etc. required mounting the lighting fixtures / lighting distribution boards / receptacles / switch boxes / lighting panels and laying of cables / conduits shall be provided by the Electrical Contractor.

All telephone and computer points shall be at 750 mm height from F.F.L

10 List of recommended vendors

Sr. No.	Description	Recommended Make
1	Air Circuit Breaker (ACB) / Moulded Circuit Breaker (MCCB) / Switch Disconnecter Fuse Units / Contactors and O/L Relay / HRC Fuse with base – LT SWITCHGEAR	L&T / SIEMENS / ABB / Schneider / C & S
2	Push Buttons / Indicating lamps	L&T / SIEMENS / Teknik / Vaisno
3	Load Manager / Meters / Measuring Instruments	HPL / Enercon / Conzerv / Rishabh / Trinity/EI measure
4	MCB / ELCB / ELMCB	Hager / HPL / Indo Asian / Havells
5	Protective Relays	Siemens / Alstom / ABB / GE
6	Timers	GEC /L&T / SIEMENS / C&S / BCH
7	Terminals	Phoenix/Elmex / Connectwell
8	Wires - FRLS	Finolex / Havells / Polycab / Avocab
9	Electrical Cable (L.T.) XLPE / PVC FRLS	Polycab / Finolex / Gemscab / KEI / Havells / Primecab / Avocab
10	Flameproof Equipments	FCG / CEAG / Sudhir / CG / ExEC / SEPL
11	Lighting Fixtures	Crompton / Wipro / Philips / Bajaj
12	Ceiling fan	Crompton / Usha / Havells / Orient
13	Flameproof Exhaust Fan	Crompton / FCG / Sudhir / CEAG
14	Current Transformer	AE/ Krishna/Ashmor / Kappa / Indcoil
15	Switch Socket & Plugs for offices	Anchor Roma / Legrand / WIPRO
16	Industrial type Switch, Socket and Plug for non hazardous areas	Legrand / Clipsal / Havells / Hager
17	Selector Switch	Siemens/ Kaycee / Salzer / L&T
18	Photocell	Reputed make
19	Space heater	Reputed make
20	Contactors	L&T / SIEMENS / ABB / Schneider
21	Lugs & Glands	Dowell's/ Comet / Ismal
22	Connectors	Salzer / Connectwell / Elemax
23	Junction Box	Hensel / Sintex / Rittal
24	Fire Alarm & Detection System	As per Existing make at site
25	Lighting Fixture	Bajaj / CGL / Philips / Osram
26	Lighting Distribution Board	Legrand / ABB / L&T / Schneider
27	Cable Tray	RR metal / Manav steel / Maheshwari Electrical Manufacturer / VSP Enterprises
28	Ceiling Fan / Exhaust Fan	Bajaj / Havells / Crompton

Final choice of the make from the above list shall be decided by the Owner / Consultant.

Make of any other equipment / components not mentioned above shall have to be approved by Owner / Consultant.

11 Standard installation drawings

The following standard installation drawings are attached with this tender as mentioned in Part-III of III Bill of Materials and schedule of rates.

STD-ETD-209 Mounting Details of Lighting Fixture

STD-ETD-276 Installation details of ceiling fan

STD-ETD-316 Earthing Connection for Equipment (G.I.).

STD-ETD-322 Earthing Bus joint & Earth wire connection to Earth Bus (G.I.)

STD-ETD-323 Earthing Bus joint & Earth wire connection to Earth Bus (Cu)

STD-ETD-327a M.S. pipe earth electrode 60mm dia 3 mtr long

STD-ETD-327b M.S. pipe earth electrode 60mm dia 6 mtr long

STD-ETD-327c M.S. pipe earth electrode 14mm dia 3 mtr long

STD-ETD-330 Typical Earth plate Copper

STD-ETD-331 Typical Earth plate Aluminium

STD-ETD-342 Typical fabricated cable tray plan & section details width 600mm and above

STD-ETD-343 Typical fabricated cable tray plan & section details width less than 600mm

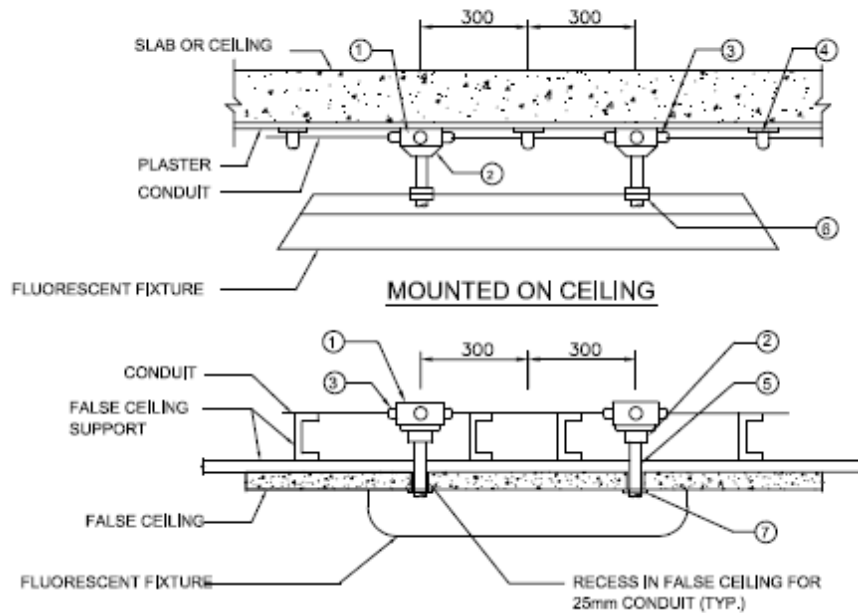
STD-ETD-344 Typical perforated cable tray plan & section details

STD-ETD-347(Sheet 1 of 2) Typical installation of motor and push button station.

STD-ETD-347(Sheet 2 of 2) Typical installation of motor and push button station.

STD-ETD-348 Motor & Push button station mounting details hazardous area.

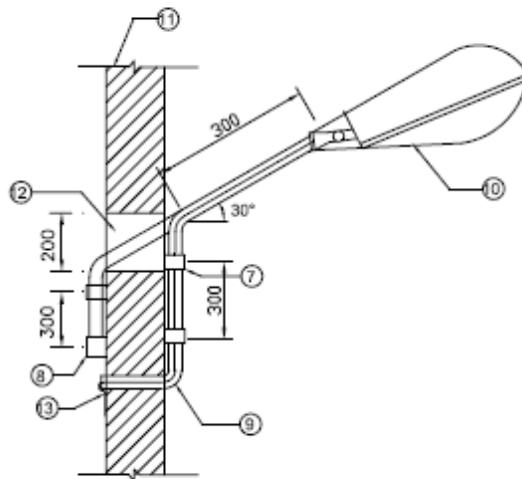
STD-ETD-349 Push Button Mounting Details.



LEGEND :

- ① 2,3 OR 4WAY JUNCTION BOX
- ② BALL AND SOCKET COVER
- ③ CONDUIT REDUCER ADAPTOR AS REQUIRED,
- ④ M,S SPACER WITH ONE WAY SADDLE WITH FIXING SCREWS
- ⑤ CONDUIT NIPPLE, LENGTH AS REQUIRED
- ⑥ CHECK NUT AND CONDUIT BUSHING
- ⑦ M.S. CLAMP
- ⑧ CONDUIT BOX
- ⑨ CONDUIT PIPE OF SUITABLE SIZE
- ⑩ 70W HPSV LIGHT FITTING
- ⑪ WALL/STRUCTURE
- ⑫ 150 x 150 , 1:2 CEMENT MORTAR GROUT
- ⑬ CABLE

MOUNTED ON FALSE CEILING



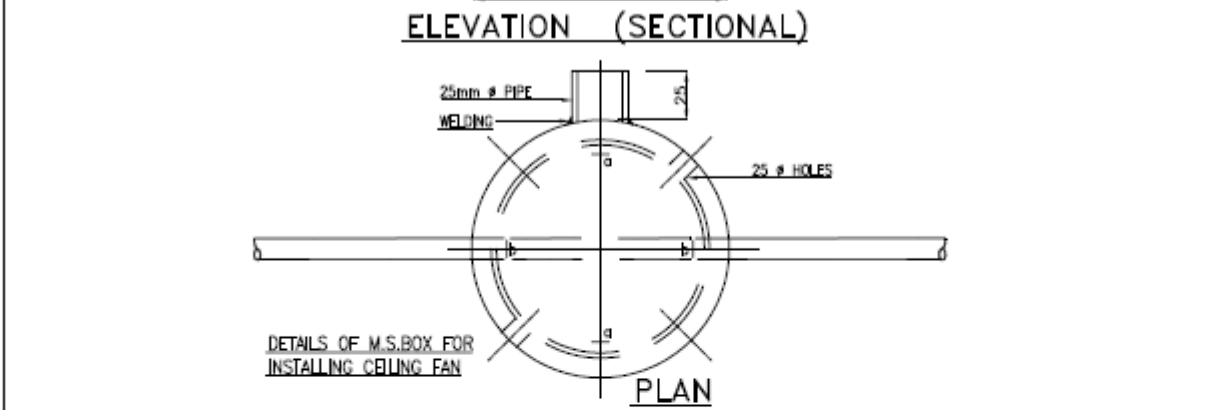
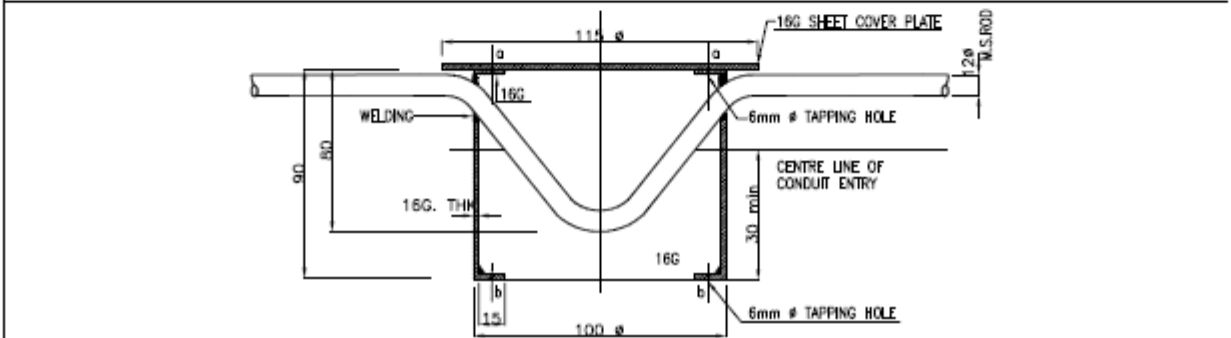
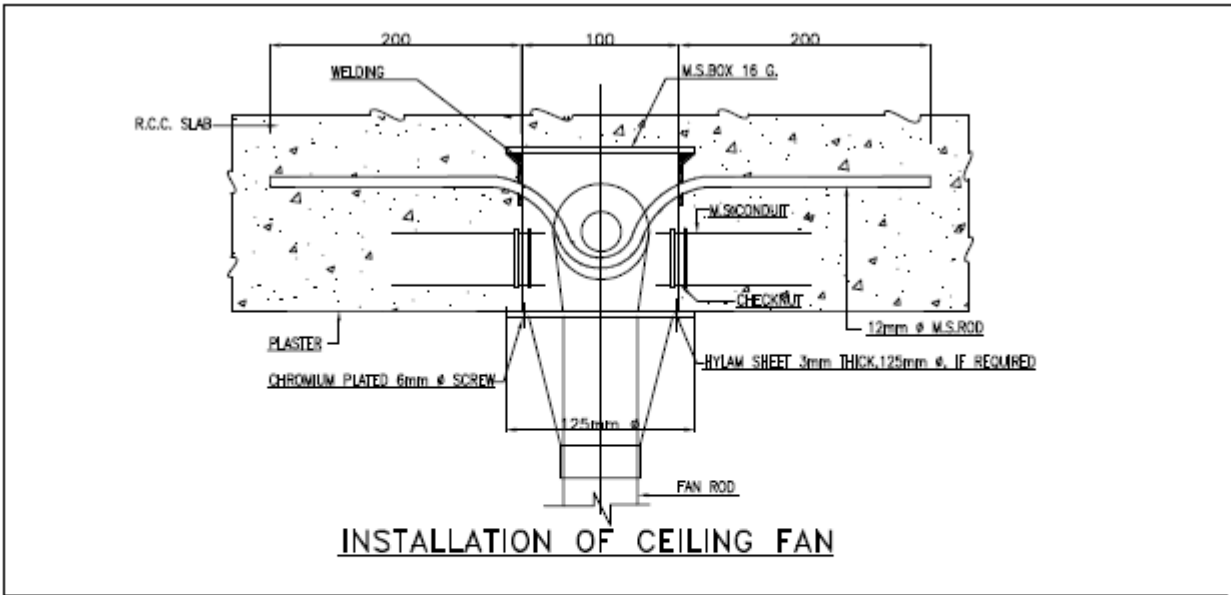
MOUNTED ON WALL

NOTES :

ALL DIMENSIONS ARE IN mm.

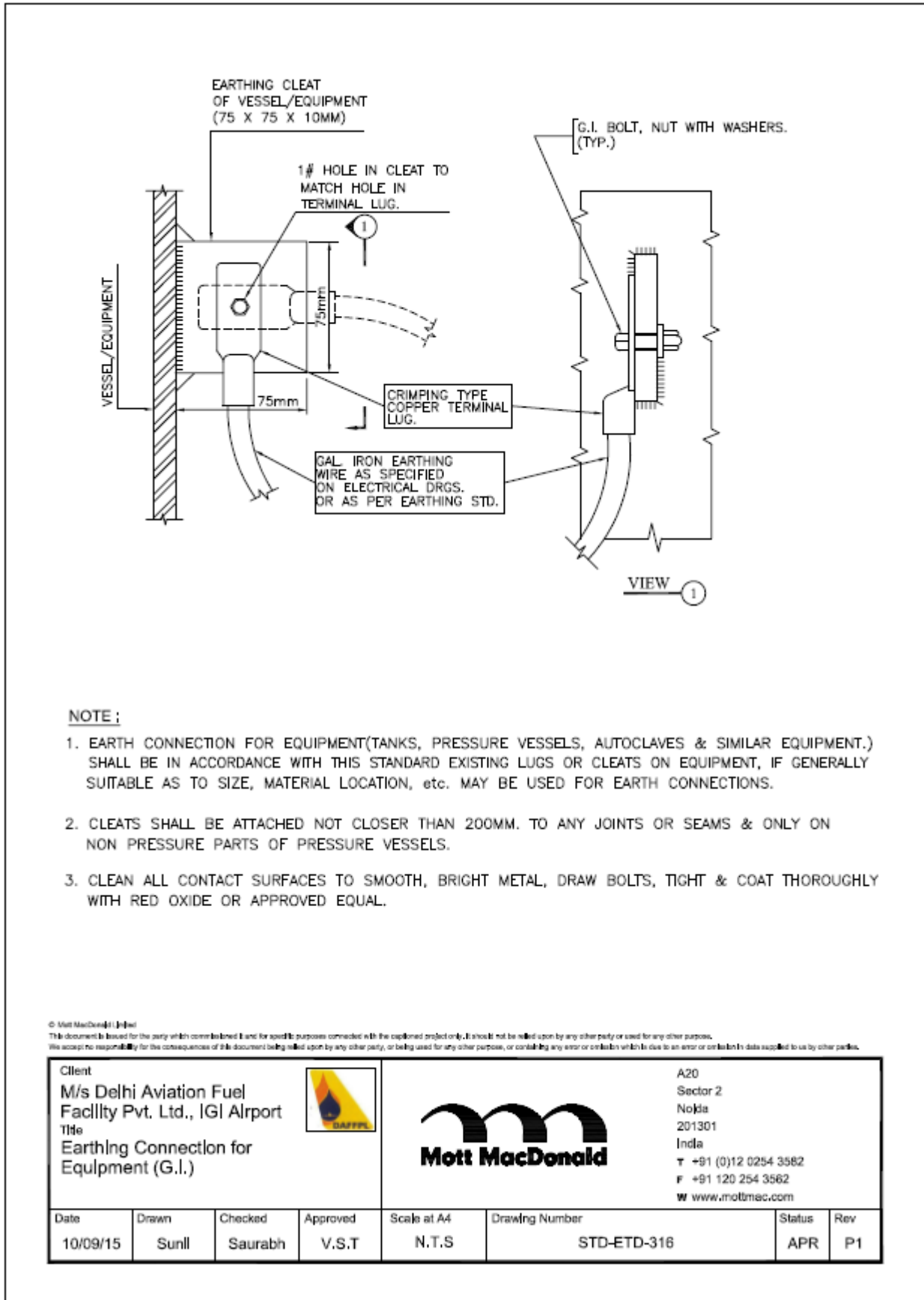
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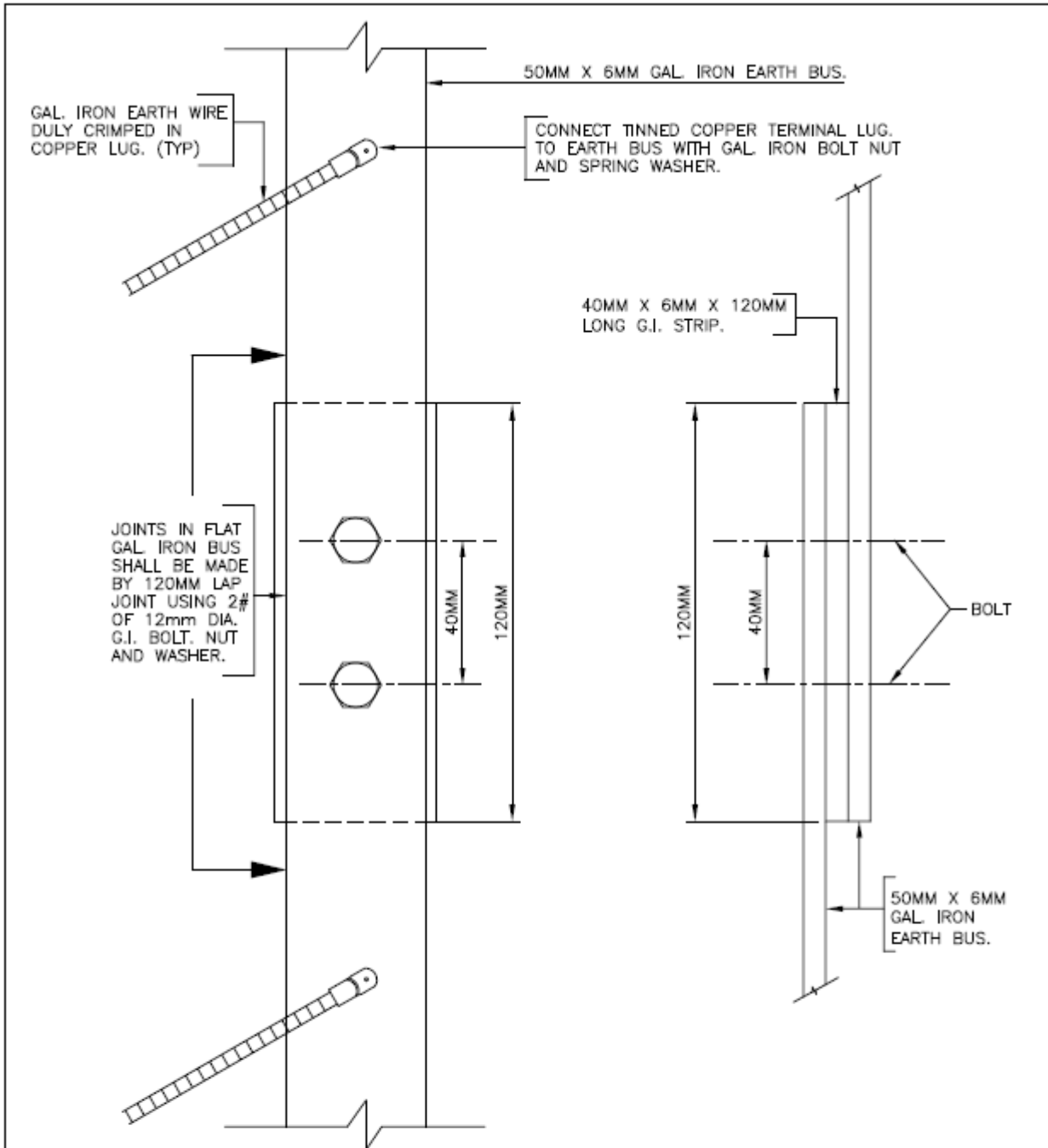
Client M/s Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport Title Mounting Details of Lighting Fixture						A20 Sector 2 Noida 201301 India T +91 (0)12 0254 3582 F +91 120 254 3562 W www.mottmac.com	
Date	Drawn	Checked	Approved	Scale at A4	Drawing Number	Status	Rev
10/09/15	Sunil	Saurabh	V.S.T	N.T.S	STD-ETD-209	APR	P1



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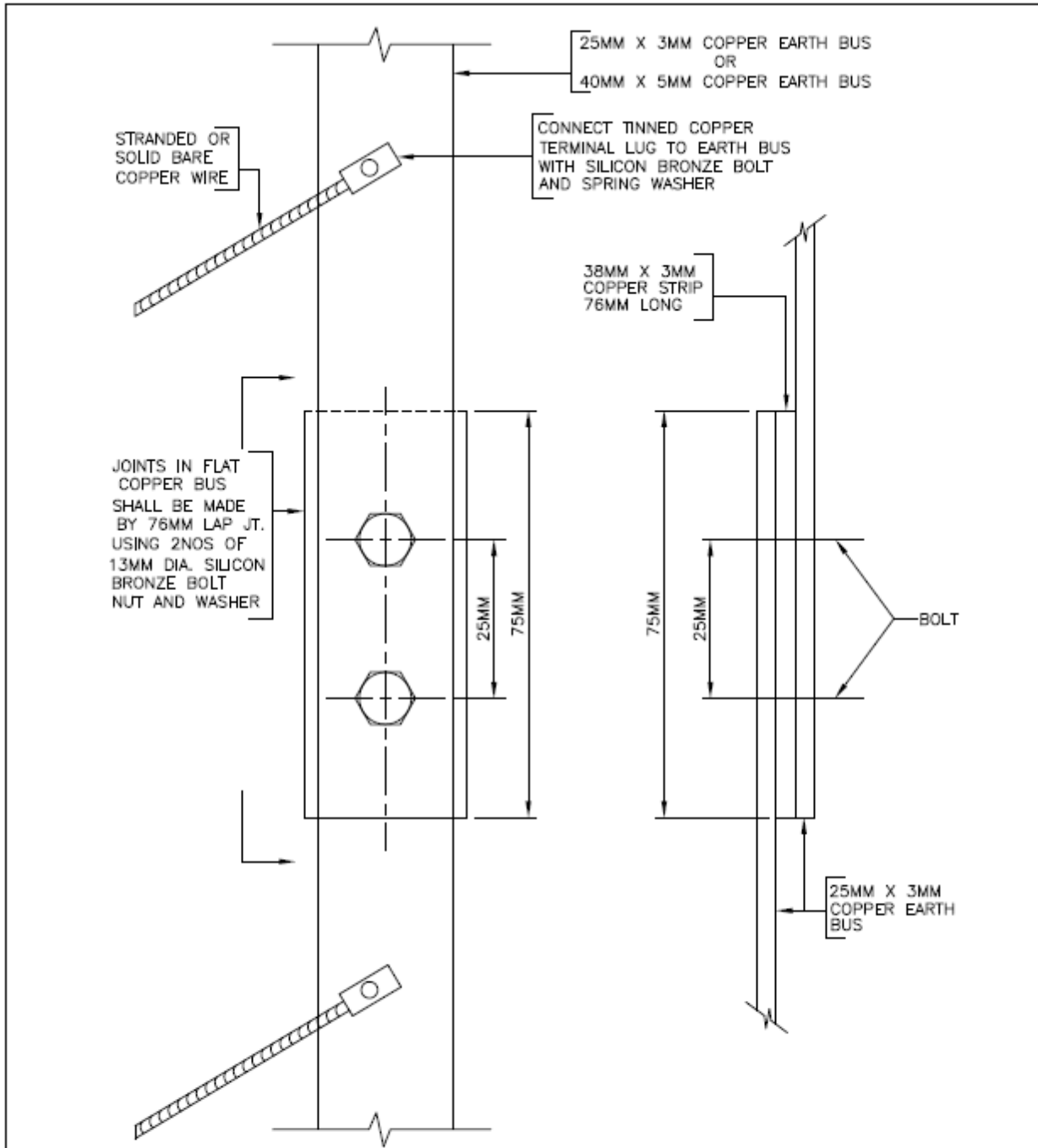
Client M/s Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport Title Installation Details of Ceiling Fan										A20 Sector 2 Noida 201301 India T +91 (0)12 0254 3582 F +91 120 254 3562 W www.motmcc.com	
Date	Drawn	Checked	Approved	Scale at A4	Drawing Number	Status	Rev				
10/09/15	Sunil	Saurabh	V.S.T	N.T.S	STD-ETD-276	APR	P1				







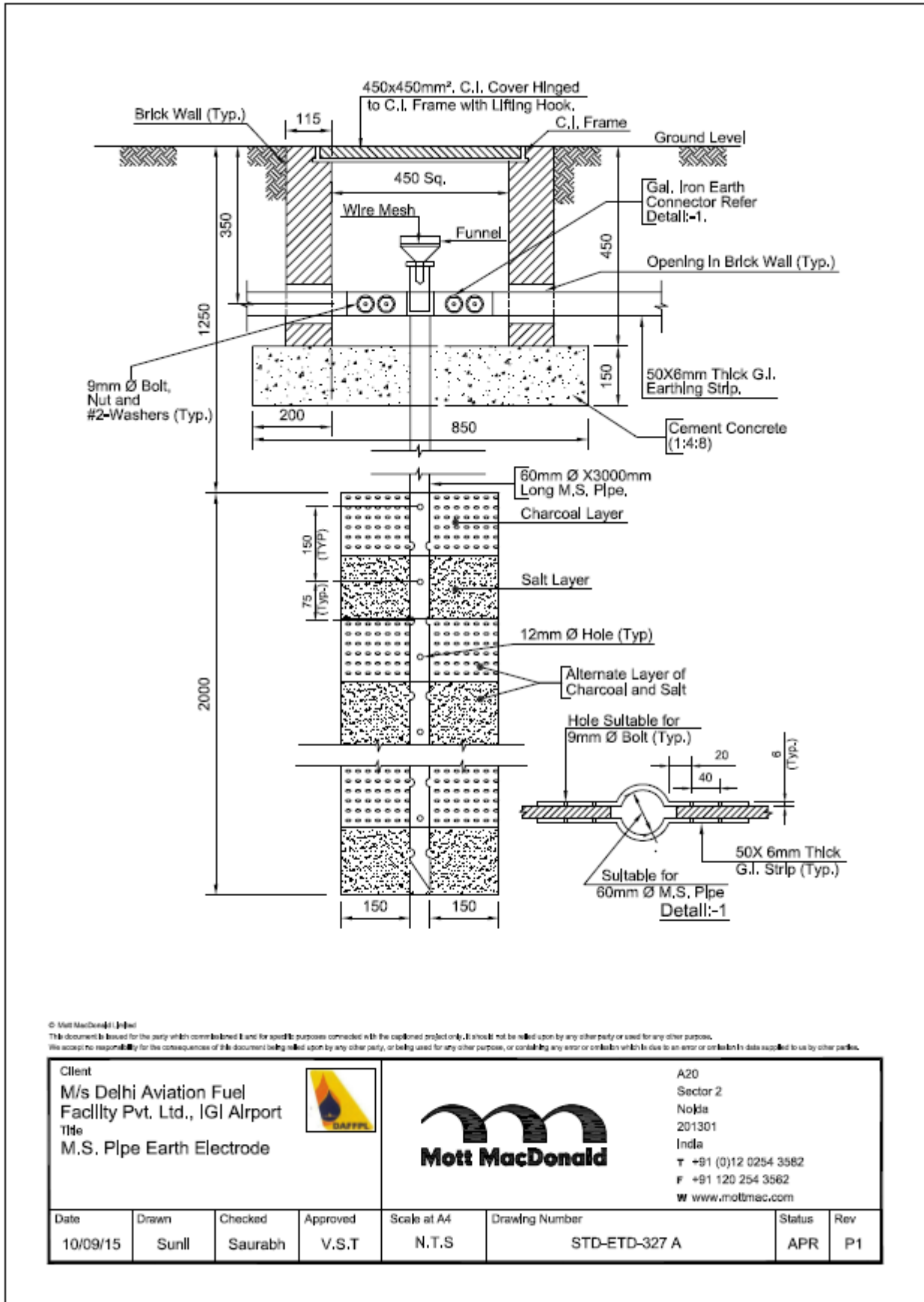
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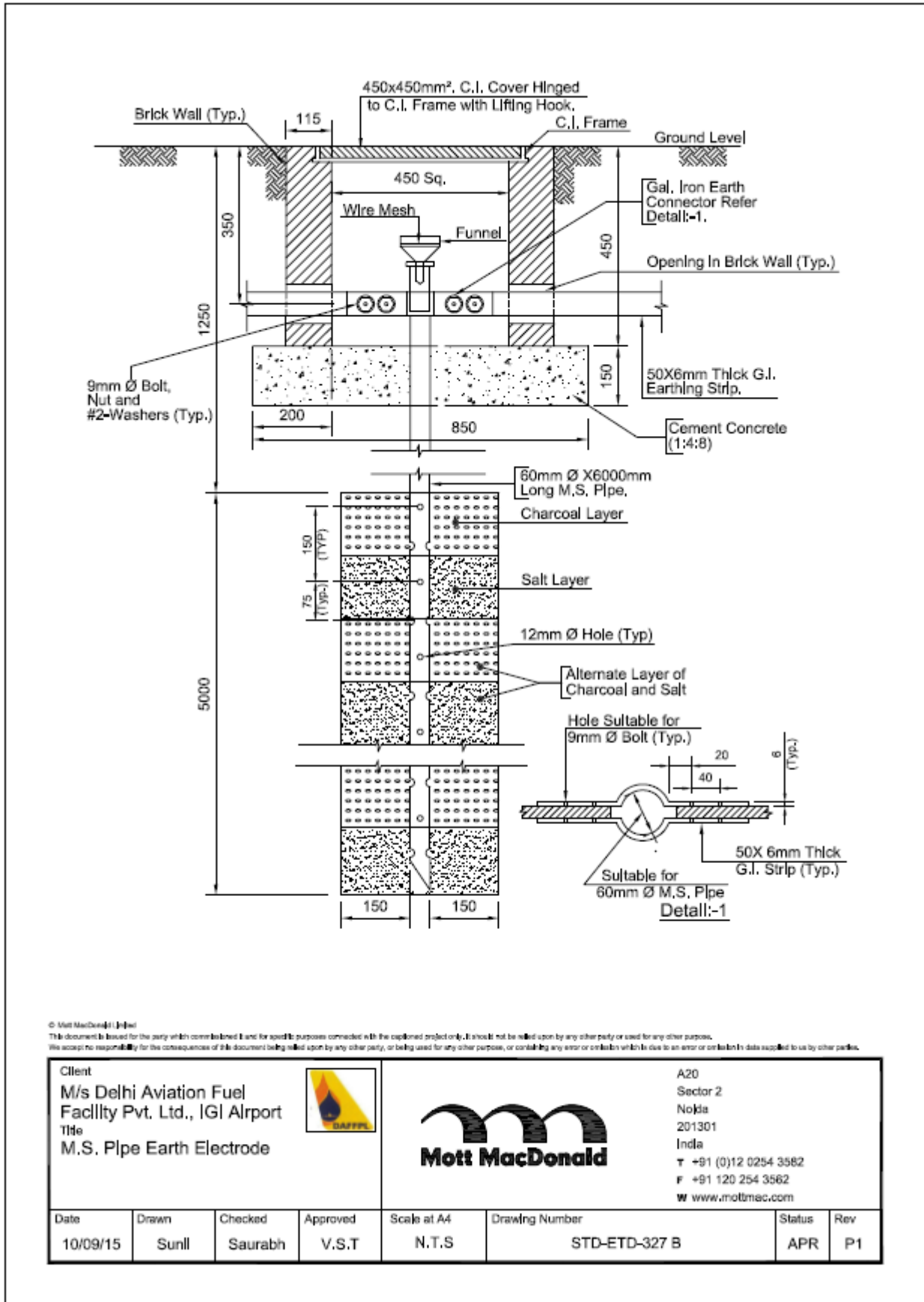
Client M/s Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport Title Earth Bus Joint & Earth Wire Connection to Earth Bus (G.I.)						A20 Sector 2 Noida 201301 India T +91 (0)12 0254 3582 F +91 120 254 3562 W www.mottmac.com	
Date	Drawn	Checked	Approved	Scale at A4	Drawing Number	Status	Rev
10/09/15	Sunil	Saurabh	V.S.T	N.T.S	STD-ETD-322	APR	P1

