

Ref. Enquiry No.: PE/PG/PA1/E-6495/2020, Dt:26/08/2020

DUE DATE
05-Sept-2020
BY 02:00 PM

OPEN TENDER ENQUIRY THROUGH E-PROCUREMENT

Dear Ma'am/Sir,

Subject: Open Tender (Indian) Enquiry for "LIGHTING FIXTURES, LAMPS & MISC. ITEMS" as per Technical Specification No. PE-TS-434-558-E006 Rev 00 for 3 x 800 MW PVUNL PATRATU TPP PHASE-I

We are pleased to invite your offers in two parts strictly as per Clause-2.0 of GCC Rev- 07 of the enclosed instructions to bidders via E –procurement (<https://bhel.abcprocure.com>) under mentioned equipment's /system.

BHEL invites your offers for Design, Manufacture, Inspection and testing at Manufacturer's works, proper packing and delivery to site for 3 x 800 MW PVUNL PATRATU TPP PHASE-I as specified/ defined as per tender technical specification PE-TS-434-558-E006 Rev 00, amendment & agreements till placement of order for LIGHTING FIXTURES, LAMPS & MISC. ITEMS for 3 x 800 MW PVUNL PATRATU TPP on F.O.R. site /C&F (Mumbai) basis as the case may be.

Item Description – LIGHTING FIXTURES, LAMPS & MISC. ITEMS			
Sl. No.	Project	TECHNICAL SPECIFICATION NO.	Delivery completion schedule
1	3 x 800 MW PVUNL PATRATU TPP PHASE-I	PE-TS-434-558-E006 Rev 00	As per Annexure – A of NIT

Your best quotation/offer for the above requirement, in line with our terms and conditions, should be submitted online via e-procurement system. It shall be the responsibility of the bidder to ensure that the tender is submitted on or before the due date by 02:00 PM. Part-I bids shall be opened at 03:00 PM. on the due date.

Note: 1. Detailed tender documents have been uploaded at the following websites.

- www.eprocure.gov.in
- <https://bhel.abcprocure.com>
- www.bhel.com
- www.bhelpem.com

Bidders are requested to upload their best offer on <https://bhel.abcprocure.com>

2. In case you are not interested to quote, please send us the regret by mail or letter.

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Power Project Engineering Institute,
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ENQUIRY TERMS AND CONDITIONS:

1. Bidders shall upload their offers meeting the requirements of the following tender documents (enclosed) and other Terms and Conditions included in this Enquiry Letter:
 - Part-I: Techno-Commercial Bid: Comprising of technical offer, Annexure-I of GCC Rev 07, Commercial terms and conditions, unpriced copy of price bid and Annexure-II of GCC Rev 07
 - Part-II: Price Bid: Containing prices, cost of withdrawal of deviation (As per Annexure-II of GCC Rev 07), to be uploaded, strictly, as per price schedule of BHEL for complete scope of Tender enquiry.
2. Bidders shall submit their offers meeting the requirements of the following tender documents indicated in GCC (Rev. 07) and other Terms and Conditions included in this Enquiry Letter. Weblink of GCC Rev 07 shall be as below, bidders may download the GCC Rev 07 from the given weblink and go through the same before quoting: - <https://www.bhelpem.com/Documents/GCC/GCCRev07.pdf>
3. Bidders to note that following form the part of tender documents:
 - a. General Conditions of Contract (GCC) Rev 07 comprising of: Instructions to Bidders and General Commercial Terms & Conditions
 - b. Technical Specifications.
 - c. Technical PQR, financial PQR
 - d. SCC Rev 00.
 - e. Enquiry terms & conditions
 - f. Performance Bank Guarantee format.
 - g. NTPC Sub-Supplier Questionnaire.
 - h. Integrity Pact(IP)-Annexure V
 - i. Annexure- A,III,IV&V
4. Any hidden conditions/deviations mentioned elsewhere in offer and standard pre-printed terms & conditions of the tenderers shall not be considered valid.
5. Tenders shall be submitted strictly in accordance with the requirements of the above mentioned tender documents. Deviations (Technical as well as Commercial), if any, shall be listed out separately in Annexure-II of GCC Rev-07 along with reasons for taking such deviations. Any deviations (Technical as well as Commercial) not mentioned in the Annexure-II shall not be considered. Bidders to note all the points mentioned in “Notes” of Annexure-II to GCC Rev.07.
6. Bidder has to submit “NO DEVIATION CERTIFICATE FOR COMMERCIAL TERMS AND CONDITIONS as per General Conditions of Contracts (GCC, Rev.07), Special Conditions of Contract and Notice Inviting Tender (NIT)” in case of no deviations.
7. Standard pre-printed terms & conditions of the tenderers shall not be considered valid.

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ou=BHEL PS PEM Noida,
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8. If any bidder has mentioned the term Not Applicable / not required / not quoted in BHEL price format, the same to be substantiated by the bidder. If such item is required to be supplied for system completion in future, same will be supplied free of cost by Vendor.
9. In case there is no change in the technical scope and / or specification and / or commercial terms and conditions, the bidder/s shall not be allowed to change his / their price bids after the due date within the validity period.
10. Any other taxes & Duties applicable on the date of bid not quoted by the bidders shall be to bidder account.
11. Purchaser shall be under no obligation to accept the lowest or any other tender and shall be entitled to accept or reject any/all tender(s) in part or full without assigning any reason whatsoever.
12. Tenderers must enclose the Quality Plan in the prescribed format, for approval. Equipment will be despatched only after Purchaser's/Owner's inspection at the hold points specified in the approved Quality Plan and issue of Material Despatch Clearance Certificate (MDCC).
13. Offers should be submitted separately in two parts online through e-procurement system only, however, all correspondence thereof, shall be addressed to the undersigned by name & designation and sent at the following address:

SHASHANK SHEKHAR, DY. ENGR, PG-III M/s. Bharat Heavy Electricals Ltd., Project Engineering Management, Power Project Engineering Institute, HRD & ESI Complex, Plot No 25, Sector-16 A, Noida-201301, U.P. E-MAIL: shashankshekhar@bhel.in Ph. No. 120-436-8842	GAURAV GARG, Dy. MGR., PG-III M/s. Bharat Heavy Electricals Ltd., Project Engineering Management, Power Project Engineering Institute, HRD & ESI Complex, Plot No 25, Sector-16 A, Noida-201301, U.P. E-MAIL: gauravgarg@bhel.in Ph. No. 120-436-8754 Email: gauravgarg@bhel.in
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14. IMPORTANT INSTRUCTION TO BIDDERS IN CASE OF REVERSE AUCTION

The Bidders has to quote the Single Price (i.e. Total Cost to BHEL i.e. Grand total FOR site excluding GST) in Reverse Auction. Price are to be inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, Freight charges, Insurance charges (if applicable), Cost of withdrawal (if any), including loading (if any), De-loading (if any) shall be done in line with NIT terms. Reverse auction details and guidelines shall be as per GCC Rev 07.

Link for RA guidelines to be followed as:

http://www.bhel.com/vender_registration/pdf/Guidelines%20for%20Reverse%20Auction-2020.pdf

Note:- Prices for supervision of E & C are firm and same are not considered for evaluation during reverse auction/PBO. Unit rate for item Sl. No. 1.1 (charges per visit) & 1.2 (mandays charges) of supervision of E & C BOQ are Rs. 20,000/- and Rs. 5000/- respectively. Separate PO will be placed

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for supervision of E & C based on above unit rates and quantity as mentioned in BOQ with prevailing GST.

15. Bidder to note that this is a Conditional Open Tender enquiry and the price bid (Part-II) opening/RA participation shall be subject to following conditions: -

- Techno-commercial qualification/ recommendation of bidder by BHEL-PEM.
- Approval of bidders by customer: -Approval shall be taken up by BHEL with customer based on the credentials/ reference list. Hence, Bidders are requested to submit the following (as part of their credentials) on or before Part-I opening: -
- Reference list indicating P.O. details, Customer name, P.O. date, execution date etc.
- Performance certificate issued by the clients.
- Filled NTPC's Main & Sub-supplier questionnaire (enclosed with enquiry) and submit all the supportive documents against details furnished therein (signed & stamped on each page).
- In line with clause No. 2.3 of GCC Rev, 07
- Pre-Qualifying Requirements: - Bids of only those bidders shall be evaluated who meet the Technical & Financial pre-qualifying requirements. Credentials of all the techno-commercially acceptable bidders shall be submitted to NTPC for their acceptance.

16. For registration in BHEL PEM – Online registration portal is operational; Non-registered Vendors who wish to apply for registration in BHEL-PEM can apply through Online Registration Portal available www.bhelpem.com at vendor section Online Supplier Registration. All credentials and/or documents duly signed and stamped related to registration has to be uploaded on the website and submit the application for registration. One set of hard copy of the filled-up SRF downloaded from Online Registration Portal duly signed and stamped has to be submitted. Above shall be part of NIT.

17. Integrity pact (IP) shall be applicable for subject tender enquiry and bidders to note the following w.r.t to IP:-

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. A panel of Independent External Monitors (IEMs) have been appointed to oversee implementation of IP in BHEL.

The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory who signs in the offer) along with techno-commercial bid. Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

Details of IEM for this tender is furnished below:

1. Shri Arun Chandra Verma, IPS (Retd.) Email:-acverma1@gmail.com	2. Shri Virendra Bahadur Singh, IPS (Retd.) Email :-vbsinghips@gmail.com
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b) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to the IEM mentioned in the tender.

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Note: No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department

For all clarifications/ issues related to the tender, please contact:

Name: SHASHANK SHEKHAR/GAURAV GARG

Deptt: PG-III

Address: BHEL -PEM Noida-201301

Phone: (Landline/ Mobile): 0120-436 8842/ 8754 / 9711879415

18. Payment terms shall be as follows: -

a) For Main Supply including E&C spares: -

Payment of basic price of material supplied, along with freight and GST shall be paid against receipt of material at site on pro-rata basis. 15% of basic price of materials supplied will be retained as security deposit which will be released on pro-rata basis as per details below: -

Ten percent (10%) will be released on pro-rata basis after submission of Material Receipt Certificate (MRC) from project site engineer of Owner/ Purchaser. For obtaining MRC from project site/ owner, vendor shall depute their representative to project site. Packages shall be opened at site in presence of vendor representative for verification of material supplied. If any material found damaged/short supplied during verification, then vendor shall be responsible for replenishment.

Five percent (5%) will be released after submission of As Built drawings prepared by vendor subsequent to inspection of installation, handover of installation and receipt of "as built markup" drawings from site. BHEL site engineer shall arrange for joint inspection of the installation by purchaser's and customer's representative for completeness and correctness of the work. In case of any defect pointed out during such inspection, revised drawing (s) for corresponding design of lighting system shall be promptly issued by vendor. Vendor shall be responsible for their design till completion of work and handing over to end client.

b) For Supervision of E&C: 100% payment shall be released after successful completion of the activity on Site certification.

c) For Mandatory Spares: As per clause no. 9.1 of GCC Rev 07.

19. A pre bid meeting will be organised one (01) week before techno commercial bid (Part- I) through online mode (details of same shall be shared separately) to facilitate fast ordering by addressing any issues (if any) of the bidders. Accordingly, all bidders are requested to please attend the meeting to address their respective pre bid queries (if any). Any pre bid queries raised after pre meeting shall not be envisaged (except in case any pre bid query is left unresolved in pre bid meeting).

20. All Indian Bidders have to quote freight charges in percentage of their quoted Total Ex-works prices.

21. Percentage of freight quoted by techno- commercial accepted bidders in subject tender shall be used to calculate freight factor at the time of Reverse Auction/Price Bid opening for evaluation purpose. (Bids with freight quoted as NIL/Inclusive/NA shall be excluded in calculation of average freight)

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22. Delivery Schedule: As per enclosed Annexure-A to NIT.
23. Overall (%) variation in contract value: The variation on overall package value due to changes in the scope shall be limited 0% (NIL) which will prevail over the quantity variation clause no. 6.0 of General Commercial Terms & Conditions of GCC, Rev.07.
24. Evaluation will be done on L1 (Total cost to BHEL excluding GST) basis.
25. Pre-Qualifying Requirement:

Bidders are requested to furnish the details as per "TECHNICAL & FINANCIAL PRE-QUALIFYING REQUIREMENTS" (enclosed with the enquiry document). Along with the offer, bidders to furnish all legible & valid documents required as per Technical & Financial PQR. The same shall be properly co-relating with respective clause of PQR. Bids of only those bidders, who meet the Technical pre-qualifying requirements, shall be evaluated.

Bidders to ensure that Third party/customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document/certificate issuing authority such as name & designation of Issuing Authority and its organisation contact number and e-mail Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.

26. "This item/Package/System falls under the list of items defined in Para 3 of Ministry of Finance guideline dated 20.09.2016 (procurement of items related to public safety, health, critical security, operations and equipment etc) & hence criteria of prior experience/ turnover shall be same for all the bidders including start-up/ MSME."
27. No CIF is available for this package.
28. PVC is not applicable for this package.
29. Bidders to note:
BHEL shall be finalizing this tender through Reverse Auction Mode. Vendor to quote suitably.
30. Bid should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure, or overwriting shall be valid only if they are attested under full signature (s) under of person (s) signing the bid else bid shall be liable for rejection". Price should be mentioned in figure & words also.
31. If any bidder uploads price bid in the unpriced section (techno-commercial attachment page) of the tender in e-procurement, in that case bidder(s) shall only be responsible for such mistake and any consequences thereof. Hence all bidders are requested to be more careful at the time of uploading the Unpriced and Price Bid for Part-I and Part-II respectively to avoid mismatch.

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32. All corrigenda, addenda, amendments, time extensions, clarifications etc. to the tender will be hosted on BHEL websites only (www.bhelpem.com, www.bhel.com & https://bhel.abcpocure.com) under subject tender reference. Bidders may go through the Sellers' manual & Help documents provided on E-Procurement Portal website & obtain required Digital Signature Certificate for participating in the subject Tender. For Bidders' convenience, the Helpdesk Nos. of E-Procurement Portal are also attached along with this NIT (File name – Annexure H Instruction regarding E- procurement).
33. All the tender documents shall automatically become a part of the Order/Contract after its finalization.
34. In case of joint bidding, Bidders shall be required to furnish scope matrix which should be clearly defined between foreign bidder and their Indian representative along with the offer for the Main Supply and Erection & Commissioning.
35. Subject package is not divisible in nature, purchase preference shall be 20% and minimum local content is 100%.

Compliance of model clauses as provided in Annexure-III of Ministry of Finance Order (Public Procurement No. 1), F.no.6/18/2019-PPD issued on 23.07.2020 (Restrictions under Rule 144 (xi) of the GFR,2017) shall be applicable for subject tender. Model Certificates provided in same Annexure-III shall also be complied. Further, relevant clause of order no. 25-11/6/2018-PG dated 02.07.20 issued by MoP shall also be complied.

35. In line with PPP-MII circular Public Procurement (preference to make in India), order 2017 Rev dated-04.06.2020:
"For this procurement, the local content to categorize a supplier as a Class I local supplier / Class II local Supplier / Non Local supplier, is as defined in Public Procurement (Preference to Make in India) Order dated 04.06.2020. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before finalization of PO against this NIT.
It is clarified that only Class I local supplier is eligible for Purchase Preference as per the stipulations laid down in the Public Procurement (Preference to Make in India) Order dated 04.06.2020. "
- Min. local content shall be as defined in the para 5 and 2 of the PPP-MII order No. P-45021/2/2017-PP (BE-II) dtd 04/06/20.
- Margin of purchase preference shall be as given in the para 6 of PPP-MII order No. P-45021/2/2017-PP (BE-II) dtd 04/06/20.
- Procedure for preference to Make in India shall be as given at Para 3A of PPP-MII order No. P-45021/2/2017-PP (BE-II) dtd 04/06/20 as applicable for case where the tendered package is divisible.
- It is to note that this is not a Global Tender.
In case L1 bid is not from a Class-I local supplier and Class-I local suppliers found within the margin of purchase preference then further counter-offering for 50:30:20 as mentioned at point no. 5 & 6 shall not be applicable.

However, if L1 bid is from Class-I local supplier or Class-I local supplier(s) is/are not in the range of margin of purchase preference then further counter-offering for 50:30:20 shall be applicable as

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mentioned at point no. 5 & 6. Vendors to note that above Make in India clause will supersede clause no 26 of "Instruction to Bidders" of GCC Rev 07.

36. Following shall be made part of NIT regarding verification of local content-
The supplier at the time of tender, bidding or solicitation shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) that the item offered meets the minimum local content, in accordance with para 9 (b) of PP-MII order revision dated-04.06.2020
37. In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders. In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss / draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s). Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.
38. MSME/Start up Vendors to submit applicable documents along with their offer for availing the benefits as per GOI guidelines. Further BHEL-PEM is already registered with RXIL(TReDS) Platform. Bidders are requested to get registered with RXIL(TReDS) Platform to avail the facility as per GOI guidelines.
39. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL website <http://www.bhel.com>.
40. The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.
41. Digital Signature: Bidders participating in subject tender will necessarily have to buy class III DSCs (Digital Signature Certificate) issued by the certifying authorities in India. Basic procedure /checklist is uploaded on www.bhel.com for participating in subject tender enquires through e procurement.
42. BHEL Conciliation Scheme 2018 shall be made a part of the contract as per the provisions of the scheme and same is available at following link:
http://www.bhel.com/bhel/index.php/story_details?story=211&heading=BHEL%20Conciliation%20Scheme%202018.
43. MSE bidders are required to declare Udyog Aadhar Memorandum (UAM).
44. All the terms & condition of SCC Rev. 00 of Project, NIT, GCC (Rev-07) and Technical Specification shall be applicable for subject package.
45. Detailed offers are to be uploaded including the following along with the Price schedule as per BHEL format enclosed with NIT: -

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- Acceptance of GCC Rev-07.
 - Acceptance of Special Conditions of Contract (SCC Rev. 00) for the project.
 - TECHNICAL Pre-Qualifying Requirement (PQR) & FINANCIAL PQR
 - Technical & Commercial Deviations, if any alongwith Cost of withdrawal. – To be filled in DEVIATION SHEET (COST OF WITHDRAWAL) format provided in e-procurement portal in bidding form only.
 - Along with your offer, please submit a copy of this letter duly signed & stamped on each page as token of acceptance of terms & instructions conveyed.
 - Un-Priced price format duly filled in ‘Quoted’ or ‘Q’ in each column/row. - To be filled in e-procurement portal in bidding form only.
 - Filled Format of Certification regarding Local content (annexure –III).
 - NTPC Sub-Supplier Questionnaires.
 - Integrity Pact (Annexure-V)
- ❖ Please contact BHEL (via mail or phone) for any clarification (technical or commercial) at least one week before the due date (Techno-Commercial bid opening).
- ❖ Please note all correspondence from BHEL-PEM before part – I opening, shall also be part of NIT.

Thanking you,
Yours faithfully,

For and on behalf of BHEL-PEM

GAURAV GARG
(Dy. MGR./PG-III/BHEL-PEM)

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Enclosures:

- a) Enquiry Terms & Conditions
- b) Technical Specifications no. PE-TS-434-558-E-006 (REV. 00).
- c) SCC (Rev. 00)
- d) TECHNICAL Pre-Qualifying Requirement (PQR) & Financial PQR.
- e) Annexure-I to Price Schedule (to be filled in bidding form in e-procurement portal only).
- f) Delivery completion cum Drawings/documents submission Schedule (Annexure –A).
- g) Annexure-II to cost of withdrawal of Deviations (to be filled in bidding form in e-procurement portal only).
- h) Annexure-III to Format for self-certification regarding local content.
- i) NTPC Sub-Supplier Questionnaires.
- j) Annexure -IV to instructions to packing list
- k) BHEL PEM GCC (Rev. 07) can be referred on link: <https://www.bhelpem.com/gcc.as>
- l) Integrity Pact (Annexure-V)

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PROJECT: 3 X 800 MW PATRATU STP
ANNEXURE – A TO NIT DELIVERY SCHEDULE FOR LIGHTING FIXTURES, LAMPS & MISC ITEMS
 Ref. Enquiry No.: PE/PG/PA1/E-6495/2020

Sl. No.	BHEL Drawing No	Drawing Title	Primary /Secondary	BHEL Inputs	Drg Sch for Vendors	Delivery Terms for Supply Portion incl. E & C Spares and Mandatory Spares	Delivery terms for Supervision of E & C
1	PE-V0-426-558-E101	OGA of equipments such as fixture, SBs, JB, Receptacles, free standing ladder, Emergency exit sign, wheel mounted ladder, ceiling fans, ELU, etc.	Primary		R-0 within 28 days from lot clearance of released items & subsequent revisions within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.	For Lot-1: Within 4 months from the approval of last applicable primary drawing/document for the released items in lot-1, subjected to drawing/document submission/re-submission schedule as stipulated, delay in initial submission (if any) of last submitted applicable primary drawing/document and/or delay in re-submissions of last applicable approved primary drawing/document (with reduction of overlapping period) shall be reduced from delivery period of four months. Delay in BHEL's comments/approval of last applicable approved primary drawing/document beyond 18 days shall also be considered for delay analysis.	Demonstration at site by vendor (Supervision of E & C):- Vendor to depute its service engineer for respective site activity within 15 days from BHEL's intimation (for deputing service engineer) for such site activity. For delay in deputing service engineer, LD on site activities portion shall be applicable @ 1/2% of the total site activities portion contract value (excluding element of taxes) per week or part thereof, with applicable GST. However, total LD (supply + site activities) shall be limited to 10% of cumulative total contract value excluding taxes and freight (supply + site activities).
2	PE-V0-426-558-E102	Datasheet of lamps, CFL, Fluorescent tube, PVC coated conduit	Primary				
3	PE-V0-426-558-E901	MQP FOR LUMINARIES	Primary				
4	PE-V0-426-558-E905	MQP FOR MISCELLANEOUS ITEMS	Primary				
5	PE-V0-426-558-E201	Lighting design Calculation	Secondary		R0 submission within 3 weeks from the date of BHEL input drawing & re-submission within 15 days of BHEL comments. BHEL shall furnish comments / approval on each submission within 18 days from receipt.		
6	PE-V0-426-558-E301	Lighting Layout	Secondary				
7	PE-V0-426-558-E401	Conduit Layout	Secondary		R0 submission within 15 days from the approval of respective LLOs & re-submission within 15 days of BHEL comments.		
8	PE-V0-426-558-E103	MOUNTING ARRANGEMENT OF BULK HEAD FIXTURE	Secondary		Along with respective OGA		
9	PE-V0-426-558-E104	TYPE TEST REPORTS FOR LIGHTING FIXTURES	Secondary		Within 2 months from lot clearance for applicable items		
10	PE-V0-426-558-E105	FIELD QUALITY PLAN OF LIGHTING FIXTURES	Secondary		Within 3 months from PO		
11	PE-V0-426-558-E106	MOUNTING ARRANGEMENT drgs.	Secondary		Along with respective OGA		

Notes:-

- (i) The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.
- (ii) The delivery conditions specified are for contractual LD purposes, however BHEL may ask for early deliveries without any compensation thereof.
- (iii) Non-applicable drawings shall be decided during execution of the package.
- (iv) Wherever schedule of drawings/documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT.

Letter head of CA/ Statutory auditor / Cost auditor (>Rs. 10 Cr value)

Ref:

Date:

To,

Bharat Heavy Electricals Limited

PEM, PPEI Building, Plot No 25,

Sector -16A, Noida (U.P)-201301

Subject: - Certification regarding local content

Reference: Tender Enquiry No-.....

Name of Package:

Dear Sir,

We hereby certify that items of(package name).....for.....(Project Name/Rate Contract).....offered by M/s(bidder's name)..... having its registered works at has local content of%.

Further, M/s(bidder's name)..... meets the requirement of minimum local content in line with clause no..... of NIT no..... dated..... and the Public Procurement (Preference to Make in India), Order 2017 dated-15.06.2017, 28.05.2018 & 29.05.2019.

Thanking You.

For (CA/Cost Firm Name with FRN & Seal)

Chartered/Cost Accountants

(name of Member)

(Membership no.)

(UDIN no.)

ANNEXURE– V TO NIT(PE/PG/PA1/E-6495/2020)
INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at “BHEL House”, Siri Fort, New Delhi – 110049 (India) hereinafter referred to as “The Principal”, which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as “The Bidder/ Contractor” which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal’s employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary

contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/ PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 – Disqualification from tender process & exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors". framed by the Principal.

Section 4 – Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-contractors

6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain

responsible for any default by his sub-contractors.

6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 – Criminal Charges against violating Bidders / Contractors / Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 –Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non-disclosure agreement.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations! views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal! administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organization.

8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code! Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.12 The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty! guarantee etc. should be outside the purview of IEMs.

9.2 If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 – Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders/ contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place-----

Date-----

Witness: _____
(Name & Address) _____

Witness: _____
(Name & Address) _____

**GAURAV
GARG**

Digitally signed by GAURAV GARG
DN: c=IN, o=BHARAT HEAVY ELECTRICALS
LIMITED, ou=BHEL PS PEM Noida,
postalCode=201301, st=Uttar Pradesh,
2.5.4.20=37201253cc3093e3418f9233c0c00e
12c63e4baab294af27bd026c6b772360e7,
cn=GAURAV GARG
Date: 2020.08.26 08:38:18 +05'30'

**3X800 MW PVUNL PATRATU TPP PHASE-I
LIGHTING FIXTURES, LAMPS AND MISC. ITEMS**

ANNEXURE -IV TO INSTRUCTIONS TO PACKING LIST

For faster verification of bills, successful bidder to submit detailed Bill of Material (BOM) at the time of drawings/ documents submission after placement of PO. Each item of the BOM to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all items which will find separate mention in the packing list are covered in this detailed BOM.

Supplier to also give the following undertaking in the BOM:

“The BOM provided herewith completes the scope (in content and intent) of material supply under PO No. Dated Any additional material which may become necessary for the intended application of the supplied items/package will be supplied free of cost in most reasonable time.

Packing List must indicate:

- a) Packing size
- b) Gross weight and net weight of each package
- c) Contents of the package with cross reference to BOM item code no. / Sl. No.
- d) Quantity of each items separately.

The packing list must cover all the BOM items.

Supplier to give following undertaking in the packing list:

The Packing list provided herewith is as per BOM approved under PO No. -----



PEM / PG-III, BHEL, Noida

SPECIAL CONDITIONS OF CONTRACT (SCC) Rev-0

3 x 800 MW PVUNL PATRATU TPP PHASE-I (Job No. 434)

These Conditions shall be read and construed along with General Conditions of Contract (GCC) rev.06 & GST related Corrigendum to GCC rev.06, to be enclosed along with the tender enquiry. In case of any conflict or inconsistency, the conditions given in SCC shall prevail over the GCC and its corrigendum.

Sl No.	Title	Description
1.	Project Name	3 x 800 MW PVUNL PATRATU TPP PHASE-I (EPC)
2.	Nature of project & Type of Bidding	Non-Mega & ICB (International Competitive Bidding)
3.	Customer Order Ref No	01/PVUNL-CS-9585-001-2/NOA-FC dated 08.03.2018 01/PVUNL-CS-9585-001-2/NOA-SC dated 08.03.2018 01/PVUNL-CS-9585-001-2/NOA-TC dated 08.03.2018
4.	BHEL's Customer	PATRATU VIDYUT UTPADAN NIGAM LIMITED (subsidiary of NTPC Limited in joint venture with JBVNL)
5.	PVUNL GST No.	20AAICP3718K1ZH
6.	Customer Consultants	No consultant
7.	Consignee Address (Bill To)	For supply package: BHEL, Power Sector-Project Engineering Management, Power Project Engineering Institute, Plot No. 25, Sector-16A, Noida, Uttar Pradesh-201301. GSTIN: 09AAACB4146P2ZC For turnkey packages (where BHEL-PEM will issue only the LOA and Purchase Order shall be issued by BHEL-PSWR): Construction Manager, BHEL site office, Patratu Vidyut Utpadan Njigam Ltd , PO: PTPS , Patratu , Ramgarh , Jharkhand - 829119 BHEL PSWR GSTIN No.- 27AAACB4146P1ZF
8.	Delivery Address (Ship To)	Construction Manager, Bharat Heavy Electricals Limited, Patratu Vidyut Utpadan Njigam Ltd, PO: PTPS , Patratu , Ramgarh , Jharkhand - 829119
9.	BHEL Site Office Address	Construction Manager, Bharat Heavy Electricals Limited, Patratu Vidyut Utpadan Njigam Ltd , PO: PTPS , Patratu , Ramgarh , Jharkhand - 829119
10.	Location of Plant	Site is Located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line. District: Ramgarh (state- Jharkhand) Next big cities to site: Ranchi Nearest Railway Station: - Patratu Nearest Airport: Ranchi (45 km by road from site)
11.	Mode of Dispatch	Air, Road, Rail & Sea Transportation For indigenous supplies: By Rail/Road on door delivery and freight pre-paid basis. For imported supplies: On C&F basis. Transit Insurance will be in BHEL scope
12.	Road Permit /E-waybill	Road Permit / E-way bill, to be arranged by Supplier/ transporter/ BHEL (as per GOI mandate).
13.	BHEL GSTIN Details	For supply packages: BHEL-PEM is registered in the State of Uttar Pradesh with GSTIN 09AAACB4146P2ZC

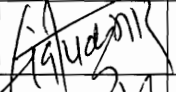
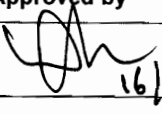
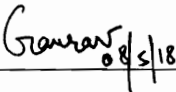
Gaurav 08/5/18

		For Turnkey packages: BHEL PSWR GSTIN No.- 27AAACB4146P1ZF
14.	Transit Insurance	<p>In BHEL Scope.</p> <p>For each dispatch, vendor shall inform the following to the Underwriter under intimation to BHEL-PEM and BHEL Site office:</p> <ul style="list-style-type: none"> (i) Policy No. (ii) Consignee Name. (iii) Consignment Details (items with their weights and value (in INR). (iv) Project Name and P.O. No. (v) LR No. and date, Dispatch origin and destination details, Invoice No. <p>Vendors to intimate the underwriters quoting the insurance Policy No. as mentioned in Purchase Order.</p>
15.	Dispatch intimation	<p>Yes in writing, Not less than 30 (Thirty) days prior to date of shipment and dispatch details to be sent to:</p> <p style="padding-left: 40px;">BHEL Site office (As mentioned in Sl. No. 9) BHEL PEM Noida (As mentioned in NIT)</p> <p>At the point of dispatch, vendor must furnish docs required as given below through Email / Fax</p> <ul style="list-style-type: none"> i. Vendor's invoice ii. LR / RR / GR / Courier Receipt iii. Packing List/ Challan indicating the items dispatched (with their weights) iv. Insurance intimation letter informing the underwriters about the dispatches v. MDCC (of BHEL / NTPC) as applicable vi. Photograph of packing / boxes showing dispatch marking as per Sl. No. 26
16.	Document required for Vendor's payment.	<p>For materials originating from Indian territory</p> <p>For claiming the payment against dispatch, MRC & Freight, documents as mentioned in GCC rev 06 & its corrigendum shall be submitted by vendor to BHEL. Original money receipt must be submitted for Freight payment.</p> <p>Packing List must comply to Clause No. 19.3 of General Commercial Terms & Conditions of GCC rev.06. Description of items in packing list shall be as per PO such that proper correlation between PO & packing list must be furnished.</p> <p>Soft copy of documents for claiming payment shall be submitted by vendor as advance copy.</p> <p>For materials originating from non-Indian Territory</p> <p>Three (3) original and Three (3) copies of clean bill of lading or One (1) clean original Airway Bill & Three (3) copies, in case of air freight.</p> <p>One (1) original and Three (3) copies of signed Invoices</p> <p>One (1) original and Three (3) copies of Packing List (clearly showing number of packages, gross weight and net weight).</p> <p>Three (3) copies of certificate of country of origin.</p> <p>Copy of MDCC from BHEL / NTPC (as applicable)</p> <p>Three (3) copies of inspection certificate, if any, issued by the customer/his authorized representative.</p> <p>Three (3) of certificate from the vendor to the effect that drawings and catalogues for customs clearance purpose have been kept with the packages for shipment.</p> <p>Three (3) copies of certificate from the vendor to the effect that the contents in each case are not less than that entered in the invoices and guaranteed as new and as per the relevant technical specifications.</p> <p>Shipping Specification – One (1) copy.</p> <p>Quality Certificate – One (1) copy.</p> <p>Approved Test Certificates, if any. - Three (3) copies.</p> <p>Guarantee Certificate – One (1) Original + One (1) copy.</p>

		Inspection Reports – One (1) Original + One (1) copy. PVC Calculation and copy of all applicable indices, if PVC applicable. – Two (2) copies.
17.	Material Receipt Certificate (MRC)	A) For supply packages- BHEL-PEM will arrange MRC from BHEL site B) For Turnkey (Supply + Erection & Commissioning) – Original MRC duly signed by customer (PVUNL) & BHEL site is to be arranged by Vendor.
18.	Buyer and Paying Authority	For packages where PEM will issue the Purchase Order: BHEL PEM will be the paying authority. For packages where BHEL-PEM will issue only the LOA and Purchase Order shall be issued by BHEL-PSWR: BHEL Patratu Site will be the paying Authority.
19.	Demurrage charges	Demurrage charges shall be paid by supplier/ vendor only to the transporter. No claim shall be acceptable to BHEL in this regard.
20.	Unloading, Storage & Movement of material at site	a) By BHEL site office for supply packages. b) By vendors for Turnkey i.e. Supply and E&C packages
21.	Concessional custom duty against Essentiality certificate (EC)	The project has been qualified through Project Import route. Accordingly, the benefits applicable to PI project would be granted for this project In this regard applicable documents such as Essentiality certificate will be issued by NTPC (ultimate customer). Under this, Concessional rate of Customs Duty shall be applicable on the Import Contents of the supplier respectively. Based on the above EC, Customs Duty Benefits will be passed on to the vendor. The Bidder to indicate the Import contents i.e. list of the item, Currency of Import and Country of Import including CIF value in their offers. BHEL shall inform, the availability of CIF value for a particular package, if any, at the time of NIT. The benefits availed in Concessional Customs Duty must be passed on to BHEL in their offer. Vendor shall inform BHEL and provide the necessary documents to obtain required certificates from BHEL to avail exemption. Obtaining custom duty benefit in line with the Essentiality Certificate issued shall be in vendor's scope.
22.	Taxes & Duties (For Domestic Vendor)	As per General Conditions of Contract (GCC rev 06) & GST related Corrigendum to GCC rev.06
23. a	Taxes & Duties (For Order Directly to Foreign Bidders)- supply packages	In case of foreign vendors, quoted prices & Dispatches shall be on C & F (Port-Chennai) basis and the Taxes & duties in the country of dispatch shall be borne by Foreign vendor.
23. b	Taxes & Duties (For Order Directly to Foreign Bidders)- Turnkey packages	Complete responsibility of import including (but not limited to) import clearance, all taxes and duties in the country of export (origin), all taxes and duties in India shall be to vendor's account.
24.	Inspection Agency	BHEL/ BHEL approved 3rd party inspection agencies and/or NTPC/ Customer Agency as applicable.
25.	Inspection procedure for Domestic supplies	<u>For Domestic supplies</u> Vendor shall raise inspection call at least 15 business days in advance on BHEL CQS website to applicable inspection agency (as mentioned in PO/LOI or to be informed later) and submit copy of inspection call to BHEL-PEM for arranging NTPC inspection/Joint inspection on the proposed date, as applicable. MDCC shall be issued on the basis of clear inspection report (CQIR). <u>For Foreign supplies</u> In case of Foreign supplies, if NTPC approved 3rd party inspection agency does not participate in the inspection, test certificates & inspection reports duly accepted by the agreed Inspection agency shall be submitted in soft copy to BHEL-PEM. The same shall be reviewed by PEM and then, sent to NTPC for clearance. The dispatch clearance (MDCC) by NTPC/ BHEL as applicable shall be given to the foreign supplier or representative in India after acceptance of above test certificates.