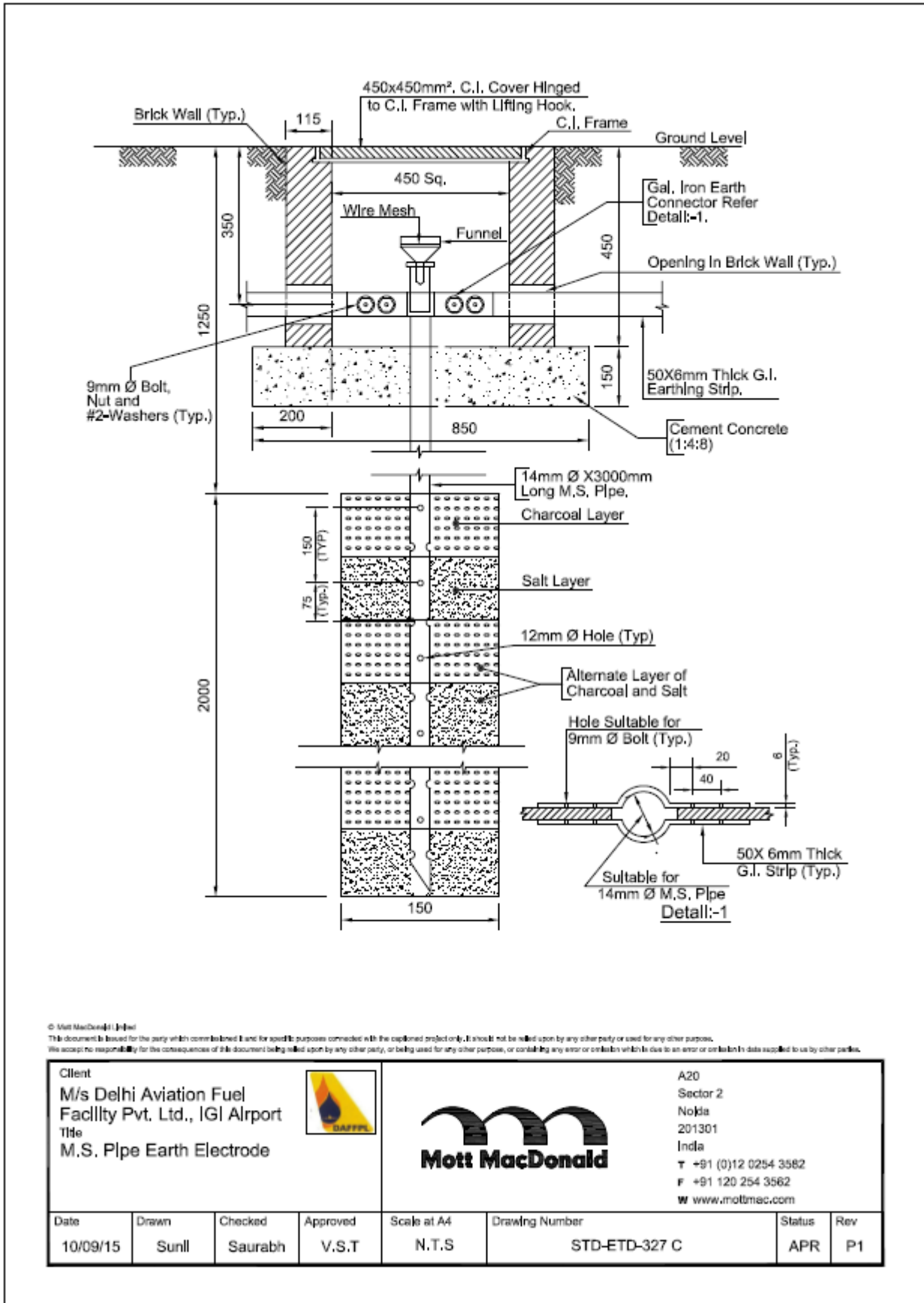


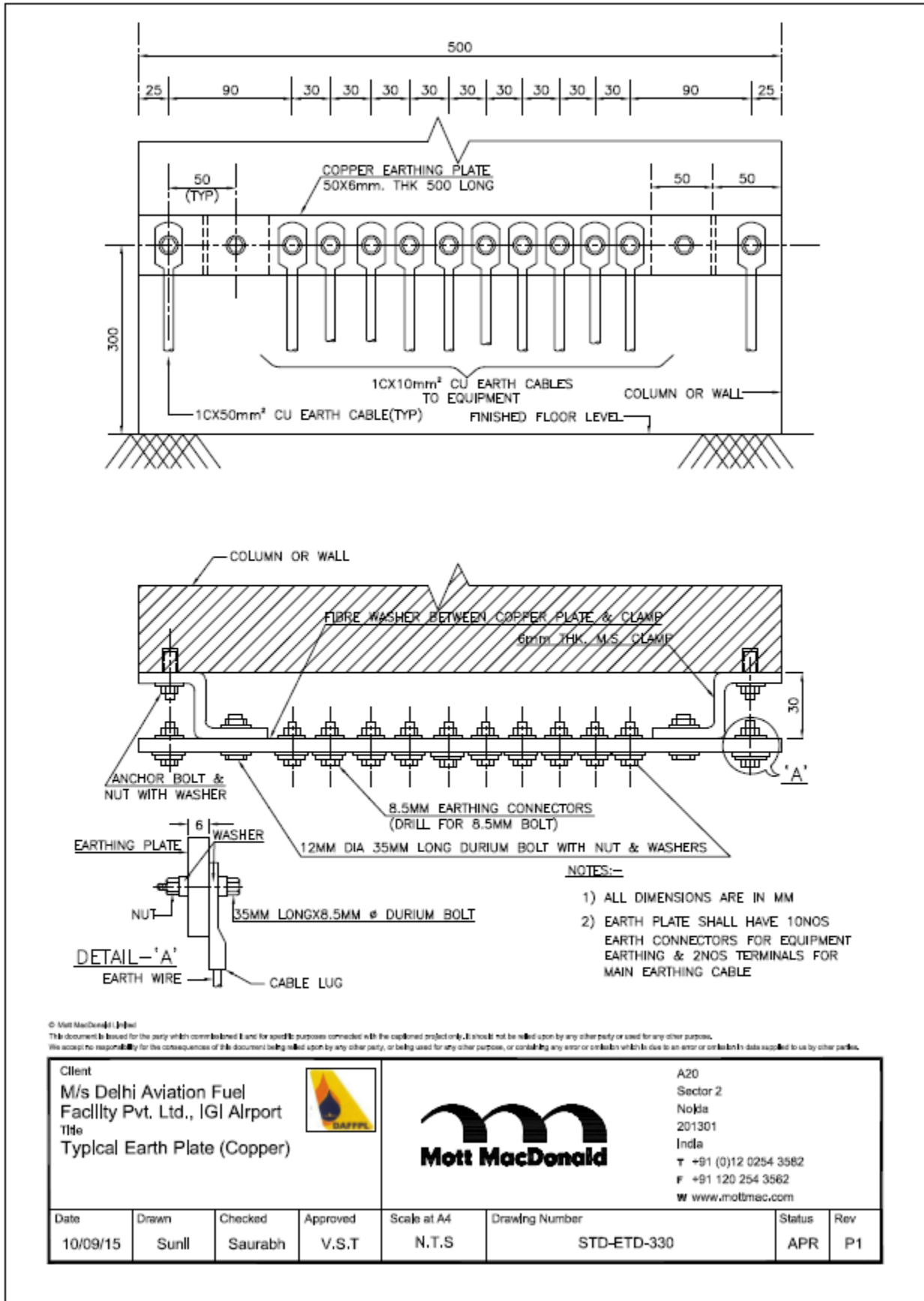
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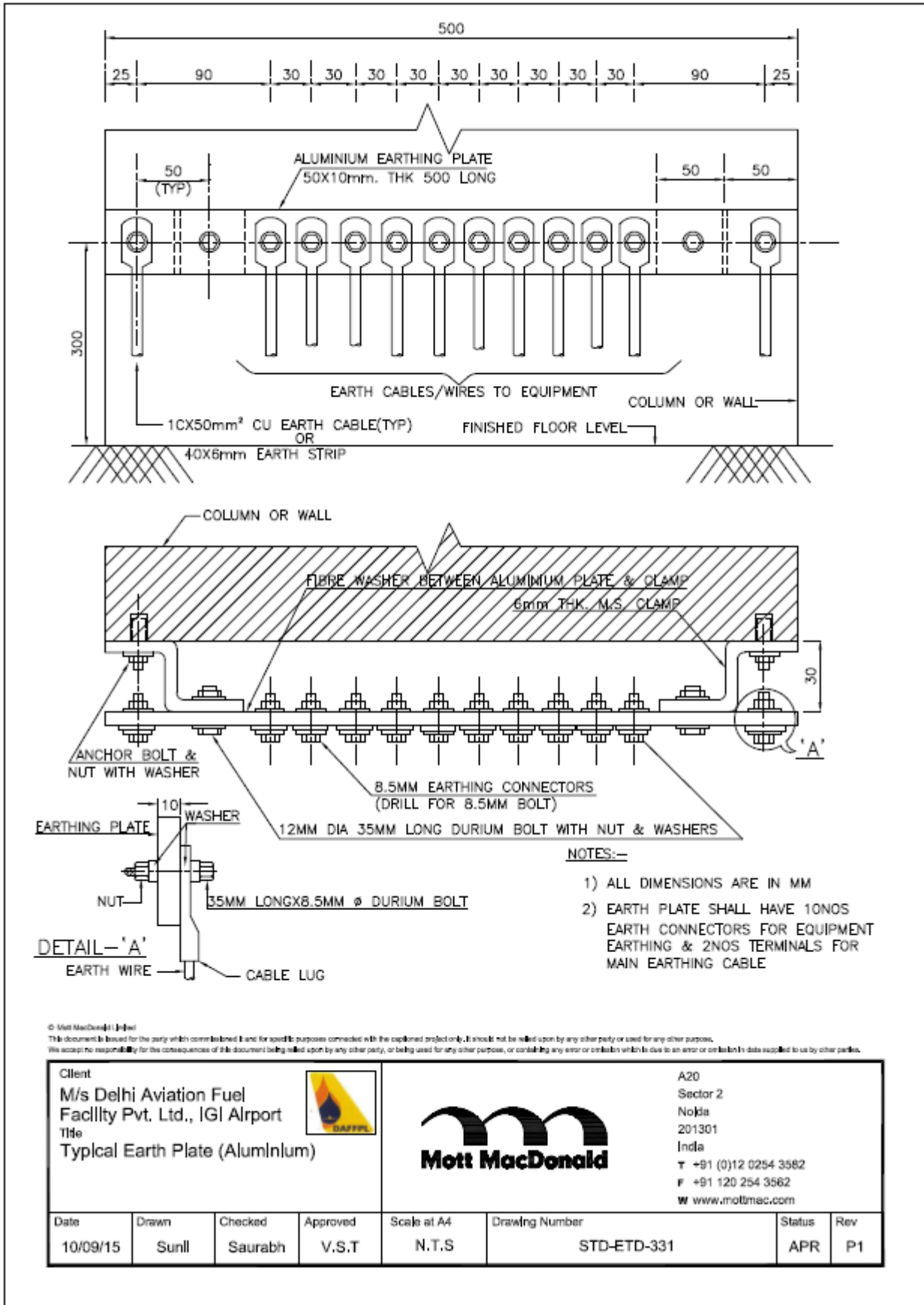
Client M/s Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport Title Earth Bus Joint & Earth Wire Connection to Earth bus (Cu.)						A20 Sector 2 Nokia 201301 India T +91 (0)12 0254 3582 F +91 120 254 3562 W www.mottmac.com	
Date	Drawn	Checked	Approved	Scale at A4	Drawing Number	Status	Rev
10/09/15	Sunil	Saurabh	V.S.T	N.T.S	STD-ETD-323	APR	P1

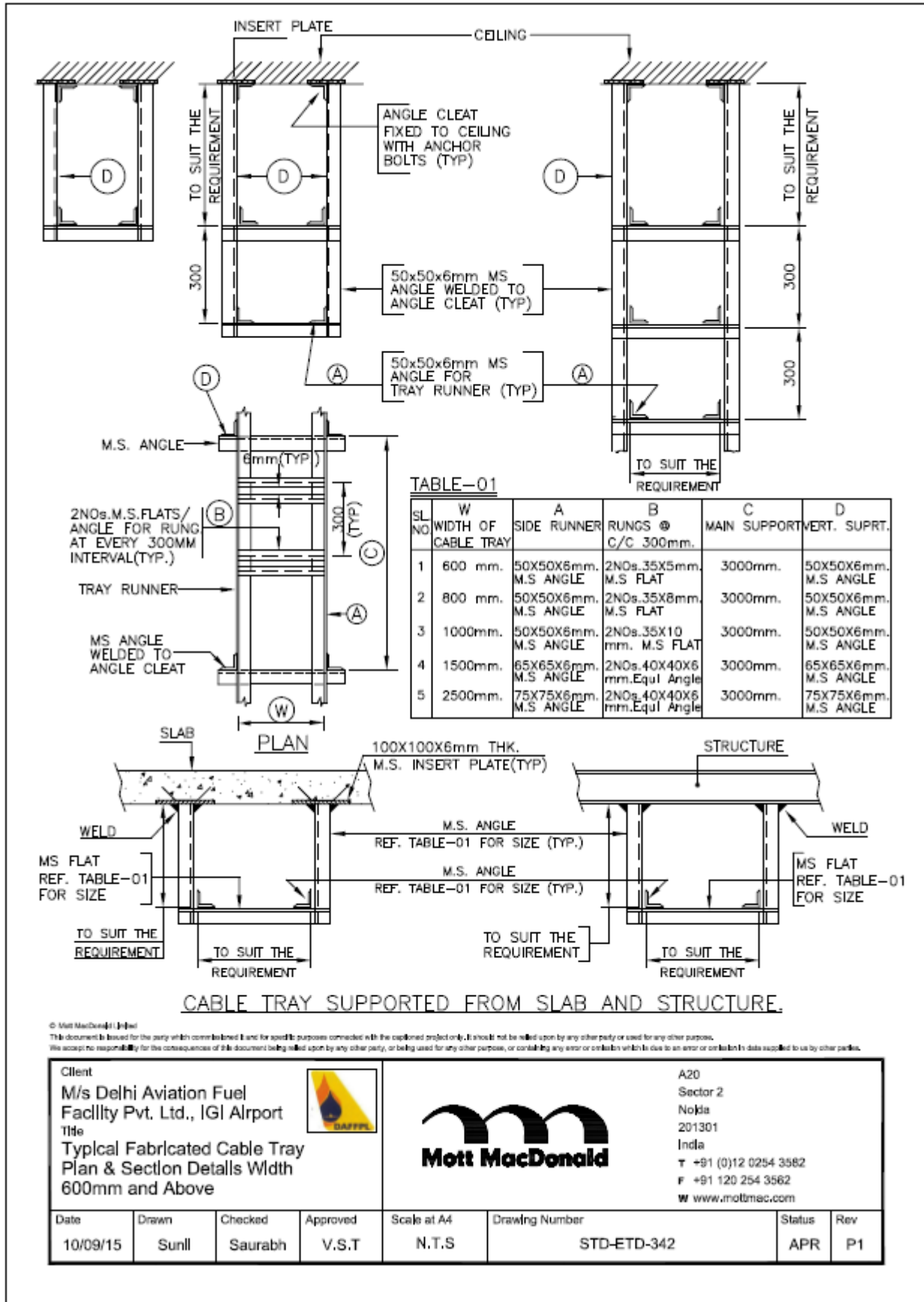


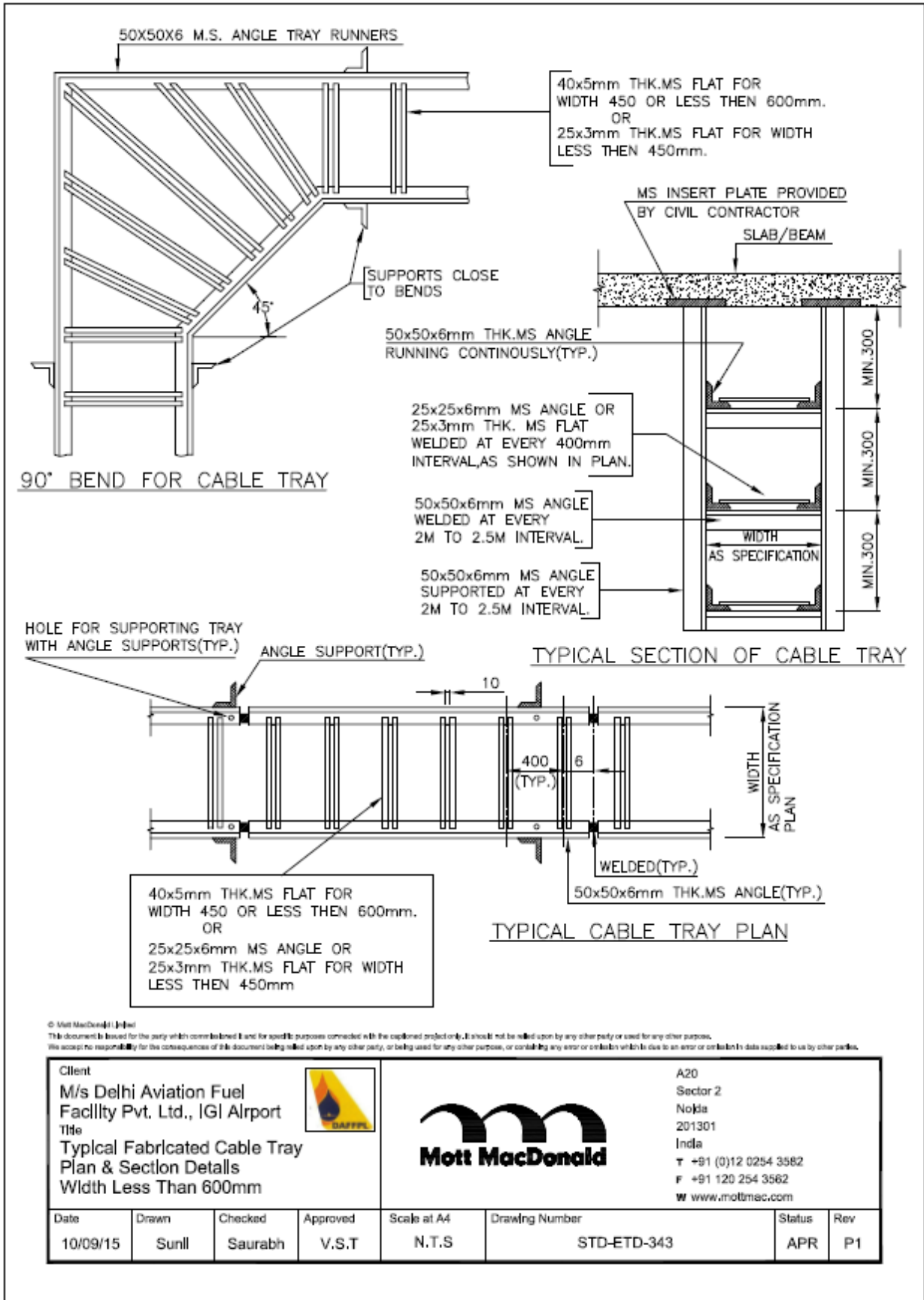


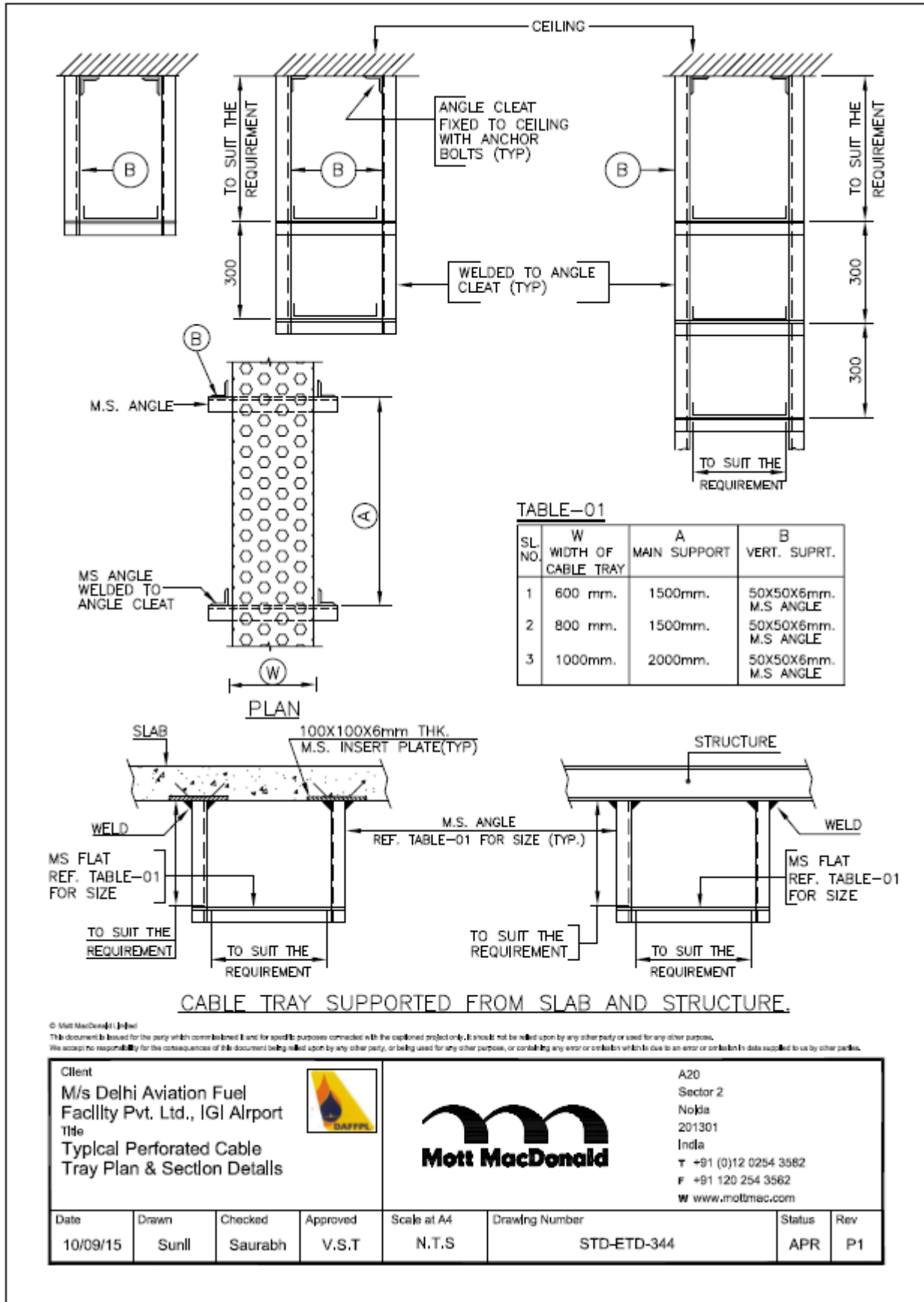


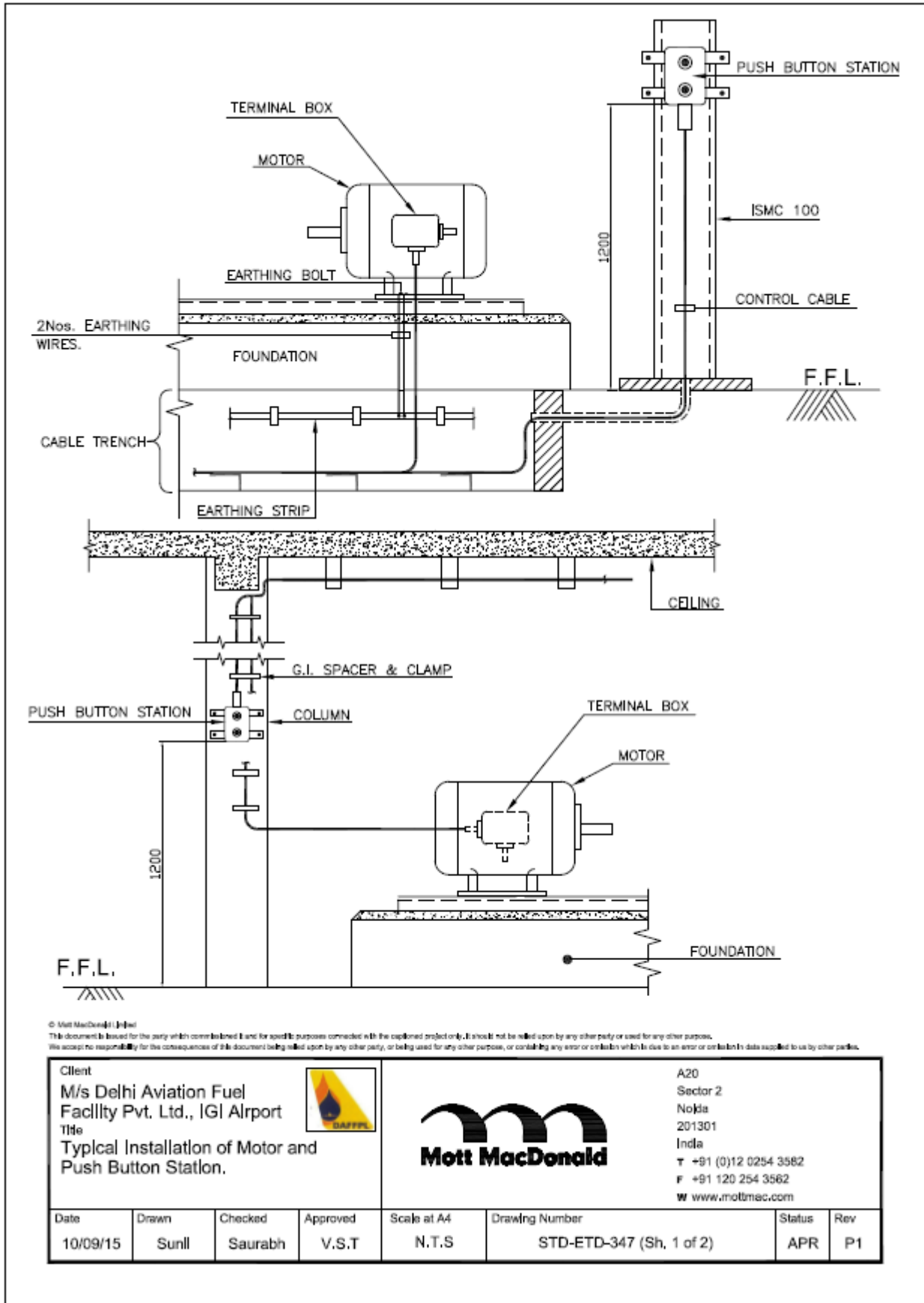


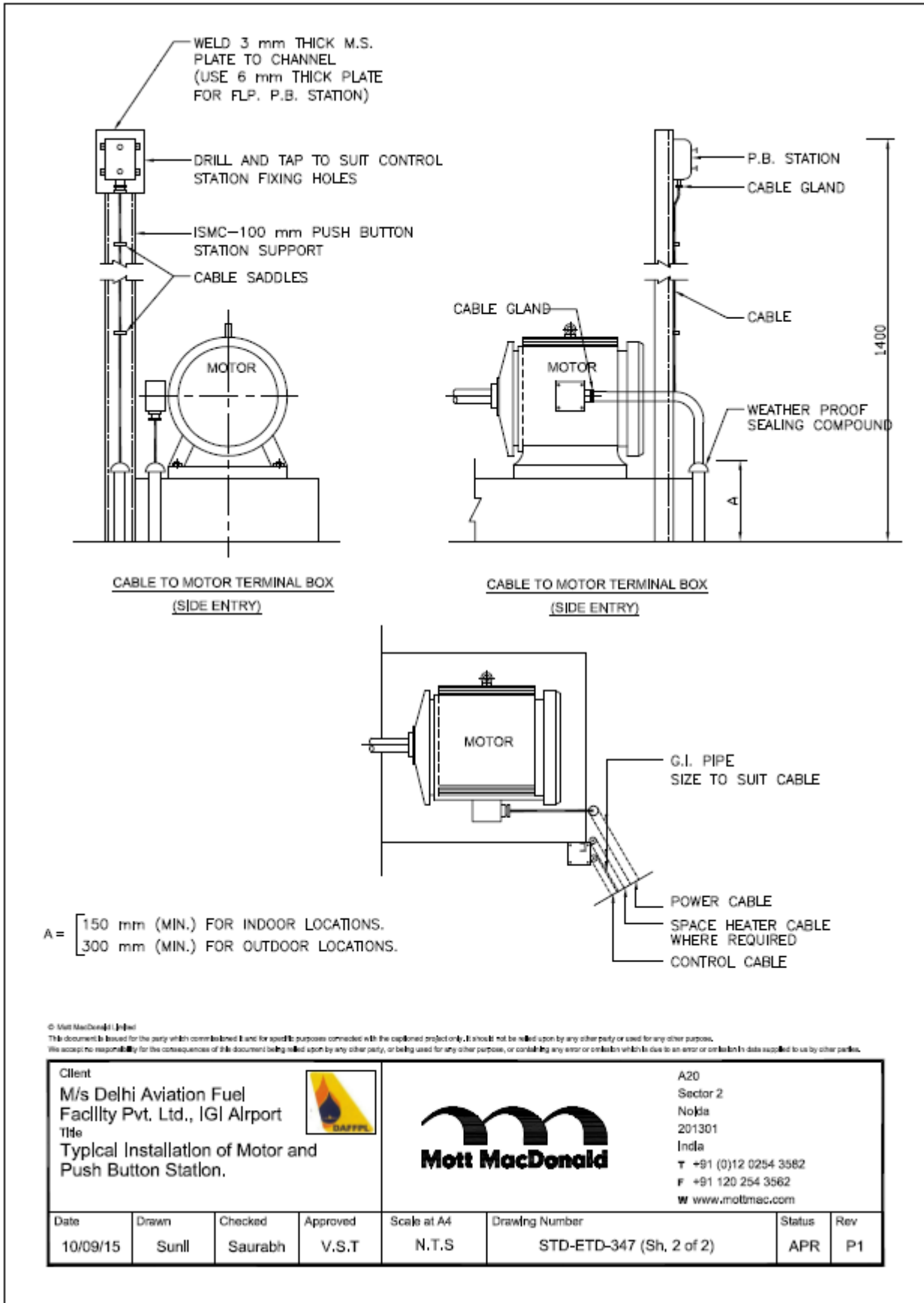


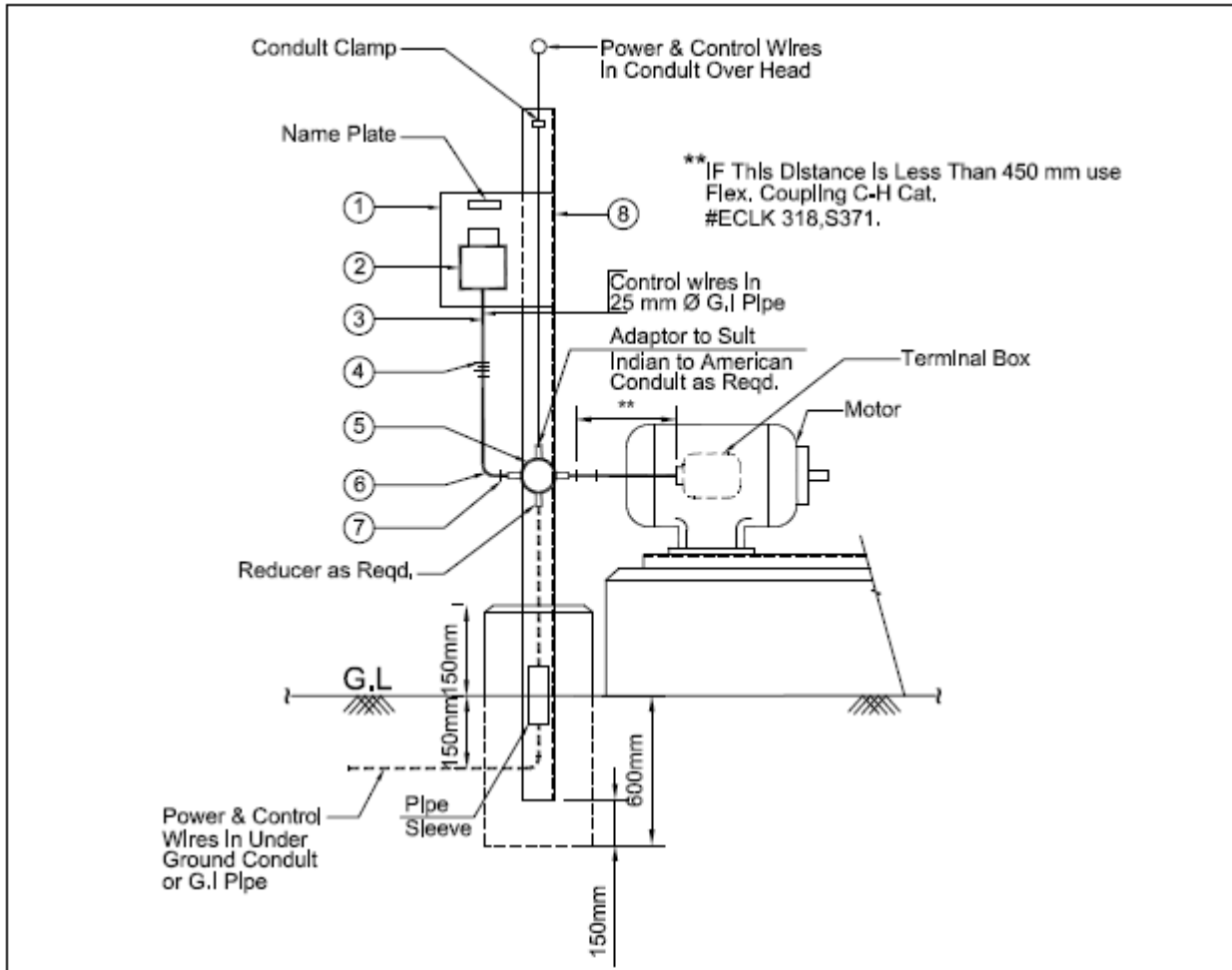












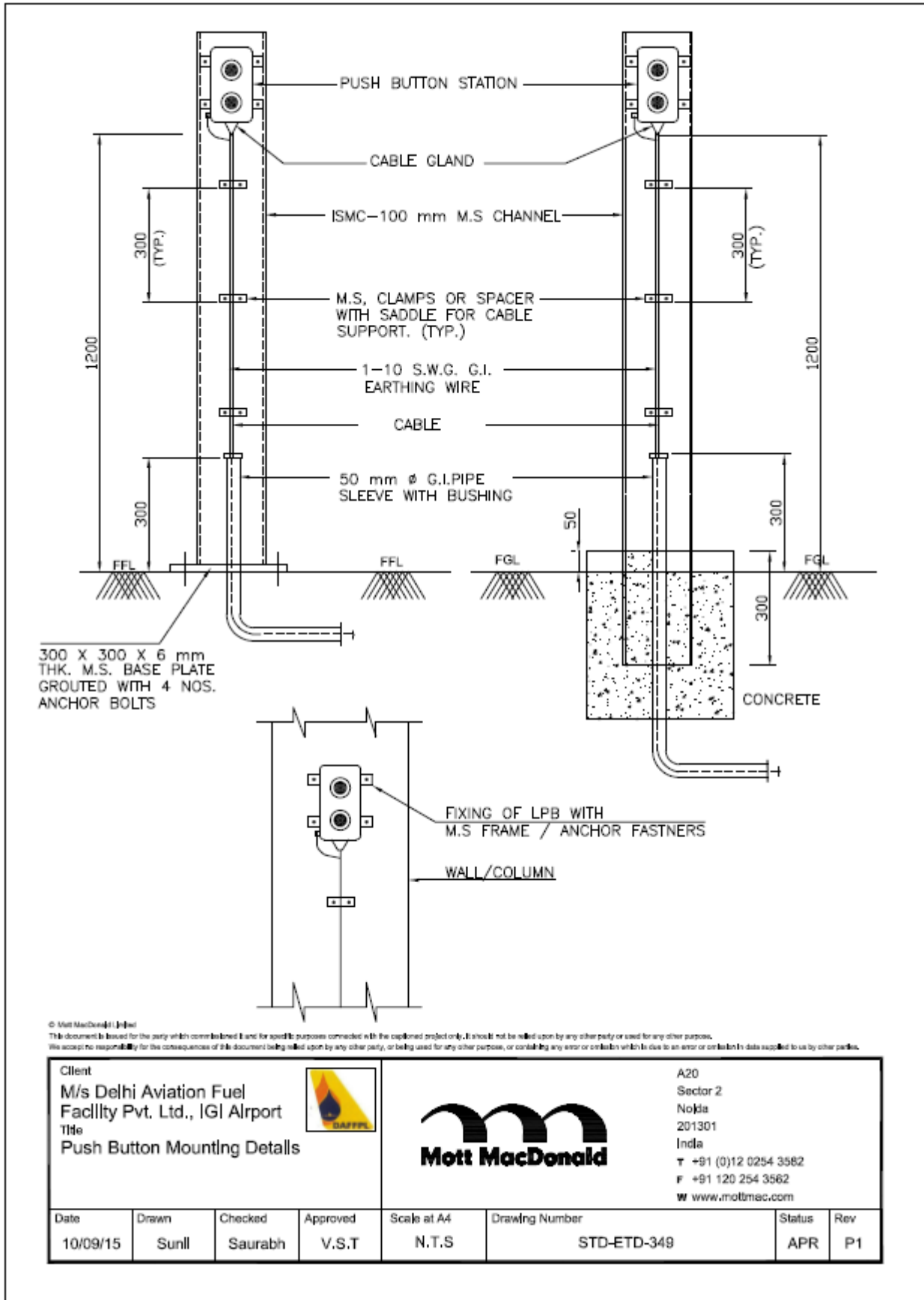
Motor supply over head or under ground by conduit

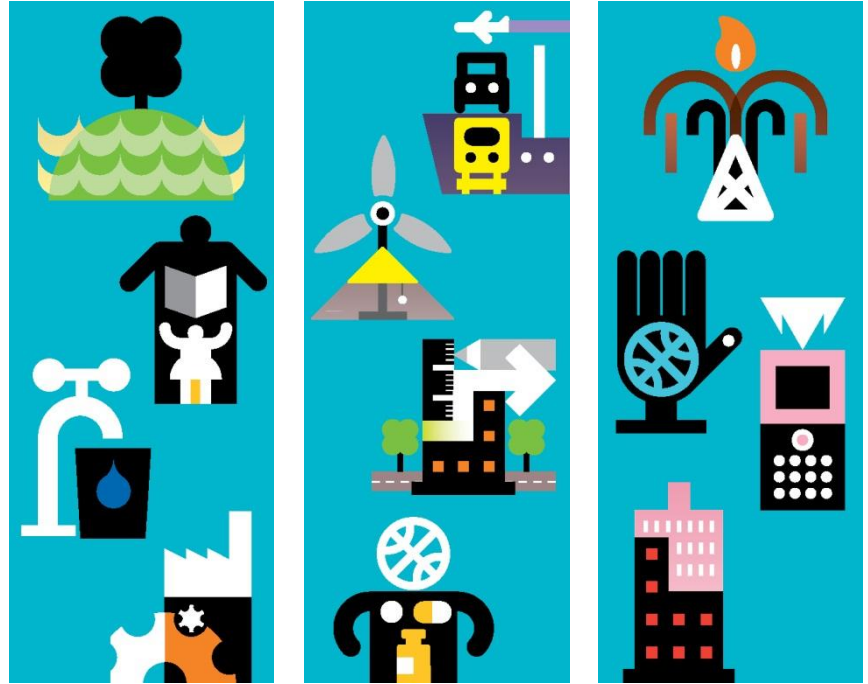
List of Material

ITEM NO.	DESCRIPTION
1	250 x 225 x 3 mm Thick M,S Plate
2	Push Button Station C-H
3	Conduit Seal C-H Cat. No.
4	Unlon C-H Type Uny. as Reqd.
5	Junction Box C-H Cat No. #
6	Elbow
7	Reducer 50 G.I Pipe Nipple as Reqd.

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Client M/s Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport Title Motor and Push Button Station Mounting Details Hazardous Area						A20 Sector 2 Noida 201301 India T +91 (0)12 0254 3582 F +91 120 254 3562 W www.motmac.com	
Date	Drawn	Checked	Approved	Scale at A4	Drawing Number	Status	Rev
10/09/15	Sunil	Saurabh	V.S.T	N.T.S	STD-ETD-348	APR	P1





Specification # ETD-01 Low Voltage Switchgear Panel

Modernisation of Fuel Farm-IGI Airport,
Shahbad Mohammadpur, New Delhi.

February 2015

Delhi Aviation Fuel Facility Pvt. Ltd

Specification # ETD-01 Low Voltage Switchgear Panel

Modernisation of Fuel Farm-IGI Airport,
Shahbad Mohammadpur, New Delhi.

February 2015

Delhi Aviation Fuel Facility Pvt. Ltd

'1st floor, Wing"A", T-III Project, IGI Airport, New Delhi-110037

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
P1	19.02.2015	SK	TKV	VST	Issued for Approval
P2	18.08.2015	SK	PPP	VST	Issued for Approval
P3	31.08.2015	SK	PPP	VST	Issued for Approval

Information Class: Standard

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1 General

1.1 Introduction

- M/s Delhi Aviation Fuel Facility Private Limited (DAFFPL) is a joint venture between Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL) & Delhi International Airport Limited (DIAL). M/s Indian Oil Sky Tanking Limited (IOSL) is responsible for running day to day operations of receiving the Jet fuel, storing the same in Fuel Farm and refuelling the Air Crafts.
- DAFFPL has avail design, engineering, procurement assistance and construction management services from Mott MacDonald which has been retained to provide consultancy services for the same.
- Existing Fuelling System i.e. Fuel Farm of Delhi Aviation Fuel Facility Pvt. Ltd. (DAFFPL) for refueling the aircrafts at IGI Airport, New Delhi is slated for modernization and up-gradation so as to conform to International Standards for receipt, storage and dispensing of Jet A1 fuel.
- At DAFFPL fuel farm, Jet A1 fuel is brought aboveground/underground pipe from Oil Terminals of IOCL and BPCL and also by road tanker. This fuel is stored in the Cone Roof Vertical Tanks installed in the fuel farm. Presently, the aircrafts are being refueled by hydrant pumps through underground Jet A1 fuel hydrant pipe line.
- This document specifies the minimum acceptable requirements set by the Purchaser for design, engineering, procurement, fabrication, assembly, inspection, testing, commissioning and delivery to site of Electrically Driven ATF Centrifugal Pumps for installation within the Fuel Farm of DAFFPL, IGI Airport, New Delhi.

1.2 Definitions

For the purposes of this document the following definitions shall be used.

- **Must/Shall** the word 'shall' is to be understood as mandatory.
- **Should** the word 'should' is to be understood as strongly recommended.
- **May** the word 'may' is to be understood as indicating a possible course of action.
- **Purchaser** Delhi Aviation Fuel Facility Pvt. Ltd., IGI Airport, New Delhi.
- **Consultant** Mott MacDonald Pvt. Ltd
- **Mfg / Supplier/vendor** The party responsible for manufacture or supply of equipment and services to perform the duties specified by the Consultant or company

2 Scope of work and basis

2.1 Scope of work

This specification covers the requirement for Low Voltage (LV) Switchboard or Main LT Panel or Power Control Centre (PCC), Motor Control Centre (MCC) and Power Distribution Board required distributing power in the plant at low voltage. The data sheets form part of the specifications

The drawings and specifications complement each other and what is shown or called for in one shall be interpreted as being called for in both. Material(s), if any, which may have been inadvertently omitted but fairly implied as required to make a complete assembly of the switchgear as shown in the drawing and the specification to make the unit properly operational shall be construed as required and covered in the Vendor's scope.

Any deviation from the specification must be stated clearly in the proposal. In the absence of such a statement, it will be considered that the requirements of specification are met without any deviation

2.2 Site particulars

2.2.1 Location

The site is located at Shahbad Mohammadpur adjoining to Indira Gandhi International Airport, New Delhi. The site is approachable by road.

2.2.2 Topography

The whole Site is levelled surface, with a nominal gradual slope.

2.2.3 Environmental Design Parameters

Elevation above M. S. L. : 237 metres. Above Sea level

Metrological data (Based on climatologically data of Delhi)

- a) Ambient temperature
 - (max.) : (+) 48.4°C
 - (min.) : (-) 2.2°C
- b) Relative humidity, % : Max: 100%; Min 25%
- c) Rainfall intensity : 20-30mm in one hr intensity in Delhi
- d) Design Wind speed : 47 m/s
- e) Area Classification : Non Hazardous – Admin. & Pump House :
Hazardous – Tank Farm & Product Pump House
- f) Earthquake Zone : Zone IV (as per IS:1893)
- g) Site Access : By Road, By Rail, By Air (Nearest Airport – Delhi)
- h) Unit Installed : Indoor

2.2.4 Design Temperature

The Maximum Design is considered as 50° C. This is an appropriate margin above the Maximum Operating Temperature of 48.4° C.

3 Technical specifications

3.1 Applicable industry standards

The design, manufacture and performance of the equipment shall comply with all Indian Standards, I.E. Rules, Statutory Regulations and Safety Codes currently applicable in the locality where the equipment will be installed.

Unless otherwise specified, the equipment shall conform to the latest applicable Indian Standards and, in particular, the following:

Table 1.1: Codes and standards

CODES	DESCRIPTION
IS : 2147	Degree of Protection provided by enclosure for low voltage switchgear and control gear.
IS : 13947	Specification for low voltage switchgear and control gear.
IS : 2705	Specification for current Transformers.
IS : 3156	Specification for voltage transformer.
IS : 1248	Specification for direct acting indicating analogue electrical measuring instrument accessories.
IS : 8623	Specification for low voltage switchgear and control gear assemblies.
IS : 3231	Specification for electrical relays for power system protection.
IS : 5578	Guide for marking of insulated conductors.
IS : 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals.
IS : 13703	Specification for Low-voltage fuses not exceeding 1000V AC or 1500V DC.
IS : 6875	Control Switches for Voltages up to and including 1000V AC or 1200V DC – Pushbuttons & Related Control Switches
IS : 2959	Contactors for Voltages not Exceeding 1000V AC or 1200V DC
IS : 4237	General Requirements for Switchgear and Control gear for Voltages not Exceeding 1000V AC or 1200V DC

3.2 Constructional requirement

3.2.1 General technical Details

1. All identical equipment and parts shall be interchangeable.
2. The switchgear shall consist of indoor, floor-mounted, metal-enclosed, compartmentalised (if not indicated specifically in data sheet), modular type, totally front side operated vertical sections.
3. It shall be dust and vermin proof and shall be easily extensible on both sides.
4. All doors and removable covers shall be gasketed all around with neoprene gaskets.
5. Each vertical section shall comprise the following:
 - Metal enclosed busbar compartment running horizontally throughout the length of switchgear and shrouded by barrier plates
 - Individual feeder modules in multi-tier formation.
 - Shrouded main and vertical bus bars and individual feeder connections by 650V grade stranded PVC insulated wires/strips
 - Vertical cable alley and bus bar alley with doors or covers covering the entire height of the feeder module panel.
 - Horizontal wire way for control wiring for full length of panel.
 - Space heater with thermostat, lighting and MCB in each vertical panel.
 - Sheet steel barrier between two adjacent vertical sections except for horizontal bus bar compartments.

- Separate door for each feeder module.
 - Additional 20% should be provided for Terminal Block. However, Vendor to keep in mind during GA designing of panel for vacant compartment, if possible.
 - Totally front operated panel, i.e. cable and bus bar alleys of suitable sizes (minimum 300 mm width) shall be on the panel front side only.
 - Each vertical panel should be divided into the distinct zones for bus bars, feeders, power cabling, control cabling and power & control terminals.
6. The switchgear unit shall consist of rigid structural frame enclosed by 2 mm thick cold rolled (CRCA) sheet steel. Doors and covers shall be of 1.6 mm thick cold rolled (CRCA) sheet steel. Structural framework with foundation bolts, etc. at the bottom shall be provided to mount the switchgear directly on concrete/steel channel base.
7. The switchgear shall be provided with removable cable gland plate (of minimum 3 mm thickness), with pack hole for cable entry, as indicated in the data sheet.
8. Separate labels shall be provided for switchgear modules, relays, instruments, switches, etc. Approval for the type of label shall be taken from the Owner / Consultant.
9. Control switches, push buttons, indicating lamps, meters and relays shall be mounted on the front door. Current Transformers (CTs) and Voltage Transformers (VTs) shall be mounted on the fixed portion. For fully draw out / semi draw out execution, all other equipment shall be mounted on withdraw able chassis with suitable guides for easy withdrawal.
10. Painting shall include seven-tank process like emulsion cleaning, pickling with dilute acid, washing and rinsing by water, phosphating and oven drying.
11. Painting shall be done by surface coating comprising pre-treatment, electrostatic powder spraying and curing. The surfaces to be coated shall be chemically de-rusted and degreased at a temperature of 70° to 80°C, zinc phosphatised and then passivated at about 60°C and, after proper drying, subjected to spraying of powder charged at about 90 KV through electrostatic guns. Curing shall be done in stoving oven at 180° to 200° C for 12 to 15 minutes ensuring a uniform and continuous coating. The colour of the shade shall be Siemens 7032 of IS 5.
12. Feeder control and motor control equipment not incorporating circuit breaker shall either be of fully draw out, semi draw out or fixed type execution, as specified in the drawing/data sheet.
- In the case of fully draw out type withdraw able chassis, all electrical power and control connections shall be of plug-in type.
 - In the case of semi draw out type withdraw able chassis, all electrical power connections shall be of plug-in type. All control connections shall be of screwing-in type.
13. Minimum 300 mm clearance shall be provided between the finished floor and the bottom of the lower most feeder compartment.
14. Panel lifting lugs shall be of removable type and to be fixed with panel using bolts and nuts.
15. Fixed type-both power and control connections shall be of bolted/screwed type.
16. All feeders name plates shall be provided. Name plate shall have white letter with Black background with rear engraving. Name plate shall have following details:
- Feeder rating with type of feeders.
 - Feeder description.
 - Feeder Module No.
17. The MCCs shall be divided into convenient shipping sections not exceeding 2.5 metres.
18. Complete panel shall be mounted on a base frame made out of ISMC 100 x 50 sections.
19. Every panel shall have independent vertical bus bar chamber / alley.
20. The panel shall be divided into following compartment:-
- Bus bar Chamber
 - Cable connection Chamber
 - Main Incomer feeder
 - Individual switch - disconnecter fuse chamber with motor starters etc.

21. Each chamber shall be divided into two by 16 SWG cold rolled steel plates.
22. Door opening shall be away from the cable alley and be provided with interlocking arrangement. Suitable keys shall be provided. Door interlock defeat arrangement shall be provided.
23. Each vertical panel shall be provided with maximum six modules. Minimum height of motor feeder shall be 300 mm and SFU feeder shall be 250 mm.
24. Switchgear shall be provided with removable minimum 3 mm thick cable gland plate. Brass cable glands and crimping type copper cable lugs for cables shall be provided if specified in data sheet.
25. The cable alley shall be provided with hinged doors for easy access to cables inside the cable alley. The compartment door shall be as far as possible, open away from the cable alley.
26. Doors with half round knob (No screws) for easy opening and closing.
27. For MCC panel feeder incomer and outgoing details, rating of feeder, busbar rating, fault level etc. refer point 2.3 Technical specification for Fire Water Pump Sets.

3.2.2 Main bus bars

1. Main bus bars shall be of uniform cross section of electrolytic quality grade in aluminium or copper as specified in the drawing/data sheet.
2. Wherever aluminium to copper connections is required, suitable bimetallic connections/clamps shall be provided.
3. Maximum temperature of the bus bars and the bus connections shall not exceed 85°C.
4. Bus bars shall be air insulated. Busbars shall also be provided with heat shrinkable PVC insulating sleeves and phase colour coded
5. Tinning shall be done for copper busbars as required.
6. Separate supports shall be provided for each bus bar. If common support is provided for all bus bars, anti-tracking barriers shall be incorporated.
7. Busbars shall run throughout the length of the chamber and shall be extensible type on either side.
8. Provision shall be made to connect the earthing busbar to the main earthing grids at the two ends.
9. Copper/Aluminium busbars shall have sufficient cross section to carry full load current and fault current without any damage. All aluminium bus bars shall be provided with current density of 0.7 A/mm² and for copper busbar with current density of 1.4A/mm²
10. In order to avoid any accidental hazards, bus bar compartments shall be protected with 3 mm thick hylem / Bakelite sheets.
11. The size of the neutral bus bar shall be similar to that of phase bus bars in the case of MLDB and Single Phase DBs. However, the neutral bus bar shall be of half size that of phase bus bars in other panels.

3.2.3 Circuit breaker

1.1.1.1 Air circuit breaker (ACB)

1. Air-break, fully draw-out type circuit breakers shall consist of the following:
 - Shunt trip.
 - Mechanical OPEN/CLOSE position indicator, visible with door closed.
 - Emergency trip push button.
 - `Red`, `Green`, `Blue` and `Amber` indicating lamps for Breaker ON, Breaker OFF and Breaker trip on fault.
2. There shall be `Service`, `Test` and `fully withdrawn` positions for the breakers along with their indications on the breaker front facia.
3. Anti-pumping and over & under voltage trip facility should be provided.
4. It shall be possible to with-draw the breaker only in open position.
5. Compartment door of the breaker shall not open unless the breaker is in open position.

6. Automatic safety shutters shall be provided to cover live contacts when carriage is withdrawn.
7. Relays shall have potential-free contacts and shall have variable time settings.
8. Facility shall be provided for blocking under-voltage releases.
9. Manual operating mechanism shall be of spring charged stored energy type.
10. Power-operated mechanism shall be of motor-wound spring-charging stored energy type. Emergency manual charging facility shall also be provided.
11. Indicators shall be provided to show 'charged' and 'discharged' conditions of the spring.
12. The operating mechanism shall be trip-free.
13. The breaker shall be provided with the microprocessor based release with breaker control through RS 485 port and communication with PC through universally used protocol.
14. The Microprocessor release should have over current / short circuit and earth fault protections along with their indications due to which the breaker has tripped.
15. It shall be ensured that circuit breaker body is grounded while it is racked-in into the panel.
16. Trip circuit healthy indicating lamp with integral push button shall be provided.
17. Flame retardant FRP Barrier plate between Incoming and Outgoing terminals of ACB shall be provided.

3.2.3.1 Moulded case circuit breaker (MCCB)

MCCBs shall be incorporated in the Main Power distribution Board and Sub Distribution Board wherever specified in SLD. MCCB's shall be suitable either for single phase or three phase.

1. The moulded case circuit breaker (MCCB) shall be air break type and having quick make quick break with trip free operating mechanism.
2. Housing of the MCCB shall be of heat resistant and flame retardant insulating material.
3. Rotary type operating handle of MCCB shall be provided in front and should clearly indicate ON/OFF/TRIP positions and should have padlocking facility.
4. The electrical contact of the MCCB shall be of high conducting non deteriorating silver alloy contacts.
5. The MCCB should have shunt trip release, earth fault release with adjustable current setting facility.
6. The MCCB shall be provided with adjustable type thermal overload release and adjustable type short circuit protection device. All the release shall operate on common trip bus bar so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three phases and thereby single phasing of the system is avoided.
7. The MCCB wherever called for in the appended drawings shall provide an earth fault relay.
8. The MCCB shall provide required sets of extra auxiliary contacts for the indication circuit, control circuit and for remote signalling purpose and should have inbuilt indications for tripping due to over current, short circuit or earth fault.
9. MCCB shall be provided with current limiting feature. All MCCB,s shall have spreaders and phase barriers on each terminal
10. The electrical parameters of the MCCB shall be as per the description given in the appended drawings.
11. MCCB up to & including of 250 A should be with Thermal Magnetic Release and above 250 A with Microprocessor Release.

3.2.4 Protective relay

1. The Microprocessor based release unit shall be provided on circuit breaker for short circuit, over current and earth fault protection with adjustable settings.
2. The release shall incorporate an Suitable bit micro-computer to offer accurate and versatile protection with complete flexibility and shall offer complete over-current protection to the electrical system in the following four zones (1)Long time protection, (2)short time protection with intentional delay (3)Instantaneous protection, (4)Ground fault protection.

3. Microprocessor based / Static type Relays shall be suitable for flush or semi flush mounting with connections from rear. Protective relays shall be in draw out cases. Load Analyser / Load manager shall have communication port to interface with the Plant DCS / Control room.
4. Relay operation / trip indication shall be provided on door.
5. All protective and tripping relays and timers shall be provided with fault display LEDs.
6. The release shall be suitable for communication between breakers to enable zone selective interlocking. This feature shall be provided for both short circuit and ground fault protection zones to offer intelligent discrimination between breakers. This feature enables faster clearance of fault conditions, thereby reducing the thermal and dynamic stresses produced during fault conditions and thus minimises the damage to the system
7. For the setting range of release, like pick-up current, time setting etc. refer respective manufacturer technical catalogue

3.2.5 Air break switches (If applicable)

1. Switches shall withstand a short circuit current of value equal to the let-through current of the associated fuse for 1 second and peak short circuit current equal to cut-off current of the fuse.
2. Switches of motor feeders shall be of motor duty (AC23A), group-operated, fault-make, load-break type. All other switches shall be of heavy-duty type. All the Switches shall be provided with phase barriers and auxiliary contacts.
3. Switch handle shall have padlocking facility in 'OFF' position.
4. It shall be possible to open the door only when switch is in 'OFF' position and it shall not be possible to close the switch when the door is open. However, defeat mechanism shall be provided for inspection purpose.

3.2.6 Fuses (If applicable)

1. Fuses shall be of link type with visible indication of operation and shall have rupturing capacity of more than the fault level specified.
2. Fuses of smaller capacity rating for control circuit shall be of cartridge type.
3. 1 no. fuse pulling handle shall be provided for each Switch-board / Power Control Centre / Motor Control Centre.
4. Fuses of smaller capacity rating for control circuit shall be of cartridge type
5. All fuse switch units shall be provided with DIN type fuse

3.2.7 Motor starter

3.2.7.1 Contactor

1. Contactors shall be air break, double break, single throw, electromagnetic type.
2. Main contacts shall be of silver faced copper.
3. Minimum Two 'NO' and two 'NC' auxiliary contacts shall be provided for each power contactor. However, additional nos. of auxiliary contactors should be added in the control scheme as per the requirement.
4. The auxiliary contacts shall be wired to the terminals.

3.2.7.2 Direct-on-line (DOL) starter

- DOL starters shall be suitable for AC3 utilisation category as per IS: 13947(Part-4 /Sec-1). It shall be comprised of: -
 - MPCB
 - Power Contactor
 - Auxiliary Contactor(s)

- Mushroom Headed stay put type. Red Stop PB.
- Start Push Button.
- O/L Relay reset push button on door
- Red, Green & Amber indicating Lamps (LED) for ON, OFF & Trip indications respectively.
- Set of selector switches as per various control requirements.

3.2.7.3 Automatic star-delta starter

- Star-delta starters shall be suitable for AC3 utilisation category as per IS: 13947(Part-4 / Sec-1). It shall be comprised of: -
 - MPCB/MCCB
 - Set of power Contactors (3 nos.)
 - Auxiliary Contactor(s)
 - O/L relay with built-in SPPR if MCCB is at an incomer.
 - Timer.
 - Mushroom Headed stay put type. Red Stop PB.
 - Start Push Button.
 - O/L Relay reset push button on door
 - Red, Green & Amber indicating Lamps (LED) for ON, OFF & Trip indications respectively.
 - Set of selector switches as per various control requirements.

3.2.7.4 Microcomputer motor protection relay – Not applicable

1. Starters shall be complete with Microcomputer based Motor protection relay with display facility for the motors of 15KW and above rating and without display for motors below 15KW rating.
2. The relay shall have over current protection (with medium tripping characteristics), Under current protection, Instantaneous short circuit protection, Single phasing protection, Current unbalance protection - for all the ratings of motors and for motors above 55KW ratings, in addition to the above standard protections, the relay should be provided with Stator Ground Fault Protection, over temperature protection and locked rotor protection.
3. The relay shall be Auto / hand reset type. A hand reset push button separate from the stop push button shall be brought out on the front of the compartment door for all starter feeders of all ratings.

3.2.7.5 Single phasing Preventer –

Separate single phasing Preventer shall be provided in the starters along with inbuilt SPP provided with over load relay. The relay shall be current operated and hand reset type with separate hand reset push button.

3.2.8 Instrument transformer

1. CTs and VTs shall conform to the requirement of IS: 2705 and IS: 3156 respectively. The ratings specified are indicative only and it shall be Vendor's responsibility to ensure that the ratings offered are adequate for the relays/meters provided considering lead resistance, etc.
2. CTs and VTs shall be of dry air insulated type.
3. Facility shall be provided in the terminal blocks for shorting and earthing the CTs and terminal blocks.
4. VTs shall be provided with adequately rated primary and secondary fuses.

3.2.9 Instrument

1. Indicating meters shall be of Digital type, 96 x 96 mm size, suitable for flush mounting with constant accuracy for entire range of respective parameter with an inbuilt provision for calibration verification.
2. Watt-hour and VAR-hour meters shall be suitable for 3 phase, 4 wire system, and balanced as well as unbalanced load and suitable for semi-flush mounting.
3. All KWH meter shall have computer interface facility through RS 485 port.

3.2.10 Miscellaneous accessories

1. Breaker control switch shall be :
 - Spring return-to-neutral type with pistol grip handle
 - Lockable in neutral position.
2. Indicating lamps shall be multiple LED type made from FR type polycarbonate material with Low voltage glow protection (up to 50V) and translucent lamp covers. Lamps shall be replaceable from front. The power consumption of each indicating lamp should not exceed 0.5 Watts.
3. The lamps shall have translucent covers. Lamps shall have diameter of 22.5.
4. Push buttons shall be momentary contact type rated for 10A at 500 V AC. The colour of push buttons shall be as follows:

– Start	- Green
– Stop	- Red
– Trip	- Amber
– Spring Charger	- Blue
– Trip Circuit Healthy	- White
5. All push buttons are required to have functional labels.
6. Battery and battery charger (110 V DC) shall be provided for supplying 110 V DC to annunciator panel, indications and tripping circuit with 2 hours battery backup. Vendor to furnish the calculations for VA rating of the control transformer.
7. Alarm Annunciator
 - a. Alarm Annunciator shall be provided, if specified in drawing/data sheet.
 - b. Alarm Annunciator shall comprise flush mounted facia units with two lamps and series resistor and ground glass plate in front for inscriptions.
 - c. Alarm annunciation scheme shall include facia units with relay for each fault, a common alarm bell and Accept / Reset / Test Push buttons.

3.2.11 Internal wiring

1. All wiring inside the switchgear shall be carried out with 650V/1100 Volt grade FRLS PVC insulated flexible stranded copper wires. Minimum size of conductor for control wiring shall be 2.5 mm² Copper. Control circuits shall be provided with MPCBs in place of fuses.
2. Ferrules shall be provided on each wire.
3. All wiring shall be terminated on terminal blocks with crimping type Copper cable lugs.
4. Power connections above 63A can be carried out with Aluminium/Copper Busbar.
5. Vertical / horizontal Al. wire ways shall be provided to run the control wires within the same vertical panel and / or between different vertical panels.
6. The control power supply shall be tapped from R phase and Neutral before / after the main fuses of each feeder. Control circuit shall have protection fuses. Wiring shall be carried out to facilitate testing of control circuit, without energising the power circuit.