Grantar
08/5/18

26.	Packing, Identification & marking [if not specified in NIT]	<p>Each box shall be marked with Capital Letters in "Red" indicating the PEM SUPPLY (Main Supply/ Commissioning Spares/ Mandatory Spares) for 3 x 800 MW PVUNL PATRATU TPP.</p> <p>NOTE: Main supply item and items for commissioning spares must be packed separately. Each package delivered under the Contract shall be marked by supplier and such marking must be distinct and in English language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and address of consignee, the Gross weight and Net weight of the package, the name of the Supplier, PEM P.O. reference number, with a distinctive number of mark sufficient for purposes of identification. Besides above necessary, packing shall bear a special marking 'TOP', 'BOTTOM', 'DO NOT TURN OVER', "KEEP DRY", "HANDLE WITH CARE", etc</p> <p>IMPORTANT: -</p> <ul style="list-style-type: none"> • Two copies of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package / container for immediate reference by BHEL site and same shall be reflected in packing slip also • The Packing list details for the consignment must be put inside the Box/Boxes. <p>Items like pumps, Valves, Hoists, Cranes etc shall essentially have O&M Manuals and E&C guidelines duly enclosed in the packing box. Certificate to such effect shall also be reflected in packing slip.</p> <p>Mandatory spares shall be properly packed separately in separate box painted in Red, indicating Mandatory Spares in bold letters and each spare shall be properly tagged giving details i.e. item number of the equipment in line with the CUSTOMER approved BBU for Mandatory spares & Number per item (to match the description given in the packing slip) to facilitate their proper identification by PVUNL/ NTPC. One Copy of Packing list must be put inside the Box along with Manufacturing drawing no. reference, Catalogue reference etc.</p>
27.	Submission of Final Drgs/Docs alongwith O&M Manual, Type Test Certificates (if any)	As per GCC rev.06/ Technical Specification/Kick-off meeting.

	Prepared by	Checked by	Reviewed by	Vetted by	Approved by
Name	Ganwan Garg	/		/	 16/05/18
Designation	Sr. Engr/ PG III	DGM/ PG III	DGM/ PG III	Finance	AGM & DH/ PG III
Signature	 08/5/18				DEEPAK GUPTA



PRE - QUALIFYING REQUIREMENTS

ENQUIRY NO:

PROJECT :

3 X 800 MW PVUNL PATRATU TPP PHASE-I

PACKAGE:

LIGHTING FIXTURES,LAMPS AND MISC ITEMS

CRITERIA FOR EVALUATION - FINANCIAL :

	Amount (in Rs.)
Average annual financial turnover during the last Three Financial Years should not be less than	Rs.5,51,00,000.00
Rupees Five Crore Fifty One Lakh(s) Only	

Notes:-

a) The bidder has to submit financial accounts (audited, if applicable comprising of Audit report, Balance Sheet, Profit & Loss A/c Statement and Notes/Schedules pertaining to Turnover/Sales/Revenue), for last three years (or from the date of incorporation, whichever is less) as on tender due date to review the above criteria. In case the incorporation of vendor is less than 3 years, average annual financial turnover shall be calculated based on available information as below:-

i) If the accounts are available for ≤ 1 Financial Year, the Average Annual Turnover shall be calculated based on available information divided by 1 (One).

ii) If the accounts are available for >1 but ≤ 2 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 2 (Two).

iii) If the accounts are available for >2 but ≤ 3 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 3 (Three).

b) Foreign bidder is to submit a latest report from reputed third party business rating agency like Dun & Bradstreet, Credit reform etc. in addition to the documents mentioned at point (a) above for review of above criteria.

c) Other Income shall not be considered for arriving at Annual Turnover/Sales. For evaluation purpose, Turnover figure excluding taxes shall be considered.

d) For evaluation of foreign bidder, exchange rate (TT selling rate of SBI) as on scheduled date of tender opening (Part -I bid in case of two part bid) shall be considered.



PRE-QUALIFYING REQUIREMENTS FOR
LIGHTING FIXTURES, LAMPS & MISC. ITEMS

PE-PQ-999-558-E006

REV. 03

DATE: 11/10/2019

SHEET 1 OF 1

ITEMS: Lighting fixtures, lamps, receptacles, Junction boxes and Miscellaneous Items.

SCOPE:

Supply(Including Design) : YES

Erection & Commissioning: No

Services : YES (Supervision of E&C)

1	Manufacturing Capability i) Manufacturer of applicable type of lighting fixtures as per BHEL-PEM sub-vendor list (Refer Note 4 below) OR ii) Manufacturer of Applicable type of lighting fixtures other than those mentioned in BHEL-PEM sub-vendor list (Refer Note 4 below). In this case, complete credentials for proposed make of lighting fixtures is to be submitted along with the offer. Bidder shall be evaluated as per sub-vendor pre-qualifying criteria attached as Annexure-I however the manufacturer should mandatorily tie up with Lighting designer as per BHEL-PEM sub-vendor list (Refer Note 4 below)
2	Lighting System Design Capability Lighting designer as per BHEL-PEM sub-vendor list (Refer Note 4 below)

Notes:

1. In case vendor is able to meet criteria at Sl. No: 1 only and not Sl. No: 2 above, vendor to furnish undertaking that in case vendor comes out as successful bidder, vendor will submit MOU on non-judicial stamp paper of Rs. 100 /- with any one of the lighting designer as per BHEL-PEM sub-vendor list prior to the placement of order.
2. In case vendor is able to meet criteria at Sl. No: 2 only and not Sl. No: 1 above, vendor to furnish undertaking that in case vendor comes out as successful bidder, vendor will submit MOU on non-judicial stamp paper of Rs. 100 /- with any one of the Manufacturer of applicable type of lighting fixtures as per BHEL-PEM sub-vendor list prior to the placement of order.
3. Bidder to note that MOU on non-judicial stamp paper once offered to BHEL cannot be changed till the execution of the project.
4.
 - a) For Cases of registration, BHEL-PEM sub-vendor list of applicable type of lighting fixtures may be obtained from BHEL-PEM.
 - b) For cases of bidding, sub-vendor list is included in the technical specification.

General Points of PQR:

1. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
3. Any other project specific requirement shall be as per Annexure – II and bidder shall submit relevant supporting documents.
4. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/ collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
5. After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all other terms of the tender.

PREPARED BY

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(DY.MANAGER)

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11/10/19

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11/10/19

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11/10/19

NATIONAL THERMAL POWER CORPORATION LIMITED

3 X 800 MW PATRATU TPS

VOLUME – II

**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS**

SPECIFICATION NO : PE-TS-434-558-E006, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UTTAR PRADESH, INDIA – 201301**



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

3 X 800 MW PATRATU TPS

SPECIFICATION NO. PE-TS-434-558-E006

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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in BOQ-Cum-Price schedule of the specification shall not be considered (i.e. technical description & quantities as per specification shall prevail).



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SPECIFIC TECHNICAL REQUIREMENTS



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1.0 SCOPE OF SUPPLY AND SERVICES

1.1 SUPPLY:

Design, manufacture, assembly, inspection & testing at vendor's/ sub-vendor's works, proper packing and delivery to site of **LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS** as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation.

1.2 SYSTEM DESIGN ENGINEERING:

System Design Engineering is included in vendor's scope, which includes design of complete lighting system for indoor and outdoor areas of the power plant. Please refer the list of LLO/LDC/CLO/PDS drawings as per Annexure-B for the tentative areas to be covered by the lighting system. The aspect of engineering covers preparation of electrical distribution and control schemes, quantity estimation, luminaire layout drawings, conduit layout drawings, wiring schemes upto luminaires, cable schedules and all associated design work not specifically mentioned in the specification. The quantity estimation to include all items required for the complete lighting system viz. lighting fixtures, lamps, Lighting DBs, Welding DBs, lighting panels, conduits, PVC wires etc.

1.3 Supervision of Erection & Commissioning (as required by site) of lighting system is included in vendor's scope.

1.4 Although Erection and Commissioning is not included in vendor's scope, the vendor shall still not be absolved of his responsibility of establishing the correctness of engineering and equipment at site.

1.5 Standard technical requirements of the lighting fixtures, lamps & miscellaneous items and lighting system design requirements are indicated in Section-II. Project specific requirements/changes are listed in Section-I.

1.6 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail and govern in case of conflict between the corresponding requirements of Section-I and Section-II.

1.7 Review of sub-vendor's documents by the purchaser shall not relieve the vendor from the responsibility of design & supply.

1.8 The documents shall be in English language and MKS system of units.

1.9 Make of all equipment and components shall be as per attached Sub-Vendor List enclosed as per Annexure-A to section- I.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per BOQ-cum-price schedule as part of NIT.

3.0 STATUTORY AND REGULATORY REGULATION

3.1 Statutory and regulatory regulation shall be applicable as per Indian Electricity Rule, 1956 with amendment-3 Rule no. 35, 48, 49, 50, 61 & 64 for illumination & low voltage power services.

4.0 DOCUMENTATION

4.1 Documents required along with the technical offer: -



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- Signed & Stamped copy of Compliance certificate
- Duly filled in signed & stamped copy of scope matrix for broad activities
- Signed & stamped copy of unpriced price schedule with "quoted" word indicated against all items.
- Duly filled in signed & stamped copy of Datasheet-B.

4.2 Documents required after award of LOI/PO shall be as per Annexure -B (to be submitted by successful bidder).

5.0 SPECIFIC TECHNICAL REQUIREMENTS

5.1

S.No.	Reference clause No. of Section-II	Specific requirement/Change
1	5.2.1(n), Page-17	"The LED chip efficacy shall be min 120 Lm/W. The luminaire efficacy shall be not less than 80Lm/W" shall be read as "The LED chip efficacy shall be min 120 Lm/W"
2. Clause: 12.4 Page no 30 of 38 : Preparation of as-built drawings shall be in BHEL Scope. However, vendor shall be furnishing the Final Auto Cad dwgs to BHEL.		
3	Additional Clause no.6 to be added under annexure-I of section-II as below:-	

6.0

SL. No.	Type of Luminaire	Description	Total Luminous flux (Lumen) of luminaire- Minimum value	Measured Electrical Input Power(Watt)- Maximum value
1	FC02	2 x 28 W T5 Fluorescent, industrial box type base and side reflectors	4200	64
2	FC06	2 x 28 Fluorescent, industrial box type base and vitreous enamelled/ anodized glossy side reflectors.	4200	64
3	FC06(LED)	Industrial type LED fixture suitable for conduit /surface/ suspended mounting, with integral driver aesthetically designed for Switchgear / Equipment room	3780	42
4	FC07(LED)	Industrial type LED fixture suitable for conduit/ surface/ suspended/ column mounting, having integral driver. Fixture shall operate on 220V DC input supply.	1260	14



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5	FC30 (LED)	Panel 600 mm X 600 mm LED luminaire suitable for recess mounting in false ceiling with integral driver aesthetically designed for Control Room/ Office	3780	42
6	FC32 (LED)	Decorative, surface mounted LED fixture having integral driver	3780	42
7	FC33 (LED)	Decorative, recessed type LED fixture having integral driver. Fixture shall operate on 220V DC input supply.	1260	14
8	FC34 (LED)	Well glass, dust proof type LED fixture having integral driver. Fixture shall operate on 220V DC input supply.	1260	14
9	FC81	2 x 28 W T5 Fluorescent, corrosion proof, totally enclosed suitable for Battery room/ corrosion proof areas	3200	64
10	FC81(LED)	Corrosion proof, totally enclosed type LED fixture having integral driver.	3780	42
11	SB11 (LED)	Medium bay, Industrial type LED fixture	10080	112
12	SB02 (LED)	High Bay Industrial type LED fixture	16920	188
13	SB03 (LED)	High Bay Industrial type LED fixture suitable for turbine hall operating floor (mounting height >10 m)	24750	275
14	SF63 (LED)	Flood light, heavy duty type LED fixture	16920	188
15	SF64 (LED)	Flood light, heavy duty type LED fixture	27000	300
16	SF66 (LED)	Flood light, heavy duty type LED fixture	45000	500
17	SS62 (LED)	Street light LED fixture	10080	112
18	SS63(LED)	Street light LED fixture	16920	188
19	SW41(LED)	Well glass type, vapour proof LED fixture suitable for Boiler / ESP platforms	4680	52
20	SW42(LED)	Well glass type, vapour proof LED fixture suitable for Boiler / ESP platforms	7380	82
21	MW96(LED)	Well glass, flame proof increased safety luminaire LED fixture having an integral driver	6000	94



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		suitable for division-2, Group IIA/IIB of hazardous areas.		
22	MW98(LED)	Well glass, flame proof increased safety luminaire LED fixture having an integral driver suitable for division-2, Group IIC of hazardous areas. (As per IS 2148 or class-I , Division –II as per NEC 70-428).	6000	94

Notes:

- 1) LED must comply all the parameters of IS 16105 or IESNA LM-80-08.
- 2) The Luminaire must comply all the parameters of IS 16106 or IESNA LM-79-08.
- 3) The LED driver should comply to IEC 61347-2-13, IS 15885: Part 2: Sec 13, IEC 62384, IS 16104 and CISPR 15.
- 4) The luminaire complete with all accessories shall comply to relevant specified standards.
- 5) The values of minimum luminous flux & maximum measured electrical input power are specified above for the luminaire (including any accessories like driver module etc). These values shall be measured as per IS 16106 & shall not be subject to any further tolerance.
- 6) All parameters mentioned in Section-II, Clause 5.2.1 are to be complied in totality.

7.0 TESTS

7.1 For LED Fixture

a) The contractor shall carry out the type tests as listed in this specification on the following types of LED fixtures to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant price schedule of bid document and the same shall be considered for the evaluation of the bids.

LED fixtures (Type test shall be conducted on one rating each of following type of LED fixtures. Rating for test conduction shall be decided by the employer during detailed engineering)

- a) High bay fixture.
- b) Well glass fixture.
- c) Street light fixture
- d) Surface mounted type fixture.
- e) Recessed mounted type fixture.

The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.

b) The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days' notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

c) In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening : 08.09.2018 , he may submit during detailed engineering the type test reports to the owner for waiver of conductance of such type test(s). These reports should be for the tests conducted



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on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.

7.2 For all other Station lighting equipment:

a) All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

b) However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening : 08.09.2018, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

7.3 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

7.4 Selection of samples for type test, acceptance test & routine test and acceptance criteria for all the items shall be as per relevant I.S

7.5 Type test reports of the following items as per technical specification requirements/ standards shall be submitted for approval.

SL NO. DESCRIPTION

- i. Lighting fixtures of each type
- ii. Lighting panel of each type (Degree of Protection)
- iii. Junction Box of each type.

Type test reports for LED as per standards for following shall be submitted for approval.

1. Visual and Dimension check
2. Proof of procurement of LEDs
3. Safety tests
 - a) Marking
 - b) Construction
 - c) Provision for Earthing
 - d) External and Internal wiring
 - e) Protection against electrical shock
 - f) Endurance and Thermal
 - g) Insulation resistance & electrical strength
 - h) Resistance to heat fire & tracking



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- i) Resistance to Humidity
- 4. Fire Retardant test
- 5. Performance tests (electrical, Photometric color and Life)
- 6. Burn-in Test
- 7. Power Cycling
- 8. Temperature rise test
- 9. Emission Tests
 - a) Radiated & conducted emission
 - b) Harmonics & flickers
- 10. Immunity tests

In addition, following test reports to be submitted for LED chip/LED luminaire:

- a) LED parameters like Lumen per watt, CRI, Beam angle from manufacturer
- b) LM 80/IS: 16105 report.
- c) LM 79/IS: 16106 report.

7.6 Acceptance Test and Routine Test

7.6.1 All lighting fixtures, lamps and other items shall be subjected to acceptance and routine test, as per relevant specified standards.

7.7 Junction boxes, switch boxes, receptacle enclosure etc. shall be subjected to physical and dimensional checks also.

7.7 Galvanizing Tests


7.7.1 The quality of galvanizing shall be smooth, continuous, free from flux stains and shall be inspected visually.

7.7.2 In addition following tests shall be conducted as acceptance tests.

(a) Uniformity of coating - The coating of any article shall withstand for one (1) minute dips in standard copper sulphate solution without the formation of an adherent red spot of metallic copper upon the basic metal.

(b) The quality of cadmium/zinc plating on items with screw threads shall be free from visible defects such as unplated areas, blisters and modules and shall be inspected visually.

(c) In addition, the plating thickness shall be determined microscopically/ chemically or electronically.

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	TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS	Revision: 0	Date: 17.03.2020
<p>1.0 SCOPE:</p> <p>a. The purpose of this design document is to cover basic approach for designing lighting system for power plant. The document covers various types of lighting system, lighting system design, and illumination levels for various areas, luminaries type and low voltage power services for various areas of the power plant including ACC.</p> <p>b. The lighting system of switchyard,AHP,CHP and chimney shall be under the scope of switchyard, AHP, CHP and Chimney package agencies respectively.</p> <p>c. All other areas as per contract shall be under the scope of main lighting package.</p> <p>2.0 LIGHTING SYSTEM DESIGN:</p> <p>2.1 Lighting system will be designed to ensure adequate uniform visual performance, safety & reliability and will be free from excessive glare and flicker from discharge lamp. In main control room, particular attention will be given to ensure that illumination is proper and aesthetic. Control room lighting will be such as to prevent any glare/ luminous patch on control board /panel/ VDUs when viewed from an angle.</p> <p>2.2 All fixtures shall be of a proven design for applications in power plant environment. All outdoor fixtures shall be weatherproof type. All outdoor fixtures, JB/ LP shall be with DOP IP-55. All HPMV lamp fixtures shall be provided with wire- wound ballasts. All fluoroscent fixtures except for class-I, Div-II fittings/ increased safety fittings (Div-II/Hazardous Area) shall be provided with electronic ballasts.</p> <p>2.3 Fixtures arrangement on boiler platforms shall be indicated in mounting detail arrangement and shall consist of fixtures mounted on columns, below beams as well as handrails as per requirement.</p> <p>2.4 High-pressure mercury vapour lighting fixtures will be installed in hazardous area as per area classifications. All highbay fixtures will have vibration damper.</p> <p>2.5 In general, the type of fixtures, type of luminaries and illumination levels to be achieved will be as per enclosed Annexure-I.</p> <p>2.6 The lighting fixtures in the plant area will be group controlled from lighting panel. The lighting fixtures in office areas, control rooms etc. will be controlled by switches.</p> <p>2.7 Lighting panel (LP) for controlling lights with additional provision for manual control shall be provided:</p> <p style="margin-left: 40px;">Indoor lighting panel: Without Timer</p> <p style="margin-left: 40px;">Outdoor lighting panel: With Timer</p> <p>2.8 Outdoor areas like Fuel oil tank area, open store etc. shall have flood light fixtures mounted on flood light poles.</p> <p>2.9 Fuel Oil areas and hazardeous areas shall have Flameproof Type fixtures. The type of fixtures, LP, JB, and receptacle used in Hydrogen generation plant building shall be suitable for group II C as per IS: 2148 or class I, Division II as per NEC 70-428.</p> <p>2.10 LED Luminaires shall be used for the lighting of all the indoor & outdoor areas in bidder's scope.</p>			

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Aviation light in Lighting Mast shall be of LED type. In false ceiling area LED luminaires shall be recessed mounting type & in non-false ceiling area the LED luminaires shall be surface mounting type.

The individual lamp wattage for LED shall be upto 3 watt. Fractional wattage LEDs are also acceptable. The LED chip efficacy shall be min 120 Lm/W. The luminaire efficacy shall be not less than 80 Lm/W. Suitable heat sink shall be designed & provided in the luminaire. The LED used in the luminaires shall have colour rendering index (CRI) of Min 80.

Colour designation of LED shall be "cool day light" (min 5700K) type for indoor areas. However for outdoor areas, the colour temperature of LED shall be min. 4000K, including rough & dust prone areas.

LED shall conform to the LM 80 requirements. The max. junction temperature of LED shall be 85 deg C. Further the lumen maintenance at this temperature shall be min 90%. The THD of LED Luminaires shall be less than 10%. Further the EMC shall be as per IS 14700. The power factor of the luminaire shall not be less than 0.9.

The marking on luminaire & safety requirements of luminaire shall be as per IS standards. Suitable heat sink with proper thermal management shall be designed & provided in the luminaire.

The connecting wires used inside the system, shall be low smoke halogen free, fire retardant type and fuse protection shall be provided in input side specifically for LED luminaires. Care shall be taken in the design that there is no water stagnation anywhere in the housing of luminaire. The entire housing shall be dust and water proof protection as per IS 12063.

Driver Circuit :

LED modules and drivers shall be compatible to each other. The LED module driver's ratings and makes shall be as recommended by corresponding LED chip manufacturer. LED Drivers shall have following control & protections:-


- Suitable precision current control of LED.
- Open Circuit Protection
- Short Circuit Protection
- Over Temperature Protection
- Overload Protection
- Surge Protection


2.11 Occupancy based Passive Infra-red sensors





The sensors shall be recess mounted, programmable type suitable for lighting load of 6A with variable off delay settings. The detection area shall be minimum 5 metres for standard room height of 3mt. All the calibrated settings shall be stored in non-volatile memory of PIR sensor which shall be unaffected by power supply fluctuations. Necessary 16A contactor shall be supplied alongwith each sensor & shall be located inside the switch box. **Occupancy sensors shall be provided in green buildings (service building, admin building, canteen & auditorium) in conference rooms, cabins and toilets.**


2.12 Service building, Administration building, Canteen building, & Auditorium shall be designed as GRIHA (Green Rating for Integrated Habitat Assessment) compliant Green building with a minimum Three (3) star rating.

2.13 Loading of each circuit shall generally be 80%.


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<p>3.0 ILLUMINATION DESIGN CALCULATION:</p> <p>3.1 Lighting design for indoor areas will be done by LUMEN method only. For a given indoor area, number of luminaires is calculated as follows:</p> $\text{Number of luminaires} = \frac{L \times W \times \text{LUX LEVEL (Average)}}{\text{LUMEN} \times \text{COU} \times \text{MF}}$ <p>where,</p> <p style="margin-left: 40px;">L= Length of room (Restricted to Max. 5 times of width) W= Width of room LUMEN= Lumen output of each lamp COU= Coefficient of Utilisation MF= Maintenance Factor</p> <p>Coefficient of Utilisation (COU) is determined from the COU chart for a particular luminaire of the manufacturer, corresponding to selected reflection factors and calculated Room Index.</p> <p>The working plane from the floor level considered at : 0.85 meter The Room Index is calculated by the following formula:</p> $\text{Room Index} = \frac{L \times W}{(L + W) \times \text{MH}}$ <p>where, MH = Mounting height of luminaire. The Reflection Factor (RF) will be considered as given below:</p> <table style="margin-left: 40px;"> <tr> <td>Ceiling (rc)</td> <td>Wall (rw)</td> <td>Floor (rf)</td> </tr> <tr> <td style="text-align: center;">80</td> <td style="text-align: center;">50</td> <td style="text-align: center;">20</td> </tr> </table> <p>Values of Maintenance Factor (MF), which includes the luminaire depreciation factor also as per IS-3646, will be considered as given below:</p> <table style="margin-left: 40px;"> <tr> <td>Boiler area</td> <td style="text-align: center;">0.6</td> </tr> <tr> <td>Control room & air conditioned area</td> <td style="text-align: center;">0.8</td> </tr> <tr> <td>Indoor area non-AC (except fluorescent fixture)</td> <td style="text-align: center;">0.7</td> </tr> <tr> <td>Dust prone indoor & outdoor area</td> <td style="text-align: center;">0.6</td> </tr> <tr> <td>Ambient temperature considered for above correction factor</td> <td style="text-align: center;">50 deg C</td> </tr> <tr> <td>Correction factor at above ambient temp. in motionless air:</td> <td style="text-align: center;">0.87</td> </tr> </table> <p>3.2 Lighting design for outdoor area, open area shall be done by computer programme as per standard norms for lighting design to meet the specified lux level. Average maintenance factor for outdoor and road lighting : 0.6</p>				Ceiling (rc)	Wall (rw)	Floor (rf)	80	50	20	Boiler area	0.6	Control room & air conditioned area	0.8	Indoor area non-AC (except fluorescent fixture)	0.7	Dust prone indoor & outdoor area	0.6	Ambient temperature considered for above correction factor	50 deg C	Correction factor at above ambient temp. in motionless air:	0.87
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TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS		<table border="1"> <tr> <td data-bbox="983 266 1123 304">Revision:</td> <td data-bbox="1123 266 1270 304">0</td> </tr> <tr> <td data-bbox="983 304 1123 344">Date:</td> <td data-bbox="1123 304 1270 344">17.03.2020</td> </tr> </table>	Revision:	0	Date:	17.03.2020										
Revision:	0															
Date:	17.03.2020															
For outdoor lighting and road lighting ratio of minimum to average illumination will not be less than 0.3 and for minimum to maximum will not be less than 0.05.																
4.0	<p>LIGHTING SYSTEM DESCRIPTION</p> <p>Lighting system will be provided with AC normal, AC emergency and DC emergency as listed against various areas as per Annexure-II enclosed.</p> <p>The sources of power lighting are as below :</p> <ul style="list-style-type: none"> (i) 415V AC Normal (ACN) Supply from different station PMCCs /MCCs (ii) 415V AC Emergency (ACE) Supply from Emergency Board (iii) 220V DC Emergency Supply from DC Distribution Board (iv) 24V AC Supply for maintenance <p>For main plant area normally all AC luminaries will be in service on normal AC supply.</p> <p>Approximately distribution of AC Luminaries on AC normal and AC emergency shall as below:</p> <table border="0"> <tr> <td>AC Normal (ACN) supply:</td> <td style="text-align: right;">80 %</td> </tr> <tr> <td>AC Emergency (ACE) supply:</td> <td style="text-align: right;">20 %</td> </tr> </table> <p>Normally all DC luminaries shall be 'OFF'. Upon failure of AC supply, DC luminaries shall be automatically switched 'ON'. On restoration of AC Emergency lighting through DG, DC luminaries shall be put-off automatically after a time gap of about three minutes following the restoration of lighting to ACN or ACE lighting system.</p> <p>For other auxiliary areas AC Normal lighting will provide 100% illumination level and normally all AC lighting fixture shall remain "ON" as long as normal AC supply is available.</p> <p>Lighting level by DC emergency lighting will be provided to meet functional/ operational requirements. DC fixtures will be located at strategic locations such as near entrance, staircase, landings etc. for safe personnel movement during emergency.</p> <p>In off-site areas/odd locations (BHEL scope), for safe movement of personal during emergency, self contained battery operated emergency lighting units with four hour backup (ELUs) is envisaged.</p> <p>4.1 AC Normal Lighting Systems:</p> <p>AC Normal lighting fixtures are fed through a number of conveniently located AC Lighting panel (ACLP) which are fed from Lighting Distribution Board (LDB).For Main Plant (TG & SG areas) and Service Building, each Lighting DB shall have 1X100% transformer. For all other offsite areas, each Lighting DB shall have 2X100% transformers.</p> <p>LDBs consisting of dry type isolation transformer housed in LDB with proper separation from distribution panels as per details indicated below is envisaged:</p> <table border="0"> <tr> <td>Transformer rating:</td> <td>50 / 100 kVA</td> </tr> <tr> <td>Transformer voltage ratio:</td> <td>415 / 415 Volt, taps of +5% to -5% in steps of 2.5%.</td> </tr> <tr> <td>Transformer type:</td> <td>Non-encapsulated</td> </tr> <tr> <td>Distribution Panel type:</td> <td>Single front fixed type</td> </tr> <tr> <td>LDB Configuration:</td> <td>One incomer</td> </tr> </table>		AC Normal (ACN) supply:	80 %	AC Emergency (ACE) supply:	20 %	Transformer rating:	50 / 100 kVA	Transformer voltage ratio:	415 / 415 Volt, taps of +5% to -5% in steps of 2.5%.	Transformer type:	Non-encapsulated	Distribution Panel type:	Single front fixed type	LDB Configuration:	One incomer
AC Normal (ACN) supply:	80 %															
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Incomer type: Incomer rating: Outgoing feeder type: Outgoing feeder rating: Cable Alley :	TPN MCCB for 100kVA / TPN SFU for 50 kVA As per lighting transformer rating TPN SFU 63A Form IVb construction		
AC normal lighting panel as per details given below is envisaged:			
Incomer type: Incomer rating: Outgoing feeder type: Outgoing feeder rating: Short circuit rating: No of outgoing feeders :	TP MCB 63A SP MCB 20A 3kA 6/12/18		(As per loading requirement of the area where LP is installed)
On/Off control	With timer (for outdoor LP)		
Street lighting panel as per details given below is envisaged:			
Incomer type: Incomer rating: Outgoing feeder type: Outgoing feeder rating: Short circuit rating: ON/ OFF control No of outgoing feeders :	TP MCB 100A TP MCB 20A 3kA With Timer 6		
4.2 AC Emergency Lighting Systems:			
AC Emergency lighting fixtures are fed through a number of conveniently located AC Lighting panel (ACLPL) which are fed from AC Emergency Lighting Distribution Board (ELDB).			
ELDBs consisting of non-encapsulated, dry type isolation transformer housed in ELDB with proper separation from distribution panels as per details indicated below is envisaged:			
Transformer rating: Transformer voltage ratio: Transformer type: Distribution Panel type: LDB Configuration: Incomer type: Incomer rating: Outgoing feeder type: Outgoing feeder rating: Cable Alley :	50 / 100 kVA 415 / 415 Volt, taps of +5% to -5% in steps of 2.5%. Non-encapsulated Single front fixed type One incomer TPN MCCB for 100kVA / TPN SFU for 50 kVA As per lighting transformer rating TPN SFU 63A Form IVb construction		
AC emergency lighting panel as per details given below is envisaged:			
Incomer type: Incomer rating: Outgoing feeder type: Outgoing feeder rating: Short circuit rating:	TP MCB 63A SP MCB 20A 3kA		


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4.3	DC Emergency Lighting Systems:																
DC Emergency lighting fixtures fed through suitable numbers of conveniently located DC Emergency Lighting panel (DCELP) which are fed through DC Lighting Distribution Board (DCLDB).																	
The DCLDB shall be fed from DCDB. The emergency lighting fixtures connected to this system shall remain DCLDBs as per details given below is envisaged:																	
<table border="0"> <tr> <td>Distribution Panel type:</td> <td>Single front fixed type</td> </tr> <tr> <td>DC Incomer type:</td> <td>DP Switchfuse unit with contactor</td> </tr> <tr> <td>DC Incomer rating:</td> <td>125A</td> </tr> <tr> <td>AC Incomer type:</td> <td>Not applicable</td> </tr> <tr> <td>AC Incomer rating:</td> <td>Not applicable</td> </tr> <tr> <td>Outgoing feeder type:</td> <td>DP Switchfuse unit</td> </tr> <tr> <td>Outgoing feeder rating:</td> <td>32A</td> </tr> </table>				Distribution Panel type:	Single front fixed type	DC Incomer type:	DP Switchfuse unit with contactor	DC Incomer rating:	125A	AC Incomer type:	Not applicable	AC Incomer rating:	Not applicable	Outgoing feeder type:	DP Switchfuse unit	Outgoing feeder rating:	32A
Distribution Panel type:	Single front fixed type																
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DCLPs as per details given below is envisaged:																	
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Incomer type:	DP Switchfuse unit																
Incomer rating:	32A																
Outgoing feeder type:	DP Switchfuse unit																
Outgoing feeder rating:	16A																
4.4	The LDBs will be provided with voltmeter and ammeter along with selector switch, supply ON indicating lamps etc. All indicating lamps will be cluster LED type. The DOP for LDB will be IP-52 and for transformer cubicle IP-42. Where as the DOP for LP will be IP-54 for indoor and IP-55with canopy for outdoor.																
4.5	24V AC Supply system:																
a)	Each 24V AC supply module will have one no. dry type two winding, 1 phase transformer and necessary																
<table border="0"> <tr> <td>Module type:</td> <td>Portable type / Fixed type</td> </tr> <tr> <td>Transformer rating:</td> <td>3 kVA</td> </tr> <tr> <td>Transformer voltage ratio:</td> <td>415 / 42 Volt</td> </tr> <tr> <td>Incomer side:</td> <td>40A TPN MCB</td> </tr> <tr> <td>Outgoing feeder</td> <td>16A MCB</td> </tr> </table>				Module type:	Portable type / Fixed type	Transformer rating:	3 kVA	Transformer voltage ratio:	415 / 42 Volt	Incomer side:	40A TPN MCB	Outgoing feeder	16A MCB				
Module type:	Portable type / Fixed type																
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Incomer side:	40A TPN MCB																
Outgoing feeder	16A MCB																
Fixed type 24V supply modules shall be provided in following areas:																	
Boiler/ HRSG area: Near inspection manholes on boiler platforms and boiler drum.																	
TG Building: Near HP & LP heaters, turbine flash tank, blow down tank, near condenser water box and near bus duct termination of generator end.																	
ESP area: Near inspection manholes.																	
other area: Near Deaerator																	
Suitable numbers of 24V portable halogen lamp unit along with flexible copper cable shall also be supplied as per details below:																	


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Lamp wattage:	40 W		
Cable size:	1.5 sq. mm		
Cable length:	15 meter		
b)	415V/42 V, 3phase 4 wire, 3kVA transformer shall be provided.		
4.6	Emergency EXIT lamps: Emergency exit lamps backed up by battery shall be provided at strategic locations of the building for safe exit of personnel. These exit lamps will remain ON all the time and normally received power supply from ACELP. Exit lamp unit shall contain maintenance free Ni-Cd battery with 4 hours backup capacity.		
4.7	ELUs shall contain maintenance free Ni-Cd battery with 4 hours backup capacity. Each ELU will have battery charger and 2x10W fluorescent lamp.		
5.0	STREET LIGHTING / OUTDOOR LIGHTING		
5.1	The roads within BHEL scope as per contract will be considered for lighting.		
5.2	Street lights / outdoor lighting will be fed from separate panel located at suitable places. Automatic switching ON/OFF of these circuits shall be done from street light panel.		
5.3	For street lighting, street light pole will be used. For outdoor area lighting lighting if required flood light pole will be used. Pole type shall be as below: Pole height: The Poles shall be mounted above ground using base plate and minimum height of pole shall be 8 mtrs.		
04	Pole type:	Hot dip galvanised (Tubular / Octagonal in shape), Av. Coating thickness of galvanisation shall be min. 70 micron.	
	The poles shall be equipped with junction boxes and all other required accessories.		
	The poles will be located 1.5 M away from the road edge. The buried cable will run in hume pipe (100 mm dia) wherever it is crossing the roads.		
5.4	High mast tower will be used, if required. High mast tower will be 30 meter high, hot dip galvanised and polygonal shaped. The location of high mast will be decided during detailed engineering. Supply to high masts shall be fed from feeder pillar panels. Each feeder panel shall consists of TPN MCB, timer circuit, MCB and other necessary accessories for its operation. Also the protection of mast and fixtures shall be provided. A separate spike electrode of suitable height shall be provided to individual lighting mast		
5.5	Solar powered lighting poles may be provided in place of normal lighting poles in areas where no nearby power source is available .		
04			
6.0	LOW VOLTAGE POWER SERVICES		
6.1	Different type of receptacles as per details below will be provided: (i) Decorative receptacle: At least 01 number 5/15A , 3-Pin, 240V AC universal socket outlet with switch will be provided in office, store, cabin etc. (ii) Industrial receptacle: Suitable number 20A, 5-Pin, 240V AC industrial type receptacles will be provided at suitable location in plant building like swgr room, MCC room (location will be decided during detailed engineering) . All receptacles will be controlled with a switch. In hazardous area receptacles will be of flameproof type.		

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<p>(iii) Welding receptacle: 63A, 3-phase, 415V AC welding receptacles with isolating switch will be provided at specific points at an average distance of 50 m (location will be decided during detailed engineering) . Atleast one 63A, 3ph, 415 V AC receptacle shall be provided in each floor of off site buildings / structures. Maximum 04 nos. receptacles will be fed through one feeder. In hazardous areas these receptacle will be located in MCC room. The welding receptacles shall be provided with RCCB/RCD of 30mA sensitivity having facility for manual testing/checking of operation of RCCB/RCD.</p>			
6.2	Transformer rating for welding distribution board shall be 100kVA. Other construction details shall be identical to AC LDB.		
6.3	Based on room size, suitable nos. of ceiling fans suitable for operation on 240V +/- 10%, 50Hz, AC supply comprising of class E or better insulated copper wound single phase motor, (1200mm sweep) with Stepped electronic regulator shall be provided in office rooms, store rooms and social buildings which are not covered by air-conditioned and ventilation system. In the office premises, one fan per 10 sq. metres shall be provided. Wall fans shall be provided in office area with false ceiling as per requirement. Power factor shall not be less than 0.9 except for hazardous and flameproof areas. Fan shall have aerodynamically designed well balanced Al blades (3 nos), down rod, die cast AL housing, capacitor, suspension hook, canopies etc. finished in stove enameled white or with electro static powder coating.		
6.4	For the maintenance of lighting fixtures within the power house, 2 nos. free standing adjustable aluminium ladder, adjustable from 05M to 10M shall be provided. For the maintenance of street lights, 01 no. of wheel mounted adjustable aluminium ladder shall be provided.		
6.5	Switchboxes in Green buildings and CCR shall be modular type. In plant area, switchbox and receptacles shall be industrial type.		
7.0 WIRING / CONDUITS/JUNCTION BOX			
7.1 Wiring of lighting system will be done as follows:			
(i) Wiring in Boiler areas, TG Hall Floors, Cable Vaults and hazardous area like transformer yard, outdoor area (like Tank area, GT area) will be done using Cu/Al, PVC insulated, FRLS PVC sheathed un-armoured cable which shall be laid in cable tray running in these areas.			
Wiring installation in CCR Room, ESP Control Room, Switchgear Rooms, Pump Houses, DG Room, Compressor House will be done by multi-stranded, PVC insulated, colour coded wires laid in GI conduits of 20 mm dia size (minimum) conforming to IS-9537 for areas like . The thickness of conduits upto & including 25 mm dia will be 1.6 mm and conduits above 25 mm will be 2.0 mm.			
(ii) Conduits will be heavy-duty type hot dip galvanised steel conforming to IS-9537. Conduit accessories will be hot dip galvanised. In corrosive area, conduits will have suitable epoxy coating additionally.			
(iii) Flexible conduit shall be water proof and rust proof made of heat resistant TERNE coated steel.			
(iv) Conduits in control room, service building, canteen building, administration building, auditorium, IT building and time office will be surface mounted on the roof above false ceiling, however vertical drops of conduits will be concealed along walls and finally plastered for better aesthetics. Concealed conduits shall be heavy duty PVC conduits.			
(v) Filling area of wires in conduit shall not exceed 40% of the conduit area.			

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8.0	EARTHING		
Earthing of lighting system will be done by using of following sizes of wire / flat:			
Lighting Distribution Board: GS Flat 50x6 mm			
Lighting Panels: GS Flat 25x3 mm			
Lighting fixtures, receptacles, conduits, junction boxes & switch boxes: 14 SWG GI wire			
Welding receptacles: GS Flat 50x6 mm			
Street light pole/ flood light pole and High mast: GS Flat 25x3 mm			
Electrode for Pole/ High mast earthing: 1 no, 40 mm dia MS rod, 3 mtr long			
9.0	Switchboxes		
Following switchboxes have been considered			
SWB1 Switch board with 1 no. 5A switch & JB type SW1			
SWB2 3 nos. 5A switches and 1 no. fan regulator with JB type SW2			
SWB3 7 nos. 5A switches and 3 nos. fan regulator with JB type SW3.			
SWB4 7 no 5A switches, 3 no fan regulators & 1 no 5A socket			
SWB5 5 no 10A switches, 1 no 10A socket (shall have provision for mounting 16A contactor)			
10.0	STATUTORY & REGULATORY REQUIREMENT		
Statutory and regulatory regulation shall be applicable as per Indian Electricity Rule, 1956 with amendment-3 Rule no. 35, 48, 49, 50, 61 & 64 for illumination & low voltage power services.			

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S. No.	LOCATION	AVERAGE LUX LEVEL	TYPE OF LIGHTING FIXTURES		
01	TG Hall operating floors	200	High/medium bay LED luminaire		
02	TG hall other platforms	200	LED high/medium bay, well glass fixtures		LED
03	Switchgear rooms, charger, rectifier room	200	Industrial type LED Luminaire		
04	Control room, computer room , control equipment room	350	LED luminaire equivalent to Mirror optics with anti glare features or downlighter		
05	Office areas, Conference rooms	300	Decorative mirror optics type LED luminaire or LED downlighter		
06	Battery rooms	100	Totally enclosed corrosion proof LED Luminaire		
07	Transformer yard	20 (general), 50 (on equipment)	LED Luminaire		
08	Boiler platforms	100	LED well glass fixtures		
09	DG room/enclosure, compressor room, pump house etc	150	LED medium bay/ industrial type LED Luminaire		
10	Fuel oil pump house	150	Flame proof fluorescent fixtures suitable for division-2 hazardous area*		
11	Cable galleries/ vaults	50	Industrial type LED Luminaire		
12	Street lighting -		LED street lights		
	primary roads	20			
	secondary roads	10			
13	Outdoor storage handling & unloading area	20	LED Luminaire		
14	Cement stores	150	Industrial dust proof type LED Luminaire		
	Chemical stores, house	150	Corrosion proof LED Luminaire		
	Permanent stores	150	LED high/ medium bay/ Industrial trough LED Luminaire		
15	Workshop building	150	LED high/ medium bay/ Industrial trough LED Luminaire		
16	Laboratory		Corrosion proof LED Luminaire		
	general	150			
	analysis area	300			
17	Garage/ Car parking	50	Industrial type LED Luminaire		
18	Facility building, canteen etc	150	Industrial type LED Luminaire		
19	Hydrogen plant building	150	Explosion proof HPMV/ fluorescent fitting suitable for class-I & division-IIC.		
20	DC lighting control room	-	CFL		

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21	DC lighting other area	-	CFL	
22	Corridors, walkways	50	LED Luminaire	
23	Building periphery lighting	10	LED Street light fixture, LED Luminaire	
24	Security lighting along boundary	10	LED Street light fixture, LED Luminaire	
25	ESP platform	150	LED well glass fixtures.	
	Area below ESP hopper	50		
	ESP side walkways	50		
26	Gate complex/ time office	150	LED Luminaire	
27	DM plant, water treatment plant, CW Pump House, Raw Water PH, Fire Water PH	150	LED high/ medium bay/ Industrial trough LED Luminaire	
28	ACC Platform : At equipment	150	LED Street light fixture, LED Luminaire	
	ACC platforms/ walkway	50		
Note:				
* The fixture will be suitable for Division-2, Group IIA/IIB of hazardous area as per IS-2148.				
i) Decorative type fixtures will be provided for false ceiling areas.				
ii) Type of fixture, JB, LP & receptacle used in hydrogen generation plant building shall be suitable for group-IIC as per IS-2148 or class-I, Division-II as per NEC70-428.				

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DC EMERGENCY LIGHTING


	AREA	AVERAGE LUX EVEL
1	Unit control room	100
2	Control equipment room	100
3	Strategic control points (In TG building & boiler area, switchgear room, SWAS, Battery room, UPS area, TG hall, Lube oil room etc.)	20
4	Cable vault and galleries	1 fixture at every 20m spacing along walkways
5	Boiler staircase	1 fixture at every 20m spacing along walkways
6	Entry/ Exit of main plant building	1 fixture
7	Fire exit sign	1 fixture


LEGEND:

- ACN: AC Normal Lighting
 ACE: AC Emergency Lighting
 DCE: DC Emergency Lighting
 Y: YES
 Y*: YES, Only in control room, offices & toilets
 \$: Emergency Lighting Unit (ELU) & 6/16A Switch socket for ELU

Note : Green buildings shall have solar power , in lieu of the same ELU is not provided in these areas.

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ANNEXURE-III			
STANDARDS FOR LIGHTING SYSTEM			
S.No	Lighting Fixtures and Accessories		
1	IS:1913 General and safety requirements for luminaires.		
2	IS:2148 Flame proof enclosures of electrical apparatus.		
3	IS:418 Tungsten filament general service electric lamps.		
4	IS:1258 Bayonet lamp holders.		
5	IS:1534 Ballast for fluorescent lamps.		
6	IS:1569 Capacitors for use in tubular fluorescent, high pressure mercury		
7	IS:1777 Industrial luminaire with metal reflectors.		
8	IS:2215 Starters for fluorescent lamps.		
9	IS:2418 Tubular fluorescent lamps for general lighting services.		
10	IS:3323 Bi-pin lamp holders for tubular fluorescent lamps.		
11	IS:3324 Holders for starters for tubular fluorescent lamps.		
12	IS:4013 Dust-tight electric lighting fittings.		
13	IS:8224 Electric Lighting fittings for Division 2 areas.		
14	IS:10276 Edison screw lamp holders.		
15	IS:10322 Luminaires.		
16	IS:13021 AC Supplied Electronic Ballasts for tubular fluorescent lamps.		
S.No	Lighting Panels, Switch-boxes, Receptacles and Junction Boxes		
1	IS:2147 Degree of protection provided by enclosures for low-voltage switchgear and control gear.		
2	IS:1293 Plugs & socket outlets of rated voltage upto and Including 250volts & rated current upto and including 16 Amps.		
3	IS:2551 Danger notice plates.		
4	IS:13947 Low voltage switchgear and controlgear		
5	IS:3854 Switches for domestic and similar purposes.		
6	IS:6875 Control switches (switching devices for control and auxiliary		
7	IS:13703 Low voltage fuses for voltages not exceeding 1000V AC or 1500 V DC.		
S.No	Conduits, Pipes and Accessories		
1	IS:2667 Fittings for rigid steel conduit for electrical wiring.		
2	IS:3837 Accessories for rigid steel conduits for electrical wiring.		
3	IS:9537 Conduits for electrical installations.		

		3 x 800 MW PATRATU STPS EXPANSION PHASE-I		Doc no :
		TECHNICAL SPECIFICATION FOR		Revision: 0
		LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS		Date: 17.03.2020
S.No	Lighting Wires/Cables			
1	IS:694 PVC insulated cables for working voltages upto and including 1100 V			
2	IS:3961 Recommended current ratings for cables.(PVC Insulated and PVC sheathed heavy duty cables and light duty cables).			
3	IS:8130 Conductors for insulated electric cables and flexible cords.			
4	IS:10810 Methods of tests for cables.			
S.No	LED Luminaries			
1	16101:2012 General Lighting. LEDs and LED modules Terms and definitions			
2	16102(Part 1):2012 Self Ballasted LED Lamps for General Lighting Services. Part-1 Safety Requirements.			
3	16102(Part 2):2012 Self Ballasted LED Lamps for General lighting Services. Part-2 Performance Requirements.			
4	16103(Part I):2012 LED modules for General lighting Safety Requirements.			
5	15885(Part 2/Sec. 13) :2012 Lamp control gear Part 2 particular Requirements Section 13 d.c. or a.c. Supplied Electronic control gear for LED modules			
6	16104:2012 d.c. or a.c. Supplied Electronic control gear for LED modules - Performance Requirements.			
7	16105:2012 Method of Measurement of Lumen maintenance of Solid-state Light (LED) Sources.			
8	16106:2012 Method of Electrical and photometric Measurements of Solid State Lighting (LED) Products			
9	16107:2012 Luminaires Performance 16108:2012 Photobiological safety of Lamps and Lamp Systems			
10	IS 513 Cold rolled low carbon steel sheets and strips			
11	IS 12063 Classification of degree of protection provided by enclosures.			
12	IS 14700 Electro magnetic compatibility (EMC) – Limits (Part 3/Sec. 2) for Harmonic current emission – THD < 15% (equipment, input current < 16 Amps. per phase.			
13	IS 9000 (Part 6) Environment testing: Test Z – AD: composite temperature/humidity cyclic test.			
14	IS 15885 Lamp control gear: particular requirements for (Part 2/Sec. 13) DC or AC supplied electronic control gear			
15	IS 16004 – 1 and 2) for LED modules. IS 4905 Method for random sampling			

	3 x 800 MW PATRATU STPS EXPANSION PHASE-I TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS	Doc no : PE-TS-434-558-E006	
		Revision: 0	Date: 17.03.2020
S.No	Electrical Installation Practices & Miscellaneous		
1	IS:1944 Code of practice for lighting of public thorough fare		
2	IS:3646 Code of practice for interior illumination.		
3	IS:5572 Classification of Hazardous areas (other than Mines) having flammable gases and Vapours for electrical installation		
4	S:6665 Code of practice for industrial lighting. . National Electrical Code - Indian Electricity Rules. Indian Electricity Act		
5	IS:5 Colour for ready mixed paints & enamels.		
6	IS:280 Mild steel wires for general engineering purposes.		
7	IS:374 Electric ceiling type fans & regulators.		
8	IS:732 Code of practice for electrical wiring installations.		
9	IS:1255 Code of practice for installation and maintenance of power cables Upto and including 33KV rating.		
10	IS:2062 Steel for general structural purposes		
11	IS:2629 Recommended practice for hot-dip galvanizing of iron and steel.		
12	IS:2633 Methods for testing uniformity of coating of zinc coated articles.		
13	IS:2713 Tubular steel poles for overhead power lines.		
14	IS:3043 Code of practice for earthing		
15	IS:5216 Guide for safety procedures and practices in electrical work.		
16	IS:5571 Guide for selection of electrical equipments for hazardous areas.		
17	BS:6121 Mechanical cable glands		

3X 800 MW PATRATU TPS: LIGHTING SYSTEM

Locations of Lighting Distribution Boards

S.No.	Location	Quantity	Type	Rating	Description	No of incomer
1.	LV Switchgear Room	PER UNIT	ACN	100 KVA	1UA	Single
2.	MV Switchgear Room		ACN	100 KVA	1UB	Single
3.	Boiler MCC Room		ACN	100 KVA	1UC	Single
4.	Boiler MCC Room		ACN	100 KVA	1UD	Single
5.	Boiler MCC Room		ACN	100 KVA	1UE	Single
6.	Boiler MCC Room		ACN	100 KVA	1UF	Single
7.	Boiler MCC Room		ACN	100 KVA	1UG	Single
8.	ESP Switchgear Room		ACN	100 KVA	1UH	Single
9.	ESP Switchgear Room		ACN	100 KVA	1UJ	Single
10.	ESP Switchgear Room		ACN	100 KVA	1UK	Single
11.	ESP Switchgear Room		ACE	100 KVA	1UL	Single
12.	MV Switchgear Room		ACE	100 KVA	1UM	Single
13.	Boiler MCC Room		ACE	100 KVA	1UN	Single
14.	MV Switchgear Room		DC	200A	1UP	Single
15.	Boiler MCC Room		DC	200A	1UQ	Single
16.	Boiler MCC Room		DC	200A	1UR	Single
17.	LV Switchgear Room-WDB		ACN	100 KVA	1US	Single
18.	Boiler MCC Room-WDB		ACN	100 KVA	1UT	Single
19.	Boiler MCC Room-WDB		ACN	100 KVA	1UU	Single
20.	ACC		ACN	100 KVA	1UV	Single
21.	Admin bldg		ACN	100KVA	0UA	Double
22.	Canteen		ACN	100KVA	0UB	Double
23.	DM plant		ACN	100KVA	0UC	Double
24.	FWPH annexe		ACN	100KVA	0UD	Double
25.	ETP MCC room		ACN	50KVA	0UE	Double
26.	Workshop		ACN	100KVA	0UF	Double
27.	RWPH Annexe		ACN	100KVA	0UG	Double
28.	FGD area		ACN	100KVA	0UH	Double
29.	FOPH Annexe		ACN	100 KVA	0UJ	Double
30.	Service bldg.		ACN	100KVA	0UK	Double
31.	Service bldg.		ACN	100KVA	0UL	Double
32.	Hydrogen plant		ACN	50KVA	0UM	Double
33.	Road		ACN	50 KVA	0UN	Double

NOTES:

- In addition to above, 1 no. 63A, 3-phase, 415V supply feeder for 63A, 5 pin welding socket to be provided in each off site building (in BHEL scope) away from BTG area.
- WDB will be used to feed 63A welding sockets in BTG area.

LEGEND:

ACN : AC Normal LDB , ACE : AC Emergency LDB, DC : DC LDB
LDB : Lighting distribution board, WDB : Welding distribution board

QUANTITY:

Total 100 KVA LDB (Single incomer) = 42 Nos.
Total 100 KVA LDB (Double incomer) = 10 Nos.
Total 50 KVA LDB = 3 Nos.
Total DC LDB = 9 Nos.
Total 100 KVA WDB = 9 Nos.



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3 X 800 MW PATRATU TPS

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DATA SHEET –A

S. No.	Description	Unit	Value
1.0	SYSTEM DESIGN DATA		
1.1	Design ambient	°C	50
1.2	AC Supply		
a)	Rated voltage	V	415
b)	Rated frequency	Hz	50
c)	Voltage variation (permissible)	%	+10% to -10%
d)	Frequency variation (permissible)	%	+3% to -5%
e)	Combined voltage & frequency variation (sum of absolutes permissible)	%	10%
f)	System fault level & duration	kA, sec.	50kA for 1 sec.
1.3	DC Supply		
a)	Rated voltage	V	220
b)	Voltage variation (permissible)	%	+10% to -15%
c)	System fault level & duration	kA, sec.	20kA for 1 sec.
2.0	SCOPE OF SYSTEM DESIGN ENGINEERING		Included in vendor's scope
3.0	Lighting Concept		
3.1	Types of supplies considered (other than AC Normal)		
a)	AC emergency		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
b)	DC emergency		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
c)	DC Normal		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
3.2	Diversity Factor for Sockets	%	25%
4.0	LUMINAIRES, LAMPS & ACCESSORIES		
4.1	Type of false ceiling for recessed fluorescent luminaire		Grid False ceiling (600mm X 600mm) / Aluminium false ceiling (for Control Room).
4.2	Degree of protection for drip proof luminaires		Outdoor : Min IP65 and weather proof



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			Indoor : Surface / pendant mounting : IP54 Recess mounting (false ceiling): IP20.
4.3	Flame proof luminaires		
a)	Hazardous area classification		IS-2148 Zone II Group-IIA & IIB ; Group –II C as per IS 2148 or class-I Division-II as per NEC 70- 428
b)	Degree of protection		IP55
c)	Mounting type for well glass		[] Eye-bolt [] MS Galvanised Strap [√] Screw neck
4.4	Non-integral controlgear box for HPMV/HPSV lamps		
a)	Material		[] CRCA sheet steel [√] Cast Aluminium LM6
b)	Sheet thickness	mm	[] 2 for CRCA sheet [√] 3 for Cast Aluminium LM6
c)	Degree of protection		IP55
d)	Surface treatment		[√] Powder co [] Galvanized
e)	If galvanized		NOT APPLICABLE
	Process		-
	Weight of zinc	g/m ^{2ma}	-
f)	If painted		
	Paint shade		RAL 7032
	Minimum paint thickness (DFT)	micron	50
4.5	Lamps		
a)	Type of Fluorescent Lamps		[√] Cool Daylight [√] White Light
4.6	Emergency Lighting Unit		
a)	Lamp type		[] FLT [√] CFL [] LED
b)	Nos. of Lamp		2
c)	Lamp wattage	W	10
d)	Lumen output of lamp at rated voltage	Lumen	To furnished by Vendor.



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e)	Type of battery (Rechargeable type)		<input checked="" type="checkbox"/> Ni-Cd <input type="checkbox"/> Lead-Acid <input type="checkbox"/> Li-Ion
f)	AH capacity of battery	AH	To furnished by Vendor.
g)	Battery voltage	V	9
h)	Battery backup time	Hr	4
i)	In built charger		Yes
4.7	Exit Sign		
a)	Lamp type		FLT/ CFL/ LED
b)	Nos. of Lamp		1
c)	Lamp wattage	W	20
d)	Lumen output of lamp at rated voltage	Lumen	To furnished by Vendor.
e)	Type of battery		<input checked="" type="checkbox"/> Ni-Cd <input type="checkbox"/> Lead-Acid <input type="checkbox"/> Li-Ion
f)	AH capacity of battery	AH	To furnished by Vendor.
g)	Battery voltage	V	To furnished by Vendor.
h)	Battery backup time	Hr	4
4.8	24V AC Supply Module (Fixed type & portable type)		FIXED TYPE NOT APPLICABLE
a)	Enclosure		
	Enclosure material		<input type="checkbox"/> Cast aluminium alloy <input checked="" type="checkbox"/> CRCA sheet steel
	Enclosure thickness	mm	<input type="checkbox"/> 3 for Cast aluminium alloy <input checked="" type="checkbox"/> 2 for CRCA sheet steel
	Louvers provided		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
b)	Surface treatment		<input type="checkbox"/> Painted <input checked="" type="checkbox"/> Galvanized
c)	If galvanized		
	Process		Hot dip
	Weight of zinc	g/m ²	460 gm / mm ² (65 microns)
d)	If painted		
	Paint shade		
	Minimum paint thickness (DFT)	micron	
e)	Transformer		
	Rating	VA	500



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	Voltage ratio & Current Rating	V	240 V/24V [6A/16A]
	Class of insulation		Class F, temperature rise limited to Class-B
f)	24V Hand lamp unit		
	Lamp type		<input checked="" type="checkbox"/> Halogen [] LED
	Lamp wattage	W	40
g)	No. of outgoing sockets		4
h)	Whether cord coiling arrangement provided		<input checked="" type="checkbox"/> Yes air cooled [] No
5.0	Junction Box		
a)	Enclosure material		JB for street lighting: CRCA sheet Indoor : Thermoplastic / thermosetting / FRP type.
b)	Enclosure thickness	mm	1.6 (min) thick CRCA sheet.
c)	Galvanized (applicable for CRCA sheet)		<input checked="" type="checkbox"/> Yes [] No
d)	Degree of protection		IP-55(indoor) / FRP Weather proof IPW-66 for outdoor area & Flameproof for hazardous area)
6.0	Industrial/ Welding Receptacle		
a)	Enclosure material		<input checked="" type="checkbox"/> MS sheet & hot dip galvanised / Die cast aluminium alloy / CRCA sheet steel with electrostatic powder coating
b)	Enclosure thickness	mm	<input checked="" type="checkbox"/> 2mm (min) / 2.5mm (min) / <input checked="" type="checkbox"/> 2mm (min) respectively.
c)	Surface treatment		[] Painted [<input checked="" type="checkbox"/>] Galvanized
d)	If galvanized		
	Process		Hot dip
	Weight of zinc	g/m ²	460 gm / mm ² (65 microns)
e)	If painted		NOT APPLICABLE
	Paint shade		
	Minimum paint thickness (DFT)	micron	
f)	Degree of protection		IP-55
7.0	Decorative Receptacle		
a)	Enclosure material		[] Cast aluminium alloy <input checked="" type="checkbox"/> MS Sheet



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b)	Enclosure thickness	mm	[] 2 for cast aluminium alloy [√] 2 for MS sheet
c)	Surface treatment		[] Painted [√] Galvanized/ Electro-plated
d)	If galvanized		
	Process		Hot dip
	Weight of zinc	g/m ²	460 gm / mm ² (65 microns)
e)	If painted		NOT APPLICABLE
	Paint shade		
	Minimum paint thickness	micron	
f)	Degree of protection		IP-55
9.0	Switch Box		
a)	Enclosure material		[] FRP [√]MS Sheet.
b)	Enclosure thickness	mm	1.6mm MS sheet with 3mm thick decorative, Perspex cover.
c)	Galvanized		[√] Yes [] No
d)	Painted		[] Yes [√] No
d)	Degree of protection		IP-55
10.0	Conduit (Flexible)		
a)	Type		[√] TERNE coated conduit [] Lead coated
b)	Size	mm	20
c)	Standard length	m	25 to 50
d)	Thickness of Galvanization	microns	
5.13	Cable Glands		By vendor for all incoming and outgoing cables
a)	Type		[√] Double compression [] Single compression
b)	Material		Brass
c)	Nickel Plating provided		[√] Yes [] No
d)	Flameproof glands with flameproof equipment		[√] Yes [] No
5.14	Cable Lugs		By vendor for all incoming and outgoing cables



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a)	Type		Crimping type/ ring type
b)	Material		Tinned copper
12.0	LADDERS		
a)	Type		<input type="checkbox"/> Free standing <input type="checkbox"/> wheel mounted <input checked="" type="checkbox"/> both
b)	Material		<input type="checkbox"/> Steel <input checked="" type="checkbox"/> Aluminium
c)	Duty		<input type="checkbox"/> Heavy <input checked="" type="checkbox"/> Medium
d)	Surface treatment		<input checked="" type="checkbox"/> Galvanised <input type="checkbox"/> Painted
e)	Reference Standard		IS: 4571, 3696

Note:

1. Detailed luminaire and lamp data shall be placed by vendor after award of contract.
2. Galvanization wherever applicable shall be hot dip galvanized with weight of Zinc as 460g/m² (65micron).