3.2.12 Terminal block

1. All Terminal Blocks for power circuit will be stud type and control circuit will be screw type.

2. Terminal blocks of different voltage groups shall be segregated and suitably labelled.
3. Terminals shall be numbered as per wiring diagrams.
4. Minimum 20% spare terminals shall be provided.
5. Shorting links shall be provided for all C.T. terminals.
6. All spare contacts of contactor shall be wired up to terminal blocks.

3.2.13 Earthing

1. An earth bus extending throughout the length of the Switch-board / PCC / MCC/ PMCC / DBs / APFCR Panel shall be provided.
2. The earth bus shall be of sufficient cross section to carry safely momentary short circuit current for 1 sec.
3. All non-current carrying metal parts shall be effectively bonded to the earth bus.
4. All doors shall be bonded to earth, wherever electrical switchgear is mounted on door.

4 Active Power Factor Correction Panel

Active Power Factor Correction Panel with Anti Harmonic Block Reactors, suitable for 415V, 3-phase with PF control.

4.1 System details of Capacitor bank with Harmonic Reactor

1. System should be capable of Fast Real Time (Cycle to Cycle) Thyristor Switching.
2. Harmonic Resonance control through Anti Harmonic reactors of 7% Detuning Frequency
3. Fixed banks for transformer no load compensation.
4. Data logging facility, Data transmission and control through internet / wireless connection.

System should be capable of compensating P.F of Balanced 3 phase network in Real Time, Cycle to Cycle basis. The sensing has to be taken from one phase to measure P.F.

Scan Feature for each bank/group shall be having Scan features contributing to longer life expectancy of all the groups. Each moment group current and temperature shall be monitored. In case of overheating of one group, the switching element should connect one group simultaneously and other group shall get disconnected resulting in lower duty cycle.

Real Time Fast Switching capabilities - System shall use advanced algorithm with suitable rapid electronic for switching time of 1 cycle.

Simultaneous Group Switching - In case of more than 1 group is required for compensation, system should be capable of firing all the groups at the same time and should not use slow ladder logic.

Separate PF for each phase – As the system should control power factor separately of each phase, it is required to display the same separately. Power factor of each phase should be visible on system controller separately at all the times.

Energy and Power Quality Management with Data Logging – System should be capable of data management with display, logging and transmission of all electrical parameters, energies, power quality, THDs, Harmonic components. System should be capable of transmitting the data with Ethernet or remotely with GSM.

The system should also be capable of recording all the important power quality and electrical parameters. Historical data should be periodically analysed to check the performance of the system

Anti-Harmonic Block Reactors – System should have 7%detuned Three Phase Anti Harmonic Block Reactors connected in series with capacitor banks for avoiding Resonance condition. Each Reactor should be with Single layer winding and proper air gaps to minimize the losses.

True RMS readings and Control taking into accounts harmonics up to 30TH: Power Factor and harmonic Resonance shall be monitored and controlled through an advanced open and closed – loop control and measuring system that uses information from all three phases as well as accounts for the effect of harmonics (3rd through 30th).

4.2 Control Module with Intelligent Data Management

Control Module technology should be advanced with digital signal processor (DSP). It should have clearly visible LCD display to display the each phase data separately for e.g. Power factor of all the 3 phases can be viewed at the same time. In order to have complete system and network control, it should have 7 input channels, 4 channels for voltage (for wye Connection), 3 channels for main network current. It should be capable of performing fast Fourier Transformation and calculating Power Factor and harmonics on all phases. It should give true RMS measurement (taking into account up to 30th Harmonic).

4.3 Advanced Data Management capabilities with Data Logging

1. The system controller should be capable of getting and showing all the data as given below for the feeder to which the system is connected.
2. System controller should have LCD displays for each phase separately. It should be capable of displaying harmonics up to 30th. It should take sensing from 1 CT and should switch ON/OFF capacitor banks on basis of average power factor.
3. The System should have Data Logging facility to record all the important power quality and electrical parameters for checking system performance.
4. System Controller should have following features:
 - Displaying P.F of each phase separately on LCD Display.
 - P.F control for Utility supply.
 - Measuring and displaying up to 30th harmonic for electrical parameters.
 - Programmable THD (Total Harmonic distortion) protection.
 - Programmable discharge time.
 - Programmable over THD alarm
 - Automatic calculation of power values for each capacitor step.
 - Providing minimum switching steps for maximum service life time
 - Displaying of electrical parameters for each phase at the same time.
 - Automatic / Manual mode selection
 - C+ / Normal / C- Condition lights
 - Automatic calculation of C/k value
 - Target Cos phi setting (Ind. 0.80 – Cap. 0.80)
 - Insufficient compensation alarm.
 - Optional temperature control
 - Capability of SMS sending for alarm sending
 - Capability of Data sending by email / FTP server
5. The system controller should be capable of measuring and displaying following parameters for each phase:-
 - Displaying P.F of each phase separately on LCD Display.
 - P.F control for Utility supply.
 - Measuring and displaying up to 30th harmonic for electrical parameters.
 - Programmable THD (Total Harmonic distortion) protection.
 - Programmable discharge time.
 - Programmable over THD alarm
 - Automatic calculation of power values for each capacitor step
 - Providing minimum switching steps for maximum service life time
 - Displaying of electrical parameters for each phase at the same time.
 - Automatic / Manual mode selection
 - C+ / Normal / C- Condition lights

- Automatic calculation of C/k value
- Target Cos phi setting (Ind. 0.80 – Cap. 0.80)
- Insufficient compensation alarm.
- Optional temperature control
- Capability of SMS sending for alarm sending
- Capability of Data sending by email / FTP server

6. Controller Measurement-The system controller should be capable of measuring and displaying following parameters for each phase:

- Currents
- Voltages
- Power Factor
- Cos Phi
- Active Power
- Reactive Power
- Apparent power
- THD-I (%)
- THD-V (%)
- Individual Current and Voltage Harmonics up to 30th
- Active Energy (KWH)
- Reactive Energy (KVARH)
- Equivalent 3 phase Active Power
- Equivalent 3 phase Reactive Power
- Equivalent 3 phase Apparent Power

7. Alarms

- It should have following alarms:-
- Insufficient compensation alarm
- Over compensation alarm
- Programmable over voltage protection and alarm for capacitors.
- Programmable over THD alarm
- Automatic disconnection of all capacitor steps in case of mains failure over 20 ms.

4.3.1 Capacitor Bank

Capacitor Bank – Capacitor used should be Heavy Duty Gas filled APP type with Un of 600V, 50Hz. Capacitor Bank should be capable of withstanding peak currents up to 4 x In. They should be capable of withstanding up to 70°C temperature on its surface without any deterioration in its lifespan. The capacitor bank rating at 600V has to be so adjusted so as to offer KVAR Bank net out- put at 415V, 50 Hz. They should be installed in Non-compartmentalized enclosure on perforated surface for proper and uniform air circulation.

4.3.2 Anti-Harmonic Block Reactor

Anti-Harmonic Block Reactor - Three Phase Harmonic Block Reactors of 7% iron core type in series with Capacitor Banks. It should be designed with very low flux designing so as to offer high linearity making it work in worst condition of ambient and harmonic overloads. It should be designed to offer low losses. It should have linearity of 200% i.e. Inductance shall not vary more than ($\pm 3\%$) in 200% Loading condition. It should have following features :

1. Single layer winding with proper air gaps
2. Step Core
3. H-Class winding (180°C)
4. Thermal temperature disconnection switch at 155°C
5. Linearity > 200%

4.3.3 Switching Module

Electronic Thyristor Switching Module (SCR-SCR configuration) should be capable of Voltage peak withstand capacity of up to 2200 Vpk. They should be installed in separate enclosure with heat sink and axial fan.

4.3.4 Enclosure with Forced Ventilation

Non-compartmentalized Enclosures should be used to house complete banking system with Axial Flow / Centrifugal fans for proper air circulation. It shall house the complete Capacitor Filter assembly.

Transformer PF correction Panels should be considered with capacitor duty contactors. Whereas for APFCR panels, thyristorised capacitor panel should be considered.

5 Inspection and testing

5.1 Inspection

The Owner or his authorised representative reserves the right to witness all the following tests at Vendor's place of manufacturing. Vendor shall give two weeks' notice prior to the proposed date of inspection to the Owner or his authorised representative.

All apparatus, instruments, etc. required for tests shall be provided by the vendor and shall have been checked and tested for accuracy during the twelve month prior to the test, bearing tag of competent authority.

5.2 Testing

- Vendor shall test the switchgear to conform to IS: 4237 with all components assembled and fully wired.
- The following routine tests shall be carried out on all the components and the assembled switchgear, as per relevant standards :-
 - Mechanical and Electrical Operation tests by simulating operating conditions as at site.
 - Secondary wiring conformity test with a low voltage (6 Volt) tester.
 - High voltage test (2.5 KV for one minute).
 - Test for verification of calibration of releases thro' primary injection test.
 - CT Polarity test.
 - Insulation resistance test before and after HV test.
 - Earth continuity test with a low voltage (6 volts) tester.
 - Test for verification of calibration of protective relays thro' secondary injection test
- Seven (7) copies of the routine and type test certificates shall be submitted for Owner's approval before despatch of the switchgear.

5.3 Spares

Vendor shall submit the list of recommended spare for 2 years of operation of switchgear and quote separately.

6 Performance, guarantee / warrantee

6.1 Performance criteria

Along with the offer, vendor shall submit guaranteed technical parameters (GTP) for the approval by Owner.

6.2 Guarantees and warrantees

Vendor shall guarantee the design, materials, workmanship and performance of all goods to be supplied under the order for a period of twelve months (12) from the date of commissioning duly certified by the site-in-charge / Owner representative for satisfactory operation of the equipment or eighteen (18) months from the date of delivery of equipment at job site, whichever is earlier.

7 Data required from the vendor

SR. NO	DESCRIPTION	SPECIFIED	VENDOR DATA
1	GENERAL		
a	Switchgear designation	See Note # 9	
b	Rated voltage	415V ± 10%	
	Rated Frequency	50 Hz ± 5%	
	1 sec short circuit withstand capacity	Vendor to offer with details /BOM and Panel SLD	
c	Dielectric withstand test voltage for		
	(i) Power circuits	2.5 Kv For One Minute	
	(ii) Control circuits	1.0 Kv For One Minute	
d	Reference ambient temperature °C	45°C	
e	Main busbar material	Aluminium	
		E91E Grade Aluminium For Rest Of All LT Panels	
f	Earth busbar material	E91E Grade Aluminium For All LT Panels	
g	Busbar rating	Continuous	As Required
		Short time	1 SEC.
h	Single front/ double front	Single / Double front as mentioned in SLD	
l	Fully, draw out / semi-draw out / fixed type	Fixed Type / Do Type (As Per SLD)	
j	Cable entry	Power cable	As per SLD
		Control cable	As per SLD
k	Painting shade	Exterior	Siemens RAL 7032 As Per IS.5
		Interior	Siemens RAL 7032 As Per IS.5
l	Cable glands and lugs	Excluded	
m	Material	CRCA	
n	Thickness of sheet steel	2 mm. frame, 1.6 mm. door, 3mm gland plate & covers	
o	Base frame channels	3 mm.	
p	Overall dimensions (L x D x H) mm.	Vendor to furnish	
q	Overall weight	Vendor to furnish	
2	BUSBAR		
a	Sizes for		
	(i) Phases	Vendor to furnish	
	(ii) Neutral	Vendor to furnish	
	(iii) Earth	Vendor to furnish	
b1	Current density for Copper Busbar	1 sq. mm = 1.4 A	
b2	Current density for Aluminium Busbar	1 sq. mm = 0.7 A	
c	Three pole/Three pole & neutral	As Per SLD	
d	Bare/painted/taped/insulating sleeve	Insulating Sleeve - Heat Shrinkable	

SR. NO	DESCRIPTION	SPECIFIED	VENDOR DATA
e	Minimum clearance in air	25 mm	
f	Temperature rise over design ambient temperature	50° c above ambient temp.	
g	Busbar support	Material	Epoxy / cast resin
		Common or individual support	Individual
3	CIRCUIT BREAKERS		
a	Vendor's name	As per approved make list	
b	Type	As per SLD	
c	Rated voltage and frequency	415v ±10%, 50 Hz ± 5%	
d	Continuous current under site conditions	Vendor to furnish	
e	Rated symmetrical interrupting current	Vendor to furnish	
f	Making current capacity	Vendor to furnish	
g	Short time current (1 sec.)	Vendor to furnish	
h	Power frequency withstand voltage	2.5 kv for one minute	
i	No. of breaks per phase	ONE	
j	Minimum clearance	Between Poles	25 mm (MIN.)
		In air between live parts & earth	19 mm (MIN.)
k	Fixed trip / trip free	Trip free	
l	Electrical & mechanical anti pumping feature provided	Required	
m	Type of opening mechanism	As per SLD	
n	Overload release setting range	Required	
o	Short circuit release setting range and time relay feature provided	Required	
p	Under voltage release setting range	Required	
q	Earth fault release setting range	Required	
r	Version / No. of pole	Vendor to furnish	
4	SWITCH - DISCONNECTOR FUSE		
a	Rating of switch disconnecter	As per SLD	
b	Duty	Heavy duty type	
c	Triple pole / triple pole and neutral	As per SLD	
d	Fuses	HRC type	
5	DIRECT ON LINE (DOL) STARTER COMPONENTS		
a	Motor Protection Circuit Breaker	Vendor to furnish	
b	Contacting rating	Vendor to furnish	
c	Microcomputer motor protection relay and separate SPP.	Not required	
d	Indicating lamp	Multiple led type	
e	Push button	Mushroom Head – Stay Put Type	
f	Control fuses	HRC type	

SR. NO	DESCRIPTION	SPECIFIED	VENDOR DATA
6	STAR - DELTA (S/D) STARTER COMPONENTS		
a	Motor Protection Circuit Breaker / Moulded Case C. B.	Vendor to furnish	
b	Contactor rating for main, star and delta rating	Vendor to furnish	
c	Microcomputer motor protection relay and separate SPP.	Required if MCCB incomer	
d	Indicating lamp	Multiple led type	
e	Push button	Mushroom head - stay put type	
f	Control fuses	HRC type	
7	CONTROL / AUXILIARY SUPPLY		
7.1	ACB		
a	SPRING CHARGING MOTOR	Vendor to furnish	
b	CLOSING COIL	Vendor to furnish	
c	TRIPPING COIL	Vendor to furnish	
d	CONTROL CIRCUITS	Vendor to furnish	
e	ANNUNCIATORS	Vendor to furnish	
7.2	MOTOR FEEDERS		
a	CONTACTOR CIRCUITS	Vendor to furnish	
7.3	POTENTIAL INDICATING LAMPS	Vendor to furnish	
7.4	OTHER INDICATING LAMPS	Vendor to furnish	
7.5	SPACE HEATERS	Vendor to furnish	
8	MISCELLANEOUS ACCESSORIES		
a	Control wiring	2.5 Sq. mm PVC Cu. Wire (FRLS TYPE)	
b	Door Earthing	Required	
c	Gaskets for doors & covers	Neoprene type	
d	Name plate	Rear engraved aluminium	
e	IP Rating	IP - 54	
f	Space heater with controls	Required for each vertical panel	
g	Hooter circuits	Vendor to furnish	
h	Relays	Vendor to furnish	
i	Current transformer for measuring instruments / protective relays with ratio class of accuracy	Vendor to furnish	
j	Burden of CTs	Vendor to furnish	
9	MAKE OF SWITCHGEAR COMPONENTS	As per approved make list	
NOTES :-			
1	Vendor to furnish list of spares.		
2	Vendor to furnish list of tools & tackles.		
3	Starter components shall be provided as per Type-2 co-ordination.		
4	Painting shall be carried out with seven tank process. Final paint shade shall be epoxy powder coated.		
5	Vendor to furnish GA sketch along with offer.		
6	Coloured heat shrinkable insulating sleeves shall be provided for bus bar.		
7	All spare contacts shall be wired up to the terminal block for any use in the future. Also minimum 20% spare terminals shall be provided for each feeder in Terminal block.		
8	All data / documents asked for in the specifications shall be furnished by Vendor		

9	Motor starters shall be as follows:
a)	Up to & including 7.5 KW - DOL starter
b)	Above 9.3 KW up to & including 30 KW - Star-Delta starter
c)	Above 30 KW - Soft Starters as per process requirements
d)	Rating – Variable Frequency Drive as per process requirements
10	Meters shall be of digital type.
11	All ACBs & MCCBs shall be provided with microprocessor based O/C, S/C & E/F releases.
12	Ics should be equal to 100% Icu for all breakers and MCCBs.
13	Cable Entry- Top/Bottom for all panels
14	All routine tests specified in relevant latest IS shall be carried out and test certificates submitted to the consultant.
15	Minimum 4 NO and 4 NC auxiliary contacts shall be provided on each circuit breaker. The contacts shall be rated 5 amps.

8 Non-material requirements (drawings and documents)

8.1 Quality assurance plan

After the order is placed, Vendor shall submit their quality assurance plan followed for manufacturing of the equipment for approval of Owner. This shall be adhered to and shall be monitored by Owner during manufacturing.

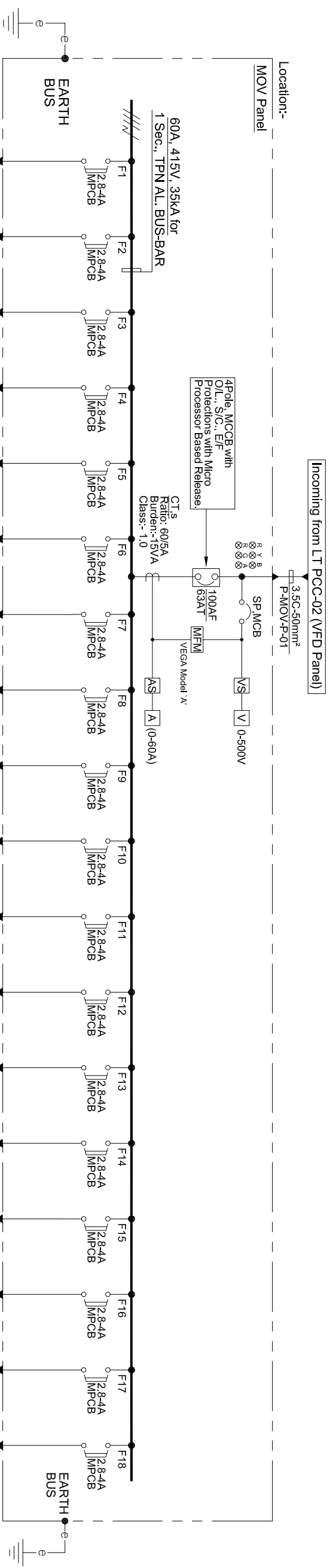
8.2 Drawings and instruction manuals

- Vendor shall submit two sets of G.A. drawings, bill of quantities, make of materials, standard product catalogues, etc., along with the initial offer and four (4) sets of the following drawings for approval of Owner / Consultant after award of contract.
 - Complete assembly drawing of the switchgear, showing plan, elevation and typical sections with dimensions and location of terminals for external connections.
 - Switchgear elevation and layout plan with floor openings and floor fixing arrangements.
 - Schematic diagrams with terminal and ferrule numbers for each module/switchboard panel.
 - Wiring diagram for each module indicating terminal blocks and various apparatus.
 - Final list of apparatus for each module.
 - Characteristic curves for circuit breaker releases, relays of each type, fuse, and thermal overload relays.
 - Manufacturer's descriptive literature on various components used in the switchgear.
 - Index sheet with document reference data like Number description, Number of sheets, Rev. No. etc.
 - The Vendor shall submit CPRI test certificates for short time rating test and temperature rise test.
 - Detailed calculations of Bus bar sizing shall be furnished.
- One print of each drawing will be returned to vendor with comments and required clarifications, if any. Vendor shall incorporate these and send within fifteen days, seven prints of each drawing marked "Certified for record and use".
- After final review, five (5) number of copies and reproducible shall be furnished as final certified drawings. As built drawings shall be submitted after installation and commissioning along with CD.
- Vendor shall also submit seven (7) copies of 'Installation and Instruction' manual.

9 Recommended vendor list for switchgear / components

For list of recommended makes, please refer approved make list for the project.

1	MCCB/MCB/ELCB/MPCB	Siemens/ L&T/ ABB / Schneider
2	CONTACTORS	Siemens/ L&T/ ABB / Schneider
3	SWITCH FUSE UNIT	Siemens/ L&T/ ABB / Schneider
4	NEUTRAL LINK	GE/ C&S /SIEMENS
5	PROTECTIVE RELAY	SIEMENS/L&T/ABB/GE
6	INDICATING LAMPS(LED TYPE)	Siemens/ Schneider/ Telemecanic
7	PUSH BUTTON AND PUSH BUTTON SET	Omron/Siemens/ L&T/ Telemecanic / Vaishno
8	TERMINALS	ELMEX/CONNECTWELL
9	PVC & XLPE Cables LT	KEI/ AVOCAB / POLYCAB/ HAVELLS / Lapp / Nicco
10	FLEXIBLE WIRE (FRLS)	Finolex / HAVELLS/ANCHOR/LAPP
11	SELECTOR SWITCH	Salzer / Kaycee
12	TIMER	Siemens/ L&T/ Selectron /HANGSLER
13	LUGS & SOCKETS	Dowell's/ 3D/ Comet
14	BIMETALLIC LUGS	Dowell's/ Comet/ Ismal/ HMI
15	CONNECTORS	Salzer/ Connectwell / Elemax
16	PVC CONDUITS AND ACCESSORIES	Precision/ Polycab/ Anchor
17	ROTARY SWITCH	Siemens/ Keycee / Salzer/ ABB
18	FRP cable tray	Kemrock/ Ercon/ EPP/ Sumip / Satyam
19	Junction Box	Hensel/ Sintex/RITTAL



Incoming from LT PCC-02 (VFD Panel)

Location:-
MOV Panel

Notes:-

- The panel shall be extensible type.
- All The Control Cables of Size 1.5mm² & Power Cables up to 6mm² Shall be XLPE/SW/APVC Copper Conductor Type
- Control Circuit for MCCB's should be of 240 V through control Transformer or Robose as shown in STD
- All Cables of size above 10mm² Shall be XLPE/SW/APVC Aluminium (AL) Conductor Type
- Panel Should be Provided with Exhaust Fans for Ventilation and Heaters for Anti Condensation
- Indicating Lamps shall be Led Cluster Type
- All Indicating Meters shall be of Digital Type with inbuilt Selector Switch & Features as Indicated
- All the Switches shall have '1No+ 1Nc Auxiliary Contacts for Control Supply'. The Control supply shall be changed through MCB only after feeder switch is ON
- MCCB, MCCB Handle shall be Provided with Handle Position Indication of on, Off & Tripped Condition
- All Multi Function Meter, Voltage, Current, Active/Reactive, Power Factor, Frequency, Max Demand, Harmonic etc shall be Digital Type with RS485 Port Shall be equivalent to model no. L&T (VEGA) series model 'C'
- Cable Entry:- Incoming Bottom Cables, Outgoing Bottom Cables
- All Aluminium Busbar's shall be Provided with current density of 0.8A/mm². Refer Following Documents:-
a).-Specifications for LT Switchgear panel:- 322538-ETD-01
b).-P&ID for Fuel tank farm Area :- 322538-PA-0002-01
Refer Vender Drawing:-
a).-SI-1 & SI -2.1 Actuators & Switches, Modbus ESD Push Button
Drawing Number:- SMP-07G-006

Key to Symbols:-

Symbol	Description	Symbol	Description
MCB	Miniature Circuit Breaker	O/L	Over Load
MPCB	Motor Protection Circuit Breaker Rating as Indicated.	O/C	Over Current.
MCCB	Moulded Case Circuit Breaker Type and Rating as Indicated.	U/C	Under Current.
R Y B	Phase Indicating Lamps.	S/C	Short Circuit with delay Trip.
R G A W	Supply Indicating Lamps R- Red, G- Green, A- Amber, W- Trip'	E/F	Earth Fault
⊗ ⊗ ⊗	ON-Green, OFF-Admber, Trip'	⌋	Cable Gland
⊗ ⊗ ⊗	Indicating Lamps SC (Blue) Spring	⊥	Earth Pit
⊗ ⊗ ⊗	Charged (TCH) (White) Trip CKT healthy.	Ⓜ	Timer
⊕	ON OFF ON- Start / OFF-Stop Push Button		
CT	Current Transformer		
VS	3Way & OFF Volt. Meter Selector Switch		
V	Volmeter- Digital Type		
AS	3Way & OFF Ammeter Selector Switch		
A	Ammeter- Digital Type		
MF	Multi Function Meter		

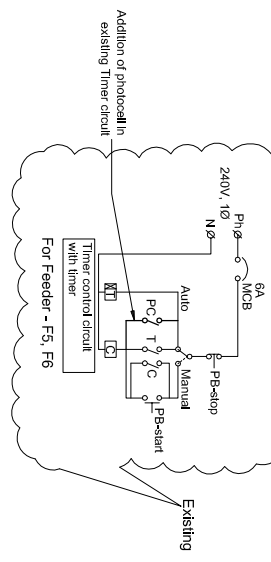
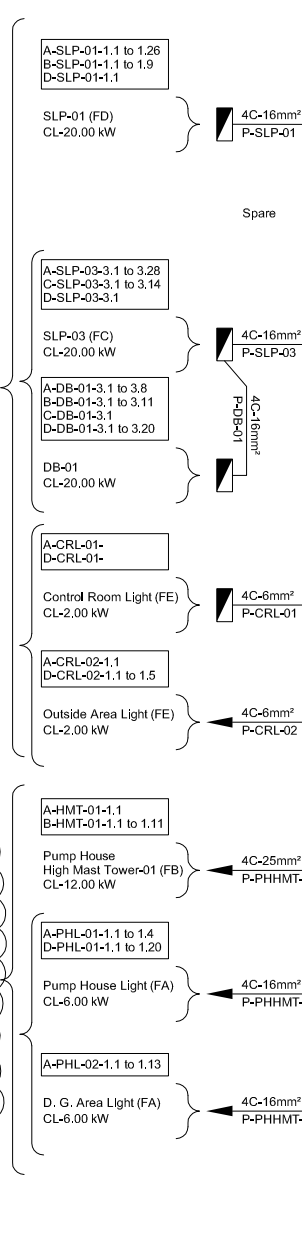
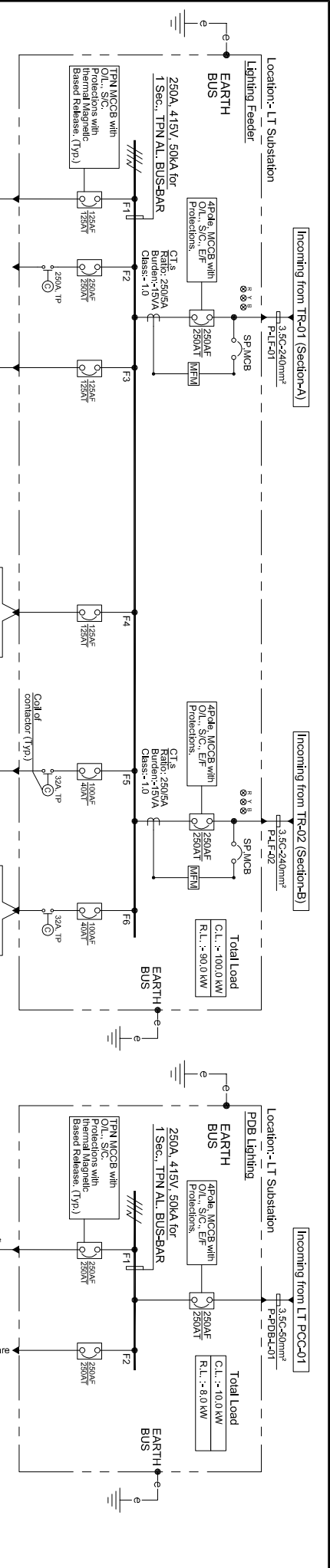
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<p>Mott MacDonald A20 Sector 2 Noida 201301 T +91 (0)12 0254 3582 F +91 120 254 3562 W www.motmac.com</p>		<p>Client M/s Delhi Aviation Fuel Facility Pvt. Ltd. Aviation Fueling Station Shahbad, Muharamad Pur IGI Airport, New Delhi - 110061</p>									
<p>Notes</p>		<p>Rev Date Drawn Description</p> <tr> <td>P1</td> <td>07.05.15</td> <td>Sunil</td> <td>Issued for Approval</td> </tr> <tr> <td>A</td> <td>15.09.15</td> <td>Sunil</td> <td>Issued for Construction</td> </tr>		P1	07.05.15	Sunil	Issued for Approval	A	15.09.15	Sunil	Issued for Construction
P1	07.05.15	Sunil	Issued for Approval								
A	15.09.15	Sunil	Issued for Construction								

Chk'd	App'd	Title	Drawn	Scale
S.K	V.S.T	Modernization of Existing Fuel Farm	Saurabh Kumar	N.T.S
S.K	V.S.T	New Motor Control Centre for Motor Operated Valve	V.S.T	Scale at A2p

Security	Status	Rev
STD	CON	A

C:\Program Files\MMAutoCAD\Backs\Drawing Frames\A2_p-TITLE.dwg — v31858



Key to Symbols:-

Symbol	Description	Additional Item
MCB	Miniature Circuit Breaker	-
MCCB	Modular Gas Circuit Breaker	-
R	Phase indicating lamps	-
⊕ ⊕ ⊕	Red, Yellow, Blue	-
C CT	Current Transformer	-
Ⓜ	3 Pole Contactor, Rating as indicated	3 NoS
MFI	Multi Function Meter	-
Ⓜ	Timer	3 NoS
O/L	Over Load	-
S/C	Short Circuit with delay Trip.	-
E/F	Earth Fault	-
Ⓜ	Photo Cell Element	3 NoS
Ⓜ	Cable Gland	-
Ⓜ	Earth Pin	-
Ⓜ	LDG/PDS/DB Distribution Board (D.B.) Panel	-

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 Aviation Fueling Station
 Shaheed, Muhammad Pur
 IGI Airport, New Delhi - 110061

Notes

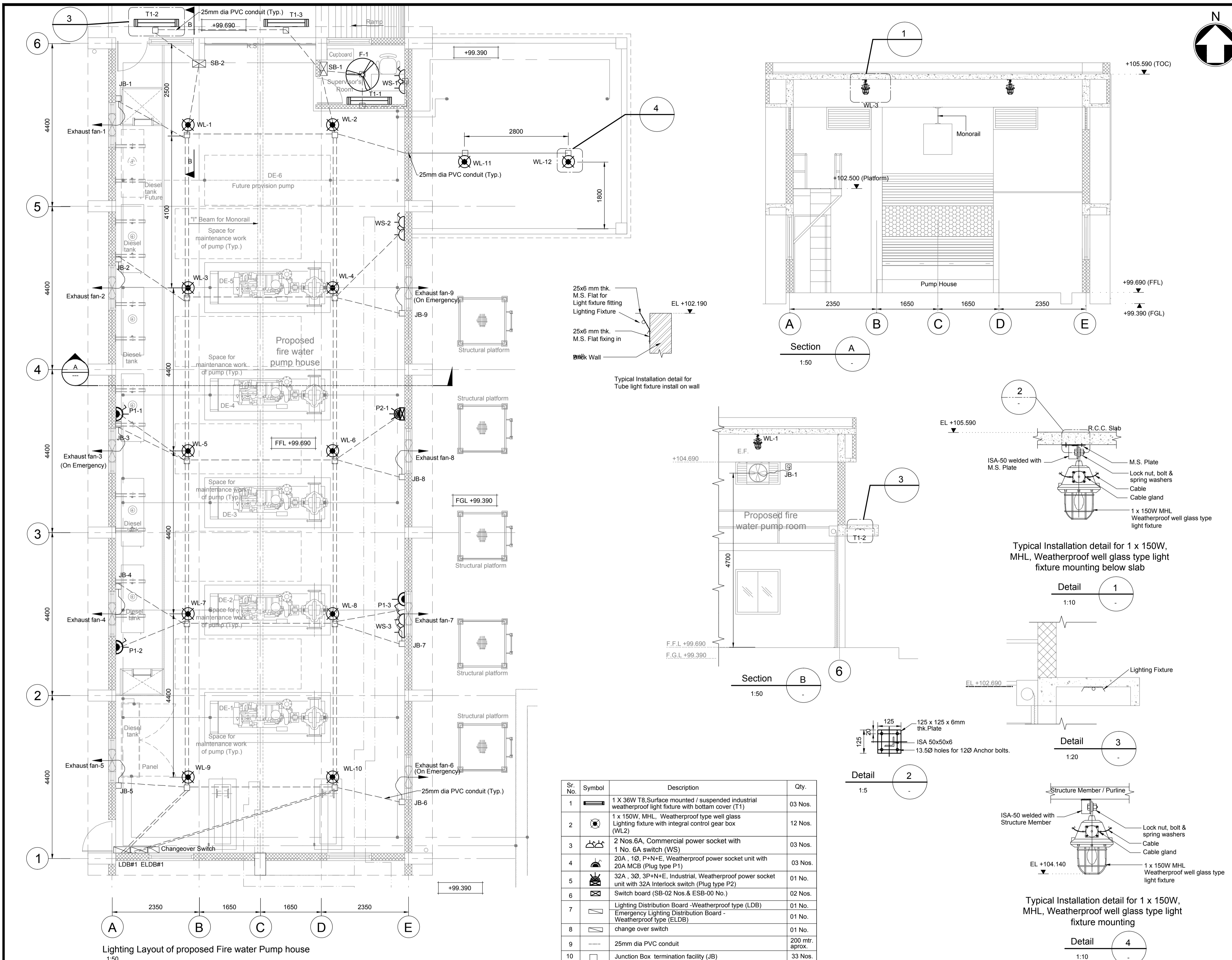
Rev	Date	Drawn	Description
A	11.05.15	Sunil	Issued for Construction
B	07.09.15	Sunil	Client's Comments incorporated and Reissued for Construction
C	11.12.15	Sunil	Client's Comments incorporated and Reissued for Construction

Checked	App'd	Title
S.K.	V.S.T	Modernization of Existing Fuel Farm
S.K.	V.S.T	Electrical Single Line Diagram
S.K.	V.S.T	Modification of Existing
S.K.	V.S.T	Lighting Feeder Panel with
S.K.	V.S.T	Timer & Photocell

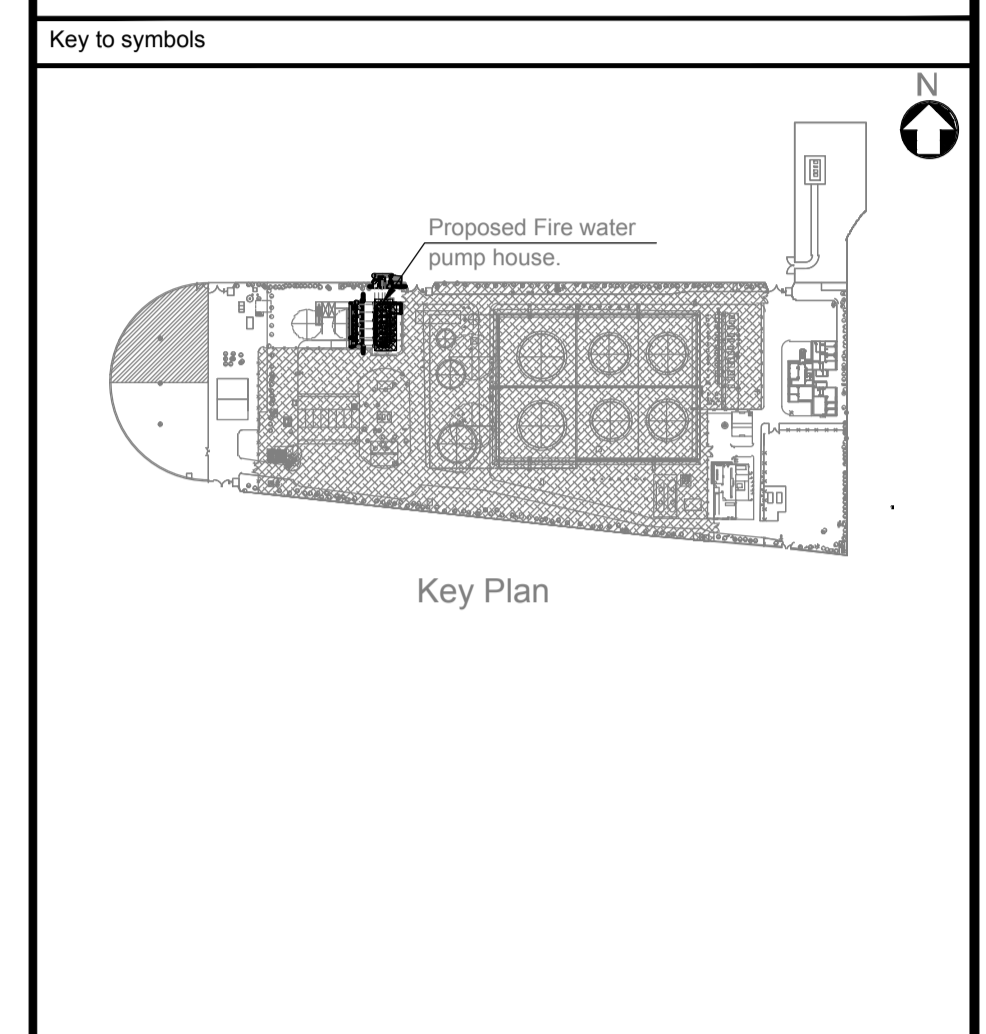
Drawing Number: 322538-EB-0004-01

Drawn	Checked	Scale at Rev	Approved	Revision Number
Sunil	Checked	N.T.S	V.S.T	1

Security Status: STD CON Rev: B



- Notes**
- (1) All dimensions are in millimeters and elevations/levels are in meters, unless mentioned otherwise.
 - (2) Dimensions are to be read from the drg. and not to be measured.
 - (3) Mounting height from FFL as under
- Panels/distribution board - 1500mm.
- Power socket points - 1200mm.
 - (4) Type of Wiring shall be Cable up to LDB/ELP and then after 25mm dia PVC conduit to be consider.
 - (5) Looping of cables should be made from fixture to fixture and not from the junction box/pull box.
 - (6) Refer following documents
- 322538-ECD-xx - for Cable schedule.
 - (7) Lighting, Power socket of 3 phase & 1 phase, Exhaust fan distribution shall be from provided LDB only.



- Reference drawings**
- | | |
|-----------------------|--|
| 1) 322538-APA-001-01 | Plot plan |
| 2) 322538-RLP-0901-01 | Layout & Section of Fire water pump house |
| 3) 322538-RPB-0906-01 | 13KL Foam concentrate storage tank (Atmospheric) |

Rev	Date	Drawn	Description	Ch'k'd	App'd
C	30.12.2015	MCP	Issued for Construction & Revised as per Email dated 23.12.2015.		
B	10.12.2015	UMW	Issued for Construction & Revised as per Arch. layout	PPP	VST
A	08.10.2015	UMW	Issued for Construction	PPP	VST

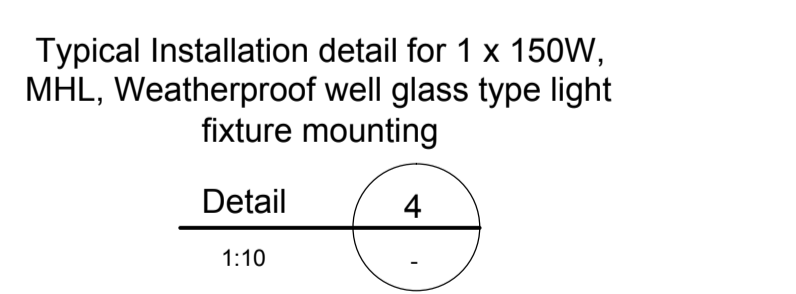
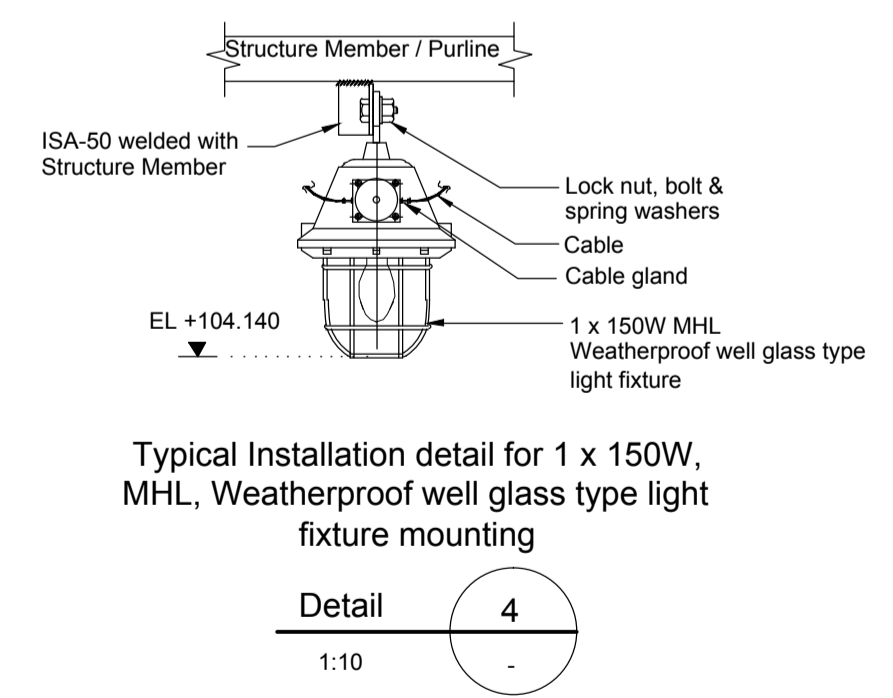
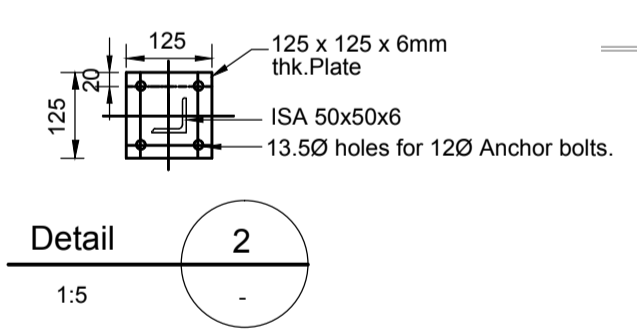
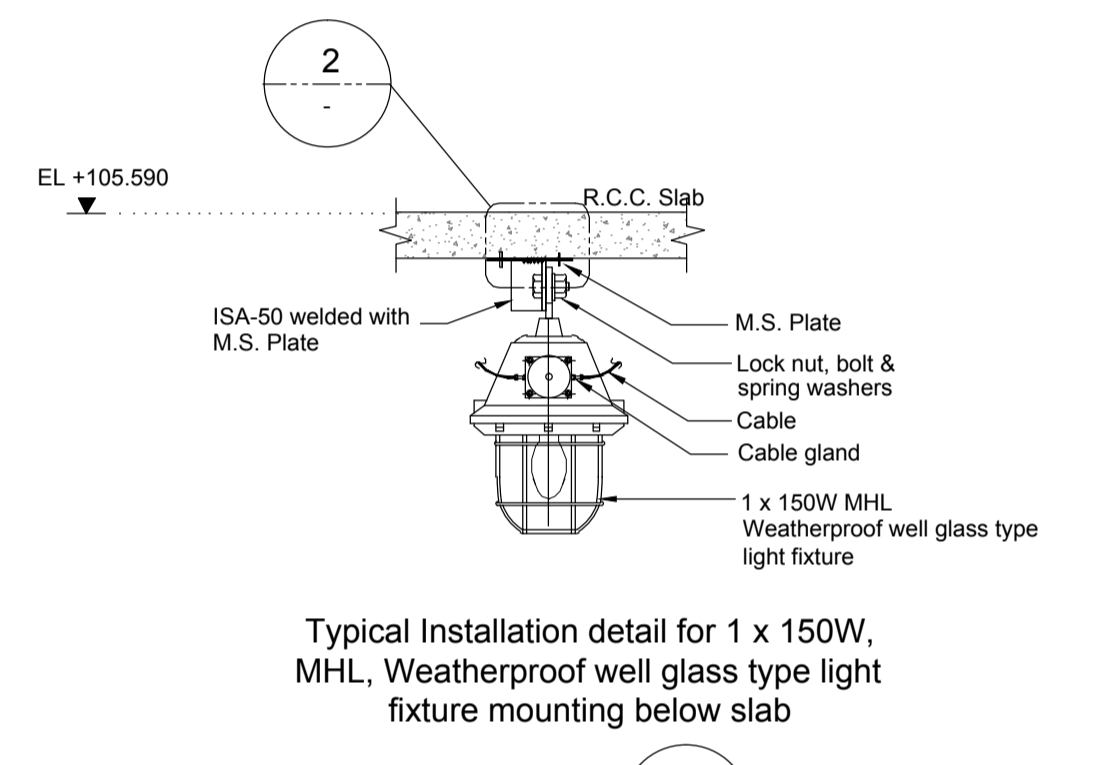
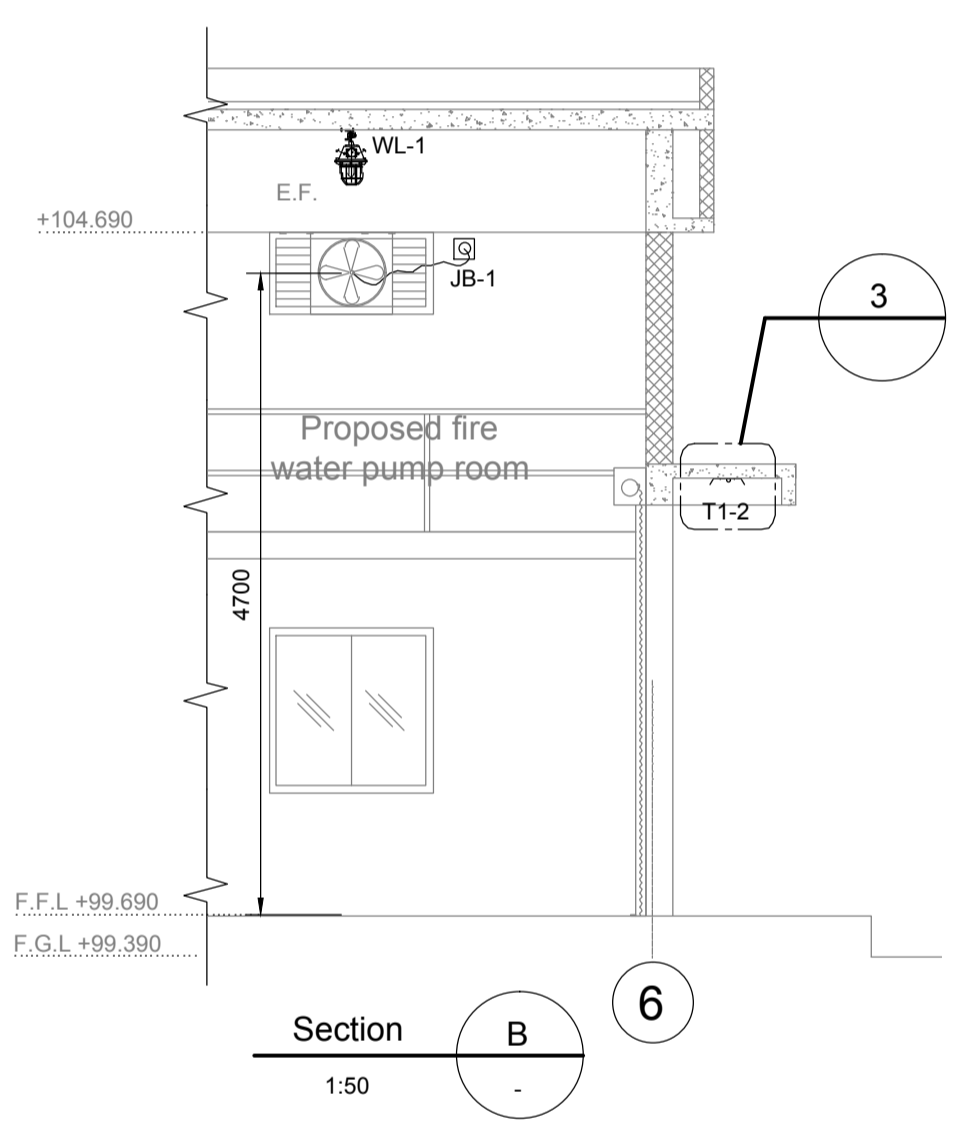
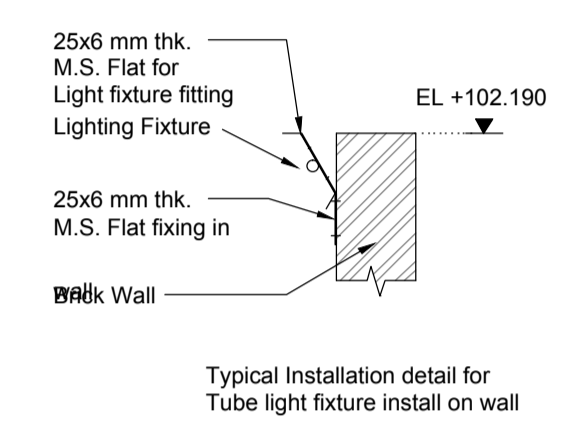
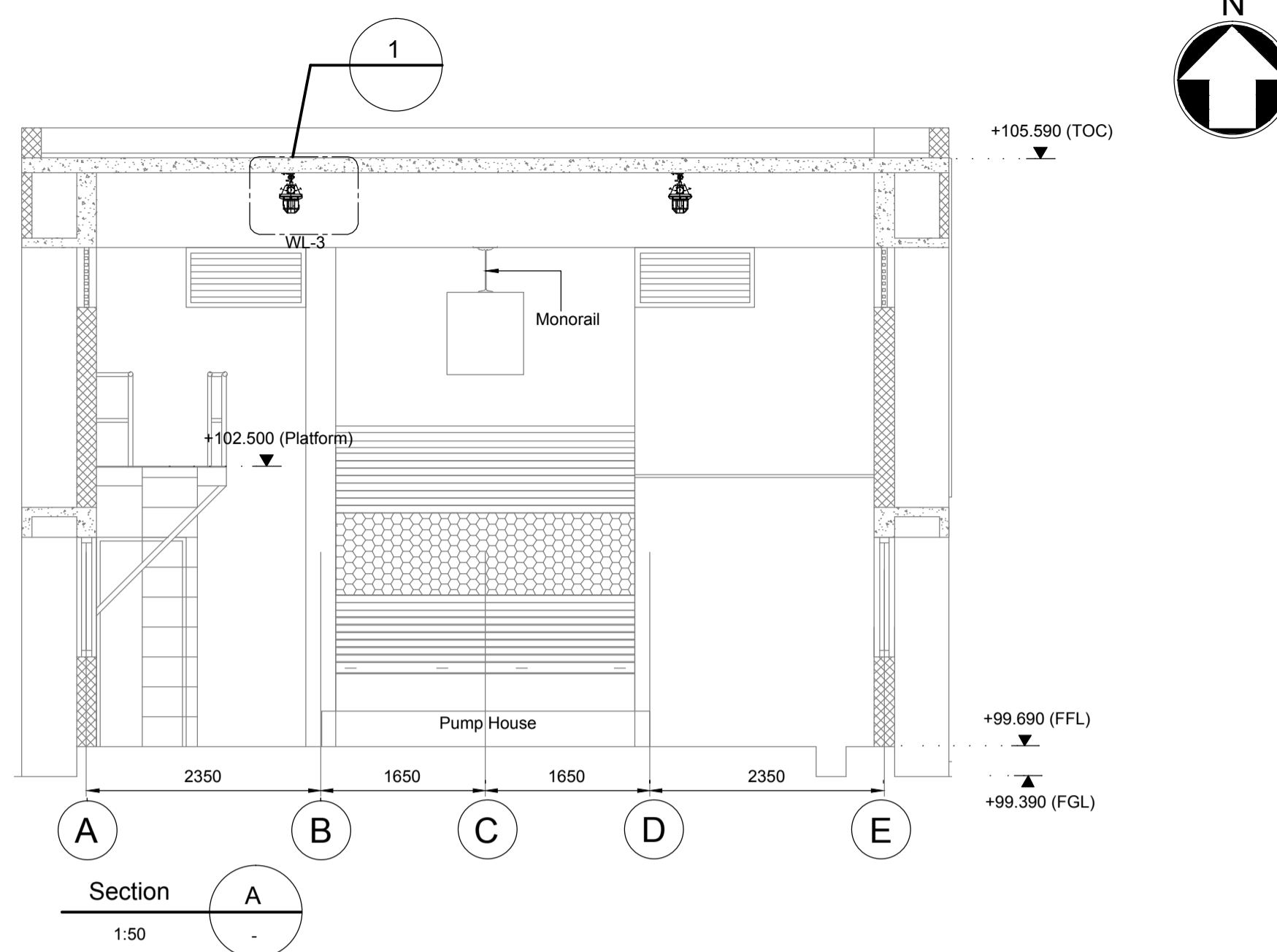
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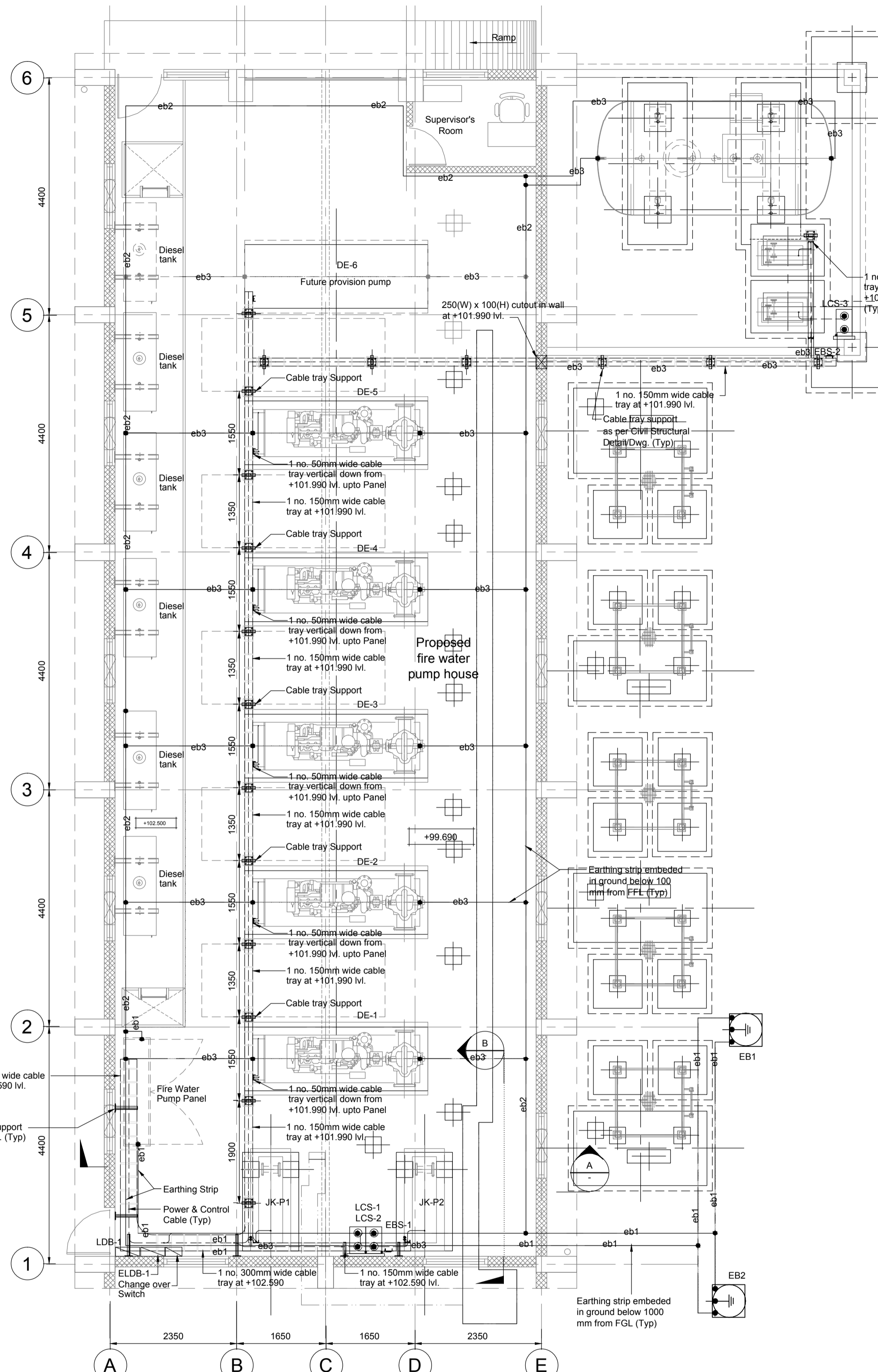
Title
Modernization of Existing Fuel Farm
Layout & Details of Lighting Layout
Fire Water Pump House

Designed	DHP	Eng check	PPP
Drawn	MCP	Coordination	AKM
Dwg check	DHP/SK	Approved	VST
Scale at A1	Status	Rev	Security
As Shown	CON	C	STD
Drawing Number	322538-ELA-0001-01		

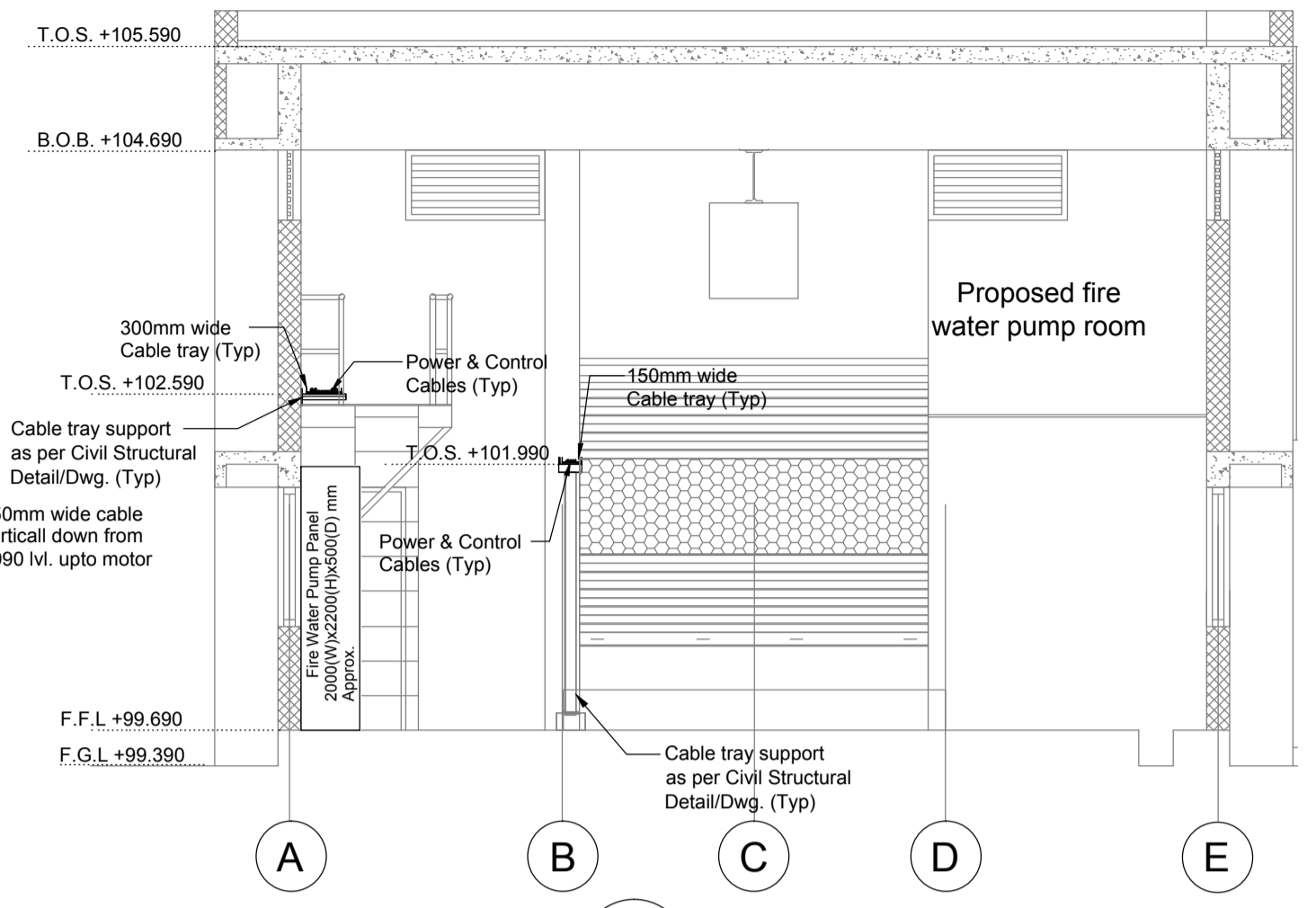


Sr. No.	Symbol	Description	Qty.
1		1 X 36W T8, Surface mounted / suspended industrial weatherproof light fixture with bottom cover (T1)	03 Nos.
2		1 x 150W, MHL, Weatherproof type well glass Lighting fixture with integral control gear box (WL2)	12 Nos.
3		2 Nos 6A, Commercial power socket with 1 No. 6A switch (WS)	03 Nos.
4		20A, 1Ø, P+N+E, Weatherproof power socket unit with 20A MCB (Plug type P1)	03 Nos.
5		32A, 3Ø, 3P+N+E, Industrial, Weatherproof power socket unit with 32A Interlock switch (Plug type P2)	01 No.
6		Switch board (SB-02 Nos. & ESB-00 No.)	02 Nos.
7		Lighting Distribution Board - Weatherproof type (LDB)	01 No.
8		Emergency Lighting Distribution Board - Weatherproof type (ELDB)	01 No.
9		change over switch	01 No.
10		25mm dia PVC conduit	200 mtr. approx.
11		Junction Box termination facility (JB)	33 Nos.
		900mm sweep, 1-phase, 240V AC, ceiling fan (F) @ 4mtr height from FFL	01 No.