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LIST OF APPLICABLE STANDARDS

ILLUMINATION

Code of practice for interior illumination	IS 3646
Code of practice for industrial lighting	IS 6665
Code of practice for lighting of public thoroughfare	IS 1944

LUMINAIRES

Luminaires	IS 10322
Industrial luminaires with metal reflector	IS 1777
Industrial lighting fittings with plastic reflectors	IS 3287
Decorative lighting outfits	IS 5077
Waterproof electric lighting fittings	IS 3528
Watertight electric lighting fittings	IS 3553
Dust-proof electric lighting fittings	IS 4012
Dust-tight electric lighting fittings	IS 4013
Flameproof electric lighting fittings - well glass & bulk head types	IS 2206
Electric lighting fittings for division 2 areas	IS 8224
General & Safety requirement of Luminaire	IS 1913
General Lighting. LEDs and LED modules Terms and definitions	IS 16101
Self Ballasted LED Lamps for General Lighting Services.	IS 16102
LED modules for General lighting Safety Requirements.	IS 16103
Lamp control gear Part 2 particular	IS 15885(Part 2)
Requirements d.c. or a.c. Supplied Electronic control gear for LED modules	IS 16104

LAMPS

Tungsten filament lamps for domestic and similar general lighting purpose	IS 418
Tubular fluorescent lamps for general lighting service	IS 2418
High pressure mercury vapour lamps	IS 9900
High pressure sodium vapour lamps	IS 9974

LUMINAIRE COMPONENTS



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Ballast for fluorescent lamps for switch start circuits	IS 1534
Ballast for high pressure mercury vapour lamps	IS 15882
Capacitors for use in tubular fluorescent high pressure mercury and low pressure sodium vapour discharge lamp circuits	IS 1569
Bi-pin lamp holders for tubular fluorescent lamps	IS 3323
Methods of measurement of lamp cap temperature rise	IS 8913
Starters for fluorescent lamps	IS 2215
Holders for starters for tubular fluorescent lamps	IS 3324
Cast acrylic sheets for use in luminaires	IS 7569

ASSEMBLED EQUIPMENT AND COMPONENTS

Low voltage switchgear and controlgear.	IS 60947
Code of practice for selection, installation & maintenance of switchgear & control gear	IS 10118
Explosive atmospheres	IS 60079
Classification of hazardous areas for electrical installations	IS 5572
Dry type transformers	IS 11171
Electrical Accessories - circuit breakers for over protection for household and similar installations	IS 60898
Low voltage Fuses for voltages not exceeding 1000 V ac or 1500 V dc	IS 13703
Indicator lamps (visual)	IS 1901

POLES, SOCKETS AND OTHER MISCELLANEOUS

Plugs and socket outlets of rated voltage upto and including 250 volts and rated current upto and including 16 amperes	IS 1293
Interlocking switch socket outlet	IS 4160
Electric ceiling type fans and regulators	IS 374
Structural steel (Standard quality)	IS 2062
Danger notice plates	IS 2551
Enclosures for accessories for household and similar fixed electrical installations	IS 14772
General construction in steel - Code of practice	IS 800
Wrought aluminium and aluminium alloy bars, rods, tubes and sections for electrical purposes	IS 5082
Code of practice for phosphating of iron and steel	IS 6005



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Colour for ready mixed paints & enamels	IS 5
Recommended practice for hot dip galvanising of iron & steel	IS 2629
Method of testing uniformity of coating on zinc coated articles	IS 2603
Flexible steel conduits for electrical wiring	IS 3480
Conduits for electrical installations	IS: 9537
Scaffolds & ladders - Code of safety	IS: 3696
Aluminium extension ladders	IS: 4571
General Requirement for enclosures for accessories for household & similar fixed electrical installations	IS: 5133

**3 X 800 MW PATRATU STP
DATASHEET-B**

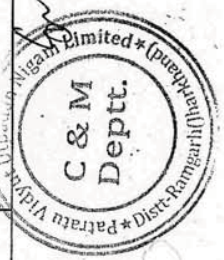
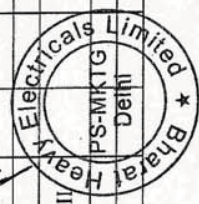
S.No	ITEM DESCRIPTION	LUMINAIRE MAKE AND MODEL	MEASURED ELECTRICAL INPUT POWER (W) MAX. VALUE	TOTAL LUMINOUS FLUX (LUMEN) OF LUMINAIRE MIN. VALUE
A	Fixtures			
1	Luminaire Type FC02 (LED)			
2	Luminaire Type FC06 (LED)			
3	Luminaire Type FC07 (LED)-DC			
4	Luminaire Type FC30 (LED)			
5	Luminaire Type FC32 (LED)			
6	Luminaire Type FC33 (LED)-DC			
7	Luminaire Type FC34 (LED)-DC			
8	Luminaire Type FC81 (LED)			
9	Luminaire Type SB11 (LED)			
10	Luminaire Type SB02 (LED)			
11	Luminaire Type SB03 (LED)			
12	Luminaire Type SF63 (LED)			
13	Luminaire Type SF64 (LED)			
14	Luminaire Type SF66 (LED)			
15	Luminaire Type SS62 (LED)			
16	Luminaire Type SS63 (LED)			
17	Luminaire Type SW41 (LED)			
18	Luminaire Type SW42 (LED)			
19	Luminaire Type MW96 (LED)			
20	Luminaire Type MW98 (LED)			
21	Downlighter LED (18 W = 6x3W)			
22	Luminaire Type FC30 (LED) with Dimmable ballast			
23	Downlighter LED (18 W = 6x3W) Dimmable			

NOTE :

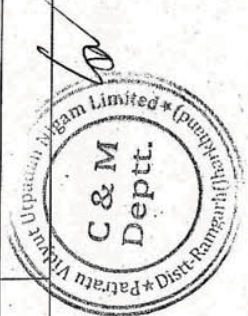
1. Bidder to fill details of Luminaires as per parameters mentioned above and furnish datasheet-B along with technical offer.


ANNEXURE-A

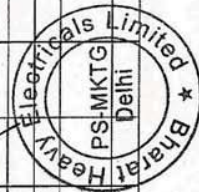
PROJECT : Patratu STPP (2X660 MW) PACKAGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2		LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24 th April 2017				
Sl. No.	ITEM	QP / INS CAT	QP No:- 9578- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER ER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS
						Engineers	Hoogly (Kolkata)			
						Patny System	Hyderabad	A		Galvanisation at Gurpreet galvaniser - Hyderabad
						Rabi Engg	Kolkata	A		Galvanizing from NTPC approved sources
						Advance Power Products	Howrah	A		
						Maheswari Electricals	Noida	DR		
						Saral Industries	Raibareli	DR		
						Parmar Mctal	Rajkot	DR		
						Pentax	Mumbai	DR		
						Eros metal	Nagpur	DR		
						Vinfab	Thane	DR		
						Namdhari	Ludhiana	DR		
						Indmark Formtech	PUNE	DR		
						Vatco	Mumbai	A		Galvanising at Sigma Mumbai
						Inar profiles	Enkapalli	A		
						Industrial perforations	Kolkata	A		
						Premier power products	Kolkata	A		Galvanising at Neha Galvaniser
						Steelite engg.	Mumbai	A		
						Indiana gratings	Pune	A		Galvanising at Poona Galvaniser
						Amtech	Pune	A		Galvanising at B.G. Shirke
						Ratan Projects	Kolkata	A		Galvanization at NTPC approved sources
						Indmark Formtech	PUNE	DR		
						M/s PLICA	Ghaziabad	A		
						M/s Lapp	Germany	DR		
						M/s Bansal Labs	Bhopal	A		
11.	Cable tray-flexible support system (GI)	I								
12.	Lead coated steel flexible conduits	III								



Sl. No.	ITEM	PROJECT : Pairatu STPP (2X660 MW)				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24 th April 2017			
		QP/INS CAT	QP No:- 9578-001-QVE	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS			
13.	Junction boxes / Link Boxes/ Test Link Box/ Adaptor box, Switch Boxes, Pull Boxes (Hot Dip Galvanized)	III				Main contractor approved sources with galvanization from NTPC approved sources (Note-2)		Noted					
14.	FRP Junction boxes	II	10			Main Contractor approved sources		Noted					
15.	Cable termination kits & straight through jointing kit upto 33KV	I	11			M/s 3M Electro & Communication Raychem Yamuna Cable Accessories Hari Consolidated Pvt Ltd	Pune Mumbai Yamunanagar Delhi	^ ^ ^ ^			up to 33 KV Heat shrinkable type up to 33 KV Heat shrinkable type Upto 11 KV with conditions, above rating DR		
16.	Cable glands	III				Main contractor approved sources		Noted					
17.	Cable lugs	III				M/s Dowell M/s Billets Eicktro Werke Ltd.	Mumbai Umbergaon	^ ^					




		PROJECT : Patratu STPP (2X660 MW) PACKAGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24 th April 2017			
Sl. No.	ITEM	QP/INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS ASPER NTPC	SC AP PL SC HE DU LE	REMARKS			
						(3 D) M/s Chetna Nasik		A					
						Additionally Any make's model with VDE or CE or UL or CSA marking or BIS approved with CML no. Refer Note-3		Noted					
18.	Lighting fixtures with accessories	I	12			M/s Crompton	Mumbai	A#		#- "A"- for filament type and "DR" for LED Type			
						M/s Bajaj Electricals	Mumbai	A					
						M/s Philips	Noida	A#					
						M/s Wipro	Mumbai	A					
						M/s Surya Rosini	Kashipur	A					
						M/s Goldwyn	Noida	A					
19.	Lamps	III				M/s Crompton	Mumbai	A#		#- "A"- for filament type and "DR" for LED Type			
						M/s Bajaj Electricals	Mumbai	A					
						M/s Philips	Noida	A#					
						M/s Wipro	Mumbai	A					
						M/s Surya Rosini	Kashipur	A					
						Goldwyn	Noida	A					
20.	Lighting Panels	I				Please refer serial no- 3 as identified in LT Switchgear & LT Busduct sub package list							

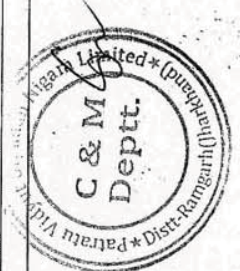
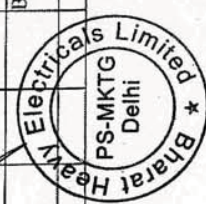



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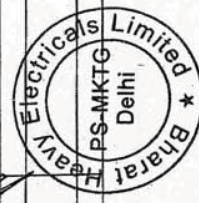
		PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017			
Sl. No.	ITEM	QP/INS CAT	QP No:- 9578-001-QVE	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS			

						M/s Ajmera	Mumbai	A		
						M/s. Sakti & Crown	Chennai	A		
						Additionally Any make's model with VDE or CE or UL or CSA marking or BIS approved with CML no		Refer Note-3		
23.	Lighting mast with raise & lower type lantern carriage	I	15			M/s Bajaj	Pune	A		
						M/s Skipper	Howrah	A		
						M/s. B.P. Project,	Hoogly	A		
24.	Lighting pole / steel tubular pole	I	16			BIS licensee as per IS 2713 with valid CML number		A		
						M/s Bajaj	Pune	A		
						M/s B.P. Projects	Hoogly	A		
26.	PVC conduit/hume pipe/lighting wire/GI pipes/HIDPE pipe/Structural Steel	III				BIS licensee / ISI marked with valid CML number		A		
27.	GI steel rigid conduit/ epoxy conduit	III				BIS licensee with valid CML number		A		



		PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24 th April 2017	
		ITEM	QP/INS CAT	QP No:- 9578-001-QVE	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS NTPC	SC AP PL SC HE DU LE	REMARKS


28.	Trefoil clamps/Earthing & Lighting Protection Material/Sheet Steel/ FRP cable trench cover/drum lifting jack/Earth wire/ FRP/Aluminum Ladder/Dimmer & Passive Infrared Sensors	III				Main Contractor Approved Sources	Noted		
29.	FAN with regulators & Exhaust Fan	III				M/s Crompton M/s Orient M/s Khaitan M/s Polar M/s GEC M/s Havells M/s Bajaj	Noted		
30.	FOP of DG Set Installation.	I	G-01						
31.	FOP of Cables & Accessories	I	G-02						



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200

		PROJECT : Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24 th April 2017	
		Sl. No.	ITEM	QP / INS CAT	QP No:- 9578-001-QVE	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE
32.	QP of Earthing	I	G-03								
33.	QP of Station Lighting	I	G-04								

NB:

Under Sub Supplier approval status as per NTPC column:

A: mean that vendor for this item is acceptable to NTPC.

Under QP / INSPN CATEGORY column:

CAT-I : For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection & witness by NTPC

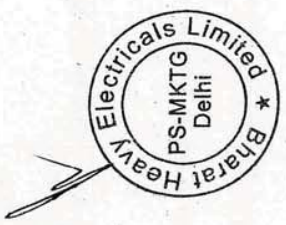
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on basis of verification of documents as per approved QP


CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.

@ : Vendors acceptance is subject to sub-QR clearance.

Note-1- Approval conditions attached to above identified vendors, as applicable shall be adhered to.

Note-2 - List of NTPC acceptable galvanizers

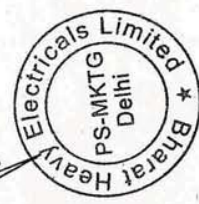


		PROJECT : Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24 th April 2017			
Sl. No.	ITEM	QP / INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH. L	QP APP SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS			

1. M/s M J Engg, Delhi	8. M/s National Galvanizer, Kolkata	16. M/s Radhakrishnan Shetty, Chennai	Additional galvanizers, if any, proposed by manufacturer through main contractor during detailed engineering shall be reviewed & assessed by NTPC as per the merits of the case.
2. M/s Jamma Metal, Delhi	9. M/s Unistar Galvanizer, Kolkata	17. Karamtara Mumbai	
3. M/s A.V. Engg, Kolkata	10. M/s B.P. Project. Kolkata	18. Poona Galvanizers Pune	
4. M/s Inar Profiles, Vishakapatnam	11. M/s Bajaj Pune	19. Ncha Galvanizer- Kolkata	
5. M/s Anand Udyog, Mumbai	12. M/s Electrocure Industries, Mumbai	20. Unittech galvanizers- Hoogly	
6. M/s Techno Engg, Chandigarh	13. M/s B.G. Shirke, Pune	21. Gurpreet galvanizers- Hyderabad	
7. M/S Steelite Engg, Mumbai	14. M/s Gurpreet Galvanizer, Hyderabad	22- DMP Projects- Kolkata	
	15. M/s Sigma, Mumbai		

Note-3 : VDE / CE / UL / CSA MARKING FOR PRODUCT QUALITY: SELF CERTIFICATION/VALID CERTIFICATION FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER WITH CML NO. FOR PRODUCT QUALITY SHALL BE SUBMITTED FOR NTPC'S INFORMATION

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NTPC



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JATIN GAHLAWAT
BHEL



SUBVENDOR LIST FOR LIGHTING DESIGNER

ITEM CODE	ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
	LIGHTING DESIGNER	1	AT13	AVAIDS TECHNOVATOR S PVT. LTD.	4A/58, SHANKAR ROAD, NEW DELHI-110060	Mr. Rajendra Panda M: 9910481854 (email: rajendra@avaids.com)	
	LIGHTING DESIGNER	2	BE13	BAJAJ ELECTRICALS LTD.	801 (8th floor), Rustomjee Aspire, Bhanu Shankar Yagnik Marg, Off Eastern Express Highway Ston (E), Mumbai 400022	Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. (email: srabans@bajajelectricals.com)	
	LIGHTING DESIGNER	3	KS13	KELSATEK SOLUTIONS PVT. LTD.	50/1 4TH FLOOR, CHURCH STREET, BANGALORE-560001	Mr. S Mudaliar Sr. VP M: 6380471362 (email: mudaliar@kelsatek.com)	
	LIGHTING DESIGNER	4	SE13	M/s SUMANAM ENGINEERING SERVICES CONSULTANT	1, ADITHYA, KOWDIAR, TRIVANDRUM 695003	Mr. Anshad S Phone: 471-2437588, (email: shaw@sumanam.org)	



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 08.09.2016

ANNEXURE-B

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S.NO No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	Primary / Secondary	Delivery schedule for vendor
1.	OGA of equipments such as fixtures, SBs, JBs, receptacles, free standing ladder, Emergency exit sign, wheel mounted ladder, ceiling fans, ELU etc.	PE-V0-434-558-101	Primary	Refer note no 2 & 3 below.
2.	Datasheet of lamps, CFL, flouroscent tube, Terne coated conduit	PE-V0-434-558-102	Primary	
3.	MQP for luminaires	PE-V0-434-558-901	Primary	
4.	MQP for miscellaneous items	PE-V0-434-558-905	Primary	
5.	Lighting design calculation	PE-V0-434-558-201	Secondary	
6.	Lighting layout	PE-V0-434-558-301	Secondary	
7.	Conduit layout	PE-V0-434-558-401	Secondary	
8.	Mounting arrangement of bulk head fixtures	PE-V0-434-588-103	Secondary	Alongwith respective OGA
9.	TTR for lighting fixtures	PE-V0-434-558-E104	Secondary	Within 2 months from lot clearance of applicable items.
10.	FQP for lighting fixtures	PE-V0-434-558-E105	Secondary	Within 3 months from PO.
11.	Mounting arrangement drawings	PE-V0-434-558-E106	Secondary	Alongwith respective OGA.

NOTE:

1.

Drawing/Documents indicated above shall be submitted through document management system (DMS).



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 08.09.2016

2. **Primary Docs:** R-0 within **28** days from lot clearance of released items & subsequent revisions within **10** days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
3. **Secondary Docs:**
 - a) LDC (Lighting Design Calculation) & LLO (Lighting Layout): R0 submission within 3 weeks from the date of BHEL input drawing & re- submission within **15** days of BHEL comments. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
 - b) CLO (Conduit Layout): R0 submission within **15** days from the approval of respective LLOs & re- submission within **15** days of BHEL comments.

ANNEXURE-C

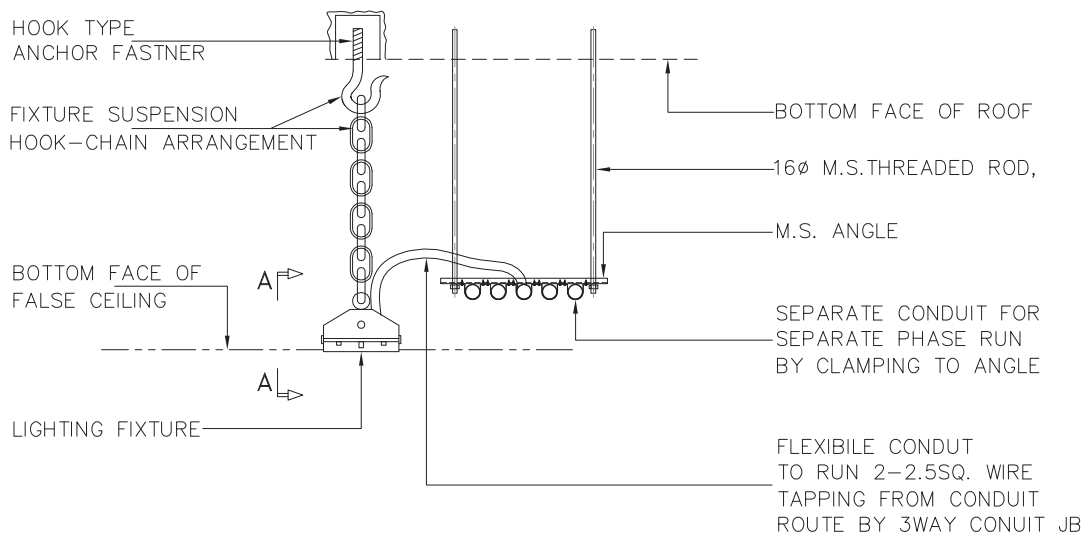
PACKING SPECIFICATIONS- LIGHTING FIXTURES, LAMPS & MISC. ITEMS

PACKING

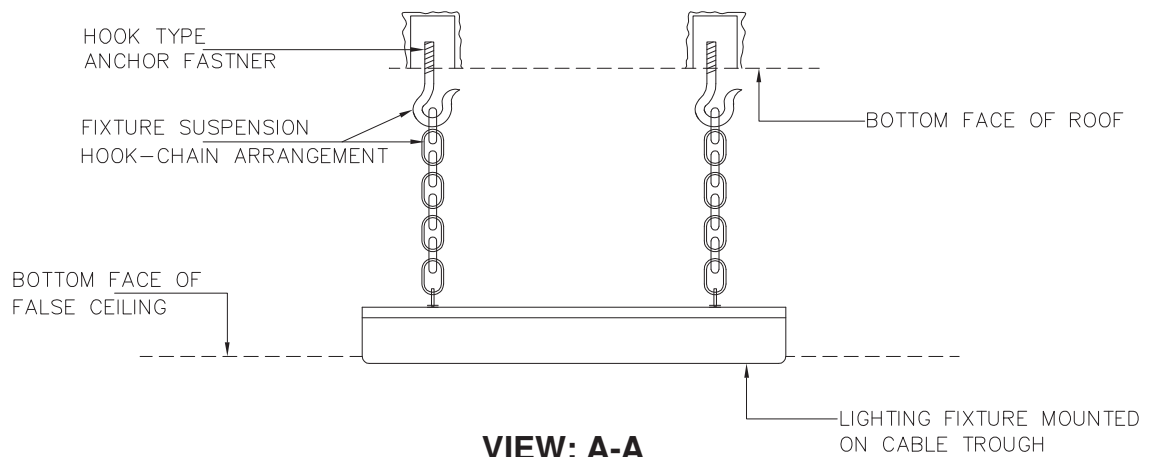
1. The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling.
2. Lighting Fixtures, Lamps, Receptacles, Switchboards, 24V Supply modules, 24V sockets, Junction Boxes, Exit signs shall be clean and dry prior to packaging.
3. All items specified at sl. No.2 above shall be supplied in packed cartons. The tapes used for packing shall not bleed, leave residue, or damage the item when removed.
4. Fixtures & other lighting material shall be wrapped in weather proof material such as polythene sheets, air bubble sheets/ thermocol etc. The lighting fixtures shall be placed in a corrugated paperboard/ fibreboard container/ mono carton.
5. The mono cartons shall be wrapped or bagged or tied in place in master cartons. The master carton shall be taped and then wrapped with cushioning material.
6. The dimensions of cartons shall be as per manufacturer's recommendations.
7. For items like step ladder, wheel mounted ladder and flexible conduits, packing shall be as per manufacturer standard.

Note: In case Manufacturer has a different packing standard which is equivalent or better same to be submitted for approval during contract stage.

Annexure-D MOUNTING ARRANGEMENT



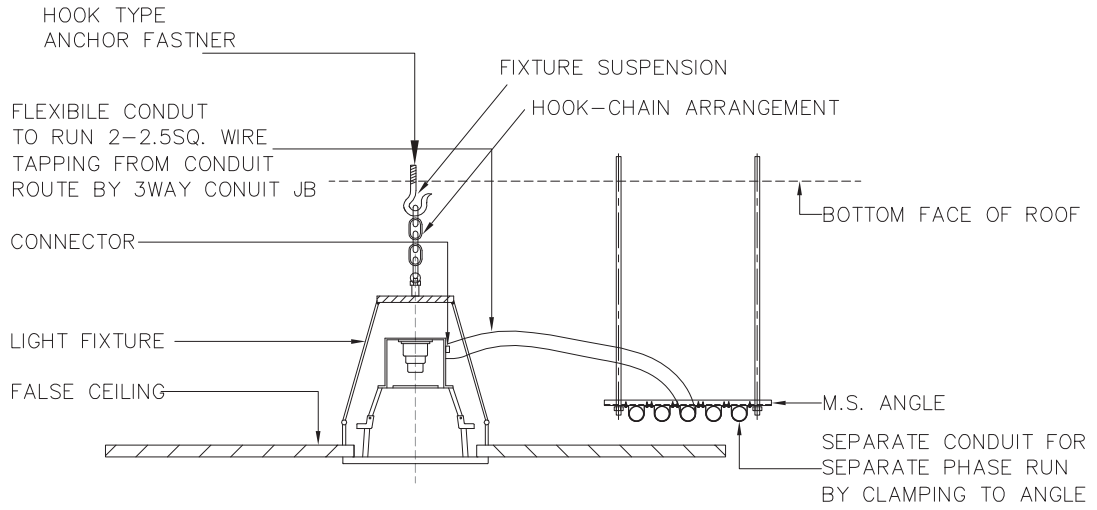
FALSE CEILING AREAS TYPE-A



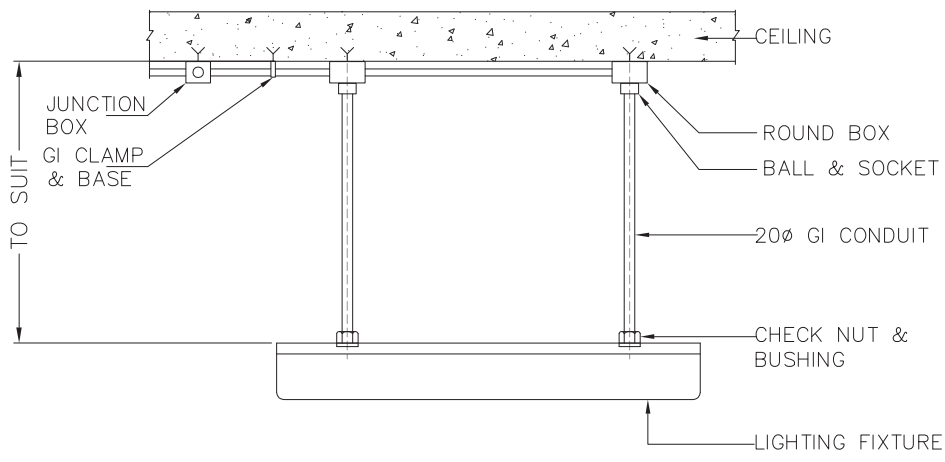
VIEW: A-A

TYPICAL MOUNTING DETAIL OF FLOURSCENT FIXTURES

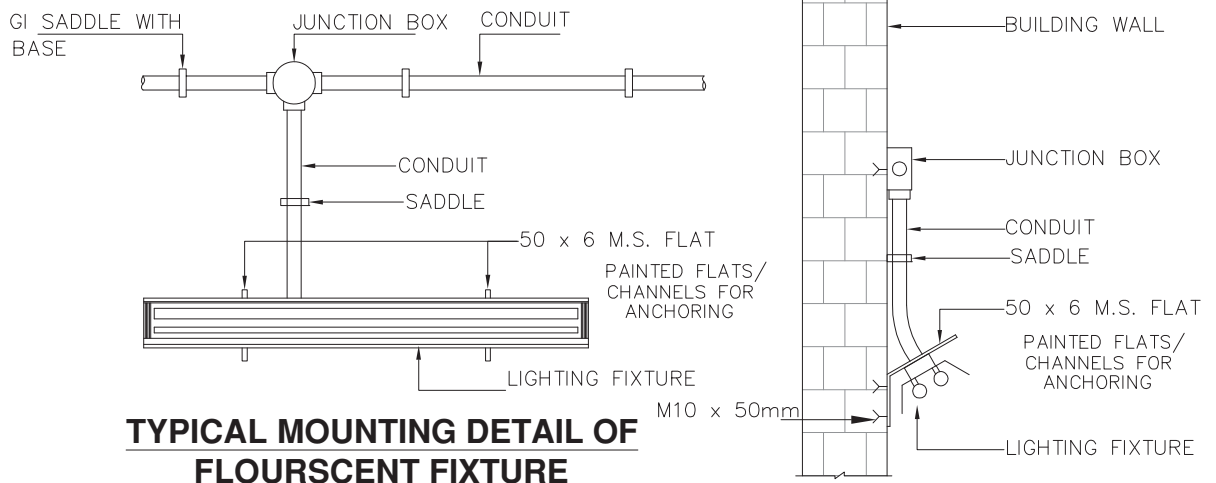
THIS IS A TYPICAL MOUNTING DRGS / DETAILS FOR GUIDANCE ONLY. FINAL MOUNTING ARRANGEMENT DRAWING SHALL BE MADE BY THE SUCCESSFUL BIDDER DURING DETAILED ENGINEERING. IT IS TO BE NOTED THAT GI CONDUIT 20 MM DIA FLEXIBLE PVC COATED CONDUIT, STRUCTURAL STEEL SHALL BE PROVIDED BY BHEL. BALANCE ALL OTHER ACCESSORIES CLAMPS / CHAINS / CLIPS / STEEL ROPE / PINS ETC. REQUIRED FOR MOUNTING AS PER TYPICAL MOUNTING ARRANGEMENT FOR THEIR FIXTURES SHALL BE PART OF FIXTURES ONLY AND SHALL BE PROVIDED BY THE BIDDERS.



**TYPICAL MOUNTING DETAIL OF RECESSED LIGHTING
FIXTURE IN FALSE CEILING AREA
TYPE-B**



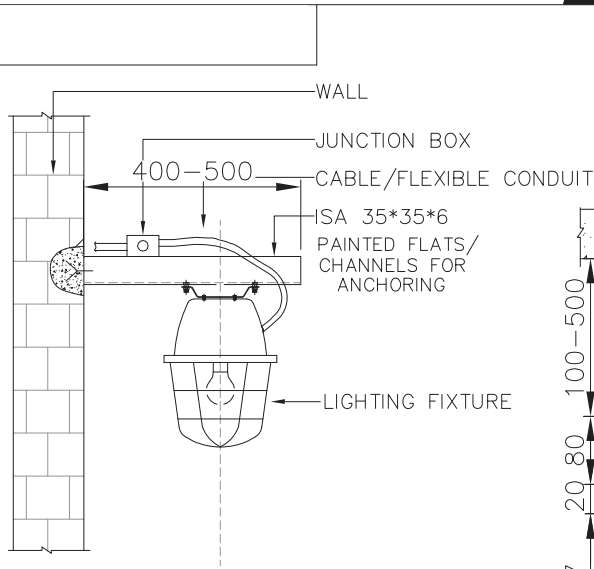
TYPE-C



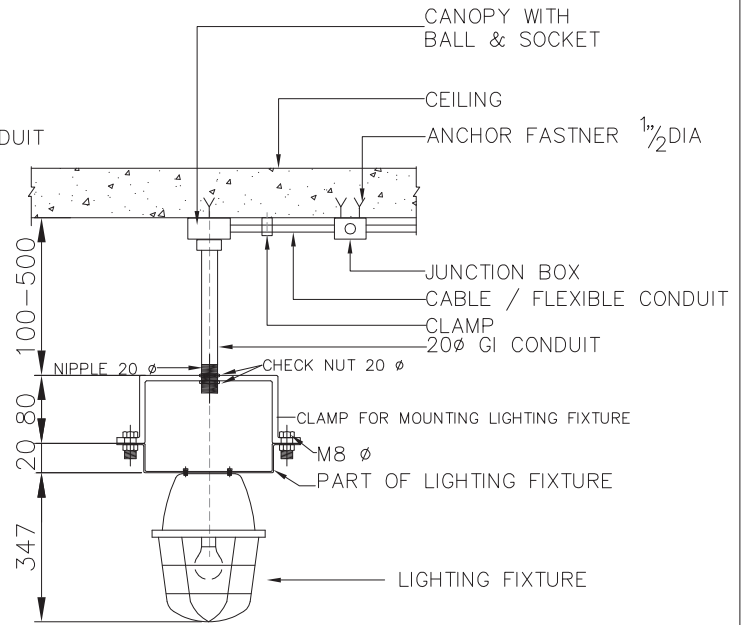
**TYPICAL MOUNTING DETAIL OF
FLUORESCENT FIXTURE**

TYPE-D

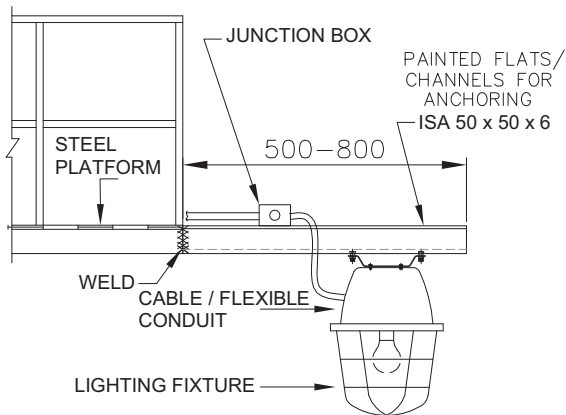
END VIEW



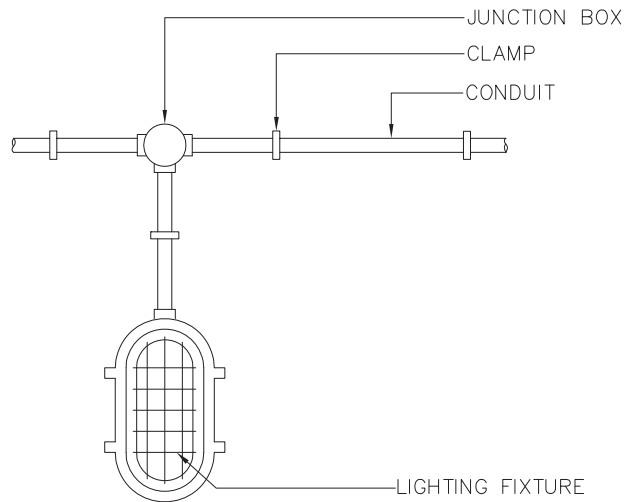
**SUPPORTED FROM WALL
TYPE-E**



**SUPPORTED FROM CEILING
TYPE-F**

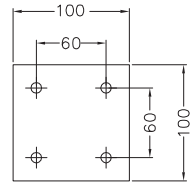
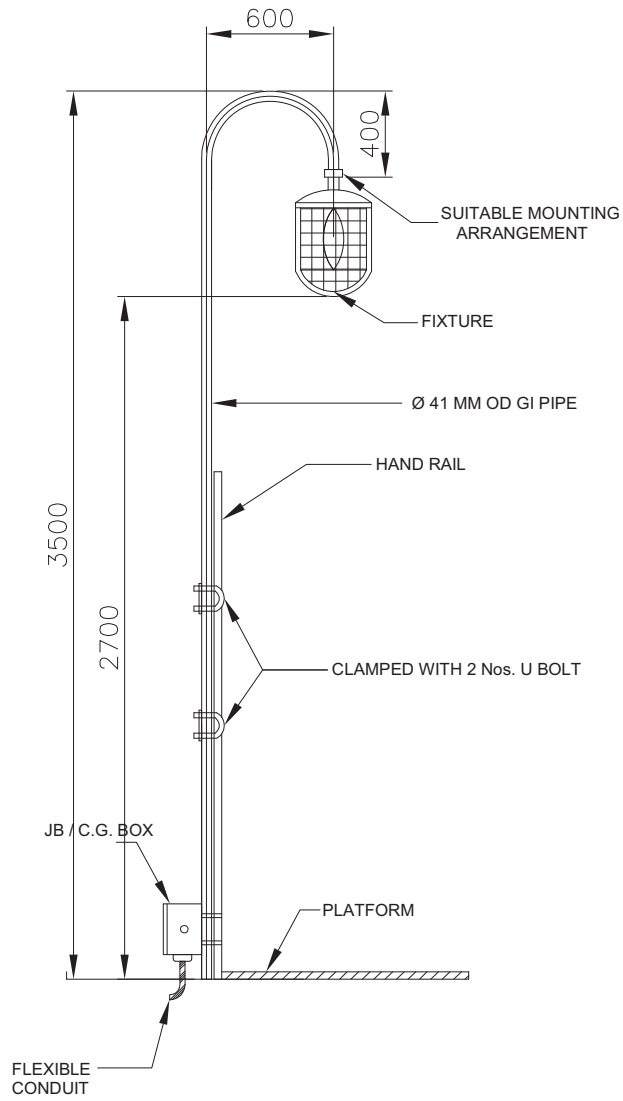


**SUPPORTED FROM
HORIZONTAL STEEL MEMBER
TYPE-G**



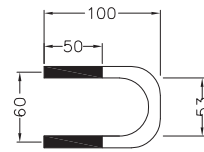
**WALL MOUNTING
TYPE-H**

**TYPICAL MOUNTING DETAIL OF
WELL GLASS FIXTURE**



NOTES:

MS PLATE

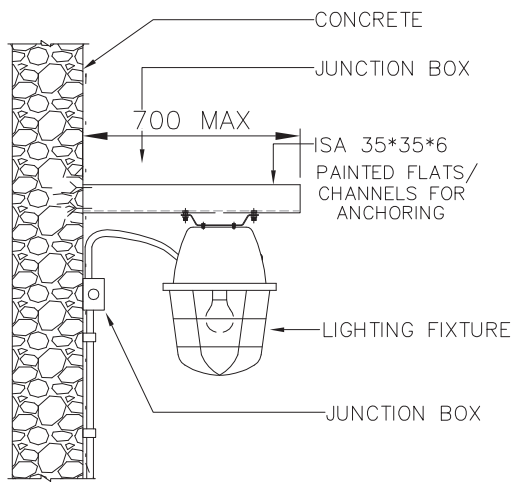


8 MM DIA G.I. 'U' BOLT

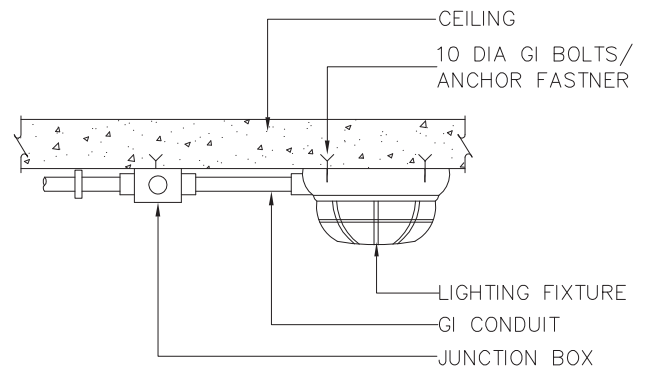
3.5M HANDRAIL MOUNTED LIGHTING POLE (TYPE-I)

NOTES

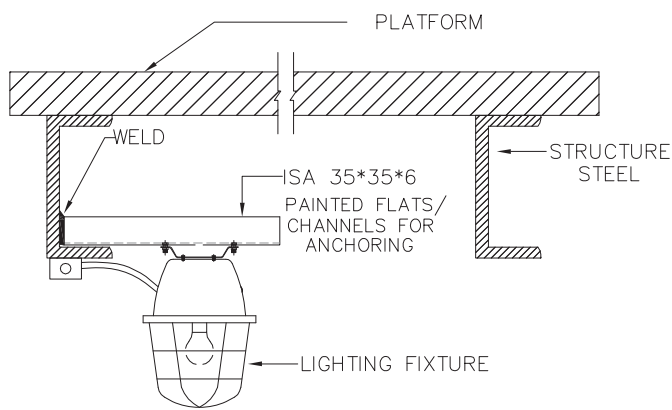
1. ALL DIMENSIONS ARE IN MM.
2. 4 Nos. OF 8MM DIA G.I. 'U' BOLT WITH NUTS AND DOUBLE WASHER REQUIRED FOR MOUNTING EACH LIGHTING POLE.



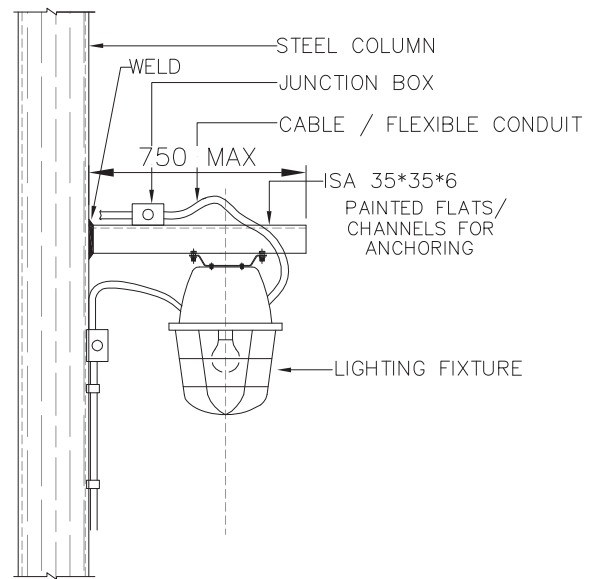
SUPPORTED FROM WALL
TYPE-J



CEILING MOUNTED
TYPE-K



STRUCTURE MOUNTING
TYPE-L



COLUMN MOUNTING
TYPE-M

ROOF

PURLINS

STRUCTURE MOUNTING **TYPE-N**

ROOF TRUSS

500-800

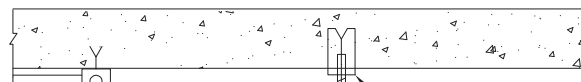
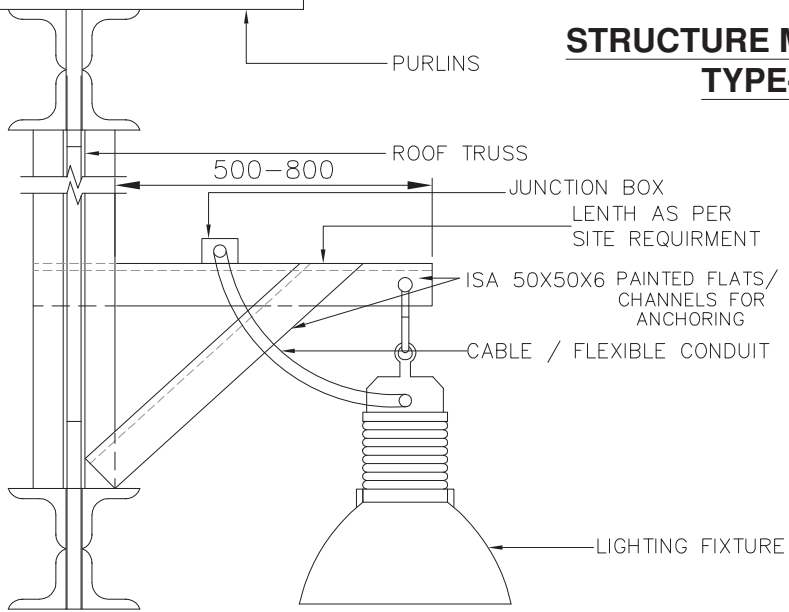
JUNCTION BOX

LENTH AS PER
SITE REQUIRMENT

ISA 50X50X6 PAINTED FLATS/
CHANNELS FOR
ANCHORING

CABLE / FLEXIBLE CONDUIT

LIGHTING FIXTURE



CONDUIT

JUNCTION
BOX

ANCHOR FASTNER

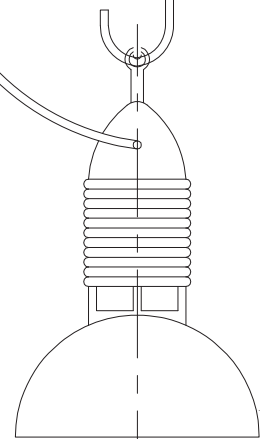
M 10 COUPLING

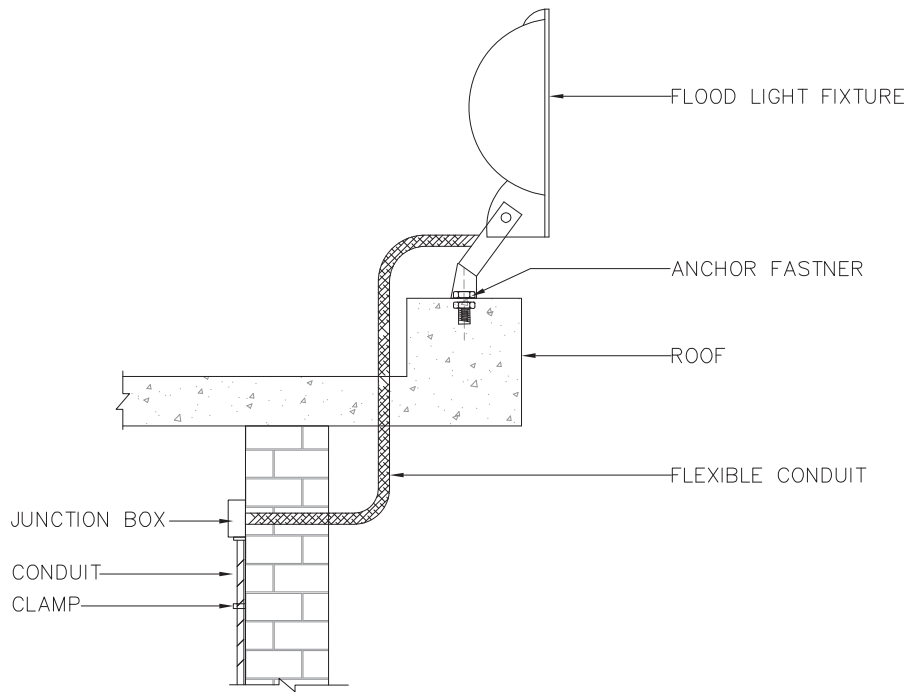
CABLE / FLEXIBLE CONDUIT

TYPICAL MOUNTING **DETAIL OF HIGHBAY** **FIXTURES**

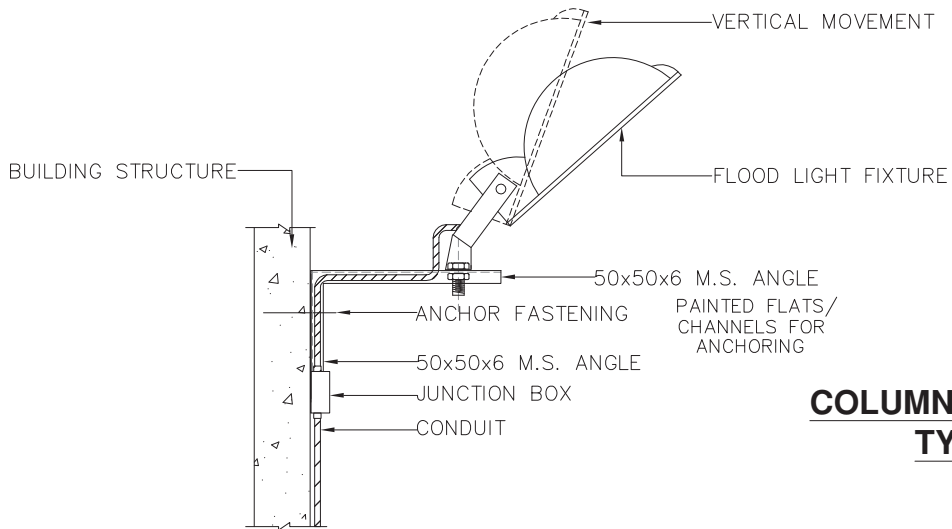
CEILING MOUNTING **TYPE-O**

LIGHTING FIXTURE



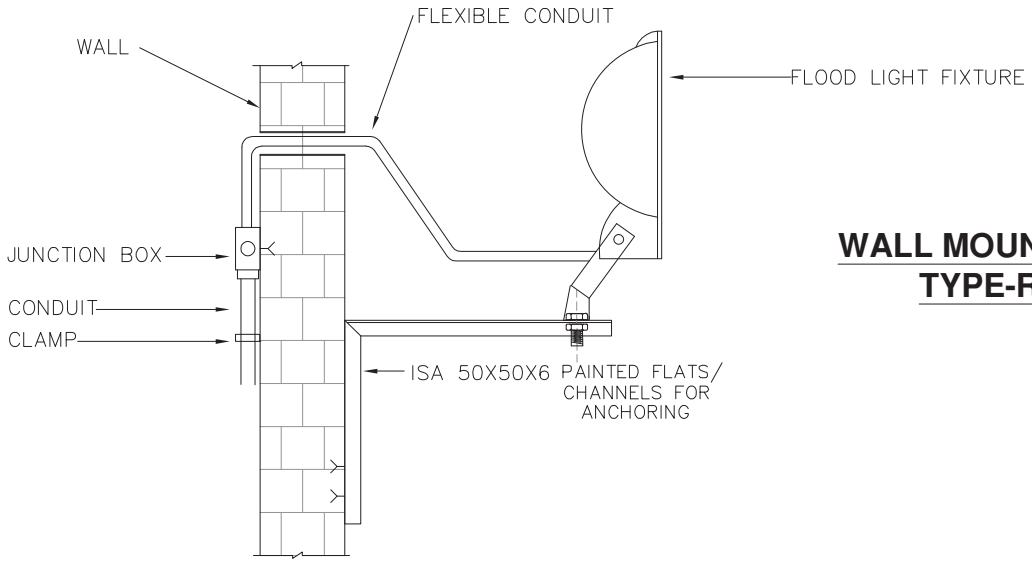


ROOF MOUNTING
TYPE-P

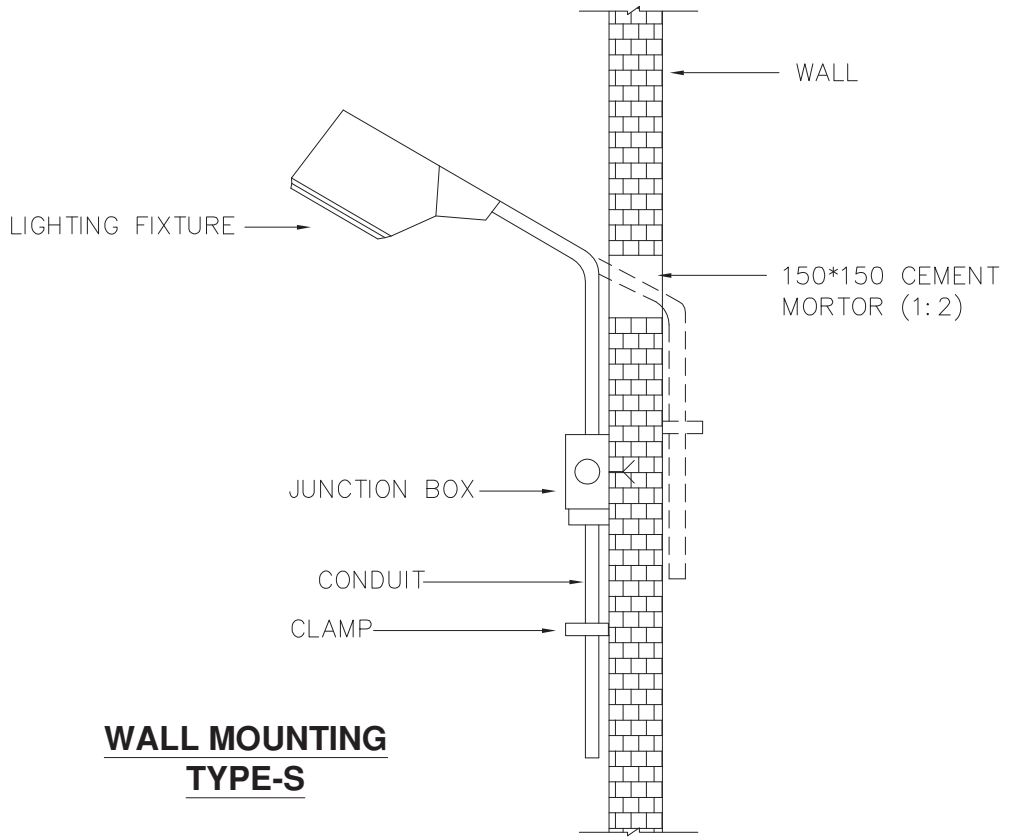


COLUMN MOUNTING
TYPE-Q

TYPICAL MOUNTING DETAIL
OF HIGHBAY FIXTURES

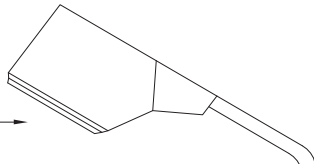


**WALL MOUNTING
TYPE-R**

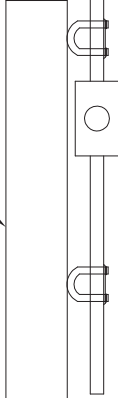


**WALL MOUNTING
TYPE-S**

LIGHTING FIXTURE



HAND RAIL
STRUCTURE

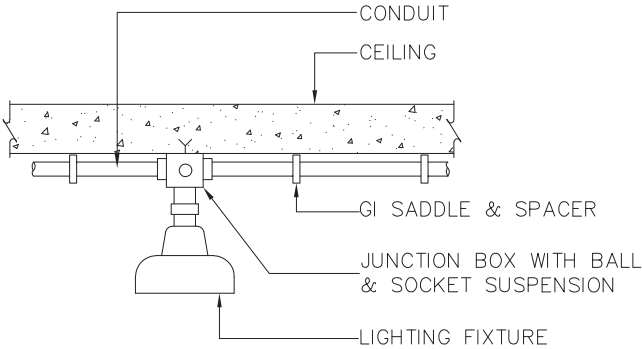


JUNCTION BOX

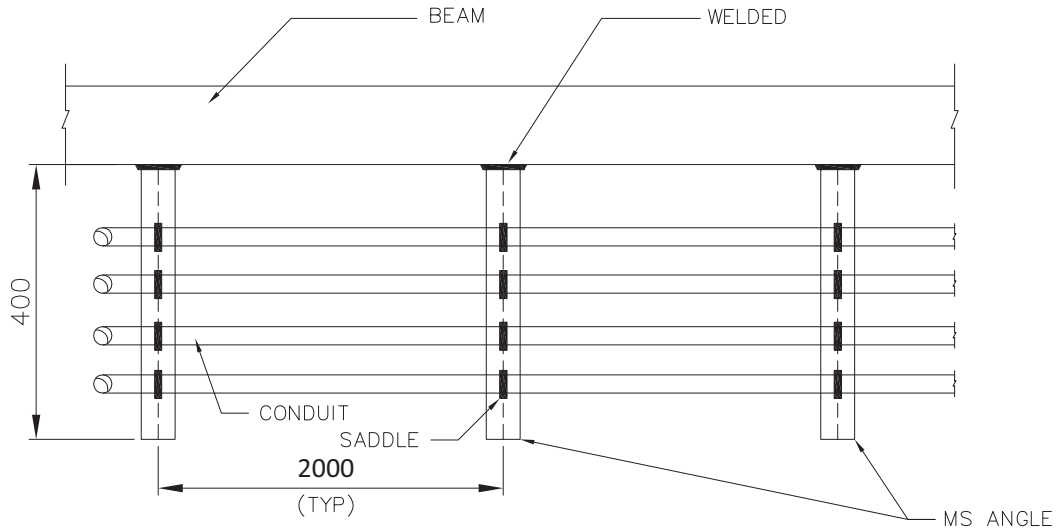
WALK WAY



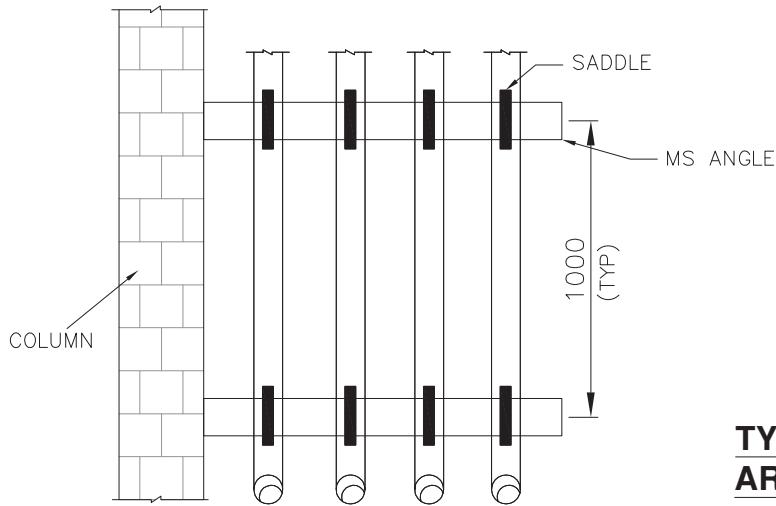
TYPE-T



CEILING MOUNTED
TYPE-U



TYPICAL CONDUIT FIXING ARRANGEMENT OF STEEL STRUCTURE

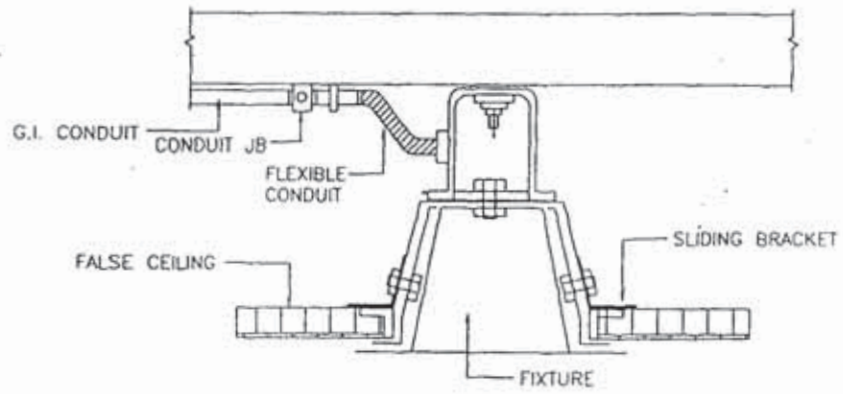


TYPICAL CONDUIT FIXING ARRANGEMENT OF WALL

NOTES:

1. THE CONDUIT SUPPORT SHALL BE PROVIDED AT AN INTERVAL OF 2000m m
2. SIZE OF STEEL FOR.
 - a) SINGLE RUN OF CONDUIT- 25X5 MS FLAT.
 - b) TWO OR THREE RUNS OF CONDUIT- 25X25X3 MS ANGLE.
 - c) FOUR RUNS OF CONDUIT ONWARD- 35X35X6 MS ANGLE.
3. ALL STEEL FABRICATION SHALL BE PAINTED WITH COATS OF METEL PRIMER FOLLOWED BY TWO COATS OF AL. PAINT.

3 X 660 MW NORTH KARANPURA STP
TECHNICAL SPECIFICATION STATION LIGHTING



* TYPICAL FIXING DETAIL OF RECESSED LIGHTING
FIXTURE IN FALSE CEILING AREA
(TYPE-B)

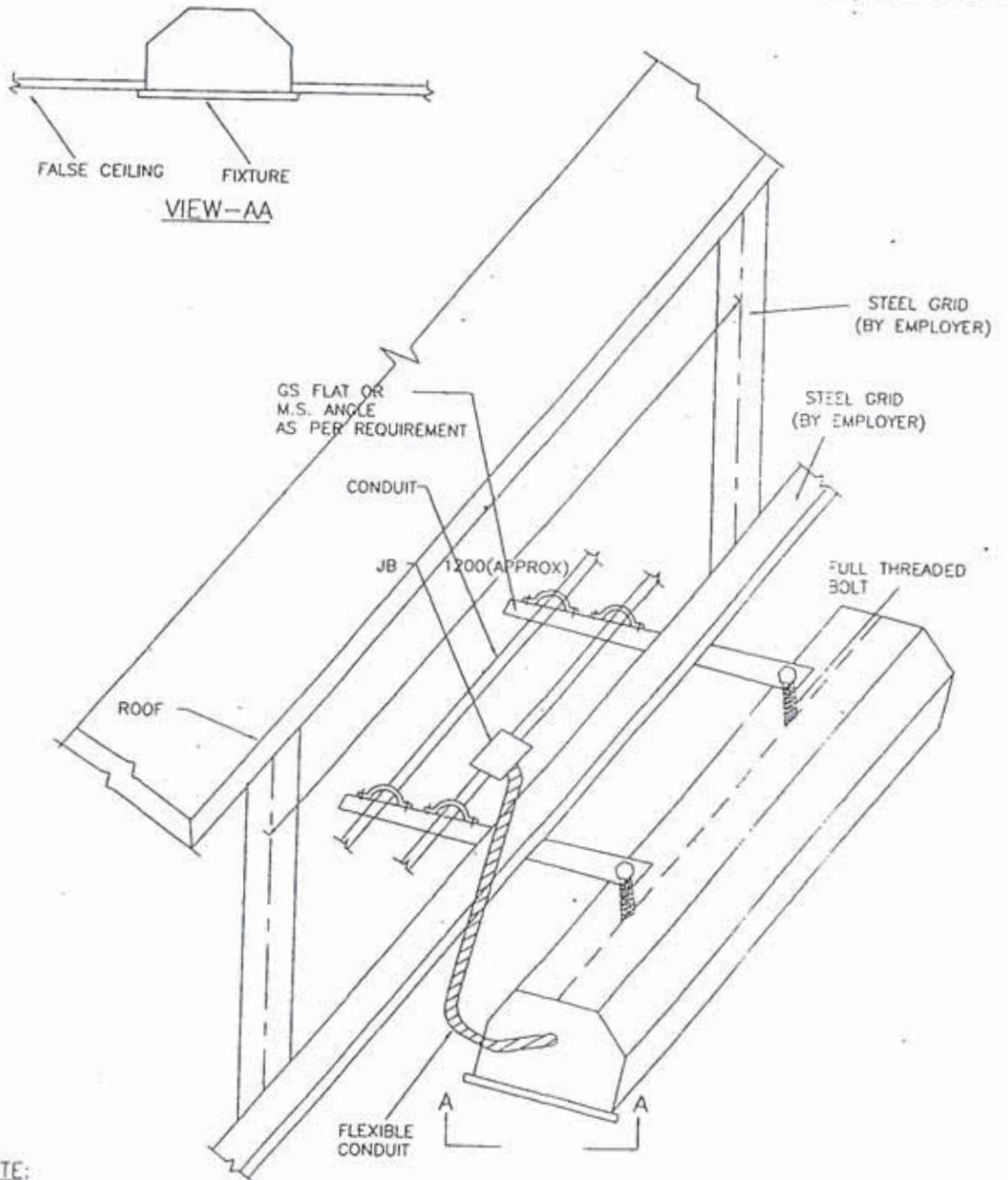
NOTE:
ALL DIMENSIONS ARE IN MM.