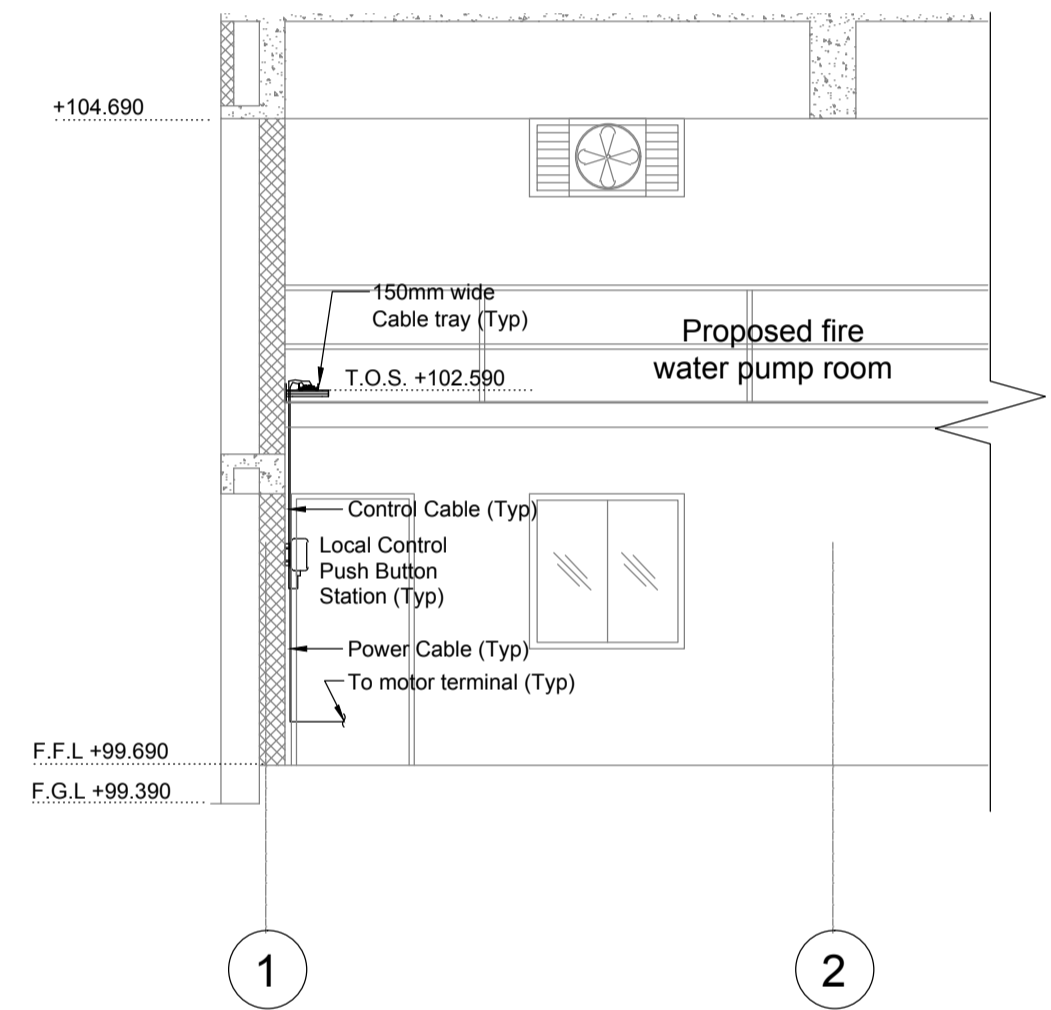
0	29.09.2015	UMW	Issued for Tender	PPP	VST
P1	18.09.15	MCP	Issued for approval		



Layout of Cable Rack
1:50
Fire Water Pump House

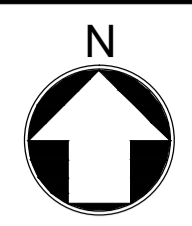
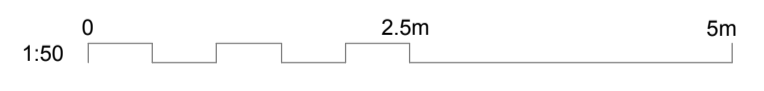


Section A
1:50

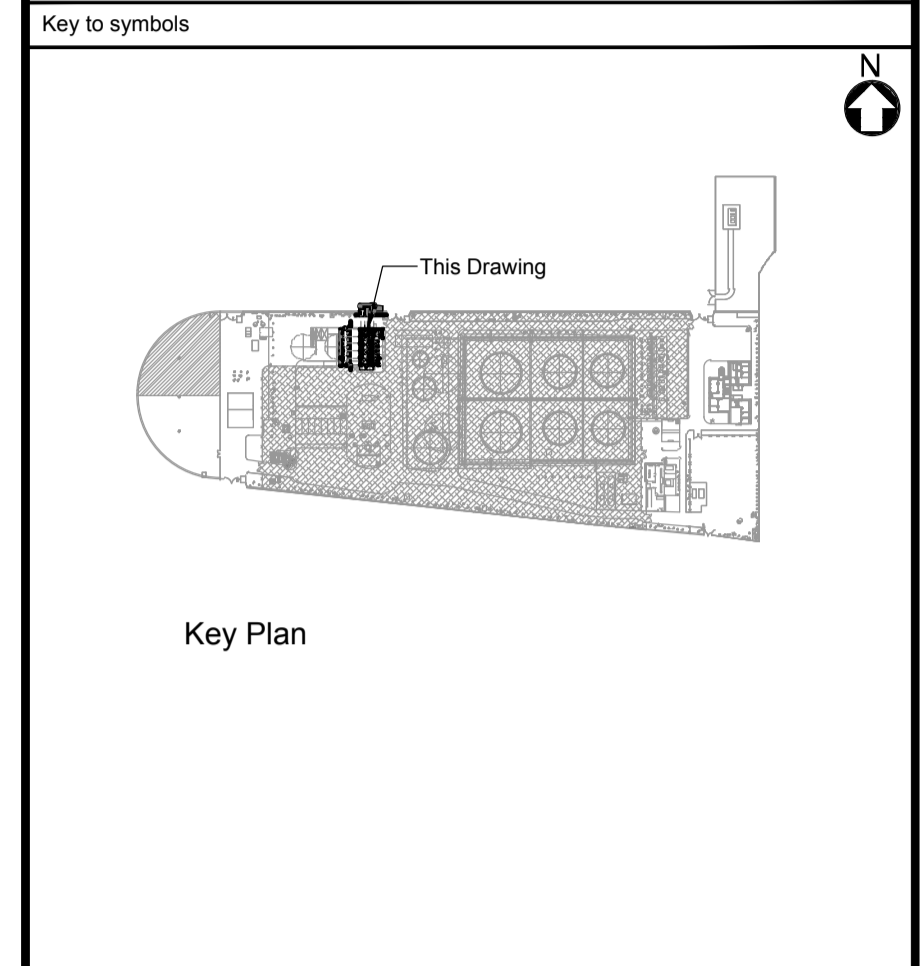


Section B
1:50

Sr. No.	Symbol	Description	Qty.
1	—eb1—	50 x 6 mm G.I Earthing strip for main Earthing Grid, earthing of PCC, PMCC, MPDB, MLDB, ELDB, All Vendor Panels, Storage Tanks & Vessels, Motors above 75 HP(55KW)	40 Mtr. Approx.
2	—eb2—	35 x 6 mm G.I Earthing strip for earthing grid	65 Mtr. Approx.
3	—eb3—	25 x 6 mm G.I Earthing strip for earthing of storage tanks & Vessels, Motors above Up to 55KW	60 Mtr. Approx.
4	—eb4—	4 Sq. mm Cu. FRLS wire for earthing of 1-Ø Power sockets, Push Button Station, etc.	25 Mtr. Approx.
5	—eb5—	16 Sq. mm Cu. FRLS wire for earthing of Motors Up to 15HP	15 Mtr. Approx.
6	EB	Maintenance free Earth electrode 3 mtr. long x 50mm dia Earthing pit (EB)	02 Nos.
7	LCS	Local Control Station (LCS)- Weatherproof Type	03 Nos.
8	CT	300 mm wide Cable tray	10 Mtr. Approx.
9	CT	150 mm wide Cable tray	37 Mtr. Approx.
10	CT	50 mm wide Cable tray	20 Mtr. Approx.
11	EBS	Earthing Busbar	02 Nos.



- Notes
- All dimensions are in millimeters and elevation in meters, unless specified otherwise
 - Dimensions are to be read from the drg. and not to be measured
 - For Installation standards, refer
Tender for Electrical Work, Part-II of III Technical Specification
a) Electrical Installation - Standards & Specifications
b) General Notes on Power & Earthing
c) Relevant standard dwg. on Earthing
 - Two nos. of earthing connection shall be provided for all panels/storage tanks/ vessels and other associated utilities
 - For detail of cable tag refer cable schedule ECD-01
 - Minimum Separation of 3 Mtrs. shall be ensured between the two earth electrodes
 - Earthing pits shall be kept min. 3000 mm away from the building
 - Contractor shall co-ordinate excavation activities for the earthing installation with Other agencies in consultation with owner's site in-charge. Earthing stations may be suitably located as per site convenience/conditions
 - All EL/Levels are with respect to FFL +99.690



- Reference drawings
- 322538-APA-0001-01 Plot Plan
 - 322538-RLA-0901-01 Layout & section of proposed Fire Water Pump House
 - 322538-RPA-0903-04 Layout and sections of Piping for Proposed Fire Water Pump House

Rev	Date	Drawn	Description	Ch'k'd	App'd
C	29.12.2015	MCP	Issued for Construction & Revised as per Email dated 23.12.2015.		
B	10.12.2015	UMW	Issued for Construction & Revised as per Arch. layout	PPP	VST
A	09.10.2015	UMW	Issued for Construction	PPP	VST



Client
M/s Delhi Aviation Fuel Facility Pvt. Ltd.
Aviation Fuelling Station
Shahbad, Muhammad Pur
IGI Airport, New Delhi - 110061

Title
Modernization of Existing Fuel Farm
Proposed Fire Water Pump House
Power & Earthing
Layout, Section & Details

Designed	DHP/SK	Eng check	PPP	
Drawn	ASP	Coordination	AKM	
Dwg check	DHP/SK	Approved	VST	
Scale at A1	Status	Rev	Security	
As Shown	CON	C	STD	

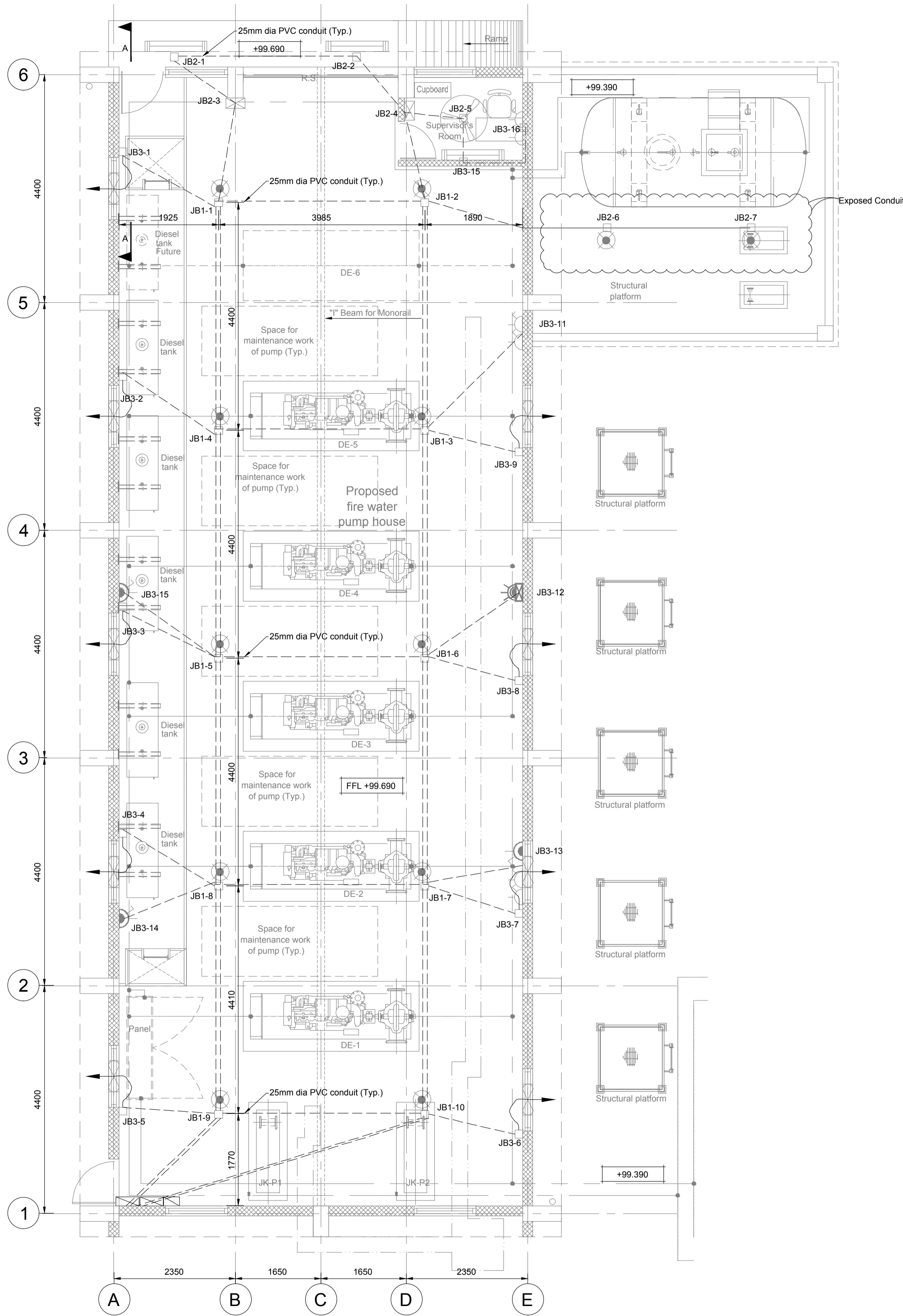
Drawing Number
322538-ELA-0002-01

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2 —eb2— 35 x 6 mm G.I Earthing strip for earthing grid
50 Mtr. Approx.

0 29.09.2015 UMW Issued for Tender PPP VST

P1 22/09/2015 ASP Issued for Approval



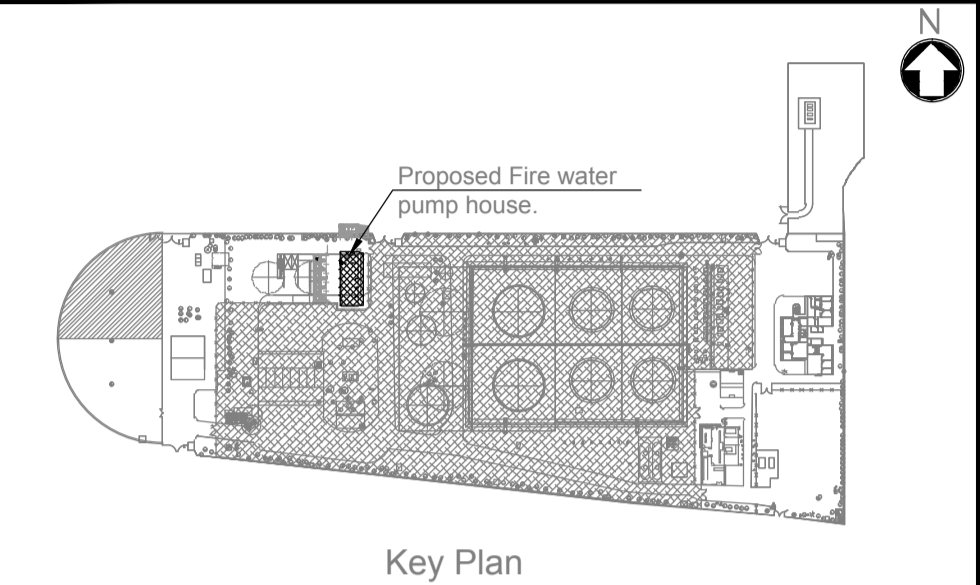
Conduit Layout of proposed Fire water Pump house
1:50

Sr. No.	Symbol	Description	Qty.
1	---	25mm dia PVC conduit	200 mtr. approx.
2	□	8 way Junction Box in ceiling (JB1)	10 Nos.
3	□	2 way Junction Box in ceiling (JB2)	07 Nos.
4	□	Wall mounted Junction Box (including Exhaust fan JB) (JB3)	16 Nos.

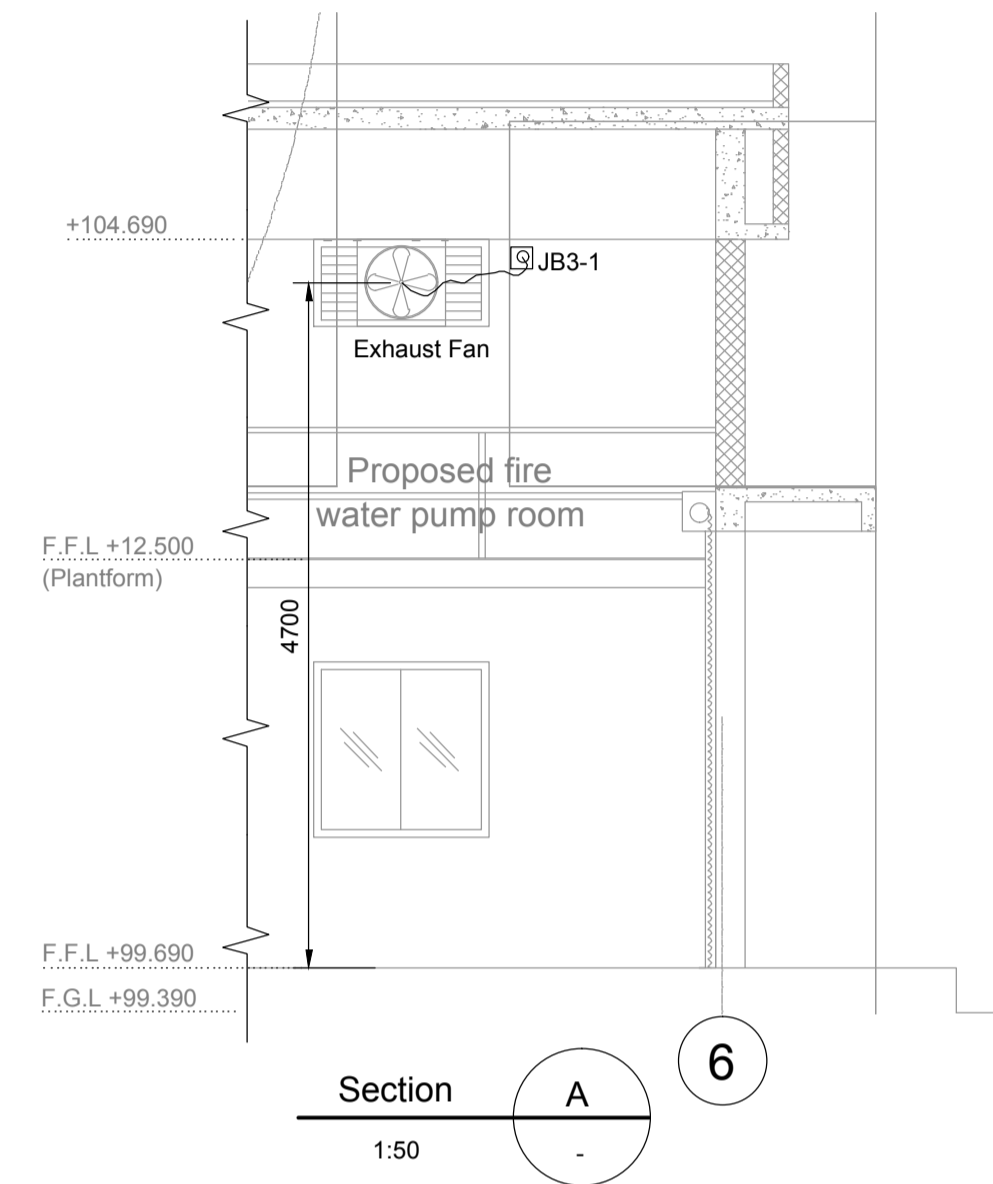


- Notes
- (1) All dimensions are in millimeters and elevations/levels are in meters, unless mentioned otherwise.
 - (2) Dimensions are to be read from the drg. and not to be measured.
 - (3) Mounting height from FFL as under
- Panels/distribution board - 1500mm.
- Power socket points - 1200mm.
 - (4) Type of Wiring shall be Cable up to LDB/ELP and then after 20mm dia GI conduit to be consider.
 - (5) Looping of cables should be made from fixture to fixture and not from the junction box/pull box.
 - (6) Refer following documents
- 322538-ECD-xx - for Cable schedule.
 - (7) Lighting, Power socket of 3 phase & 1 phase, Exhaust fan distribution shall be from provided LDB only.

Key to symbols



Key Plan



Section A-6
1:50

Reference drawings

- | | |
|-----------------------|--|
| 1) 322538-APA-0001-01 | Plot plan |
| 2) 322538-RLP-0901-01 | Layout & Section of Fire water pump house |
| 3) 322538-RPB-0906-01 | 13KL Foam concentrate storage tank (Atmospheric) |

Rev	Date	Drawn	Description	Ch'k'd	App'd
B	29.12.2015	MCP	Issued for Construction & Revised as per Email dated 23.12.2015.		
A	10.12.2015	UMW	Issued for Construction & Revised as per Arch. layout	PPP	VST



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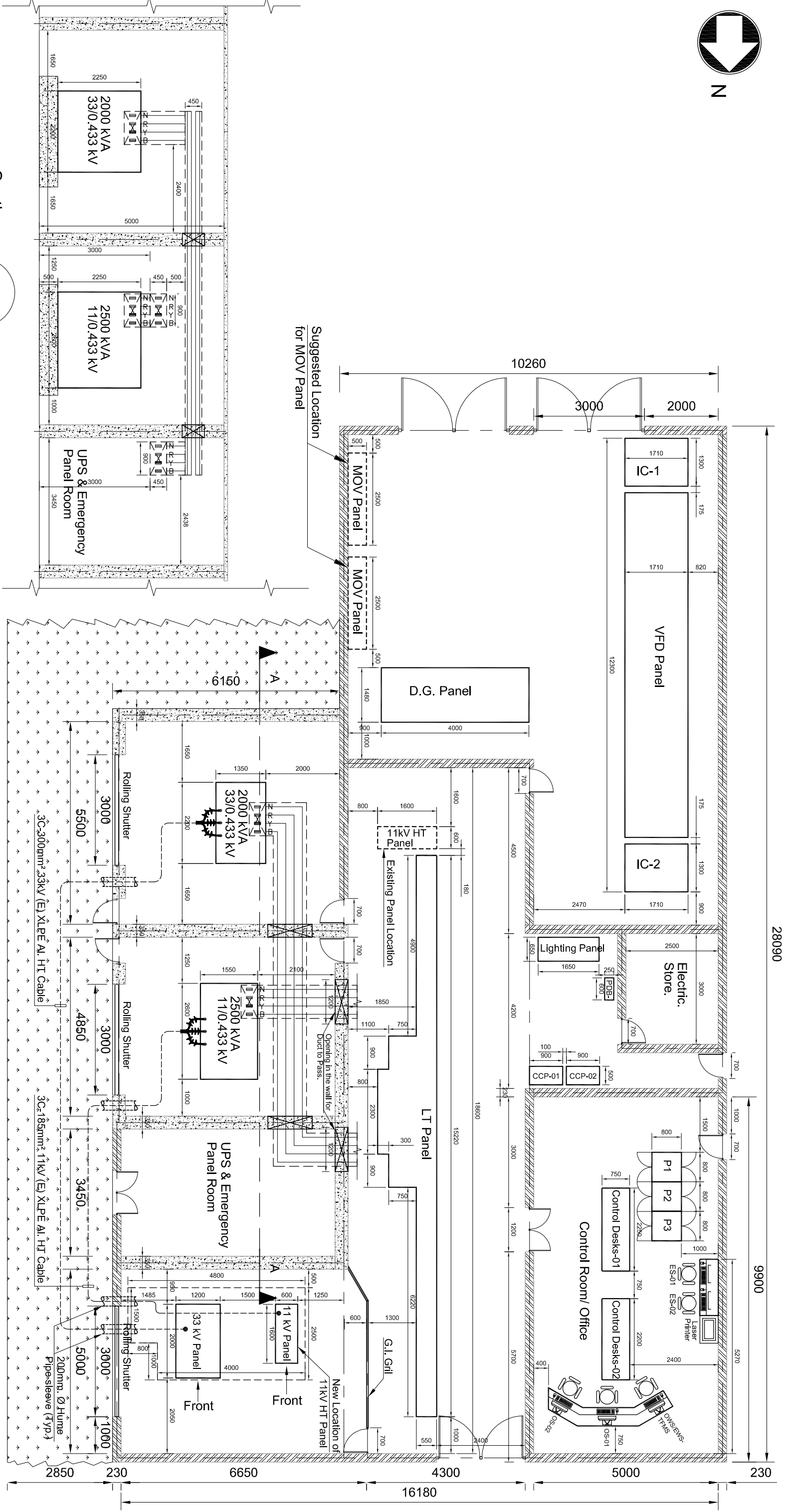
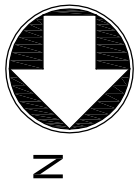
Title
Modernization of Existing Fuel Farm

Layout & Details of Conduit Fire Water Pump House

Designed	DHP/AB	Eng check	PPP
Drawn	MCP	Coordination	AKM
Dwg check	DHP/SK	Approved	VST
Scale at A1	Status	Rev	Security
As Shown	CON	B	STD

Drawing Number
322538-ELA-0003-01





Section A
1:100

- Notes:-**
1. All Dimensions are in Millimeters and Levels are in Meters.
 2. MOV Panel shall be installed as to Suit at site in VFD Room.

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A20 Sector 2 Noida 201301 India		T +91 (0)12 0254 3582 F +91 120 254 3562 W www.mottmac.com		Rev Date Drawn Description Ch'k'd App'd Title Drawing Number	
P1 22/02/16 Sunil Issued for Approval		SK VST Modernization of Existing Fuel Farm HT & LT Sub Station MOV Panel Layout		Drawn Checked Approved Scale at A3 Sunil Saurabh Kumar VST 1:100	
Security STD		Status APR		Rev P1	



Mott MacDonald

A-20, Sector-2
Noida-201301

ITEM DESCRIPTION:- LV Cable Schedule

Revision :- 01

Customer :-M/s DAFFPL

Description :- Issued for Bidding

Location :- Shahbad Mohammadpur

10.12.15

State:- New Delhi

Document No: 322538-ELS-0001-01

S. No.	From	To	Cable Location/connection/Scope	Cable Size Selected	No. of Cables	Type of Cable	Length of cable meters	Total length(m)	Remarks
Power Cable									
	LTPCC-01								
1	LTPCC-01	Outlet Valve Tank No.4		4C-4	1	XLPE/SWA/PVC/CU	145	145	
2	LTPCC-01	Inlet Valve Tank No.203		4C-4	1	XLPE/SWA/PVC/CU	145	145	
3	LTPCC-01	Inlet Valve Tank No.4		4C-4	1	XLPE/SWA/PVC/CU	175	175	
4	LTPCC-01	Outlet Valve Tank No.203		4C-4	1	XLPE/SWA/PVC/CU	175	175	
5	LTPCC-01	Inlet Valve Tank No.206		4C-4	1	XLPE/SWA/PVC/CU	175	175	
6	LTPCC-01	Inlet Valve Tank No.202		4C-4	1	XLPE/SWA/PVC/CU	200	200	
7	LTPCC-01	Outlet Valve Tank No.206		4C-4	1	XLPE/SWA/PVC/CU	200	200	
8	LTPCC-01	Outlet Valve Tank No.202		4C-4	1	XLPE/SWA/PVC/CU	200	200	
9	LTPCC-01	Main Hydrant Valve		4C-4	1	XLPE/SWA/PVC/CU	200	200	
10	LTPCC-01	Inlet Valve Tank No.205		4C-4	1	XLPE/SWA/PVC/CU	145	145	
11	LTPCC-01	Outlet Valve Tank No.205		4C-4	1	XLPE/SWA/PVC/CU	145	145	
12	LTPCC-01	Inlet Valve Tank No.1		4C-4	1	XLPE/SWA/PVC/CU	175	175	
13	LTPCC-01	Outlet Valve Tank No. 1		4C-4	1	XLPE/SWA/PVC/CU	175	175	
14	LTPCC-01	New Fire MCC Panel		3.5C-240	1	XLPE/SWA/PVC/AL	275	275	
	VFD Panel								
1	VFD Panel	MOV Panel		3.5C-50	1	XLPE/SWA/PVC/AL	50	50	
	Old Fire Pump house								
1	Old Fire Pump house	Change over SFU Unit (New fire pump house)	Exiting cable connection extention	3.5C-95	1	XLPE/SWA/PVC/AL	75	75	



A-20, Sector-2
Noida-201301

ITEM DESCRIPTION:- LV Cable Schedule

Revision :- 01

Customer :-M/s DAFFPL

Description :- Issued for Bidding

Location :- Shahbad Mohammadpur

10.12.15

State:- New Delhi

Document No: 322538-ELS-0001-01

S. No.	From	To	Cable Location/connection/Scope	Cable Size Selected	No. of Cables	Type of Cable	Length of cable meters	Total length(m)	Remarks
	Fire Fighting panel								
1	Fire Fighting panel	Jockey pump 1 (37 kW considered)	Supply in scope of Fire vendor	3C-70	2	XLPE/SWA/PVC/AL	20	40	
2	Fire Fighting panel	Jockey pump 2 (37 kW considered)	Supply in scope of Fire vendor	3C-70	2	XLPE/SWA/PVC/AL	20	40	
3	Fire Fighting panel	Mono Rail		4C-16	1	XLPE/SWA/PVC/AL	50	50	
4	Fire Fighting panel	Change over SFU Unit (New fire pumop house)		3.5C-35	1	XLPE/SWA/PVC/AL	25	25	
5	Fire Fighting panel	AFF motor	First supply	3C-6	1	XLPE/SWA/PVC/Cu	50	50	
	Change over SFU Unit								
1	Change over SFU Unit (New fire pumop house)	Lighting Power DB (New Fire Pump House)		4C-16	1	XLPE/SWA/PVC/AL	10	10	
2	Change over SFU Unit (New fire pumop house)	Emergency Lighting DB (New Fire Pump House)		4C-16	1	XLPE/SWA/PVC/AL	10	10	
	Emergency Lighting power DB		New Fire pump House						
1	Emergency Lighting power DB	Lighting Circuit		3C-2.5	1	XLPE/SWA/PVC/Cu	150	150	
2	Emergency Lighting power DB	Power Circuit		3C-4	1	XLPE/SWA/PVC/Cu	150	150	
3	Emergency Lighting power DB	AFF motor	Second supply	3C-6	1	XLPE/SWA/PVC/Cu	40	40	
	Lighting power DB		New Fire pump House						
1	Lighting power DB	Lighting Circuit		3C-2.5	1	XLPE/SWA/PVC/Cu	125	125	
2	Lighting power DB	Power Circuit		3C-4	1	XLPE/SWA/PVC/Cu	125	125	



A-20, Sector-2
Noida-201301

ITEM DESCRIPTION:- LV Cable Schedule

Revision :- 01

Customer :-M/s DAFFPL

Description :- Issued for Bidding

Location :- Shahbad Mohammadpur

10.12.15

State:- New Delhi

Document No: 322538-ELS-0001-01

S. No.	From	To	Cable Location/connection/Scope	Cable Size Selected	No. of Cables	Type of Cable	Length of cable meters	Total length(m)	Remarks
	MOV Panel								
1	MOV Panel	Storage Tank VF-202 Inlet Header	P-ROSOV-2001	4C-4	1	XLPE/SWA/PVC/CU	145	145	
2	MOV Panel	Storage Tank VF-203 Inlet Header	P-ROSOV-2002	4C-4	1	XLPE/SWA/PVC/CU	145	145	
3	MOV Panel	Storage Tank VF-201 Inlet Header	P-ROSOV-2003	4C-4	1	XLPE/SWA/PVC/CU	175	175	
4	MOV Panel	Storage Tank VF-204 Inlet Header	P-ROSOV-2004	4C-4	1	XLPE/SWA/PVC/CU	175	175	
5	MOV Panel	Storage Tank VF-204 Inlet Header	P-ROSOV-2004A	4C-4	1	XLPE/SWA/PVC/CU	175	175	
6	MOV Panel	Storage Tank T-205 Inlet Header	P-ROSOV-2005	4C-4	1	XLPE/SWA/PVC/CU	200	200	
7	MOV Panel	Storage Tank T-205 Inlet Header	P-ROSOV-2005A	4C-4	1	XLPE/SWA/PVC/CU	200	200	
8	MOV Panel	Storage Tank VF-206 Inlet Header	P-ROSOV-2006	4C-4	1	XLPE/SWA/PVC/CU	200	200	
9	MOV Panel	Storage Tank VF-206 Inlet Header	P-ROSOV-2006A	4C-4	1	XLPE/SWA/PVC/CU	200	200	
10	MOV Panel	Storage Tank T-202 Outlet Header	P-ROSOV-2007	4C-4	1	XLPE/SWA/PVC/CU	145	145	
11	MOV Panel	Storage Tank VF-203 Outlet Header	P-ROSOV-2008	4C-4	1	XLPE/SWA/PVC/CU	145	145	
12	MOV Panel	Storage Tank VF-201 Outlet Header	P-ROSOV-2009	4C-4	1	XLPE/SWA/PVC/CU	175	175	
13	MOV Panel	Storage Tank VF-204 Outlet Header	P-ROSOV-2010	4C-4	1	XLPE/SWA/PVC/CU	175	175	
14	MOV Panel	Storage Tank VF-205 Outlet Header	P-ROSOV-2011	4C-4	1	XLPE/SWA/PVC/CU	200	200	
15	MOV Panel	Storage Tank VF-206 Outlet Header	P-ROSOV-2012	4C-4	1	XLPE/SWA/PVC/CU	200	200	
	SLP03								
1	SLP-03	Motor starter panel for OWS near Tank form area		4C-16	1	XLPE/SWA/PVC/AL	75	75	
2	Motor starter panel for OWS near Tank form area	Motor for OWS pump		3C-6	1	XLPE/SWA/PVC/Cu	25	25	

4B	20A	2C x 4.0	WS-2	2C x 4.0	----	----	WS-2	FWPH	250	500	500
	DP	Cu. Flex (P+N) & 1C x 2.5	WS-3	Cu. Flex (P+N) & 1C x 2.5			WS-3	EL +99.690m Lvl.	250		
		Cu. Flex (Earth)		Cu. Flex (Earth)							
5R	20A	2C x 4.0	P1-1	----	----	----	P1-1	FWPH	750	750	750
	DP	Cu. Flex (P+N) & 1C x 2.5						EL +99.690m Lvl.			
		Cu. Flex (Earth)									
5Y	20A	2C x 4.0	P1-3	----	----	----	P1-3	FWPH	750	750	750
	DP	Cu. Flex (P+N) & 1C x 2.5						EL +99.690m Lvl.			
		Cu. Flex (Earth)									
5B	20A	2C x 4.0	P1-2	----	----	----	P1-2	FWPH	750	750	750
	DP	Cu. Flex (P+N) & 1C x 2.5						EL +99.690m Lvl.			
		Cu. Flex (Earth)									
6R	32A	4C x 4.0	P2-1	----	----	----	P2-1	FWPH	1500	1500	1500
6Y	FP	Cu. Flex (P+N) & 1C x 2.5						EL +99.690m Lvl.			
6B		Cu. Flex (Earth)									
7R	20A	2C x 4.0	WS-1	----	----	----	WS-1	FWPH	250	250	250
	DP	Cu. Flex (P+N) & 1C x 2.5						EL +99.690m Lvl.			
		Cu. Flex (Earth)									
7Y	20A										
	DP		SPARE				SPARE				
7B	20A										
	DP		SPARE				SPARE				
8R	20A										
	DP		SPARE				SPARE				
8Y	20A										
	DP		SPARE				SPARE				
8B	20A										
	DP		SPARE				SPARE				
CONNECTED LOAD									TOTAL LOAD		
3 PHASE LOAD		1500	WATTS								
R PHASE		2425	WATTS								
Y PHASE		1860	WATTS								
B PHASE		2420	WATTS								
		8205	WATTS								

DISTRIBUTION SCHEDULE FOR ELDB # 1											
PROJECT : Modernization of Fuel Farm, DAFFL											
ELDB # 1						CABLE SIZE :					
LOCATION : FF Pump House											
FED FROM : Main Emergency Panel											
Type of Wiring : Conduit Wiring / Cable Wiring						DOC. NO:- 322538-ESD-02					
Reference Drg. No. : 322538-ELA-0001-01						Prepared by		DKF	Rev.B	Date: 10.12.15	
Ckt. No.	MCB Type & Rating	Mains Cable / Wire Size	Connected Equip./SB / Plug point No.	Looped Cable / Wire Size	Sw. No.	Sw. Rating	Tag. No.	Area of Installation	Connected Load in Watts	Connected Load of SB/Ckt. in Watts	Connected Load of Ckt. in Watts
1R	10A	2C x 2.5	----	2C x 2.5	----	----	WL-1,2	FWPH	350	350	350
	DP	Cu. Flex (P+N) & 1C x 1.5		Cu. Flex (P+N) & 1C x 1.5				EL +99.690m Lvl.			
		Cu. Flex (Earth)		Cu. Flex (Earth)							
1Y	10A	2C x 2.5	----	2C x 2.5	----	----	WL-5,6	FWPH	350	350	350
	DP	Cu. Flex (P+N) & 1C x 1.5		Cu. Flex (P+N) & 1C x 1.5				EL +99.690m Lvl.			
		Cu. Flex (Earth)		Cu. Flex (Earth)							
1B	10A	2C x 2.5	----	2C x 2.5	----	----	WL-9,10	FWPH	350	350	350
	DP	Cu. Flex (P+N) & 1C x 1.5		Cu. Flex (P+N) & 1C x 1.5				EL +99.690m Lvl.			
		Cu. Flex (Earth)		Cu. Flex (Earth)							
2R	20A	2C x 2.5	JB-3	2C x 2.5	----	----	Exhaust Fan-3 (EX-3)	FWPH	410	410	410
	DP	Cu. Flex (P+N) & 1C x 1.5		Cu. Flex (P+N) & 1C x 1.5				EL +99.690m Lvl.			
		Cu. Flex (Earth)		Cu. Flex (Earth)							
2Y	20A	2C x 2.5	JB-6	2C x 2.5	----	----	Exhaust Fan-6 (EX-6)	FWPH	410	410	410
	DP	Cu. Flex (P+N) & 1C x 1.5		Cu. Flex (P+N) & 1C x 1.5				EL +99.690m Lvl.			
		Cu. Flex (Earth)		Cu. Flex (Earth)							
2B	20A	2C x 2.5	JB-9	2C x 2.5	----	----	Exhaust Fan-9 (EX-9)	FWPH	410	410	410
	DP	Cu. Flex (P+N) & 1C x 1.5		Cu. Flex (P+N) & 1C x 1.5				EL +99.690m Lvl.			
		Cu. Flex (Earth)		Cu. Flex (Earth)							
3R	MPCB	3Cx4.0 Sq.mm	----	----	----	----	5.5 kW DOL Starter	FWPH	5500	5500	5500
3Y		Cu XLPE Cable						EL +99.690m Lvl.			
3B											
4R	20A		SPARE				SPARE				
	DP										
4Y	20A		SPARE				SPARE				
	DP										
4B	20A		SPARE				SPARE				
	DP										
CONNECTED LOAD								TOTAL LOAD		7780 WATTS	
3 PHASE LOAD			5500	WATTS							
R PHASE			760	WATTS							
Y PHASE			760	WATTS							
B PHASE			760	WATTS							
			7780	WATTS							



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE II – DEVIATION SHEET

EXCEPTION AND DEVIATIONS STATEMENT				
S.NO.	PAGE NO. OF TENDER DOCUMENT	CLAUSE NO.	SUBJECT	DEVIATIONS

Bidder shall list all the deviations in the following given format only on their Letterhead. The Deviation sheet should be submitted along with technical bid.

In case no deviation sheet is submitted along with technical bid, it would be concluded that bidder has accepted all specifications, terms and conditions.

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE III – DECLARATION SHEET

Date:

DECLARATION

We, M/s _____ hereby, unconditionally accept all terms & conditions of TENDER NO. : DAFFPL/MOD/FF/2016-17/14 (JOB: TENDER FOR MISCELLANEOUS ELECTRICAL WORKS) including Scope of job, quantities, completion period, terms & condition without any deviations.

Sign & Stamp of Bidder

Note: In case of deviations (whether technical or commercial) the above declaration should not be submitted and the deviations should be mentioned separately on bidders letter head with the heading "DEVIATION SHEET". In absence of "DEVIATION SHEET", it would be concluded that bidder has submitted his offer as per tender specifications, terms & conditions. Corrections in tender booklet will not be accepted.

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE-IV

PROFORMA OF BANK GUARANTEE (EARNEST MONEY DEPOSIT)

(On Non-Judicial Stamp paper for appropriate value)

BANK GUARANTEE NO. :

BANK GUARANTEE AMOUNT:

CLAIM:

(Till 120 days from date of submission of Proposal)

TENDER NO. /DATE:

JOB DESCRIPTION/

LOCATION:

Tender Security No. [*]

Name and Address of the Beneficiary: Delhi Aviation Fuel Facility (Private) Limited
Aviation Fuelling Station, Shahabad Mohammadpur, IGI Airport, New Delhi – 110 061, India

We [*name and address of the issuing bank*] have been informed that [*Name of the Interested party*] (hereinafter called the “Interested Party”) is submitting a proposal for the Award of the Works in response to a Request for Proposal (“RFP”) by Delhi Aviation Fuel Facility (P.) Ltd. (“DAFFPL” or ‘Beneficiary’) for [*Insert description of work*] (“Works”). The conditions of the RFP, which are set out in a documents entitled Request for Proposal dated [*Please insert*] require its offer to be supported by a Tender Security.

At the request of the Interested Party, we hereby irrevocably undertake to pay you without demur, the Beneficiary, any sum or sums not exceeding Rs. _____ [*Please insert*].

Upon receipt by us of your demand in writing and your written statement (in the demand) stating that:

- 1) The Interested Party has, without written consent of DAFFPL, withdrawn its offer after the latest time specified for its submission and before the expiry of its period of validity; or
- 2) The Interested Party has refused to accept the correction of errors in nits offer in accordance with the instructions to Interested parties contained in the RFP; or

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

- 3) DAFFPL entered in to the contract with the Interested party but the Interested party has failed to deliver the **COMPOSITE BANK GUARANTEE (SECURITY DEPOSIT & PERFORMANCE)** in compliance with the Contract conditions; or
- 4) The Interested Party has failed to enter into the Contract within 30 (Thirty) days of being required to do so by the Tender Officer.

Any demand for payment must contain your signature(s). The demand must be received by us at this office on or before the expiry of the earliest of the following dates, when this security guarantee shall expire and shall be returned to us:

- a) Date of issue of letter communicating to the Interested Party that it has not qualified for the contract or the Proposal submitted by the Interested Party is unsuccessful or the TENDER is withdrawn and/or cancelled by the Beneficiary; or
- b) 7 (seven) days after the date of delivery of an acceptable performance bond complying with the Contract conditions and execution of the Contract after the award of the works to the Interested Party; or
- c) 120 (One hundred twenty) days from the last date of submission of Proposal in accordance with the TENDER.

Date:

Signature:

Designation:

Name of the Branch

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE-V

PROFORMA OF COMPOSITE BANK GUARANTEE (SECURITY DEPOSIT & PERFORMANCE)

(On Non-Judicial paper of Rs. 100/-value)

To,

DAFFPL

Dear Sirs,

M/shave taken tender for the workfor DAFFPL,.

The tender Conditions of Contract provide that the Contractor shall pay a sum of Rs. (Rupees) as security deposit & performance guarantee in the form therein mentioned. The form of payment of security deposit & performance guarantee includes guarantee executed by Scheduled Bank at New Delhi, undertaking full responsibility to indemnify DAFFPL, in case of default. The said party have approached us at and their request and in consideration of the premises we having our office at have agreed to give such guarantees as hereinafter mentioned.

1. We -----hereby undertake and agree with you that if default shall be made by M/s. -----in performing any of the terms and conditions of the tender or in payment of any money payable to Daffpl. We shall on demand pay to you, without demur, protest or requiring you to seek recourse to M/s _____, in such matter as to you may direct the said amount of Rupees ----- only or such portion thereof not exceeding the said sum as you may from time to time require.
2. You will have the full liberty without reference to us and without effecting this guarantee, postpones for any time or from time to time the exercise of any of the powers and rights conferred on you under the contract with the said -----and to enforce or to forbear from endorsing any powers of rights or by reason of time being given to the said -----which under law relating to the sureties would but for provision have the effect of releasing us.
3. Your right to recover the said sum of Rs. ----- (Rupees -----) from us in manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. -----

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

- and/or that any dispute or disputes are pending before any officer, tribunal or court.
4. The guarantee herein contained shall not be determined or affected by the liquidation or winding up dissolution or change of constitution or insolvency of the said -----but shall in all respect and for all purposes be binding operative units payment of all money due to you in respect of such liabilities is paid.
 5. Our liability under this guarantee is restricted to Rupees -----our guarantee shall remain in force until -----unless a suit or action to enforce a claim under Guarantee is filed against us within six months from -----(which is date of expiry of guarantee) all our rights under the said guarantee shall be forfeited and we shall be relieved and discharged from all liabilities there under.
 6. NOT WITHSTANDING anything hereinbefore contained our liability under this Bank Guarantee is restricted to Rupees -----(Rupees -----).This Bank Guarantee shall be valid up to -----and we are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before.
 7. This guarantee is to be returned to us within fifteen (15) days from the date it ceases to be in force. If the guarantee is not returned to us within the date of aforementioned it shall be automatically cancelled.
 8. We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do under the Power of Attorney dated -----granted to him by the Bank.

Yours faithfully

-----Bank
 By its Constituted Attorney
 Signature of a person duly
 Authorized to sign on behalf of the bank



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

Annexure- VI

Form of Letter of Undertaking

[On the letterhead of the Interested Party]

Letter of Undertaking

Date:

Delhi Aviation Fuel Facility (Private) Limited
Aviation Fuelling Station, Shahabad Mohammadpur,
IGI Airport, New Delhi – 110 061, India

Re:

The undersigned Interested Party acknowledges that the TENDER issued is confidential and personal to the undersigned Interested Party and hereby undertakes and agrees as follows:

1. **“Confidential Information”** means the TENDER and everything contained therein, all documentation, data, particulars of the Works and technical or commercial information made by (or on behalf of) Delhi Aviation Fuel Facility (Private) Limited or obtained directly or indirectly from Delhi Aviation Fuel Facility (Private) Limited or its representatives by the undersigned Interested Party or which is generated by the undersigned Interested Party or any information or data that the undersigned Interested Party receives or has access to, as a result of the TENDER, as being confidential information of Delhi Aviation Fuel Facility (Private) Limited, provided that such term does not include information that (a) was publicly known or otherwise known to undersigned Interested Party prior to the time of such disclosure, (b) subsequently becomes publicly known through no act or omission by undersigned Interested Party or any person acting on its behalf.
2. The undersigned Interested Party shall maintain the confidentiality of Confidential Information in accordance with procedures adopted by the undersigned Interested Party in good faith to protect confidential information of third parties delivered to it, provided that the undersigned Interested Party may deliver or disclose Confidential Information to its authorized representatives who agree to hold confidential the Confidential Information substantially in accordance with the terms of this Undertaking.
3. The undersigned Interested Party shall not at any time whatsoever:
 - (i) Disclose, in whole or in part, any Confidential Information received directly or indirectly from the Delhi Aviation Fuel Facility (P) Limited to any third party.

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

(ii) Reproduce, publish, transmit, translate, modify, compile or otherwise transfer the Confidential Information.

4. In case the Proposal of the undersigned Interested Party is not accepted and immediately upon the acceptance of the Proposal of any of the other Interested Party, the undersigned Interested Party, shall:

(i) Return all Confidential Information including without limitation, all originals, copies, reproductions and summaries of Confidential Information; and

(ii) Destroy all copies of Confidential Information in its possession, power or control, which are present on magnetic media, optical disk or other storage device, in a manner that ensures that the Confidential Information is rendered unrecoverable.

5. The undersigned Interested Party shall certify to Delhi Aviation Fuel Facility (Private) Limited that it has returned or destroyed such Confidential Information to the Delhi Aviation Fuel (Private) Limited within two (2) days of such a request being made by Delhi Aviation Fuel (Private) Limited.

Name of Interested Party's

Signature of Authorized Representative

Sign & Stamp of Bidder



DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

Annexure VII

DECLARATION to be submitted along with Technical Bid

(M/s. _____) hereby declare / clarify that we have not been banned or delisted by any government or quasi Government agencies or Public Sector Undertakings.

Stamp & Signature of the bidder

NOTE: If a bidder has been banned by any Government or quasi Government agencies or PSUs, this fact must be clearly stated with details. If this declaration is not given along with the technical bid, the tender will be rejected as non-responsive.

Sign & Stamp of Bidder



PART A: SUPPLY



TENDER-322538-E-01, Part II OF II

REV: 01, 02.02.2016

BILL OF MATERIAL FOR ELECTRICAL SUPPLY

Sr. No.	Item Description	Qty.	UoM	Unit Rate of supply items in all respects, inclusive of transportation, handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Supply (Rs.)
1	LT SWITCHGEAR PANEL				
1.1	Supply of following low voltage switchgear panel - floor / Wall mounted type / Control Panels as per the relevant drawings & Specification.				
1.1.1	New MCC for MOV, Ref. Drawing No- 322538-EIB-0003-01. Max. Dim. - 2500mm (L) x 500mm(B) x 2200mm (H) (Approx.)	1	No.		
1.1.2	Chageover Switch with SFU rated 100 Amp for FFH lighting and power distribution board with cable gland, lugs etc. SFU rating 100 amp, Changeover switch rated 100Amp, Cable termination incomer 3.5C-95 sqmm and 3.5C-35sqmm, outging two nos 4C-16sqmm.	1	No.		
1.1.3	Junction Box for incoming and outgoing of cable size 3.5C-95 sqmm for extention from old fire room to new fire room new FFH change over panel. Max. Dim. - 300mm (L) x 450mm(B) x 200mm (H) (Approx.)	1	No.		
1.1.4	Supply of the Single Starter Control panel suitable for 415 volts, 3 phase, 4 wire, 50Hz system, which shall include MCCB/MPCB's, Contactor, Overload relay, Auxiallary contacts etc.				
a)	Single starter control panel for OWS pump rated 5.5 kW (tentative) outdoor type.	1	No.		
1.2	Supply of Items required for the Modification, connection, Termination, testing and commissioning of following low voltage switchgear panel - floor / Wall mounted type / Control Panels as per the relevant drawing and Site conditions.				
1.2.1	Timers		U.R / No.		
1.2.2	Contactor		U.R / No.		
1.2.3	Photocell		U.R / No.		
1.2.4	MCB		U.R / No.		
1.2.5	Auxillary Contact NO, NC		U.R / No.		
2	STEEL STRUCTURE				
2.1	Supply of steel structures required for base frames of switchgear, supports of push button stations, brackets for miscellaneous electrical equipment and cables and cable tray supports, made from rolled M.S. sections, including welding, bolting, riveting, supply of necessary anchor fasteners and grouting, including supply and application of one coat of antirust primer and two finishing coats of approved synthetic enamel paint, and supply of all materials including G.I. hardware as per specifications & drawings.	2000	Kgs.		
3	LT CABLES				
3.1	Supply of following types and sizes of cables. The rates shall include the supply of aluminium number tags, Aluminium saddles/clamps, saddle bars, etc. of clamp thickness 3 mm as per the specifications & drawing. 1.1KV grade, XLPE insulated stranded Al. / Cu. Conductor, extruded PVC inner sheathed and extruded PVC -FRLS outer sheathed, round / flat steel wire armoured cables of following sizes.				
3.1.1	3.5C x 240 Sq.mm XLPE , Al. Conductor, Flat Strip armoured	275	Mtrs.		
3.1.2	3.5C x 150 Sq.mm XLPE Al. Conductor, Flat strip armoured		U.R / Mtrs.		
3.1.3	3.5C x 120 Sq.mm XLPE Al. Conductor, Flat strip armoured		U.R / Mtrs.		
3.1.4	3C x 95 Sq.mm XLPE Al. Conductor, Flat strip armoured	75	Mtrs.		



PART A: SUPPLY



TENDER-322538-E-01, Part II OF II

REV: 01, 02.02.2016

BILL OF MATERIAL FOR ELECTRICAL SUPPLY

Sr. No.	Item Description	Qty.	UoM	Unit Rate of supply items in all respects, inclusive of transportation, handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Supply (Rs.)
3.1.5	3C x 70 Sq.mm XLPE Al. Conductor, Flat strip armoured	U.R /	Mtrs.		
3.1.6	3.5C x 50 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	50	Mtrs.		
3.1.7	3.5C x 35 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	25	Mtrs.		
3.1.8	3.5C x 25 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	U.R /	Mtrs.		
3.1.9	4C x 16 Sq.mm XLPE Al.. Conductor, round wire armoured	150	Mtrs.		
3.1.10	4C x 10 Sq.mm XLPE Al.. Conductor, round wire armoured	U.R /	Mtrs.		
3.1.11	3C x 6 Sq.mm XLPE Cu. Conductor, round wire armoured	150	Mtrs.		
3.1.12	4C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured	5000	Mtrs.		
3.1.13	3C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured for power	275	Mtrs.		
3.1.14	3C x 2.5 Sq.mm XLPE Cu. Conductor, round wire armoured for lighting	275	Mtrs.		
3.1.15	4C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured	100	Mtrs.		
3.1.16	3C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured Timer & Photocell cable connection	750	Mtrs.		
4	LT CABLE END TERMINATION				
4.1	Supply of cable gland for termination of XLPE insulated armoured cables including supply of flameproof and weatherproof double compression type cable glands with gland cap also including supply of crimped type solderless tinned copper lugs as per specifications & drawing. 1.1KV grade, XLPE insulated stranded Al. / Cu. Conductor, extruded PVC inner sheathed and extruded PVC outer sheathed, round / flat steel wire armoured cables of following sizes.				
4.1.1	3.5C x 240 Sq.mm XLPE , Al. Conductor, Flat Strip armoured	2	Nos.		
4.1.2	3.5C x 150 Sq.mm XLPE Al. Conductor, Flat strip armoured	U.R /	Nos.		
4.1.3	3.5C x 120 Sq.mm XLPE Al. Conductor, Flat strip armoured	U.R /	Nos.		
4.1.4	3C x 95 Sq.mm XLPE Al. Conductor, Flat strip armoured	2	Nos.		
4.1.5	3C x 70 Sq.mm XLPE Al. Conductor, Flat strip armoured	U.R /	Nos.		
4.1.6	3.5C x 50 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	2	Nos.		
4.1.7	3.5C x 35 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	2	Nos.		
4.1.8	3.5C x 25 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	U.R /	Nos.		
4.1.9	4C x 16 Sq.mm XLPE Al.. Conductor, round wire armoured	8	Nos.		
4.1.10	4C x 10 Sq.mm XLPE Al.. Conductor, round wire armoured	U.R /	Nos.		
4.1.11	3C x 6 Sq.mm XLPE Cu. Conductor, round wire armoured	6	Nos.		
4.1.12	4C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured	60	Nos.		
4.1.13	3C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured for power	U.R /	Nos.		



PART A: SUPPLY



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Sr. No.	Item Description	Qty.	UoM	Unit Rate of supply items in all respects, inclusive of transportation, handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Supply (Rs.)
4.1.14	3C x 2.5 Sq.mm XLPE Cu. Conductor, round wire armoured for lighting	U.R /	Nos.		
4.1.15	4C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured	4	Nos.		
4.1.16	3C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured Timer & Photocell cable connection	U.R /	Nos.		
4.1.17	Power cable 3core x 70Sq.mm armoured Al. Conductor as required sqmm.	8	Nos.		
4.1.18	Control cable 4C x 1.5 sq.mm cu. armoured FRLS Cable	4	Nos.		
4.1.19	Control cable of required rating as required 5 nos. x 4C x 4.0 sq.mm cu. un-armoured FRLS Cable for Diesel engine control cable.	10	Nos.		
5	CABLE TRAY				
5.1	Supply of FRP/GRP Ladder / perforated type cable tray of following sizes with all the accessories like bends, tees, reducers, elbow, joints, etc. and fixing hardware including supply of all materials as per specifications, drawings.				
5.1.1	600 mm wide-100mm height-4 mm thick Ladder type cable tray	100	Mtrs.		
5.1.2	450 mm wide-75mm height-4 mm thick Ladder type cable tray	U.R /	Mtrs.		
5.1.3	300 mm wide-50mm height-4 mm thick Ladder type cable tray	250	Mtrs.		
5.1.4	200 mm wide x 50 mm height - 4 mm thick - Perforated type	U.R /	Mtrs.		
5.1.5	150 mm wide x 50 mm height-4 mm thick - Perforated type	200	Mtrs.		
5.1.6	100 mm wide x 25 mm height -4 mm thick - Perforated type	250	Mtrs.		
5.1.7	50 mm wide x 25 mm height -4 mm thick - Perforated type	25	Mtrs.		
6	LIGHTING FIXTURE				
	Supply of following lighting fixtures with lamps sources, with the junction box provided for the point wiring, with suitable control gear box, chain for fixture, gear box, if any, including supply of all hardware. Materials required for installation & materials as per Tender, drawings. Vendor to provide Optional cost for Equivalent type of LED fixtures for listed below except highmast.				
6.1	Flameproof and Weatherproof Lighting Fixture				
6.1.1	1 x 36W, FTL flame proof & weatherproof twin tube fixture complete with integral control gear, suitable for wall / surface mounting arrangement.	U.R /	Nos.		
6.1.2	2 x 36W, FTL flame proof & weatherproof twin tube fixture complete with integral control gear, suitable for wall / surface mounting arrangement.	U.R /	Nos.		
6.2	Weatherproof Lighting Fixture				
6.2.1	1 x 36W, FTL, surface/Recess mounted type Lighting Fixture.	U.R /	Nos.		
	Optional LED Fixture for item 6.2.1	R/O	Nos.		**
6.2.2	2 x 36W, FTL, surface/Recess mounted type Lighting Fixture.	U.R /	Nos.		
	Optional LED Fixture for item 6.2.2	R/O	Nos.		**



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Sr. No.	Item Description	Qty.	UoM	Unit Rate of supply items in all respects, inclusive of transportation, handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Supply (Rs.)
6.2.3	1x150W,MHL,Weatherproof well glass light fixture with integral control gear box	12	Nos.		
	Optional LED Fixture for item 6.2.3	R/O	Nos.		**
7	LIGHTING PANELS				
7.1	Supply of Prefabricated, lighting panels (MCBDBs), surface / flush mounting, double door type in dust tight, power coated enclosure and provided with four pole MCB as incomer and DP RCCB per phase (3 No.) with 100mA sensitivity (as asked for in individual item) and required No. of 10 KA breaking capacity SP MCBs for individual circuit control as outgoing feeders. The rates shall include complete inter panel wiring (if required) and all materials as per drawing & specification.				
7.1.1	Lighting cum Power Distribution Boards (LPDBs). Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.40A DP RCCBs-100mA and 4 Nos. 10A SP MCB, 5 Nos.32/40A DP RCCBs-100mA.	R/O	Nos.		**
7.1.2	Lighting Distribution Board. Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.40A DP RCCBs-100mA and 4 Nos 10A DP MCBs, 17 Nos 20amps DP MCBs,1 No 32A FP MCB.	1	Nos.		
7.1.3	Emergency Lighting Distribution Board. Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.40A DP RCCBs-100mA and 3 Nos 10A DP MCBs, 6 Nos 20amps DP MCBs,1 No MPCB for 5.5 kW.	1	Nos.		
7.2	Supply of flameproof and weatherproof type lighting panels made of LM6 alloy surface / floor mounting provided with four pole MCB as incomer, and DP RCCB per phase (3 No.) with 100mA sensitivity (as asked for in individual item) and required No. of 10 KA breaking capacity DP MCBS for individual circuit control as outgoing feeders. The rate shall include all erection materials as per drawings, specifications.				
7.2.1	Lighting Panels - FLP type(LPs). Incomer -25A 4 pole MCB -10 KA, Outgoing circuits -3 Nos.40A DP RCCBs-100mA and 3 Nos.10A SP MCBs -10 KA.	R/O	Nos.		**
7.2.2	Sub Power Distribution Boards - FLP type (SPDBs). Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.32/40A DP RCCBs-100mA and 06Nos 20amps DP MCBs.	R/O	Nos.		**
8	INTERNAL POINT WIRING				
8.1	Point Wiring (supply) as per mentioned below. Supplying of Wiring of points to be done in semiconcealed/concealed/open manner in 25/32mm dia PVC Medium guage conduit. Wiring shall be done with FRLS type flexible wire of 650V/1100V. Separate pipe should be taken for circuit mains. Nos of circuit of the same phases may be taken in same conduit as per specification.The point rate shall include all the necessary piping and wiring from sub panel / Distribution board to switch board & switch board to the holder / angle holder / connector / ceiling rose all inclusive except sub panel / Dist board. All the wires should of FRLS type only. The rate should include the cost of required PVC conduits switch,sockets, plates & concealed boxes etc. of approved make.				
8.1.1	From Lighting Panel to Switchbox/ Lighting fixtures using 2.5 sq.mm wires for Phase & Neutral conductors and 1.5 Sq.mm wire for Earthing conductor (Supply of the PVC conduits Switches, Switchboxes, Power socket units, Grid, Cover Plates and accessories are included) (Avg length-15mtr.)	22	Nos.		
8.1.2	Circuit Wiring Between Switchboxes/lighting fixtures using 2.5 sq.mm wires for Phase & Neutral conductors and 1.5 Sq.mm wire for Earthing conductor. (Supply of the PVC conduits Switches, Switchboxes,Power socket units, Grid, Cover Plates and accessories are included) (Avg length-5mtr.)	25	Nos.		
8.1.3	From SPDB/ LDB to 6/16A or 2 Nos 6A , commercial modular type Power Socket using 2.5/4 sq. mm flexible wires for Phase & Neutral conductors and 1.5/2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories.(Avg length-10mtr.)	R/O	Nos.		**



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Sr. No.	Item Description	Qty.	UoM	Unit Rate of supply items in all respects, inclusive of transportation, handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Supply (Rs.)
8.1.4	Circuit wiring between 6/16A or 2 Nos 6A, commercial modular type Power Socket using 2.5/4 sq. mm flex.wires for Phase & Neutral conductors and 1.5/2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories. (Avg length-10mtr.)	R/O	Nos.		**
8.1.5	From LDB to 20A Industrial Power Socket using 4 sq. mm flex.wires for Phase & Neutral conductors and 2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories. Power Socket Unit is covered in Item No. 15.3 & 15.4 in installation part) (Avg length-10mtr.)	R/O	Nos.		**
8.1.6	From LDB to 32A,3Ph, Industrial Power Socket using 4 sq. mm flex.wires for 3 Phase & Neutral conductors and 2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories. (Avg length-10mtr.)	R/O	Nos.		**
8.1.7	Ceiling fan points with electronics step type regulator (using 2.5 sq.mm. Cu. Wires)	U.R /	Nos.		
8.1.8	Exhaust fan points (using 2.5 sq.mm. cu. wires) with 6A switch on switchbox and 6A plug socket near Exhaust Fan.	R/O	Nos.		**
8.1.9	Exhaust fan points (using 2.5 sq.mm. cu. wires) with 2 way junction box(100x100mm) with termination facility near Exhaust Fan.	9	Nos.		
8.1.10	6A power plug points (with 2.5 sq.mm cu. wires) installed on switchboxes along with the other switches.	8	Nos.		
8.1.11	Supply of PVC insulated stranded flexible copper wires as per specifications				
a	1.5 sq.mm wire	150	Mtrs		
b	2.5 sq.mm wire	150	Mtrs		
c	4 sq.mm wire	75	Mtrs		
8.2	Supply of following types of fans, including supply of all necessary supports, etc., and including all materials and accessories like fixing bolts, etc., as per standard drawings, specifications.				
8.2.1	300mm dia, 1400 rpm, 1-phase, exhaust fan.	R/O	Nos.		**
8.2.2	450mm dia, 1400 rpm, 1-phase, exhaust fan.(for Fire Pump House)	9	Nos.		
8.2.3	1200mm sweep, 1-phase, 240V AC, ceiling fan	R/O	Nos.		**
8.2.3	900mm sweep, 1-phase, 240V AC, ceiling fan	1	Nos.		
9	EARTHING SYSTEM				
9.1	Supply of Advance Earthing System (Maintenance free earthing system) : 60mmDiax3.0mts long,made from M.S in accordance to IS 1909 & IS 3043,along with 75 kgs.of premium Ground improving compound as per IS 3043 duly modified for excellent electrical conductivity & moisture retaining capacity.	2	Nos.		
9.2	Supply of Advance Earthing System (Maintenance free earthing system) : 14mmDiax3.0mts long,made from M.S in accordance to IS 1909 & IS 3043,along with 75 kgs.of premium Ground improving compound as per IS 3043 duly modified for excellent electrical conductivity & moisture retaining capacity.	R/O	Nos.		**
9.3	Supply of Copper / G.I. earthing loop / grid conductors / Earthing wires of following sizes as per standard drawings, specifications				
9.3.1	50 x 6 mm G.I. Strip	100	Mtrs.		
9.3.2	50 x 6 mm Cu. Strip for control room instruments earthing	U.R /	Mtrs.		
9.3.3	25 x 6 mm Cu. Strip for control room instruments earthing	U.R /	Mtrs.		