LTO.DWG

47

3 X 660 MW NORTH KARANPURA STP
 TECHNICAL SPECIFICATION STATION LIGHTING

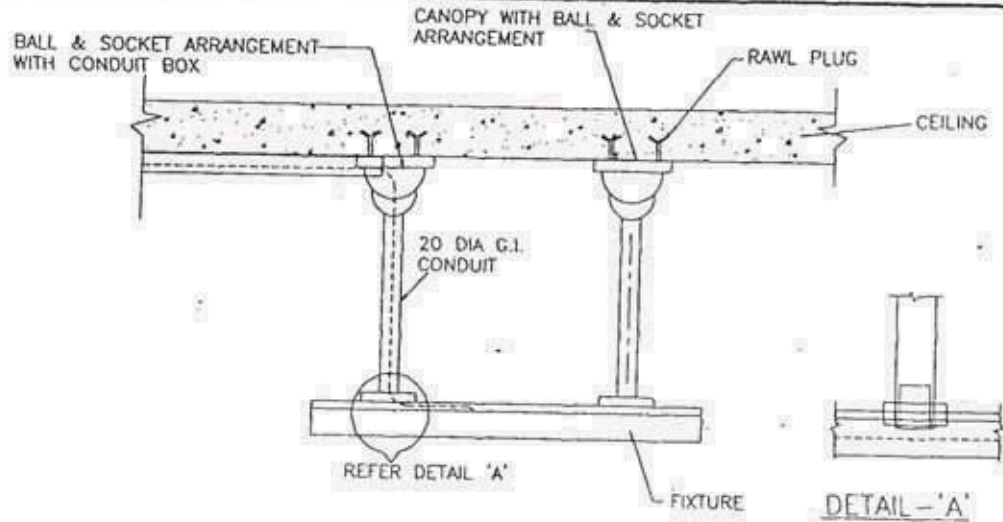
This drawing is made for prosecution.



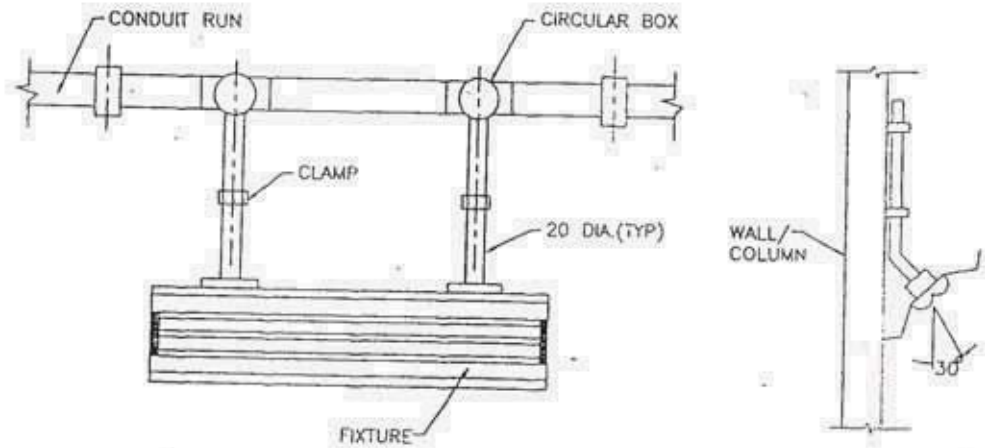
NOTE:

1. ALL DIMENSIONS ARE IN MM.
2. MINIMUM CLEAR DISTANCE BETWEEN FALSE CEILING AND STRUCTURE SHALL BE 300MM (APPROX.)

3 X 660 MW NORTH KARANPURA STP
TECHNICAL SPECIFICATION STATION LIGHTING



TYPE-C

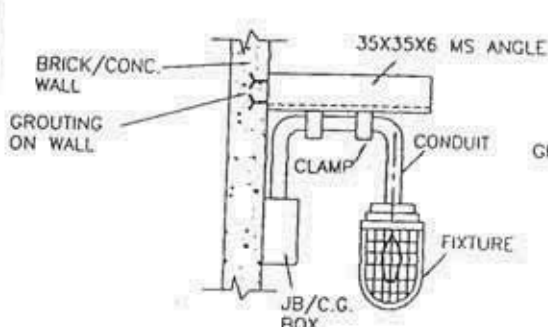


TYPE-D

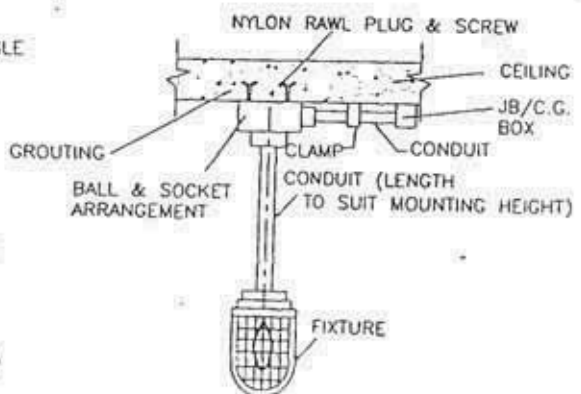
END VIEW

3 X 660 MW NORTH KARANPURA STP
 TECHNICAL SPECIFICATION STATION LIGHTING

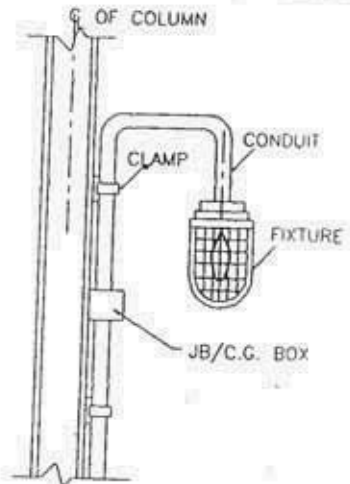
This drawing is to be used for prosecution.



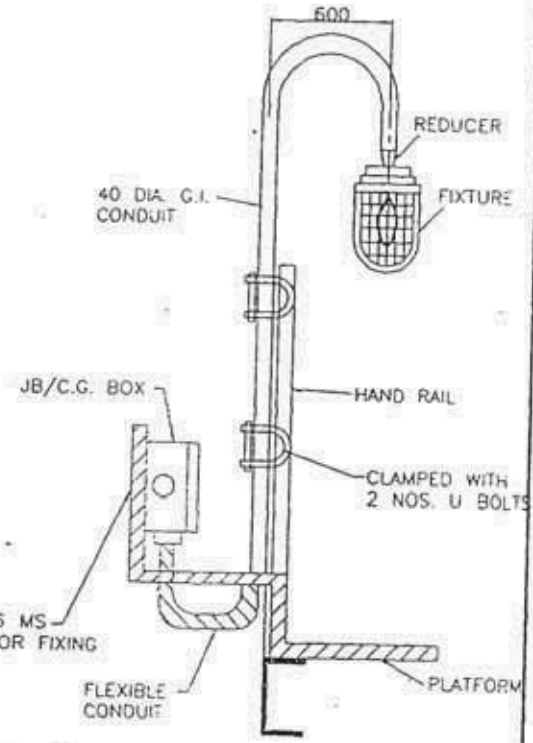
WALL MOUNTING (TYPE-E)



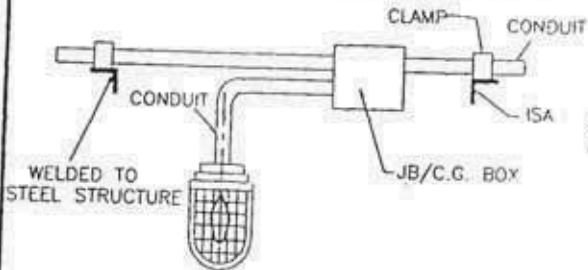
CEILING MOUNTING (TYPE-F)



COLUMN MOUNTING (TYPE-G)



HAND RAIL MOUNTING (TYPE-I)



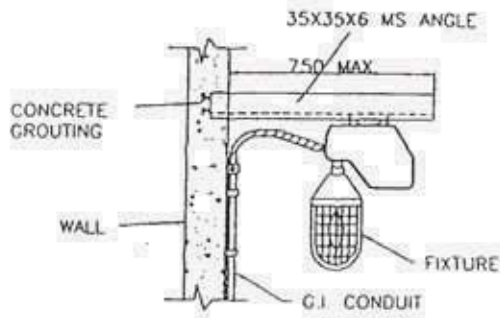
STRUCTURE MOUNTING (TYPE-H)

NOTES:
 ALL DIMENSIONS ARE IN MM.

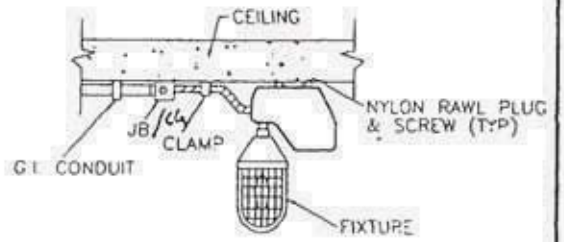


L12.DWC

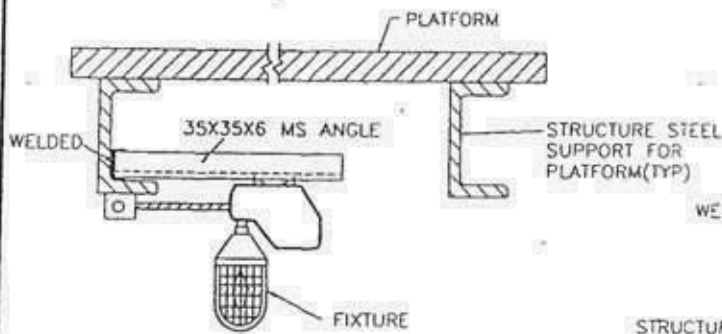
3 X 660 MW NORTH KARANPURA STP
 TECHNICAL SPECIFICATION STATION LIGHTING



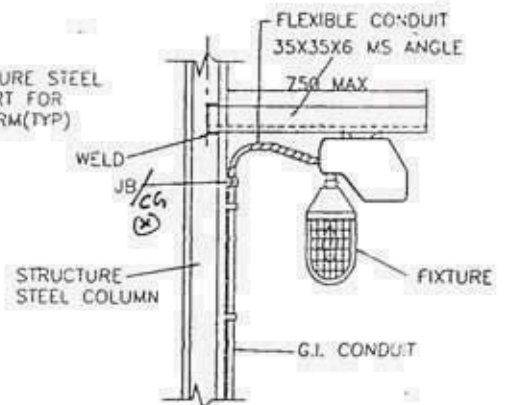
WALL MOUNTING (TYPE-J)



CEILING MOUNTING (TYPE-K)



STRUCTURE MOUNTING (TYPE-L)



COLUMN MOUNTING (TYPE-M)

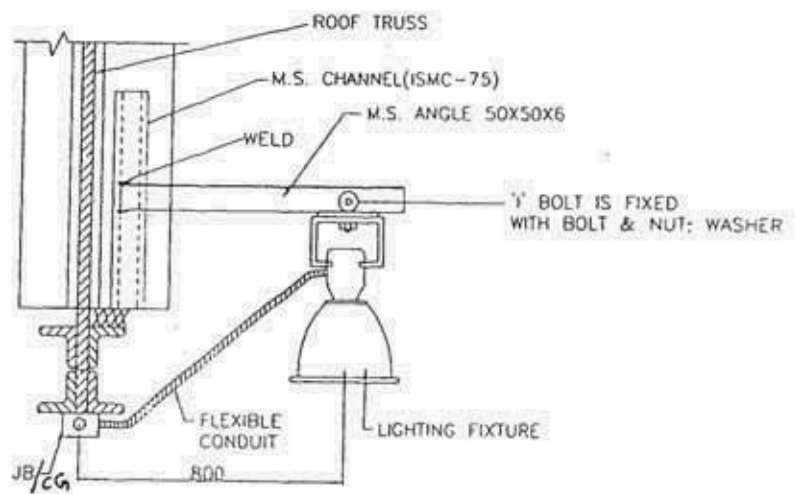
NOTES:

ALL DIMENSIONS ARE IN MM.

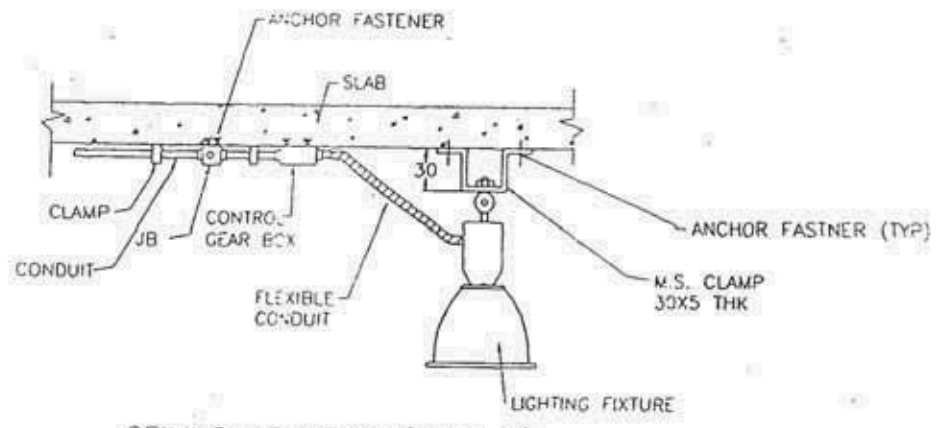
⊕ In case of non-integral CG box

The details and dimensions are subject to change without notice.

3 X 660 MW NORTH KARANPURA STP
 TECHNICAL SPECIFICATION STATION LIGHTING

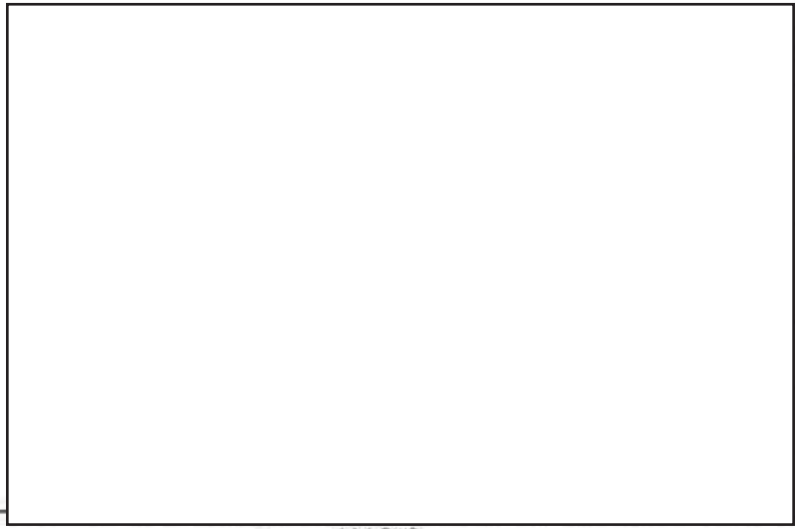


STRUCTURE MOUNTING (TYPE-N)

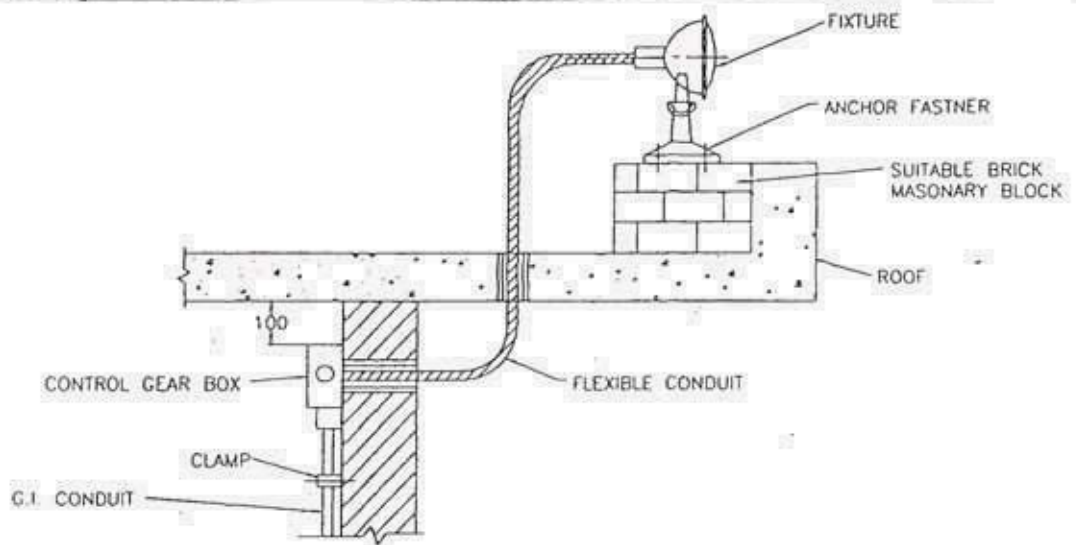


CEILING MOUNTING (TYPE-O)

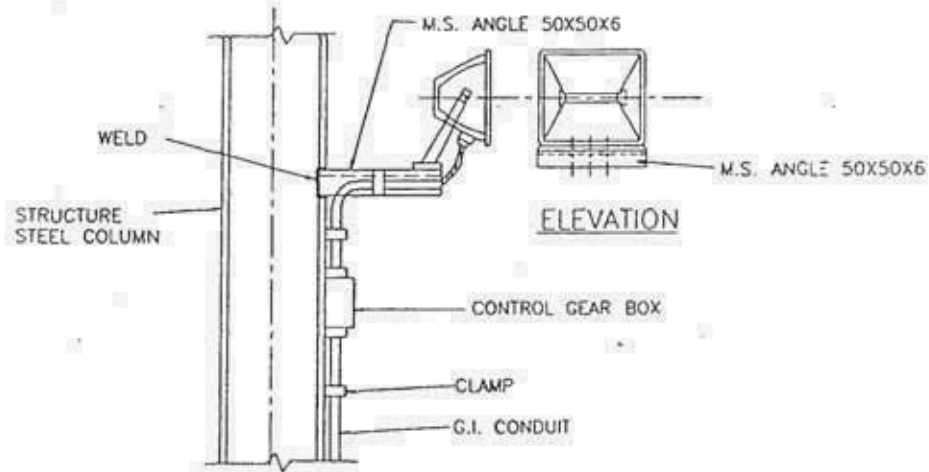
NOTES:
 ALL DIMENSIONS ARE IN MM.



3 X 660 MW NORTH KARANPURA STP
TECHNICAL SPECIFICATION STATION LIGHTING



ROOF MOUNTING (TYPE-P)

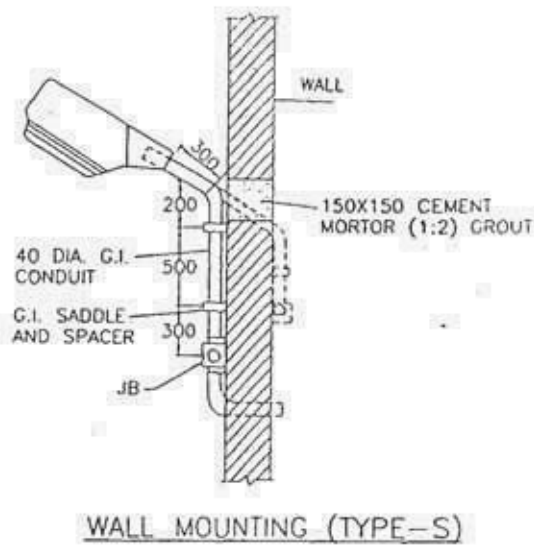
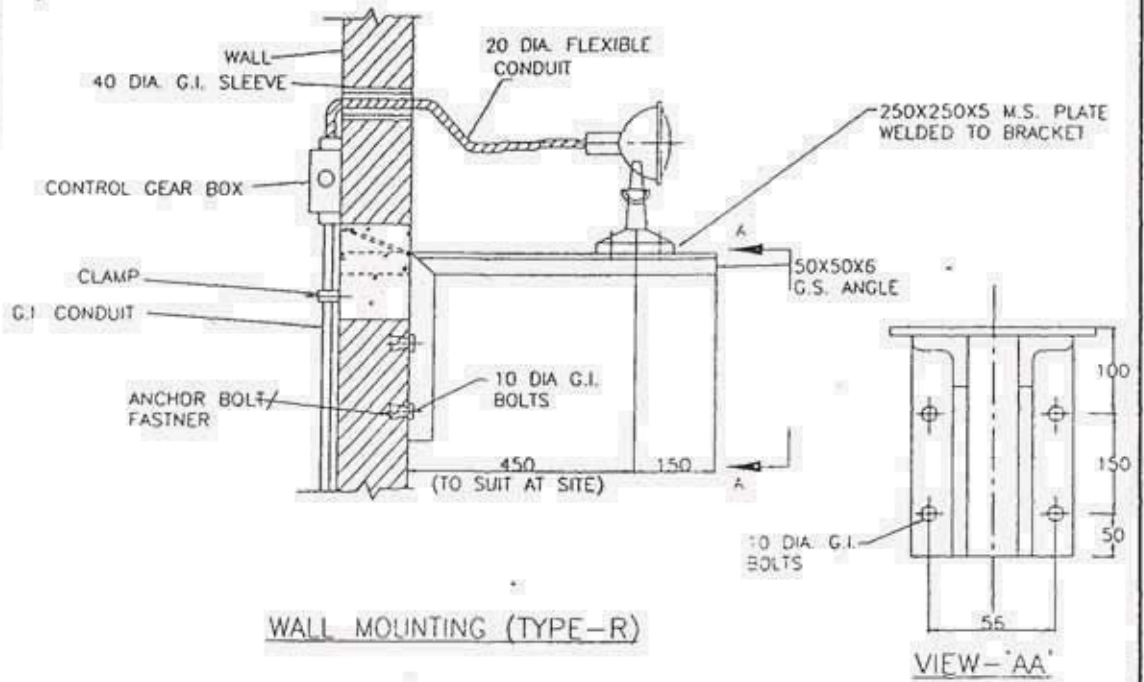


COLUMN MOUNTING (TYPE-Q)

NOTES:

ALL DIMENSIONS ARE IN MM.

3 X 660 MW NORTH KARANPURA STP
 TECHNICAL SPECIFICATION STATION LIGHTING

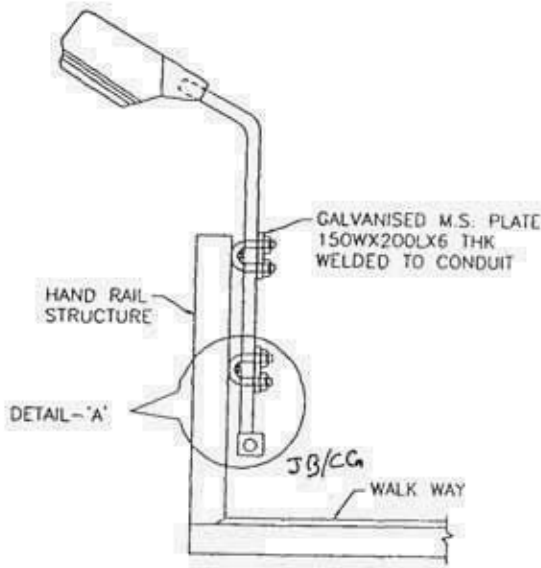


NOTES:

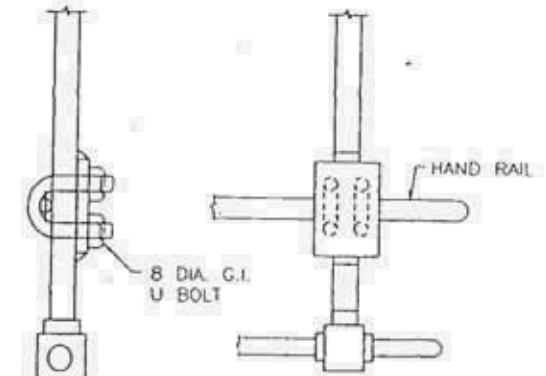
ALL DIMENSIONS ARE IN MM.

3 X 660 MW NORTH KARANPURA STP
 TECHNICAL SPECIFICATION STATION LIGHTING

DRAWING PREPARED BY: M/S. P. V. M. PROSECUTION



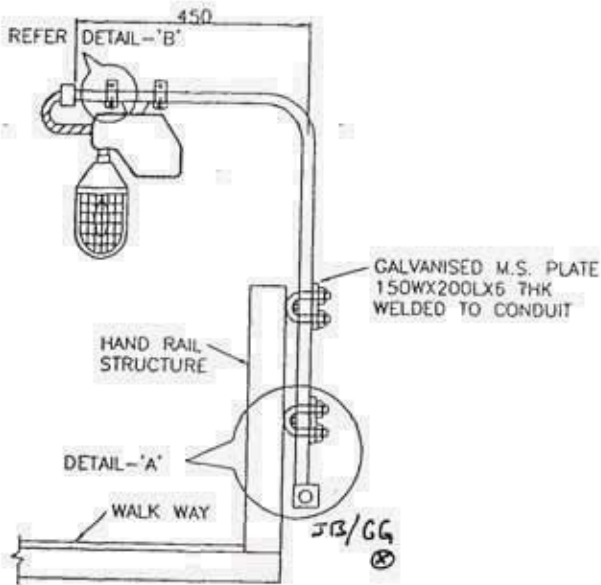
TYPE-T



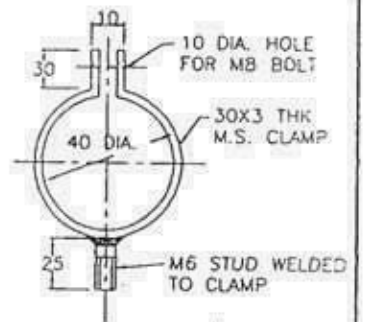
ELEVATION

SIDE VIEW

DETAIL - 'A'



TYPE-U



DETAIL - 'B'

NOTES:

- ALL DIMENSIONS ARE IN MM.
- ⓐ In case of non-integral control gear

ANNEXURE-E



GRIHA Requirements for Electrical

Lighting Requirement - GRIHA v2015

1. Occupancy sensor to be installed in all meeting room, conference hall and storage spaces. For other relevant spaces, either schedule based timer (one timer for not more than 2500 sq.m or one floor) or occupancy sensors that shall turn the lights off within 30 minutes of occupant leaving the space shall be proposed.
2. Each space enclosed by ceiling –height partitions shall have at least one control device to independently control the general lighting within the space. Each control device shall be activated either manually by an occupant or automatically by sensing an occupant. Each Control device shall:
 - a) Control a maximum of 200 m²(2500ft²) for a space less than or equal to 1,000m² (10000ft²), and a maximum of 1,000m²(10000ft²) for a space greater than 1,000m² (10000ft²).
 - b) Capable of overriding the required shutoff control for no more than 2 hours.
 - c) Be readily accessible and located so the occupant can see the control.
3. Luminaire in daylighted areas greater than 25m² (250ft²) shall be equipped with either a manual or automatic control device that:
 - Is capable of reducing the light output of the luminaires in the daylighted areas by at least 50%
 - Controls only the luminaires located entirely within the daylighted area.
4. Lighting for all exterior applications shall be controlled by a photosensor or astronomical time switch that is capable of automatically turning off the exterior lighting when daylight is available or the lighting is not required.
5. Internally-illuminated exit signs shall not exceed 5W per face.

Other Electrical Requirement - GRIHA v2015

1. Power Transformer selected shall satisfy the minimum acceptable efficiency at 50% & 100% load as specified by ECBC (refer the enclosed file).
2. All measurement of losses shall be carried out by using calibrated digital meters of class 0.5 or better accuracy and certified by manufacturer. All transformers of capacity of 500kVA and above would be equipped with additional metering class current transformers (CTs) and potential transformers (PTs) additional to requirements of utilities so that periodic loss monitoring study may be carried out.
3. Motors shall meet IS 12615 energy efficiency standard. (eff1/ eff2 class motors are recommended).
4. Motor Horse power shall not exceed 20% of the calculated maximum load being served.
5. All electricity supplies exceeding 100A, 3 phases shall maintain their power factor between 0.95 lag and unity at the point of connection.
 - a. Services exceeding 1000 kVA shall have permanently installed electrical metering to record demand (kVA), energy (kWh), and total power factor. The metering shall also display current (in each phase and the neutral), voltage (between phases and between each phase and neutral), and Total Harmonic Distortion (THD) as a percentage of total current.
 - b. Services not exceeding 1000 kVA but over 65kVA shall have permanently installed electric metering to record demand (kW), energy (kWh), and total power factor (or kVARh).
 - c. Services not exceeding 65 kVA shall have permanently installed electrical metering to record energy (kWh).
6. Solar PV - on site renewable energy to offset 2.5% of the total annual energy consumption of internal artificial lighting & HVAC system.

We are a dedicated team of more than 50 Architects, Engineers, and Environmentalists with headquarters located in Noida and branch offices in Kolkata, Navi Mumbai, Hyderabad, and Lucknow. With an extensive experience spanning over 450+ projects around the globe, we are well versed with the Energy Policies and Sustainability Design Frameworks available in the Buildings and Industries Sector. We have also worked closely with various government organizations to extend advisory support for implementation of Energy Codes and Standards in existing/new built environment. Over the span of last 8 years, we have developed widespread experience in building energy simulation tools like IES, EnergyPlus, eQUEST etc. Our current international exposure extends across countries like South Korea, Bangladesh, Russia, Vietnam and Kuwait to name a few.