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9.3.4	32 x 6 mm G.I. Strip	U.R /	Mtr.		
9.3.5	25 x 6 mm G.I. Strip	400	Mtrs.		
9.3.6	25 x 3 mm G.I. Strip	U.R /	Mtrs.		
9.3.7	16 sq.mm Cu. PVC flexible wires	15	Mtrs.		
9.3.8	4 sq.mm Cu. PVC flexible wires	225	Mtrs.		
9.3.9	6 sq.mm Cu. PVC flexible wires	U.R /	Mtrs.		
9.4	Supply of G.I. earth bus for to club nos of joints in one place, size of earth bus is 75mm x 6mm and length of earth bus is 450mm, it shall be suitable for minimum of 12 nos of 10mm holes connection on both of the sides of bus, it shall be painted with yellow colour and details shall be as per drawings & specification.	2	Nos.		
10	MISCELLANEOUS				
10.1	Supply of mechanical Anchor fasteners 12mm Ø size	25	Nos.		
10.2	Supply of class-B (Medium gauge) G.I. pipes of following sizes including all accessories and hardware as per specifications.				
10.2.1	25mm Dia	U.R. /	Mtr.		
10.2.2	40mm Dia	U.R. /	Mtr.		
10.2.3	50mm Dia	U.R. /	Mtr.		
10.2.4	65mm Dia	U.R. /	Mtr.		
10.2.5	100mm Dia	U.R. /	Mtr.		
10.3	Supply of Heavy duty PVC pipes of following sizes including all accessories and hardware as per specifications				
10.3.1	25mm Dia	U.R. /	Mtr.		
10.3.2	32mm Dia	U.R. /	Mtr.		
10.3.3	50mm Dia	U.R. /	Mtr.		
11.0	Supply of approved fire bricks / Concrete tiles, fine river sand in the all sort of soil for maximum depth of 1500/1000mm cable trenches including supply of cement/RCC markers for routes of underground cables and for earth pits including 1Mtr. long board 150 x 150 mm size painted with yellow colour for background and black letters.	100	M ³		
12.0	Supply of the following items including supply of necessary hardware				
12.1.1	Shock Treatment chart complete with frame and glass	1	Nos.		
12.1.2	First aid box	1	Nos.		
12.1.3	Sand buckets with stand (4 No. buckets in a stand)	2	Nos.		
12.1.4	Rubber hand gloves - 33kV grade	2	pairs		
12.1.5	Rubber hand gloves - 415V grade	4	pairs		



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Sr. No.	Item Description	Qty.	UoM	Unit Rate of supply items in all respects, inclusive of transportation, handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Supply (Rs.)
12.1.6	Supply of 900 mm wide, 12 mm thick rubber floor mat of insulation level 1.1 kV.	25	Mtrs.		
13.0	Push button Station				
13.1	Supply of push button stations including supply of channel, all fixing and supporting materials frame work hardware etc. in an approved manner.	1	No.		
14	Supply of following 1 ph/3 ph/non flame proof plug/flameproof plug receptacle with plug top duly interlocked with front operated rotary handle MCB isolator housed in common 14 gauge M.S. powder coated enclosure duly interconnected with plug top receptacles shall have additional earth pin and earth terminal on enclosure. Provide SS304 (2mm thk) SS304 cover on top.				
14.1	Industrial type, Three Phase/ Single Phase flameproof				
14.1.1	32A, 415V, 5 Pin + MCB Isolator	R/O	Nos.		**
14.1.2	63A, 415V, 5 Pin + MCB Isolator	R/O	Nos.		**
14.1.3	16A, 240 V, 3 Pin Switch Socket Outlet	R/O	Nos.		**
14.2	Supply of Engineering Chemical & UV resistant, Dust & Waterproof, Plastic socket with MCB, made of polycarbonate material having interlock with MCB with ON/OFF position to prevent the plug removal in Switched ON condition and to prevent the closing of the MCB when Plug shall be in isolation condition. The Power socket units shall be of following ratings with minimum ingress protection of IP 66, including supply of necessary hardware as per specifications and directions of Engineer-in-charge. (Supply of the required structural steel covered else where in this tender)				
14.2.1	20 AMPS P + N + E	R/O	Nos.		**
14.2.2	32 AMPS 3P + N+ E	R/O	Nos.		**
14.3	Supply of Commercial 2 Nos.6A ,P+N+E, 5pin shuttered modular socket outlet with 1 way 6A modular switch.	R/O	Nos.		**
14.4	Supply of Commercial 6/16A ,P+N+E, 5pin shuttered modular socket outlet with 1 way 16A modular switch.	R/O	Nos.		**
Sub Total(A)					
VAT * % on % Sub total(A)					
Total Amount(A) (inclusive of taxes - including Freight & Insurance - FOR Site)					
Total Amount in words:					
Notes:					
1	**Amount of Items with rate only (R/O) not to be considered for Total.				



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2	* If VAT is not applicable, then mention as "Nil".				
3	Construction power, water, loading and boarding, Site Storage with watch and ward, receipt, unloading, shifting material to store and internal shifting to site shall be included in Vendor's scope.				
4	The unit rates as quoted to arrive at above total price shall be firm and inclusive of all taxes, duties, levies, transportation etc. No separate payment shall be made for site mobilization / demobilization, insurance etc.				
5	The Schedule of Rates should be read with all the other sections of the tender.				
6	The tenderer shall be deemed to have studied the drawings, specifications and the details of work to be done within the time schedule and to have acquainted with the conditions prevailing at site. Site visit is mandatory.				
7	The quantities shown against the various items are only indicative of the quantum of work and it may vary to any extent. Billing will be done as per actual.				
8	The rate quoted shall be inclusive of all work as mentioned in the scope of work (Technical Specifications).				
9	All the items of work in the schedule of rates shall be carried out as per specifications, drawings and instructions of the Engineer -in- Charge.				
Signature of Bidder along with company seal					



PART A: INSTALLATION



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Sr. No.	Item Description	Qty.	UoM	Unit Rate of Installation in all respects, inclusive of handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Installation (Rs.)
1	LT SWITCHGEAR PANEL				
1.1	Installation, connection, testing and commissioning of following low voltage switchgear panel - floor / Wall mounted type / Control Panels as per the relevant drawings. The rates shall include installation directly on readymade trenches/Floors as indicated in drawings or location decided in the plant. Work shall include all hardware required for aligning, levelling, grouting / mounting on floor / base channel etc. Testing and setting / adjusting relays and meters, including loading/unloading of panels all labour and materials as per specifications and directions of Engineer-in-charge.				
1.1.1	New MCC for MOV, Ref. Drawing No- 322538-EIB-0003-01. Max. Dim. - 2500mm (L) x 500mm(B) x 2200mm (H) (Approx.)	1	No.		
1.1.2	Chageover Switch with SFU rated 100 Amp for FFH lighting and power distribution board with cable gland, lugs etc. SFU rating 100 amp, Changeover switch rated 100Amp, Cable termination incomer 3.5C-95 sqmm and 3.5C-35sqmm, outgoing two no.s 4C-16sqmm.	1	No.		
1.1.3	Junction Box for incoming and outgoing of cable size 3.5C-95 sqmm for extention from old fire room to new fire room to new FFH change over panel. Max. Dim. - 300mm (L) x 450mm(B) x 200mm (H) (Approx.)	1	No.		
1.1.4	Installation & commissioning of dust & vermin proof cubicle type Motor Control Centre for Fire Water pump panel. 2000mm(L)x500mm(B)x2200mm(H).	1	No.		
1.1.5	Installation & commissioning of OWS Starter panel for 5.5 kW Motor including cable connection from SLP-03/directed location.	1	No.		
1.2	Modification, connection, Termination, testing and commissioning of following low voltage switchgear panel - floor / Wall mounted type / Control Panels as per the relevant drawings. The rates shall include installation directly on floor as indicated in drawings, aligning, levelling, grouting. Testing and setting / adjusting relays and meters, including loading/unloading of panels all labour and materials as per specifications and directions of Engineer-in-charge.				
1.2.1	Lighting Feeder panel modification with Timers, Contactors & photocell Timers, Contactors & Photocells shall be added in the panel and connecting cables as per control scheme for all the desired feeders as required on site. (drawing No. 322538-EIB-0004-01).	1	No.		
1.2.2	SLP-01 modification with addition of Timers, Contactors & photocells, cables connection from photocells to contactors connecting cables as per control scheme for all the desired feeders as required on site.	1	No.		
1.2.3	SLP-02 modification with addition of Timers, Contactors & photocells, cables connection from photocells to contactors connecting cables as per control scheme for all the desired feeders as required on site.	1	No.		
1.2.4	SLP-03 modification with addition of Timers, Contactors & photocells, cables connection from photocells to contactors connecting cables as per control scheme for all the desired feeders as required on site.	1	No.		
2	STEEL STRUCTURE				
2.1	Fabrication and erection of steel structures required for base frames of switchgear, supports of push button stations, brackets for miscellaneous electrical equipment and cables and cable tray supports, with all materials including G.I. hardware and labour, as per specifications, drawings and directions of Engineer-in-charge.	2000	Kgs.		



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3	LT CABLES				
3.1	Laying & Termination (horizontally and vertically) of following types and sizes of cables on cable trays, supported on steel structures, buried in ground including excavation, back filling, sand & bricks and / or to pull-through pipes. The rates shall include fixing of aluminium number tags, Aluminium saddles / clamps, saddle bars, etc, of clamp thickness 3 mm including transportation with all labour and materials as per the specifications, drawing and direction of Engineer-in-charge. 1.1KV grade, XLPE insulated stranded Al. / Cu. Conductor, extruded PVC inner sheathed and extruded PVC -FRLS outer sheathed, round / flat steel wire armoured cables of following sizes.				
3.1.1	3.5C x 240 Sq.mm XLPE , Al. Conductor, Flat Strip armoured	275	Mtrs.		
3.1.2	3.5C x 150 Sq.mm XLPE Al. Conductor, Flat strip armoured	U/R	Mtrs.		
3.1.3	3.5C x 120 Sq.mm XLPE Al. Conductor, Flat strip armoured	U/R	Mtrs.		
3.1.4	3C x 95 Sq.mm XLPE Al. Conductor, Flat strip armoured	75	Mtrs.		
3.1.5	3C x 70 Sq.mm XLPE Al. Conductor, Flat strip armoured	U/R	Mtrs.		
3.1.6	3.5C x 50 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	50	Mtrs.		
3.1.7	3.5C x 35 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	25	Mtrs.		
3.1.8	3.5C x 25 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	U/R	Mtrs.		
3.1.9	4C x 16 Sq.mm XLPE Al.. Conductor, round wire armoured	150	Mtrs.		
3.1.10	4C x 10 Sq.mm XLPE Al.. Conductor, round wire armoured	U/R	Mtrs.		
3.1.11	3C x 6 Sq.mm XLPE Cu. Conductor, round wire armoured	150	Mtrs.		
3.1.12	4C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured	5000	Mtrs.		
3.1.13	3C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured for power	275	Mtrs.		
3.1.14	3C x 2.5 Sq.mm XLPE Cu. Conductor, round wire armoured for lighting	275	Mtrs.		
3.1.15	4C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured	100	Mtrs.		
3.1.16	3C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured Timer & Photocell cable connection	750	Mtrs.		
3.1.17	Power cable 3core x 70Sq.mm armoured Al. Conductor as required sqmm.	100	Mtrs.		
3.1.18	Control cable 4C x 1.5 sq.mm cu. armoured FRLS Cable	50	Mtrs.		
3.1.19	Control cable of required rating as required 5 nos. x 4C x 4.0 sq.mm cu. un-armoured FRLS Cable for Diesel engine control cable	100	Mtrs.		



PART A: INSTALLATION



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Sr. No.	Item Description	Qty.	UoM	Unit Rate of Installation in all respects, inclusive of handling and safe custody at site & all incidental cost. (Rs.)	Total Amount of Installation (Rs.)
4	LT CABLE END TERMINATION				
4.1	Erection of cable gland for termination of XLPE insulated armoured cables and connection of the cable leads including flameproof and weatherproof double compression type cable glands with gland cap with crimped type solderless tinned copper lugs, including cutting / stripping of cable insulation fixing of cable glands, cable tag number, crimping of the cable cores, marking with wire number ferrules, etc., including all labour and materials, as per specifications and directions of Engineer-in-charge. 1.1KV grade, XLPE insulated stranded Al. / Cu. Conductor, extruded PVC inner sheathed and extruded PVC outer sheathed, round / flat steel wire armoured cables of following sizes.				
4.1.1	3.5C x 240 Sq.mm XLPE , Al. Conductor, Flat Strip armoured	2	Nos.		
4.1.2	3.5C x 150 Sq.mm XLPE Al. Conductor, Flat strip armoured	U/R	Nos.		
4.1.3	3.5C x 120 Sq.mm XLPE Al. Conductor, Flat strip armoured	U/R	Nos.		
4.1.4	3C x 95 Sq.mm XLPE Al. Conductor, Flat strip armoured	2	Nos.		
4.1.5	3C x 70 Sq.mm XLPE Al. Conductor, Flat strip armoured	U/R	Nos.		
4.1.6	3.5C x 50 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	2	Nos.		
4.1.7	3.5C x 35 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	2	Nos.		
4.1.8	3.5C x 25 Sq.mm XLPE Al.. Conductor, Flat Strip armoured	U/R	Nos.		
4.1.9	4C x 16 Sq.mm XLPE Al.. Conductor, round wire armoured	8	Nos.		
4.1.10	4C x 10 Sq.mm XLPE Al.. Conductor, round wire armoured	U/R	Nos.		
4.1.11	3C x 6 Sq.mm XLPE Cu. Conductor, round wire armoured	6	Nos.		
4.1.12	4C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured	60	Nos.		
4.1.13	3C x 4 Sq.mm XLPE Cu. Conductor, round wire armoured for power	U/R	Nos.		
4.1.14	3C x 2.5 Sq.mm XLPE Cu. Conductor, round wire armoured for lighting	U/R	Nos.		
4.1.15	4C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured	4	Nos.		
4.1.16	3C x 1.5 Sq.mm XLPE Cu. Conductor, round wire armoured Timer & Photocell cable connection	U/R	Nos.		
4.1.17	Power cable 3core x 70Sq.mm armoured Al. Conductor as required sqmm.	8	Nos.		
4.1.18	Control cable 4C x 1.5 sq.mm cu. armoured FRLS Cable	4	Nos.		
4.1.19	Control cable of required rating as required 5 nos. x 4C x 4.0 sq.mm cu. un-armoured FRLS Cable for Diesel engine control cable.	10	Nos.		
5	CABLE TRAY				
5.1	Erection of FRP/GRP Ladder / perforated type cable tray of following sizes with all the accessories like bends, tees, reducers, elbow, joints, etc. and fixing hardware including all materials and labour, as per specifications, drawings and directions of Engineer-in-charge.				
5.1.1	600 mm wide-100mm height-4 mm thick Ladder type cable tray	100	Mtrs.		
5.1.2	450 mm wide-75mm height-4 mm thick Ladder type cable tray	U.R /	Mtrs.		



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5.1.3	300 mm wide-50mm height-4 mm thick Ladder type cable tray	250	Mtrs.		
5.1.4	200 mm wide x 50 mm height - 4 mm thick - Perforated type	U.R /	Mtrs.		
5.1.5	150 mm wide x 50 mm height-4 mm thick - Perforated type	200	Mtrs.		
5.1.6	100 mm wide x 25 mm height -4 mm thick - Perforated type	250	Mtrs.		
5.1.7	50 mm wide x 25 mm height -4 mm thick - Perforated type	25	Mtrs.		
6	LIGHTING FIXTURE				
6.1	Installation, connection and testing of following lighting fixtures with lamps sources, with the junction box provided for the point wiring, with suitable control gear box, chain for fixture, gear box, if any, including supply of all hardware. materials required for installation, labour & materials as per Tender, drawings and direction of Engineer in-charge. Vendor to provide Optional cost for Equivalent type of LED fixtures for listed below except highmast. Flameproof and Weatherproof Lighting Fixture				
6.1.1	1 x 36W, FTL flame proof & weatherproof twin tube fixture complete with integral control gear, suitable for wall / surface mounting arrangement.	U.R /	Nos.		
6.1.2	2 x 36W, FTL flame proof & weatherproof twin tube fixture complete with integral control gear, suitable for wall / surface mounting arrangement.	U.R /	Nos.		
6.2	Weatherproof Lighting Fixture				
6.2.1	1 x 36W, FTL, surface/Recess mounted type Lighting Fixture.	U.R /	Nos.		
	Optional LED Fixture for item 6.2.1	R/O	Nos.		
6.2.2	2 x 36W, FTL, surface/Recess mounted type Lighting Fixture.	U.R /	Nos.		
	Optional LED Fixture for item 6.2.2	R/O	Nos.		
6.2.3	1x150W,MHL,Weatherproof well glass light fixture with integral control gear box	12	Nos.		
	Optional LED Fixture for item 6.2.3	R/O	Nos.		
7	LIGHTING PANELS				
7.1	Installation, testing and commissioning of Prefabricated, lighting panels (MCBDBs), surface / flush mounting, double door type in dust tight, power coated enclosure and provided with four pole MCB as incomer and DP RCCB per phase (3 No.) with 100mA sensitivity (as asked for in individual item) and required No. of 10 KA breaking capacity SP MCBs for individual circuit control as outgoing feeders. The rates shall include all materials as per drawing & specification, & direction of Engineer-in-charge.				
7.1.1	Lighting cum Power Distribution Boards (LPDBs). Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.40A DP RCCBs-100mA and 4 Nos. 10A SP MCB, 5 Nos.32/40A DP RCCBs-100mA.	R/O	Nos.		
7.1.2	Lighting Distribution Board. Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.40A DP RCCBs-100mA and 4 Nos 10A DP MCBs, 17 Nos 20amps DP MCBs,1 No 32A FP MCB.	1	Nos.		
7.1.3	Emergency Lighting Distribution Board. Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.40A DP RCCBs-100mA and 3 Nos 10A DP MCBs, 6 Nos 20amps DP MCBs,1 No MPCB for 5.5 Kw.	1	Nos.		



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7.2	Installation, testing and commissioning of flameproof and weatherproof type lighting panels made of LM6 alloy surface / floor mounting provided with four pole MCB as incomer, and DP RCCB per phase (3 No.) with 100mA sensitivity (as asked for in individual item) and required No. of 10 KA breaking capacity DP MCBS for individual circuit control as outgoing feeders. The rate shall include all erection materials as per drawings, specifications and directions of Engineer-in-charge.				
7.2.1	Lighting Panels - FLP type(LPs). Incomer -25A 4 pole MCB -10 KA, Outgoing circuits -3 Nos.40A DP RCCBs-100mA and 3 Nos.10A SP MCBS -10 KA.	U.R /	Nos.		
7.2.2	Sub Power Distribution Boards - FLP type (SPDBs). Incomer - 63A 4 pole MCB -10 KA, Outgoing circuits - 3 Nos.32/40A DP RCCBs-100mA and 06Nos 20amps DP MCBS.	U.R /	Nos.		
8	INTERNAL POINT WIRING				
8.1	Point Wiring with installation as per mentioned below. All the wires should of FRLS type only. Installation ,Testing & Commissioning of Wiring of points to be done in semiconcealed/concealed/open manner in 25/32mm dia PVC Medium guage conduit. Wiring shall be done with FRLS type flexible wire of 650V/1100V. Separate pipe should be taken for circuit mains. Nos of circuit of the same phases may be taken in same conduit as per specification.The point rate shall include all the necessary piping and wiring from sub panel / Distribution board to switch board & switch board to the holder / angle holder / connector / ceiling rose all inclusive except sub panel / Dist board. The wiring shall be done as per IS 732 and IS 4648. The looping of the wiring should be done in the switch boxes or light and fan point outlet boxes to avoid the junction boxes. The junction boxes and switch boxes for the ceiling light point, fan point. Whenever pipes are required to be laid in flooring for lighting the same shall be of heavy guage.Wiring should be done as per distribtion details. Each circuit should have dedicated phase, neutral & earth wire. Contractor will have to clean boxes before drawing the wire. Average point length to be considered is 8 Mtr./point. Wire sizes to be used as under				
8.1.1	From Lighting Panel to Switchbox/ Lighting fixtures using 2.5 sq.mm wires for Phase & Neutral conductors and 1.5 Sq.mm wire for Earthing conductor (Avg length-15mtr.)	22	Nos.		
8.1.2	Circuit Wiring Between Switchboxes/lighting fixtures using 2.5 sq.mm wires for Phase & Neutral conductors and 1.5 Sq.mm wire for Earthing conductor. (Avg length-5mtr.)	25	Nos.		
8.1.3	From SPDB/ LDB to 6/16A or 2 Nos 6A , commercial modular type Power Socket using 2.5/4 sq. mm flexible wires for Phase & Neutral conductors and 1.5/2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories) (Avg length-10mtr.)	10	Nos.		
8.1.4	Circuit wiring between 6/16A or 2 Nos 6A, commercial modular type Power Socket using 2.5/4 sq. mm flex.wires for Phase & Neutral conductors and 1.5/2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories.Power Socket Unit is covered in Item No. 15.3 & 15.4) (Avg length-10mtr.)	9	Nos.		
8.1.5	From LDB to 20A Industrial Power Socket using 4 sq. mm flex.wires for Phase & Neutral conductors and 2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories.Power Socket Unit is covered in Item No. 15.3 & 15.4) (Avg length-10mtr.)	3	Nos.		
8.1.6	From LDB to 32A,3Ph, Industrial Power Socket using 4 sq. mm flex.wires for 3 Phase & Neutral conductors and 2.5 sq.mm Flex. wire for Earthing conductor (Including PVC conduits, Cover Plates and accessories.Power Socket Unit is covered in Item No. 15.2.2) (Avg length-10mtr.)	1	Nos.		
8.1.7	Ceiling fan points with electronics step type regulator (using 2.5 sq.mm. Cu. Wires)	U.R./	Nos.		



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8.1.8	Exhaust fan points (using 2.5 sq.mm. cu. wires) with 6A switch on switchbox and 6A plug socket near Exhaust Fan.	R/O	Nos.		
8.1.9	Exhaust fan points (using 2.5 sq.mm. cu. wires) with 2 way junction box(100x100mm) with termination facility near Exhaust Fan (exhaust fan installation included in head 8.2.2)	9	Nos.		
8.1.10	6A power plug points (with 2.5 sq.mm cu. wires) installed on switchboxes along with the other switches.	8	Nos.		
8.1.11	Laying of PVC insulated stranded flexible copper wires as per specifications as and directions of Engineer - in - charge.				
a	1.5 sq.mm wire	150	Mtrs		
b	2.5 sq.mm wire	150	Mtrs		
c	4 sq.mm wire	75	Mtrs		
8.2	Installation, testing and commissioning of following types of fans, including supply of all necessary supports, etc., and including all labour, materials and accessories like fixing bolts, etc., as per standard drawings, specifications and directions of Engineer-in-charge.				
8.2.1	300mm dia, 1400 rpm, 1-phase, exhaust fan.	R/O	Nos.		
8.2.2	450mm dia, 1400 rpm, 1-phase, exhaust fan.(for Fire Pump House)	9	Nos.		
8.2.3	1200mm sweep, 1-phase, 240V AC, ceiling fan	R/O	Nos.		
8.2.3	900mm sweep, 1-phase, 240V AC, ceiling fan	1	Nos.		
9	EARTHING SYSTEM				
9.1	Installation of Advance Earthing System (Maintenance free earthing system) : 60mmDiax3.0mts long,made from M.S in accordance to IS 1909 & IS 3043,along with 75 kgs.of premium Ground improving compound as per IS 3043 duly modified for excellent electrical conductivity & moisture retaining capacity.	2	Nos.		
9.2	Installation of Advance Earthing System (Maintenance free earthing system) : 14mmDiax3.0mts long,made from M.S in accordance to IS 1909 & IS 3043,along with 75 kgs.of premium Ground improving compound as per IS 3043 duly modified for excellent electrical conductivity & moisture retaining capacity.	U.R /	Nos.		
9.3	Installation, testing and commissioning of Copper / G.I. earthing loop / grid conductors / Earthing wires of following sizes along the cable trenches /cable trays / on the wall or structures / buried in ground (min.500mm depth) including excavation and back filling. Installation shall include the welding at joints and providing anti corrosive paint (black bitumen) at the welded portion and clamping using G.I. clamps and necessary hardware and materials as per standard drawings, specifications and directions of Engineer-in-charge.				
9.3.1	50 x 6 mm G.I. Strip	100	Mtrs.		
9.3.2	50 x 6 mm Cu. Strip for control room instruments earthing	U.R /	Mtrs.		
9.4.3	25 x 6 mm Cu. Strip for control room instruments earthing	U.R /	Mtrs.		
9.4.4	32 x 6 mm G.I. Strip	U.R /	Mtr.		
9.4.5	25 x 6 mm G.I. Strip	400	Mtrs.		
9.4.6	25 x 3 mm G.I. Strip	U.R /	Mtrs.		



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9.4.7	16 sq.mm Cu. PVC flexible wires	15	Mtrs.		
9.4.8	4 sq.mm Cu. PVC flexible wires	225	Mtrs.		
9.4.9	6 sq.mm Cu. PVC flexible wires	U.R /	Mtrs.		
9.4.10	50 x 6 mm G.I. Strip	40	Mtrs.		
9.4.11	35 x 6 mm G.I. Strip	65	Mtrs.		
9.4.12	25 x 6 mm G.I. Strip	60	Mtrs.		
9.5	Installation of G.I. earth bus for to club nos of joints in one place, size of earth bus is 75mm x 6mm and length of earth bus is 450mm, it shall be suitable for minimum of 12 nos of 10mm holes connection on both of the sides of bus, it shall be painted with yellow colour and details shall be as per drawings and directions of Engineer-in-charge.	2	Nos.		
10	MISCELLANEOUS				
10.1	Fixing of mechanical Anchor fasteners 12mm Ø size, in RCC Slab, RCC/Brick wall. The rate shall include all labour, material and hardware including nuts and spring washers and shall be carried out as per the instruction of Engineer-in-charge.	25	Nos.		
10.2	Installation of class-B (Medium gauge) G.I. pipes of following sizes including all accessories and hardware as per specifications and directions of Engineer-in-charge.				
10.2.1	25mm Dia	U.R. /	Mtr.		
10.2.2	40mm Dia	U.R. /	Mtr.		
10.2.3	50mm Dia	U.R. /	Mtr.		
10.2.4	65mm Dia	U.R. /	Mtr.		
10.2.5	100mm Dia	U.R. /	Mtr.		
10.3	Installation of Heavy duty PVC pipes of following sizes including all accessories and hardware as per specifications and directions of Engineer-in-charge.				
10.3.1	25mm Dia	U.R. /	Mtr.		
10.3.2	32mm Dia	U.R. /	Mtr.		
10.3.3	50mm Dia	U.R. /	Mtr.		
11.0	Installation/excavation/spreading of approved fire bricks / Concrete tiles, fine river sand in the all sort of soil for maximum depth of 1500/1000mm cable trenches including all labour also supply and installation of cement/RCC markers for routes of underground cables and for earth pits including 1Mtr. long board 150 x 150 mm size painted with yellow colour for background and black letters as per drawings and directions of Engineer-in-charge.under this item shall include disposal of surplus earth and shoring, shuttering and dewatering if required. Excavation shall be done as per directions of Engineer-in-charge.	100	M ³		
12.0	Installation of the following items including supply of necessary hardware, as per the directions of Engineer-in-charge.				
12.1.1	Shock Treatment chart complete with frame and glass	1	Nos.		



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12.1.2	First aid box	1	Nos.		
12.1.3	Sand buckets with stand (4 No. buckets in a stand)	2	Nos.		
12.1.4	Rubber hand gloves - 33kV grade	2	pairs		
12.1.5	Rubber hand gloves - 415V grade	4	pairs		
12.1.6	Supply and laying of 900 mm wide, 12 mm thick rubber floor mat of insulation level 1.1 kV.	25	Mtrs.		
13.0	Push button Station				
13.1	Install, test and commission push button stations. The push buttons shall be installed on wall/column or channel as indicated on the drawings. Installation shall include supply and installation of channel, all fixing and supporting materials frame work hardware etc. in an approved manner. Cable terminations and cables are not to be included in this item, which are measured separately.	1	No.		
13.2	Install, test and commission push button stations. The push buttons shall be installed on wall/column or channel as indicated on the drawings. Installation shall include supply and installation of channel, all fixing and supporting materials frame work hardware etc. in an approved manner. Cable terminations and cables are not to be included in this item, which are measured separately.	2	Nos.		
14	Install, test & commission following 1 ph/3 ph/non flame proof plug/flameproof plug receptacle with plug top duly interlocked with front operated rotary handle MCB isolator housed in common 14 gauge M.S. powder coated enclosure duly interconnected with plug top receptacles shall have additional earth pin and earth terminal on enclosure. Provide SS304 (2mm thk) SS304 cover on top. Installation shall include with supply of consumables, necessary accessories, hardwares, drilling, cutting, welding, painting etc., in an approved manner.				
14.1	Industrial type, Three Phase/ Single Phase flameproof				
14.1.1	32A, 415V, 5 Pin + MCB Isolator	R/O	Nos.		
14.1.2	63A, 415V, 5 Pin + MCB Isolator	R/O	Nos.		
14.1.3	16A, 240 V, 3 Pin Switch Socket Outlet	R/O	Nos.		
14.2	Installation, connection, testing and commissioning of Engineering Chemical & UV resistant, Dust & Waterproof, Plastic socket with MCB, made of polycarbonate material having interlock with MCB with ON/OFF position to prevent the plug removal in Switched ON condition and to prevent the closing of the MCB when Plug shall be in isolation condition. The Power socket units shall be of following ratings with minimum ingress protection of IP 66, including supply of necessary hardware as per specifications and directions of Engineer-in-charge. (Supply of the required structural steel covered else where in this tender)	R/O			
14.2.1	20 AMPS P + N + E	R/O	Nos.		
14.2.2	32 AMPS 3P + N+ E	R/O	Nos.		
14.3	Installation,connection ,testing and commissioning of Commercial 2 Nos.6A ,P+N+E, 5pin shuttered modular socket outlet with 1 way 6A modular switch	R/O	Nos.		



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15.0	Charges for doing liaison work for obtaining the necessary clearances from the Electrical inspector / competent Authorities for the total Electrical installation. All necessary drawings, calculations, test certificates, etc. as required by these authorities shall be obtained and furnished by the successful bidder. Any modification / rectification as required by these authorities shall be carried out by the successful bidder at free of cost. The fees required to be paid to these authorities for inspection shall be borne by Owner on production of documentary evidences.	1	Lump Sum		
16.0	Contractor to check finally with all aspect as per given scope and panel to panel relay co-ordination to be done as per actual load of respective feeder/panel.	1	Lump Sum		
Sub Total(B)					
Service Tax * % on % Sub total(B)					
Total Amount(B) (inclusive of taxes - including Freight & Insurance - FOR Site)					
Total Amount in words:					
Final Total: Total Amount (A) + Total Amount (B)					

Final Amount in Words:

Notes:

- 1 **Amount of Items with rate only (R/O) not to be considered for Total.
- 2 * If Service Tax is not applicable, then mention as "Nil".
- 3 Construction power, water, loading and boarding, Site Storage with watch and ward, receipt, unloading, shifting material to store and internal shifting to site shall be included in Vendor's scope.
- 4 The unit rates as quoted to arrive at above total price shall be firm and inclusive of all taxes, duties, levies, transportation etc. No separate payment shall be made for site mobilization / demobilization, insurance etc.
- 5 The Schedule of Rates should be read with all the other sections of the tender.
- 6 The tenderer shall be deemed to have studied the drawings, specifications and the details of work to be done within the time schedule and to have acquainted with the conditions prevailing at site. Site visit is mandatory.
- 7 The quantities shown against the various items are only indicative of the quantum of work and it may vary to any extent. Billing will be done as per actual.
- 8 The rate quoted shall be inclusive of all work as mentioned in the scope of work (Technical Specifications).
- 9 All the items of work in the schedule of rates shall be carried out as per specifications, drawings and instructions of the Engineer-in-Charge.

Signature of Bidder along with company seal