Our Domain Expertise:

- ✓ Energy Policy Development and Implementation:
 - Policy Development Assistance to ULBs, SDAs, International Agencies
 - Energy Software development (ECONirman, ECObench)
 - Capacity Building & Training Programs
- ✓ Green Building Design & Certification (GRIHA, IGBC, LEED, ESTIDAMA, & GREENSTAR)
- ✓ ECBC 2007& 2017 Conformance Analysis & Documentation
- ✓ Energy, Daylight & CFD Simulation, LEED Commissioning
- ✓ Energy Auditing & ESCO Implementation
- ✓ Energy Metering Solution

Activities/ Experiences:

- ✓ **ECBC development assistance for States of Uttar Pradesh, Uttarakhand, West Bengal, Tamil Nadu, Haryana and Assam**

We have been involved in the adaption of ECBC guidelines prescribed on the basis of the local climatic and geographical conditions for the States of Uttar Pradesh, Uttarakhand, West Bengal, Tamil Nadu, Haryana and Assam. GreenTree, as a member of ECBC drafting committee, introduced adequate alterations and specifications related to locally available materials and technologies in the draft undergoing notification protocol. It is anticipated that the inclusion of 'easy to implement' guidelines shall help the SDA (State designated agency)/ ULBs (Urban local bodies) in implementing the energy code across these states.

- ✓ **Worked with Swiss Development Agency (SDC): Assessment Study**

SDC has engaged GreenTree for "Mapping & Assessment of Sustainable Building Rating Systems in India". The overall objective of this study was to get an overview of existing rating systems and their response to the energy efficiency challenge in India from the market and from the institutional perspective. This study shall further lead to exploring the potential of a simple energy-efficient rating system for the residential building sector.

Worked with USAID ECO-III Programme: Energy Tools Development

GreenTree has developed **ECOnirman** phase 1: a code Compliance Tool which makes it easier for the user to find out if their proposed or existing building meets the compliance requirements as set by Bureau of Energy Efficiency (BEE) in the Energy Conservation Building Code (ECBC). It is intended as a self-contained tool that addresses the Envelope, Air-conditioning, Service hot water system, lighting system, and Electrical Power requirements.

It also has developed **ECObench**: A building Energy Benchmarking Tool which helps building owners/designers in evaluating performance of their buildings by comparing energy consumption of their building with similar buildings. USAID ECO-III Project in partnership with Bureau of Energy Efficiency (BEE) launched an online building energy data collection and benchmarking tool. The building level data collected has been analyzed and used to compute energy consumption benchmarks and comparative performance based rating of the building among its peer group.

Green Building Solutions for High Performance Design and NET ZERO Approach:

We have worked on more than 450 building/ industry projects worldwide. A brief snapshot of a few selected projects or clientele,

- ✓ **Net Zero Projects:** UHBVN Project- Panchkula, UPNEDA-Kannauj
- ✓ **Domestic Projects (GRIHA/LEED/ IGBC):** Country Inn-Jim Corbett, Lotus Isle, Fortis, Exide Industries, Signature Global, Orris, M3M, Conscient, AIPL, ATS, Dasnac, Gulshan Homz, Ajnara, Assotech, Jones Lang LaSalle, University of Petroleum & Energy Studies, Mahindra, NTPC, AAI, BHEL, Abbott, Panasonic, Jindal Power, SNC, etc.
- ✓ **International LEED Projects:** Marriott Hotel-Nepal, POSCO Power Mirae Center, SK Chemicals R&D Center, SK Networks, KTC Tower, Kuwait Mosque, Nokia Factory- Vietnam and 10 completed New Zealand Projects.

Training & Capacity Building:

With in-house three BEE Certified ECBC Master trainers, Two Energy Auditors, Two CMVPs, 10 IGBC Aps, and Four GRIHA CPs, and 2 LEED APs, We have supported capacity building programme of Bureau of Energy Efficiency at the central &state and the ULBs levels. We have organized and supported more than 500 awareness programs and Energy Simulation trainings focusing on capacity building of SDAs and other Government departments such as CPWD, LDA (Lucknow Development Authority), and PEDDA (Punjab Renewable Energy Development Agency) etc.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 08.09.2016

SECTION – II

STANDARD TECHNICAL REQUIREMENTS



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2.0	CODES & STANDARDS
3.0	LIGHTING SYSTEM DESCRIPTION (CONCEPTUAL VIEW)
4.0	SYSTEM DESIGN ENGINEERING
4.1	ENGINEERING INPUTS
4.2	DESIGN CRITERIA
4.3	ENGINEERING OUTPUTS
5.0	LUMINAIRES, ACCESSORIES AND LAMPS
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5.2	LUMINAIRE & OTHER ITEMS
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5.5	LAMP HOLDERS
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5.18	PVC CONDUITS
6.0	SURFACE TREATMENT
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11.0	TOOLS & TACKLES
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	ANNEXURE-I: LUMINAIRE DETAILS



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1.0 INTENT OF SPECIFICATION

- 1.1 The requirements given in specification for supply of equipment and system design engineering shall be fully complied with.
- 1.2 For the equipment of supply in vendor's scope, the "design" shall broadly cover the selection of components, materials, sizes etc. and complete responsibility of establishing the correctness of equipment design rests with the vendor.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing required function in a manner acceptable to Purchaser, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgement is not in full accordance herewith.
- 1.4 Make of all equipment and components shall be to the approval of Purchaser. Bidder to comply to Sub-vendor list enclosed as Annexure to Section I, however same shall be subjected to end client approval without any commercial implication.

2.0 CODES & STANDARDS

- 2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 2.2 The material, construction, manufacture, inspection and testing shall conform to the latest revisions of standards as specified in Data Sheet-A.
- 2.3 In case of conflict between the applicable reference standard and this specification, stringent requirement shall govern.

3.0 LIGHTING SYSTEM DESCRIPTION (CONCEPTUAL VIEW)

- 3.1 All areas of plant (indoor and outdoor) shall be provided with suitable lighting arrangement to meet the functional requirements by use of various types of luminaires so as to achieve the desired quality and level of illumination.
- 3.2 Lighting system shall also cover the low voltage power services such as power receptacles and single phase feeders.
- 3.3 Lighting system shall be fed through various power sources such as AC Normal, AC Emergency and DC Emergency supply to achieve the desired reliability.
- 3.4 Power tapped from various sources shall be distributed through lighting distribution boards and lighting panels upto the various luminaires and power outlet sockets / feeders.



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4.0 SYSTEM DESIGN ENGINEERING

Engineering shall be done by the vendor only during the contract engineering stage as the same is covered in his scope. During tender stage, bidder shall make his quotation on the basis of BOQ furnished by the purchaser with the tender document.

4.1 ENGINEERING INPUTS : Complete engineering shall be done by the vendor on the basis of documents listed below. The engineering inputs shall be furnished by purchaser. However, furnishing of these inputs shall not absolve the vendor of responsibility to visit site and get acquainted with actual site conditions.

4.1.1 Indoor Areas

- a) Room dimensions (details as covered in various layout drawings)
- b) Lighting System Design Data (LSDD) covering typical values for various types of indoor areas, indicating :
 - i. Required average illumination level
 - ii. Reflection factors for walls, ceiling and floor
 - iii. Maintenance factor
 - iv. Type of luminaire
 - v. Mounting height of luminaire
 - vi. Height of working plane
- c) AC Emergency lighting requirements
- d) DC lighting requirements
- e) Requirement of sockets
- f) Requirement of exhaust fans and fan points

4.1.2 Outdoor Areas

- a) Area geometry (details as covered in various layout drawings)
- b) Lighting System Design Data (LSDD) covering typical values for various types of outdoor areas, indicating:
 - i. Average illumination level
 - ii. Type of luminaire
 - iii. Pole heights / mounting height
 - iv. AC Emergency lighting requirement



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- v. DC lighting requirements
- vi. Maintenance factor
- c) Requirement of sockets

4.1.3 Other inputs

- a) Plot plan, Main equipment plan and TG hall floor plans (to assess quantum of area lighting drawings)
- b) Suggestive location of LDBs
- c) Suggestive power distribution scheme (SLDs)
- d) Control schemes
- e) Single phase feeder details
- f) No. of sockets / criteria for computation of no. of sockets / location of sockets etc.
- g) LDB/WDB details
- h) LP details
- i) Poles & Masts details
- j) Conduit sizes
- k) Wire sizes
- l) Earthing material sizes

4.2 DESIGN CRITERIA:

4.2.1 General Requirements of Design

- a) Lighting system shall be provided to ensure adequate visual performance, safety and reliability and shall be free from excessive glare and flicker from discharge lamps. Particular attention shall be paid to ensure that level of illumination is satisfactory in all respects including viewing of all instruments, alarms, annunciators and indicating lamps.
- b) Complete system design shall be done on the basis of inputs provided by the purchaser and in line with the laid down criteria.
- c) Requirements of sockets shall be as per the criteria / number of sockets given by the purchaser during detailed engineering stage.



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- d) Complete power distribution system shall be designed keeping following criteria in view :
- Simplicity
 - Controlled voltage drop
 - Cost effectiveness

4.2.2 Sources of Power Supply

- a) The illumination of various indoor and outdoor areas in the main plant and off site areas shall comprise of one or more of the following systems:
- Normal AC Lighting System
 - Emergency AC Lighting System
 - DC Lighting System
- b) Arrangement and distribution of power shall depend upon the functional requirements of areas and therefore supply from all types of power sources shall not be made available to all areas. Lighting & LV power services in different areas shall be provided as per Annexure-B enclosed.
- c) 24V AC lighting for maintenance purposes (for hand lamps and/or hand operated tools) shall be supplied from 240/24V fixed/ portable lighting module.

4.2.3 Lighting philosophy

a) Normal AC Lighting System

Normal AC lighting system 415V, 3 phase, 4 wire, will be fed from lighting panels (LPs) which in turn will be fed from the lighting distribution boards (LDBs). Street lights/ flood lights shall be fed from Street Lighting Panel (SLP), Welding receptacles shall be fed from Welding DB/ MCC in offsite areas.

b) Emergency AC Lighting System

This system shall be provided for certain important areas in the main plant. The lighting fixtures connected to this system shall be normally "ON" along with the normal AC system. These will be fed from emergency lighting panels (ELPs) which in turn will be fed from 3-phase, 4-wire supply from the emergency lighting distribution boards (ELDB'S). These lights will go off for a few seconds in case of AC supply failure at Emergency Switchgear, but shall be automatically restored when Emergency Switchgear is energized by Diesel generator set.

c) DC Lighting System

At strategic locations in the main plant, a few lighting fixtures fed from 220V DC supply, shall be provided to enable safe movement of operating personnel and access to important control points during an emergency, when both the normal AC and Emergency Lighting system fail. These lighting fixtures will be fed from 220V DC LPs which in turn will be fed from DC LDBs.



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The supply to the DC lighting panels shall be automatically switched ON in case of loss of AC supply at station service switchgear as well as Emergency switchgear. The DC supply will be automatically switched OFF after about 3 minutes following the restoration of supply to normal AC or emergency AC lighting system.

In auxiliary /off site buildings, emergency DC lighting is to be provided through self contained DC emergency fixture at strategic locations. The fixtures shall be switched 'ON' automatically in case of failure of AC supply.

d) Street Lighting/ Flood Lighting

Street lights / flood lights will be fed from Street Lighting Panel (SLP). The number of street lights / flood lights shall be grouped in such a way that they will be fed from the nearest SLP available. Street lights shall have provision of automatic switching ON and OFF in any one of the following modes and as per the purchaser's scheme:

- i. Manual
- ii. Automatic through 00 - 24 hrs time switch
- iii. Automatic through combination of 00 - 24 hrs time switch and a remote sensing device for monitoring external illumination level. Each SLP shall be provided with a time switch and a remote light sensing device.

4.2.4 Number of Luminaires

- a) All calculations shall be done as per the input data covered under "Engineering Inputs".
- b) Total AC luminaires

Total number of AC luminaires for indoor and outdoor areas shall be calculated on the basis of point to point method by an established computer program. Optimisation criteria shall form part of street lighting calculations.

For AC emergency lighting, a specified percentage of total AC luminaires shall be considered as AC emergency luminaires. The percentage shall be informed during detail engineering.

4.2.5 Layout Considerations

a) General Layout Considerations

- i. Layout of equipment such as LDBs and LPs shall be on the basis of following criteria :
 - Ease of operation
 - Maintainability
 - Aesthetics
- ii. Luminaires shall be located to meet the functional requirements of the area. Aesthetics shall form part of layout considerations.
- iii. Due considerations shall be given to the mounting arrangement depending upon location and type of area.



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- iv. While preparing lighting system layout drawings for air conditioned control rooms/areas having false ceilings, the vendor shall be required to interface with the Air Conditioning / Ventilation Duct layout and false ceiling layout drawings to avoid fouling / interference.
- v. The poles shall be located 1.5m away from the road edge. The buried cable shall run in hume pipe / duct bank wherever it is crossing the roads.
- vi. 240V AC, 5/15A universal socket (at least two number) shall be provided in office, store, cabin etc. The receptacles shall be provided at interval of 20m or part thereof for hand tools etc. One no. 20A, 240V AC industrial type receptacle shall be provided at suitable location in all other area as required. The receptacles shall be controlled through switch/MCBs. In hazardous area, receptacles shall be flame proof.
- vii. Suitable nos. of 63A/125A, 3 phase, 415V industrial receptacle with switch shall be provided at specific points in power plant area for welding purposes. At least one 63A/125A receptacle shall be provided in each off-site building.
- viii. 1200mm/ 1400mm sweep ceiling fans with stepped electronic regulator shall be provided for office room, store rooms and social buildings which are not covered by air-conditioned and ventilation system.
- ix. All fans including pedestal fans shall comply to relevant IS.

b) Conduit System

- i. Unless indicated otherwise, conduits shall originate from respective lighting panels and shall continue upto the luminaires for all indoor areas.
- ii. Conduits shall run in straight runs, parallel to building columns, walls etc. as far as practicable.
- iii. Unnecessary bends and crossings shall be avoided.
- iv. In the corrosive environment, conduit installations shall be made with corrosion proof conduits. Such requirements shall be clearly indicated while preparing BOQ.
- v. Conduits in control room and other air-conditioned areas shall be surface mounted on the roof above false ceiling. However vertical drops of conduits shall be through column flanges or grooved to the wall, finally covered for better aesthetics.

c) Wiring

- i. Each circuit from LP shall be taken in a separate conduit.
- ii. Wiring of AC normal, AC emergency & DC emergency lighting system shall be carried out in separate conduits.



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- iii. Receptacle wiring shall be distinct from lighting conduits. No two phase circuits shall be run in the same conduit. However different circuits of same phase may be laid in the same conduit.
- iv. Maximum three nos. of receptacles shall be loop-in & loop-out in a circuit.
- v. Filling area of wires in conduit shall not exceed 40% of the conduit area.
- vi. Wiring shall be done with following conductor sizes:
 - Luminaires – 2.5 sq. mm
 - 5A plug & socket – 2.5 sq. mm
 - 5/15A and 20A plug & socket – 4 sq.mm
- vii. Wiring shall be designed for the uniformly distributed spread of luminaires on each phase i.e. R,Y,B. Distribution of luminaires on these phases shall be such so that there is generally uniform light intensity in the event of failure of one or two phases.
- viii. Luminaires located in offices, stores, laboratories, toilets etc. shall be individually or group controlled.

d) Cabling

- i. Cables shall be considered wherever it is not desirable to run the insulated wires due to long runs or for any other valid reason.
- ii. Cable Schedule shall be prepared for all cable connections.

4.3 ENGINEERING OUTPUTS:

Vendor shall prepare and submit following documents and drawings for purchaser's approval :

- a) Lighting calculations for indoor areas covering details such as room dimensions (length, width, height), illumination level, reflection factors (walls, ceiling, floor), maintenance factor, type of luminaire, mounting height of luminaire, room index, coefficient of utilisation, no. of luminaires (AC Normal & AC Emergency), lumen output of each luminaire, reference drawings and remarks.
- b) Lighting calculations for outdoor areas covering average illumination level, type of luminaire, chart for illumination level at various points in the area; location (coordinates), number and height of poles; type, number (normal + emergency) and orientation of luminaires etc. Calculated values of average and minimum illumination level as obtained through computer package shall also be furnished. Dot density plots for lux level shall be furnished if available in the computer package.
- c) Single line diagrams of power distribution upto Lighting Panels. Separate drawing for complete lighting distribution shall also be prepared by vendor.



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- d) Loads on each phase of LP and LDB with consideration of diversity factor for sockets.
- e) Layout drawings for each indoor area indicating location of luminaires, sockets, fan points, exhaust fans, LDBs and LPs. Details of type of luminaires, source of power supply (AC Normal, AC Emergency, DC Normal and DC Emergency). Bill of Material shall also be covered which shall include unit wise requirements of luminaires and other items.
- f) Layout drawings for each outdoor area indicating location of poles / towers, orientation of luminaires, sockets and LPs. Details of pole height / mounting height, type of luminaires, source of power supply (AC Normal, AC Emergency, DC Emergency). Bill of Material shall also be covered for various types of luminaires.
- g) Conduit layout drawings with wiring and load distribution details as superimposed on the area layout drawings indicated above. Drawings shall include Bill of Material for conduits, wires etc.
- h) Wiring and load distribution details for outdoor areas.
- i) Master Bill of Material (to be submitted at regular intervals of engineering progress) including all items required for the complete lighting system viz. lighting fixtures, lamps, Lighting DBs, Welding DBs, lighting panels, conduits, PVC wires etc.
- j) In case of revised inputs or site feedback, preparation and submission of revised engineering outputs shall also be in the scope of vendor.
- k) Calculation for selection of number and size of containers
- l) Packing procedures and drawings.

5.0 LUMINAIRES, ACCESSORIES AND LAMPS

5.1 GENERAL REQUIREMENTS OF LUMINAIRES

- a) All luminaires and accessories shall be designed for continuous operation and shall be suitable for the system design data given in Data Sheet A.
- b) Luminaires shall be complete with accessories mounted inside the luminaire assembly. Lamps shall be supplied separately as per BOQ.
- c) All luminaires and accessories shall be suitable for operation in the atmospheric conditions prevailing at site.
- d) Power factor for fluorescent lamp luminaires shall be 0.9 or more and that for HPMV/ HPSV luminaires shall be 0.85 or more. Power factor correction capacitors shall be provided for this purpose.



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- e) Luminaires shall be designed for minimum glare. No bright spots should appear from the lamp or from the reflectors.
- f) All accessories shall be wired upto a terminal block or a separate weather proof metallic terminal box suitable for 2.5 sq. mm. copper wire termination.
- g) All internal wiring shall be of PVC or silicon rubber insulation, capable of withstanding the maximum temperature to which it will be subjected under specified service conditions without deterioration.
- h) All luminaires and accessories including the breathing holes shall be vermin proof.
- i) Surface Treatment:
- All surfaces after manufacture shall be thoroughly cleaned and degreased. Pre-treatment of surfaces shall be as per the applicable standard. Pretreated surfaces shall be free from rust, sharp edges, scales and burrs.
 - Finish of surfaces shall be non-porous, smooth and unfaded.
- j) All metal parts of the luminaires shall be bonded and connected to the earthing terminal. Earthing terminal shall be suitable for connecting 14 SWG GI wire.
- k) Flood lights shall be provided with base frame / base plate for mounting on structural steel members / wall.
- l) All weather proof luminaires shall have the control gear housed in a weather proof enclosure with necessary gaskets, mounting bracket, locking screws etc.

5.2 LUMINAIRE TYPES & OTHER ITEMS

5.2.1 General requirements depending upon type of luminaire are listed below. Specific requirements of each luminaire are indicated in "Luminaire Details" enclosed as Annexure-I.

a) Channel Mounted Luminaires (Fluorescent Luminaires)

- Channel mounted luminaires, except the special purpose luminaires, shall have CRCA sheet steel base plate / rail / channel / box / side panels / housing as per "Luminaire Details". Sheet shall be completely stove enameled unless mentioned vitreous enameled in "Luminaire Details". Colour of enamel shall be grey on all non-reflecting surfaces and white on reflecting surfaces.
- Twin fluorescent luminaires shall be wired in lead-lag circuit to minimise stroboscopic effect.
- Luminaires suitable for surface mounting shall also be suitable for pendant mounting. Knockouts of 20mm ET conduit fixation shall be provided for this purpose.



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b) Decorative Fluorescent Luminaires

- Decorative luminaires shall be provided with one of the following as per “Luminaire Details” :
 - i. Perspex acrylic diffuser.
 - ii. High purity, anodised aluminium, mirror optic reflectors with anodised aluminium matt finish transverse fins to control glare.
 - iii. Opal polystyrene louvers and sheet steel side panels.
 - iv. Vertical metallic louvers finished in stove enamelled white and with sheet steel side panels.
- End plates of decorative luminaires shall be of high impact polystyrene or sheet metal finished in black colour.
- Diffusers and louvers for the fluorescent lamps shall be made of high impact polystyrene sheet and shall have no yellowing property over a prolonged period of use.
- Recessed type decorative luminaires shall be suitable for mounting with gypsum boards / luxalon / plaster of Paris/aluminium frame false ceiling of standard size as per Data Sheet A and “Luminaire details”.

c) Industrial Fluorescent Luminaires (General Purpose)

- Additional reflectors, wherever provided, shall be easily removable type.

d) Industrial Fluorescent Luminaires (Special Purpose)

- Luminaires for chemical vapour (acidic / alkaline) laden environment shall be of cast aluminium controlgear box and end boxes. Controlgear housing shall have detachable, one piece neoprene gasket cover to make it weather proof. Design shall be suitable for chemically charged environment.
- Luminaires for corrosive and dust laden environment shall be made of tray type sheet steel housing and transparent acrylic visor supported by a galvanised sheet steel frame, fitted to the housing with gasket all around. Cable entry shall be from the side of luminaire. Luminaire shall be totally dust and vapour proof.
- Luminaires for highly corrosive environment shall have with sheet aluminium/ polycarbonate housing. controlgear housing, CRCA sheet steel controlgear tray with a stove enamelled white reflector. A clear acrylic cover of dish shape, secured to canopy by stainless steel toggle and neoprene gasket lining, shall be provided at the bottom.



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- Luminaires for drip proof environment such as street lighting fluorescent luminaire shall have sheet aluminium canopy, a detachable reflector-cum-controlgear housing, clear ribbed acrylic cover held in aluminium frame. Luminaire shall have the degree of protection IP:55 unless mentioned otherwise in Data Sheet A. Luminaire shall be suitable for side entry mounting with the pole bracket arm.

e) Bay Type Luminaires

- Luminaires shall be designed for following indoor applications:
 - i) High bay
 - ii) Medium bay
 - iii) Low bay
- Luminaires shall have top mounted, cast aluminium controlgear housing. Housing shall have cooling fins and canopy for easy access to the components. Canopy shall be hinged at one end and wing screw bolted at the other end.
- Controlgear shall be connected to the detachable lamp housing at the bottom such that heat dissipation is proper and distributed.
- Lamp housing-cum-reflector shall be made from spun aluminium, electrochemically brightened and anodised.
- Lamp housing for the dust laden environment shall be totally enclosed type. A clear toughened glass cover shall be attached to the lamp housing with an aluminium frame and neoprene gasket. Luminaire shall be provided with a safety chain for toughened glass.
- Mounting arrangement shall consist of MS brackets with an anti-vibration eye-bolt.
- Side mounted controlgear box shall be provided for low bay luminaires, if mentioned in "Luminaire Details".

f) Well Glass Luminaires

- Well glass luminaires shall be suitable for dust and vapour laden environment.
- Luminaires shall be provided with a die-cast aluminium canopy and heat resistant well glass, fitted with a ring type gasket.
- All well glass luminaires shall be provided with vitreous enamelled reflector.
- Zinc plated MS wire guard shall be provided for protection of well glass.



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- Separate side mounted and top connected control gear box shall be provided for use with HPMV & HPSV lamps.
- Integral control gear box, where applicable, shall be of die cast aluminium material with one piece neoprene gasket between the box and its cover to make it dust and vapour proof.
- Luminaires shall be conduit mounted type for incandescent lamps and surface mounting type for HPMV & HPSV lamps.

g) Flame Proof Well Glass Luminaires

- Housing material shall be cast aluminium alloy LM6. Housing outer surface shall be provided with cooling fins.
- Flame proof luminaires shall be provided with heavy toughened well glass cemented in a retaining ring.
- Zinc-coated / chrome-plated MS chain connected to the main body and glass retaining ring shall be provided.
- A detachable terminal box at the top shall be provided.
- Neoprene gaskets, where needed, shall be provided for weather proof construction and indoor and outdoor application.
- Two cable entries of 20mm ET conduit shall be provided with one flame proof plug.
- Luminaires shall be suitable for the hazardous areas as classified in Data Sheet A. Design of flame proof luminaire shall be supported by the type test report for flame proofness from a government or government approved independent laboratory.

h) Street Lighting Luminaires (Other than Fluorescent Luminaire)

- These luminaires shall be suitable for street lighting and general purpose outdoor area lighting.
- Luminaire housing shall be one piece cast aluminium alloy to accommodate lamp housing and controlgear for lamp wattage upto 150 watts. For lamp wattage above 150 watts, controlgear housing shall be of cast aluminium alloy whereas lamp housing shall be of deep drawn aluminium.
- Inside finish of the lamp housing shall be stove enamelled white. Optical control shall be provided with two high purity, electro brightened and anodised side reflectors.



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- Clear acrylic bowl fitted with a rubber gasket and easily removable type shall be secured to the lamp housing.
- Provision shall be made for adjustment of lamp location for proper focussing.
- Luminaires shall be suitable for mounting with pole bracket arm.

i) Flood Lighting Luminaires

- Flood light lamp housing and reflector shall be separate from controlgear box. Requirements of controlgear box are specified elsewhere.
- Lamp reflectors shall be of high purity spun aluminium attached to the cast aluminium lamp holder housing at the rear. Lamp holder housing shall be provided with cooling fins.
- Reflector shall be closed from the front by heat resistant toughened glass and synthetic "S" type weather proof gasket.
- Luminaire shall be provided with special lamp centering and focussing device ensuring good beam control.
- MS mounting bracket shall allow fixation of the flood light in any position in a horizontal plane and the flood light can be locked in at any set angle in the vertical plane. Cast iron base and / or two protector scales shall also be provided where specified in "Luminaire Details"
- Design shall permit replacement of lamp from the rear without disturbing the previously set aiming angles. Special guide pins shall also be provided for protecting the lamps from damage while replacing.

j) Halogen Flood Lighting Luminaire

- Luminaires shall be compact in design with aluminium alloy housing and three piece highly polished and anodised reflector assembly.
- Toughened glass panel in the front shall be provided with silicon gaskets.
- Lamp replacement from the front is also acceptable.

k) Post Top Lanterns

- Luminaire shall comprise of a spun aluminium canopy, opal acrylic diffuser and a cast aluminium spigot.
- Controlgear shall be integral type and shall be housed in the spigot.
- Luminaire shall be supplied without mounting pole.



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l) Bulk Head (Flame Proof)

- Bulk head luminaires shall be used for the locations where explosion or fire hazard exists.
- Luminaire shall be made of cast iron housing with integral terminal box.
- Front of the luminaire shall be covered with flat toughened glass cemented into a retaining ring.
- Lamp replacement shall be from the front.
- Controlgear box for HPMV lamps shall be integral to the housing.
- MS fixing straps shall be provided for mounting.
- Luminaire shall be stove enameled grey outside and white inside.
- Terminal box shall be provided with 20 mm ET conduit entry.
- Complete luminaire shall be suitable for the hazardous area as classified in Data Sheet A. Type test certificate for flame proofness test from government or government approved independent laboratory shall be submitted.

m) Bulk Head (Weather Proof)

- Luminaire shall be suitable for indoor / outdoor applications having weather proof features.
- The luminaire shall comprise of die cast aluminium alloy body of dish shape.
- Luminaire shall have a heat resistant prismatic cover held in a weather proof gasket.
- Luminaire shall be stove enamelled grey outside and white inside.
- Glass cover shall have a galvanised wire protection.
- Luminaire shall be provided with locking arrangement with Allen key to prevent pilferage.
- Luminaire shall be suitable for use with incandescent lamp upto 100W.
- Provision for 20 mm ET conduit entry shall be provided at the bottom.



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n) LED type Luminaires:

- LED Luminaires shall be used for the lighting if specified in BOQ as part of NIT.
- In false ceiling area LED luminaires shall be recessed mounting type & in non-false ceiling area the LED luminaires shall be surface mounting type.
- The individual lamp wattage for LED shall be upto 3 watt.
- The LED chip efficacy shall be min 120 Lm/W. The luminaire efficacy shall be not less than 70Lm/W.
- The LED used in the luminaires shall have colour rendering index (CRI) of Min 65. Colour designation of LED shall be "cool day light" (min 5700K) type.
- The LED luminaire shall have minimum life of 25,000 burning hours with 80% of lumen maintenance at the end of the life.
- The beam angle for LED chip shall be 120 degrees.
- The max. junction temperature of LED shall be 85 deg C, further the lumen maintenance at this temperature shall be min 90%.
- The THD of LED Luminaires shall be less than 10%. Further the EMC shall be as per IS 14700. The power factor of the luminaire shall not be less than 0.9.
- The marking on luminaire & safety requirements of luminaire shall be as per IS standards.
- Suitable heat sink with proper thermal management shall be designed & provided in the luminaire.
- The connecting wires used inside the system, shall be low smoke halogen free, fire retardant PTFE cable.
- Fuse protection shall be provided in input side specifically for LED luminaires.
- Care shall be taken in the design that there is no water stagnation anywhere. The entire housing shall be dust and water proof protection as per IS 12063.
- Driver Circuit: LED modules and drivers shall be compatible to each other. The LED module driver's ratings and makes shall be as recommended by corresponding LED manufacturer. LED Drivers may have following control & protections:
 - Suitable precision current control of LED.
 - Open Circuit Protection



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- Short Circuit Protection
- Over Temperature Protection
- Overload Protection

o) Emergency Lighting Luminaires

- The luminaire shall be automatic having in-built battery.
- Battery shall have integral charging unit.
- Charger shall be suitable for operation as per system design data.
- The battery enclosure shall be suitably painted and ventilated for the performance with sealed lead acid battery, as applicable.

5.3 CONTROLGEAR BOX (NON-INTEGRAL TYPE)

- a) Boxes shall have weatherproof construction and shall be provided with one piece neoprene gasket.
- b) Boxes shall be provided with HRC fuse mounted on a removable tray. Boxes shall be provided with all necessary components having a neat layout arrangement such that it is possible to test, inspect or replace any component without difficulty.
- c) Boxes shall be suitable for mounting on structures, walls and columns.
- d) Suitable number of terminals shall be provided for looping-in and looping-out of cable connections and also connections to the luminaire(s).
- e) Cable / conduit knock-outs shall be for each loop-in and loop-out connection and also connection to the luminaire(s).

5.4 REFLECTORS

- a) Reflectors shall be made of sheet steel or aluminium as applicable.
- b) The aluminium reflectors shall be made of high purity aluminium sheet. Sheet will be polished, electrochemically brightened and anodised.
- c) Wherever reflectors are separate from housing, they shall be securely attached to the luminaire by means of easily accessible fastening devices such that they are readily removable from the housing for maintenance.



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5.5 LAMP HOLDERS

- a) Holders shall be resistant to wear and shall be smooth in operation.
- b) Contacts shall be of durable quality.
- c) Holders shall hold the lamp under condition of shock and vibration.
- d) Lamp holders for fluorescent lamp shall be spring loaded, bi-pin, rotor type with low contact resistance.
- e) Live parts of the holder shall not be exposed when the lamp is inserted or removed in case of fluorescent luminaires.
- f) Lamp holders for HPMV & HPSV lamps shall be of porcelain material.
- g) Holders shall be screw type for HPSV & HPMV lamps. Holders for incandescent lamps shall be screw type, unless mentioned otherwise in Data sheet A.
- h) Lamp holders for incandescent lamps shall be of brass or porcelain.

5.6 STARTER HOLDERS

- a) Starter holders shall be designed and manufactured as per the applicable standard.

5.7 BALLASTS

- a) Fluorescent fixtures shall have electronic ballasts. Ballasts shall be totally enclosed type.
- b) Ballasts shall be easily removable type.
- c) Core shall be made of low loss, electrical grading stampings.
- d) End connections shall be made available in a terminal block, rigidly fixed to the ballast enclosure.
- e) Ballasts shall be free from humming.
- f) Ballast shall be provided separately for each lamp in a multi-lamp luminaire.
- g) Tappings shall be provided to set the voltage within range for HPMV & HPSV luminaires.

5.8 STARTERS

- a) Starters shall be made of aluminium material. Plastic or any other material if used shall be subject to purchaser's approval.
- b) Starters shall have bi-metal electrodes.



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- c) Starter shall be replaceable without the use of any tool and without disturbing any accessory or lamp.
- d) Starters shall have high mechanical strength.
- e) Starters shall be provided with radio interference suppressing capacitors.
- f) Starters shall have brass contacts.

5.9 CAPACITORS

- a) Capacitors shall have constant value of capacitance, suitable for operation at supply voltage.
- b) Capacitors shall be hermetically sealed, preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.

5.10 LAMPS

- a) Lamps shall be suitable for use in any position.
- b) Lamps shall be capable of withstanding small vibrations without breakage to filaments / electrodes and lead-in wire.

5.10.1 Type of Lamps

- a) Fluorescent Lamp
 - i. Anode rings shall be provided to prevent blackening of the ends.
 - ii. Lamp caps shall be two pin type at each end.
- b) Incandescent (GLS) Lamps
 - i. Incandescent lamps shall be "clear" type.
- c) Mercury Vapour Lamps
 - i. Lamp caps shall be screw type.
- d) Sodium Vapour Lamps
 - i. Lamps shall be ovoid shaped with diffusing powder coating.
 - ii. Lamps shall be provided with external igniters and rapid restart facility.
 - iii. Lamp caps shall be screw type.



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e) Halogen Lamps

- i. Lamps shall be double ended linear type.
- ii. Lamps shall be of immediate start type.
- iii. Design of lamps shall ensure high performance and high efficiency.

5.11 JUNCTION BOXES

a) Junction boxes with terminals shall be supplied for branching and terminating lighting wires/cables whenever required, as specified.

b) Construction Features

- i. The junction boxes shall be fabricated out of material & thickness as specified in Datasheet-A and shall be of rectangular shape. The cover shall be hinged or bolted with captive nuts and bolts and shall be provided with neoprene gasket lining all over.
- ii. The junction boxes shall be provided with suitable knock outs/ gland plates for conduit/ cable connection. The conduit connection shall be properly sealed. The junction boxes meant for cable connection shall be complete with removable gland plates, glands and cable lugs, as required. The junction boxes shall be provided with two earthing terminals suitable for GI earthing wires.
- iii. The junction boxes shall be weather proof type conforming to IP-55..
- iv. The boxes and cover shall be hot dip galvanised. Junction boxes for corrosive areas like DM Plant, water treatment plant etc. shall have additional epoxy/acrylic coating of thickness not less than 50microns on outer surface.
- v. The junction boxes shall be suitable for mounting on wall, columns, etc. The brackets, bolts, nuts, screws and any other erection accessories required for erection shall be included.

c) Terminals

- i. Multiway terminal blocks of approved type and make complete with galvanised screws, nuts, washers and marking strips shall be furnished for terminating the lighting wires.
- ii. All the terminals blocks shall be of 650V grade one piece construction with insulating barriers. These terminals shall be made of copper alloy and shall be stud type. Each terminal provided on junction box shall be suitable for terminating two numbers of aluminium conductors of the size as specified without any damage to the conductors or looseness.



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d) The junction boxes shall be of following types:

Type	Description
JB-F	Provided with four (4) way stud type terminals for terminating upto 2 nos. 10 mm ² stranded aluminium conductors on each terminal, suitable for outdoor installations.
JB-FE	Same as above but with an additional epoxy coating of 50 micron thickness.
JB-S	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 3.5Cx50 mm ² stranded aluminium conductors & with one no.6A HRC fuse and link.

5.12 RECEPTACLES

- a) Receptacle unit shall consist of socket outlet with associated switch and plug. The socket outlet and switch shall be flush mounted on a box which shall be suitable for mounting on wall or steel structures.
- b) Receptacle boxes shall be fabricated from material with thickness mentioned in Data Sheet A.
- c) Steel boxes shall be hot dip galvanised/ painted as specified in Datasheet-A and as per the requirements of applicable standard corresponding to the sheet thickness.
- d) The boxes shall have conduit knock-outs and shall be suitable for cable entry of the size to be specified by purchaser during detailed engineering.
- e) The boxes shall be provided with neoprene rubber gaskets to make them moisture and dust proof.
- f) Suitable loop-in and loop-out terminals shall be provided inside the box. Terminals for incoming and outgoing shall be suitable for the size of conductor of cables.
- g) The receptacle units shall be of the following types:
 - I. Type RA: It shall have the following:
 - i. 20A, 240V, 1-phase, 2 pole, 3-pin (third pin scrapping earth) porcelain, metal clad socket with a metallic cover tied to it.
 - ii. Rotary, heavy duty 20A switch conforming to applicable standard.
 - iii. Shrouded, die-cast aluminium plug.
 - iv. It shall be combined interlocked weather proof industrial unit.



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v. Mechanical interlock shall be provided as follows :

- Switch can be put ON only when plug is fully engaged.
- Plug can be withdrawn only when switch is in OFF position.
- Cover can be opened only when switch is in OFF position.

vi. The arrangement should ensure that water does not enter the plug when socket is ON.

vii. Loop-in loop-out terminals shall be provided inside the box suitable for 10 mm² Al conductor.

II. Type RB: It shall have the following:

- i. Combination of 5A & 15A, 240V, 1-phase, 2 pole, 3-pin, third pin grounded socket with integral piano key type 15A switch, flush mounted on decorative bakelite (6 mm thick)/ perspex (3 mm thick) sheet as cover of the boxes.
- ii. Loop-in loop-out terminals similar to type RA shall be provided. These will be located in office areas.

III. Type RC: It shall have the following:

- i. 63A, 415V, 3-phase-neutral earth, metal clad socket with cover
- ii. Rotary, heavy duty 63A switch conforming to applicable standard.
- iii. Shrouded, die-cast aluminium plug
- iv. It shall be combined, interlocked weather proof industrial unit.
- v. Mechanical interlock shall be same as that are applicable for RA type receptacles
- vi. The receptacle boxes shall be suitable for entry and exit of 3.5CX70 mm² Al conductor PVC cable and loop-in loop-out terminals for the same shall be provided such that not more than one core is terminated at one terminal. Removable, undrilled cable gland plate shall be provided. Tinned copper lugs and double compression cable glands shall also be supplied by the bidder.

IV. Type RD: It shall have the following:

- i. 125A, 415V, 3-phase-neutral earth, metal clad socket with cover.
- ii. Rotary, heavy duty 125A switch conforming to applicable standard.
- iii. Shrouded, die-cast aluminium plug



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iv. It shall be combined, interlocked weather proof industrial unit.

v. Mechanical interlock shall be same as that are applicable for RC type receptacles

vi. The receptacle boxes shall be suitable for entry and exit of 3.5CX95 mm² Al conductor PVC cable and loop-in loop-out terminals for the same shall be provided such that not more than one core is terminated at one terminal. Removable, undrilled cable gland plate shall be provided. Tinned copper lugs and double compression cable glands shall also be supplied by the bidder.

V. Type RE: It shall have the following:

i. 5A, 240V, 1-phase, 2 pole, 3-pin, third pin grounded socket with integral piano key type 5A switch, flush mounted on decorative bakelite (6 mm thick)/ perspex (3 mm thick) sheet as cover of the boxes.

ii. Loop-in loop-out terminals similar to type RA shall be provided. These will be located in office areas.

5.13 CEILING FAN & REGULATORS

a) The bidder shall supply the following ceiling fans complete with suspension rod, canopy and accessories and regulators:

i. 1200 mm sweep

ii. 1400 mm sweep

b) The fan motor shall be totally enclosed. The motor winding shall be of copper wire provided with double or reinforced class-E insulation.

c) The fan shall have three (3) well balanced blades. Precaution shall be taken in the manufacture of fan as well as regulators to ensure reasonable degree of silence at all speeds.

d) The regulator shall be electronic type with stepped/smooth (stepless) control of approved make.

5.14 LIGHTING CONTROL SWITCH-BOXES

a) The switch-boxes shall be of bent steel construction, fabricated of 1.6 mm thick MS steel with 6 mm thick decorative bakelite or 3 mm thick perspex sheet cover. The boxes shall be hot dip galvanised.

b) The switch-boxes shall be suitable for surface mounting as well as flush mounting in brick walls. They shall be flush mounted in the walls in the office areas where false ceiling is provided.



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- c) Switch-boxes shall have conduit knock-out on two sides. Adequate provision shall be made for ventilation of these boxes. Conduit knock-out sizes shall be as per conduit layout drgs.
- d) Switches shall be of piano-key type having quick-make, quick-break mechanism, provided with position marking, suitable for mounting on insulating plate. The switches shall be suitable for 1-phase, 240V, 50 Hz supply. They shall conform to relevant standards. The switches shall be supplied loose and shall be fixed at site according to requirement.
- e) All components housed in the switch-boxes shall be wired to an outgoing junction box by 1.5 mm² Cu wire. The junction box shall have adequate nos. of terminals.
- f) The size of switch-boxes shall be adequately chosen to accommodate the no. of switches and fan regulator boxes specified below. Fan regulators shall be supplied separately.
- i. Type SWB1 - Switch board with 1 no. 5A switch, JB type SW1.
 - ii. Type SWB2 - 3 nos. 5A switches and 1 no. fan regulator, JB type SW2.
 - iii. Type SWB2a - 4 nos. 5A switches, JB type SW2.
 - iv. Type SWB3 - 7 nos. 5A switches, 3 nos. fan regulator, JB type SW3.
 - v. Type SWB3a - 8 nos. 5A switches, JB type SW3.

JB details for lighting control switch boxes are as below:

JB-SW1 Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 10 mm² stranded aluminium conductor.

JB-SW2 Similar to the JB-SW1 but provided with ten (10) way terminals.

JB-SW3 Similar to the JB-SW1 but provided with eighteen (18) way terminals.

5.15 CABLE GLANDS

- a) Whether specifically mentioned or not, cable glands of suitable sizes shall be supplied along with each equipment for power and control cables.
- b) Rubber components used in the gland shall be of neoprene.
- c) Name / trade name of manufacturer, type no. and applicable range of outer diameter of cable shall be engraved / indelibly printed on the cable gland.

5.16 CABLE LUGS

- a) All equipment shall be supplied with the power and control cable lugs of suitable size, whether specifically mentioned or not.



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- b) Name / trade name and size of lug shall be engraved/ indelibly printed on each cable lug.

5.17 FLEXIBLE METALLIC CONDUITS AND FITTINGS

- a) Flexible metallic conduits shall generally conform to the requirements of IS:3480.
- b) Flexible conduits shall be made of strip steel, which shall be of cold rolled mild steel. The strip shall be of uniform width and thickness throughout.
- c) The strip for making flexible conduit shall be wound tightly and so overlapped in subsequent helicals that no openings are seen in normal position.
- d) The surface of the strip shall be thoroughly cleaned before application of protective coating. Pre-treatment, before galvanization, shall conform to IS:6005.
- e) The strip shall be electro-galvanized to a minimum thickness of 25 microns as per IS 3480.
- f) Flexible conduits shall be lead coated for application in high temperature zones if specifically mentioned in Data Sheet A.
- g) The conduit shall have uniform diameter throughout its length. The internal surface of all conduits shall be free from burrs and sharp edges and suitable for pulling insulated cables and wires without damage.

5.18 PVC CONDUITS

- a) PVC conduits shall generally conform to the requirements of IS: 9537(Part I & Part III).

6.0 SURFACE TREATMENT

- 6.1 All metal parts and the surfaces (exterior & interior) of equipment, unless stated otherwise in case of reflectors, shall be degreased by dipping in hot alkaline solution and rubbed with wire brush to remove oil & scale from them & then rinsed in water. Alternatively, they may be shot / sand blasted.
- 6.2 Parts shall be pickled by dipping in hydrochloric acid tank to remove the rust from the surfaces formed during storage of sheets & then rinsed to remove traces of the acid. The cleaning and pretreatment of all metal parts shall be as per applicable standard.
- 6.3 The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting & to create a good bond with the paint. The pretreatment shall conform to the applicable standard.
- 6.4 All parts shall then be subjected to a coat of red oxide primer paint.
- 6.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade as per Data Sheet A.



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- 6.6 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.
- 6.7 Wherever possible, finished parts shall be coated with peelable compound by spraying method to protect the finished product from scratches, grease, dirty and oily spots during handling and transportation.

7.0 PACKING

- 7.1 Vendor shall furnish packing procedure along with packing drawing at contract stage for applicable items for purchaser approval.
- 7.2 Containers adequate for storing 70% of P.O. quantity material at site are to be supplied. Vendor shall furnish suitable justification to purchaser during detailed engineering for the number and size of containers being supplied.
- 7.3 Specification for the sea worthy packing, if enclosed, for the export jobs shall form part of the specification.

8.0 GUARANTEED PERFORMANCE REQUIREMENTS

- 8.1 The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.
- 8.2 Vendor shall ensure satisfactory performance for lighting system designed by them at site.

9.0 INSPECTION & TESTING

- 9.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-558-E006) without any deviations. The equipment which are not covered in the Quality Plan shall be tested as per the QP to be submitted by bidder. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of any changes in QP during contract stage.
- 9.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards. Charges for these tests shall be deemed to be included in equipment price.
- 9.3 All the specified type and routine tests shall be carried out to verify the rating and performance of the equipment. Where valid type test certificates in evidence of equipment performance claimed are available & approved by purchaser, the requirements for conducting type tests may be waived. The general arrangement of object under test shall be to purchaser's approval.
- 9.4 All manufacturing processes viz. machining, sheet forming, electroplating, wire routing, cleating & crimping, assembly, surface preparation shall conform to good manufacturing practices.



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9.5 Inspection for dimensional & visual checks especially of the following, with respect to contract drawings, documents & standards shall be conducted:

- a) General sturdiness & rigidity of equipment
- b) Surface finishing
- c) Gasketting
- d) Inter-changeability
- e) Constructional features viz. location, accessibility & marking of components, segregation, accessibility to live parts (shrouding) etc.
- f) Completeness of scope

9.6 Equipment shall be liable for rejection if tolerances on the values of dimensions, power consumption, impedances, temperature rise etc. exceed the specified values by purchaser and / or standards.

10.0 SPARES

- 10.1 Mandatory spares (if applicable) are indicated in BOQ-cum-price schedule.
- 10.2 Erection & commissioning spares are included in the bidder's scope of supply. BE&C spares are indicated in BOQ-cum-price schedule.
- 10.3 A list of recommended O&M spares quantities for a duration of 3 years A shall be filled up in the applicable schedule / format and submitted by bidder along with offer. However, the acceptance of the same shall not be binding on purchaser.

11.0 TOOLS AND TACKLE

- 11.1 Tools & tackle which are essential to facilitate assembly, adjustments, erection, maintenance & dismantling of equipment shall be provided as part of equipment supplied.
- 11.2 The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.
- 11.3 Vendor shall also submit a list of recommended tools and tackle. Acceptance of these tools and tackle shall not be a binding on the purchaser.
- 11.4 Schedule of tools & tackle shall be filled up by bidder.

12.0 DOCUMENTATION

12.1 Documents to be submitted by the vendor immediately after award of contract

- a) Bar chart of activities of manufacture, testing, inspection and despatch.

12.2 Documents to be submitted during detailed engineering of contract

- 12.2.1 Engineering documents (refer clause 4.3) to be generated by the vendor, if applicable.



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- a) Lighting calculations for indoor areas.
- b) Lighting calculations for outdoor areas.
- c) SLD of power distribution upto LPs.
- d) Power load on each LP & LDB
- e) Layout drawings for indoor areas
- f) Layout drawings for outdoor areas.
- g) Conduit layout drawings.
- h) Wiring and load distribution details for outdoor areas.
- i) Master Bill of Material.
- j) Packing Procedure & drawing.
- k) Calculation for selection of no. & size of container.

12.2.2 Other documents :

- a) Final Quality Plans
- b) Technical data sheet
- c) Polar curves, zonal flux diagram and CoU charts of luminaires.
- d) Complete design calculations for arriving at number of luminaires.
- e) Fixing / mounting details of luminaires and other items.
- f) General arrangement drawings of following:
 - i. Luminaires
 - ii. Receptacles
 - iii. 24 V Supply module
- g) Field Quality Plan as per General Technical Conditions.
- h) Control Scheme for fluorescent, HPMV and HPSV luminaires.
- i) Schematic drawings for LDBs / LPs.
- j) Type test certificates.
- k) Catalogues / leaflets

12.3 Operation and Maintenance (O&M) manual :

The document shall comprise of installation, operating and maintenance instructions for various items / components. The O&M manual shall include the following :

- a) Write ups / instructions / procedures for
 - i. Storage at site.
 - ii. Unpacking.
 - iii. Handling at site.



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- iv. Erection.
- v. Pre-commissioning / commissioning tests.
- vi. Operating procedures.
- vii. Maintenance procedures.
- viii. Precautions to be taken during operation and maintenance work.
- ix. Trouble shooting charts covering problems, cause and solution.
- b) Approved Technical Data Sheets.
- c) Technical leaflet of various items / components.
- d) Copies of the type, acceptance and routine test certificates in bound volume.
- e) Details of all components liable to be replaced during the life of the equipment.
- f) List of maintenance tools required.
- g) List of testing equipment required.

12.4 AS BUILT DRAWINGS

- a) Preparation of as-built drawings shall be in the scope of vendor.
- b) The as-built drawings shall be prepared on the basis of marked up copies received from the erection contractor.
- c) Entire work of as-built drawings shall be to the satisfaction of purchaser.



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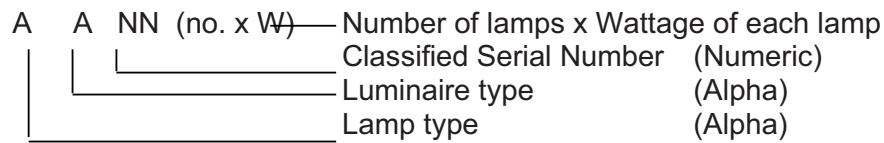
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ANNEXURE-I

LUMINAIRE DETAILS

LUMINAIRE CODING SCHEME

1.0 Code Structure



2.0 Lamp types

- a) F - Fluorescent
- b) M - Mercury Vapour
- c) S - Sodium Vapour
- d) T - Tungsten
- e) H - Halogen

3.0 Luminaire types

- a) C - Channel Mounted (Fluorescent)
- b) B - Bay Mounted
- c) W -Well Glass
- d) S - Street Lighting
- e) F - Flood Lighting
- f) H - Bulk Head
- g) P - Post Top Lantern
- h) E - Emergency Lighting
- i) X - Others

4.0 Serial Numbers

- a) 01 - 20 General Purpose (Industrial)
- b) 21 - 40 Decorative
- c) 41 - 50 Vapour Proof
- d) 51 - 60 Dust Proof
- e) 61 - 70 Drip Proof
- f) 81 - 90 Corrosion Proof
- g) 91 - 99 Flame Proof

NOTES :

- 1. Flood lighting luminaires to have non-integral control gearbox.
- 2. All other luminaires shall have integral control gearbox, unless specifically mentioned otherwise in enclosed sheets.
- 3. For more details of each luminaire, refer specification.



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1.0 Fluorescent Lamp Luminaires

- | | | | |
|------|------|--------|---|
| 1.1 | FC01 | 1 x 28 | Fluorescent, industrial box type base without any cover. |
| 1.2 | FC02 | 2 x 28 | Fluorescent, industrial box type base without any cover. |
| 1.3 | FC03 | 1 x 28 | Fluorescent, industrial box type base and stove enamelled side reflectors. |
| 1.4 | FC04 | 2 x 28 | Fluorescent, industrial box type base and stove enamelled side reflectors. |
| 1.5 | FC05 | 1 x 28 | Fluorescent, industrial box type base and vitreous enamelled side reflectors. |
| 1.6 | FC06 | 2 x 28 | Fluorescent, industrial box type base and vitreous enamelled/ anodized glossy side reflectors. |
| 1.7 | FC07 | 1 x 18 | Fluorescent, industrial box type base and vitreous enamelled side reflectors operating on 220V DC input supply. |
| 1.8 | FC21 | 1 x 28 | Fluorescent, decorative with 3 side perspex acrylic diffuser. |
| 1.9 | FC22 | 2 x 28 | Fluorescent, decorative with 3 side perspex acrylic diffuser. |
| 1.10 | FC23 | 1 x 28 | Fluorescent, decorative, recessed type with perspex acrylic diffuser. |
| 1.11 | FC24 | 2 x 28 | Fluorescent, decorative, recessed type with perspex acrylic diffuser. |
| 1.12 | FC25 | 1 x 28 | Fluorescent, decorative, recessed type with mirror optic reflector. |
| 1.13 | FC26 | 2 x 28 | Fluorescent, decorative, recessed type with mirror optic reflector. |
| 1.14 | FC27 | 2 x 28 | Fluorescent, decorative with opal polystyrene louvers. |
| 1.15 | FC28 | 2 x 28 | Fluorescent, decorative, recessed type with opal polystyrene louvers. |
| 1.16 | FC29 | 2 x 28 | Fluorescent, decorative with vertical metallic louvers. |
| 1.17 | FC30 | 4 x 14 | Fluorescent, decorative, recessed type, 600 x 600 size with perspex acrylic diffuser. |
| 1.18 | FC31 | 4 x 20 | Fluorescent, decorative, recessed type, 600 x 600 size with opal polystyrene louvers. |



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- | | | | |
|------|------|--------|---|
| 1.19 | FC32 | 2 x 28 | Fluorescent, decorative, surface mounted with mirror optic reflector. |
| 1.20 | FC33 | 1 x 18 | Fluorescent, decorative, recessed type with mirror optic reflector operating on 220V DC input supply. |
| 1.21 | FC34 | 1 x 18 | Fluorescent, dust proof, totally enclosed type with sheet steel housing operating on 220V DC input supply |
| 1.22 | FC41 | 2 x 28 | Fluorescent, vapour proof with end boxes and controlgear box of cast Al. |
| 1.23 | FC51 | 2 x 28 | Fluorescent, dust proof, totally enclosed type with sheet steel housing. |
| 1.24 | FC61 | 1 x 28 | Fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover. |
| 1.25 | FC62 | 2 x 28 | Fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover. |
| 1.26 | FC81 | 2 x 28 | Fluorescent, corrosion proof, totally enclosed type with sheet aluminium/ polycarbonate housing. |

2.0 High Pressure Mercury Vapour (HPMV) Lamp Luminaire

- | | | | |
|------|------|----------|--|
| 2.1 | MB01 | 1 x 250 | Mercury, high bay, industrial type. |
| 2.2 | MB02 | 1 x 400 | Mercury, high bay, industrial type. |
| 2.3 | MB03 | 1 x 1000 | Mercury, high bay, industrial type. |
| 2.4 | MB04 | 1 x 250 | Mercury, high bay, totally enclosed industrial type. |
| 2.5 | MB05 | 1 x 400 | Mercury, high bay, totally enclosed industrial type. |
| 2.6 | MB06 | 1 x 250 | Mercury, high bay with non-integral controlgear box. |
| 2.7 | MB07 | 1 x 400 | Mercury, high bay with non-integral controlgear box. |
| 2.8 | MB11 | 1 x 250 | Mercury, medium bay, industrial type. |
| 2.9 | MB12 | 1 x 400 | Mercury, medium bay, industrial type. |
| 2.10 | MB13 | 1 x 250 | Mercury, medium bay, totally enclosed industrial type. |
| 2.11 | MB14 | 1 x 400 | Mercury, medium bay, totally enclosed industrial type. |



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2.12	MB17	1 x 80	Mercury, low bay, industrial type.
2.13	MB18	1 x 125	Mercury, low bay, industrial type.
2.14	MB19	1 x 80	Mercury, low bay, totally enclosed industrial type.
2.15	MB20	1 x 125	Mercury, low bay, totally enclosed industrial type.
2.16	MW41	1 x 80	Mercury, well glass, vapour proof with vitreous enamelled reflector.
2.17	MW42	1 x 125	Mercury, well glass, vapour proof with vitreous enamelled reflector.
2.18	MW51	1 x 80	Mercury, well glass, dust proof with vitreous enamelled reflector.
2.19	MW52	1 x 125	Mercury, well glass, dust proof with vitreous enamelled reflector.
2.20	MW91	1 x 80	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
2.21	MW92	1 x 125	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
2.22	MW93	1 x 80	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing
2.23	MW94	1 x 125	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
2.24	MW95	1 x 80	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div.-2 areas.
2.25	MW96	1 x 125	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas.
2.26	MW98	1 x 125	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing
2.27	MS61	1 x 125	Mercury, street light with one piece cast aluminium body.
2.28	MS62	1 x 250	Mercury, street light with two piece cast aluminium body.
2.29	MS63	1 x 400	Mercury, street light with two piece cast aluminium body.



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- 2.30 MF61 1 x 250 Mercury, flood light, general purpose.
2.31 MF62 1 x 400 Mercury, flood light, heavy duty type.
2.32 MF63 2 x 400 Mercury, flood light, heavy duty type.
2.33 MP21 1 x 80 Mercury, post top lantern
2.34 MP22 1 x 125 Mercury, post top lantern

3.0 High Pressure Sodium Vapour (HPSV) Lamp Luminaire

- 3.1 SB01 1 x 150 Sodium, high bay, industrial type.
3.2 SB02 1 x 250 Sodium, high bay, industrial type.
3.3 SB03 1 x 400 Sodium, high bay, industrial type.
3.4 SB04 1 x 150 Sodium, high bay, totally enclosed industrial type.
3.5 SB05 1 x 250 Sodium, high bay, totally enclosed industrial type.
3.6 SB06 1 x 400 Sodium, high bay, totally enclosed industrial type.
3.7 SB07 1 x 150 Sodium, high bay with non-integral controlgear box.
3.8 SB08 1 x 250 Sodium, high bay with non-integral controlgear box.
3.9 SB09 1 x 400 Sodium, high bay with non-integral controlgear box.
3.10 SB11 1 x 150 Sodium, medium bay, industrial type.
3.11 SB12 1 x 250 Sodium, medium bay, industrial type.
3.12 SB13 1 x 150 Sodium, medium bay, totally enclosed industrial type.
3.13 SB14 1 x 250 Sodium, medium bay, totally enclosed industrial type.
3.14 SB17 1 x 70 Sodium, low bay, industrial type.
3.15 SB18 1 x 150 Sodium, low bay, industrial type.
3.16 SB19 1 x 70 Sodium, low bay, totally enclosed industrial type.
3.17 SB20 1 x 150 Sodium, low bay, totally enclosed industrial type.
3.18 SW41 1 x 70 Sodium, well glass, vapour proof with vitreous enamelled/
powder coated type reflector.



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3.19	SW42	1 x 150	Sodium, well glass, vapour proof with vitreous enamelled/ powder coated type reflector.
3.20	SW51	1 x 70	Sodium, well glass, dust proof with vitreous enamelled reflector.
3.21	SW52	1 x 150	Sodium, well glass, dust proof with vitreous enamelled reflector.
3.22	SW91	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
3.23	SW92	1 x 150	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
3.24	SW93	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
3.26	SW95	1 x 70	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas.
3.27	SW96	1 x 150	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas.
3.28	SS61	1 x 70	Sodium, street light with one piece cast aluminium body.
3.29	SS62	1 x 150	Sodium, street light with one piece cast aluminium body.
3.30	SS63	1 x 250	Sodium, street light with two piece cast aluminium body.
3.31	SS64	1 x 400	Sodium, street light with two piece cast aluminium body.
3.32	SF61	1 x 250	Sodium, flood light, general purpose.
3.33	SF62	1 x 400	Sodium, flood light, general purpose.
3.34	SF63	1 x 250	Sodium, flood light, heavy duty type.
3.35	SF64	1 x 400	Sodium, flood light, heavy duty type.
3.36	SF65	2 x 250	Sodium, flood light, heavy duty type.
3.37	SF66	2 x 400	Sodium, flood light, heavy duty type.
3.38	SP21	1 x 70	Sodium, post top lantern.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

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4.0 Tungsten Lamp Luminaires

- | | | | |
|------|------|---------|--|
| 4.1 | TW41 | 1 x 100 | Tungsten, well glass, vapour proof with vitreous enamelled reflector. |
| 4.2 | TW42 | 1 x 200 | Tungsten, well glass, vapour proof with vitreous enamelled reflector. |
| 4.3 | TW51 | 1 x 100 | Tungsten, well glass, dust proof with vitreous enamelled reflector. |
| 4.4 | TW52 | 1 x 200 | Tungsten, well glass, dust proof with vitreous enamelled reflector. |
| 4.5 | TW91 | 1 x 100 | Tungsten, well glass, flame proof with vitreous enamelled reflector. |
| 4.6 | TW92 | 1 x 200 | Tungsten, well glass, flame proof with vitreous enamelled reflector. |
| 4.7 | TW95 | 1 x 100 | Tungsten, well glass, increased safety (Div. 2) with vitreous enamelled reflector. |
| 4.8 | TW96 | 1 x 200 | Tungsten, well glass, increased safety (Div. 2) with vitreous enamelled reflector. |
| 4.9 | TB21 | 1 x 60 | Tungsten, bulk head, weather proof. |
| 4.10 | TB22 | 1 x 100 | Tungsten, bulk head, weather proof. |
| 4.11 | TB91 | 1 x 100 | Tungsten, bulk head, flame proof. |
| 4.12 | TB92 | 1 x 200 | Tungsten, bulk head, flame proof. |
| 4.13 | TP21 | 1 x 200 | Tungsten, post top lantern. |
| 4.14 | TE02 | 1 x 20 | Tungsten, portable emergency unit with rechargeable battery. |
| 4.15 | TE02 | 1 x 40 | Tungsten, portable emergency unit with rechargeable battery. |
| 4.16 | TX01 | 1 x 60 | Tungsten, dispersive vitreous enamelled reflector. |
| 4.17 | TX02 | 1 x 100 | Tungsten, dispersive vitreous enamelled reflector. |
| 4.18 | TX03 | 1 x 75 | Decorative recessed mounting luminaire suitable for comptalux lamp. |
| 4.19 | TX04 | 1 x 100 | Decorative recessed mounting luminaire suitable for comptalux lamp. |



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4.20 TX05 2 x 100 Double obstruction aviation light of cast Al. alloy with red glass.


5.0 Halogen

5.1 HF61 1 x 300 Halogen, flood light, drip proof.

5.2 HF62 1 x 500 Halogen, flood light, drip proof.

5.3 HF63 1 x 750 Halogen, flood light, drip proof.


5.4 HF64 1 x 1000 Halogen, flood light, drip proof.

		ITEM : LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN				APPROVED BY	
		CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	CONFORMING TO CODE : As applicable	Rev No.: 00 Date: 02/11/15 VALID UPTO: 01/11/18	REVIEWED BY
1	3	4	5	6 M 6 C/N	7	8	9	10	11
COMPONENT & OPERATIONS		REMARKS		RECORD		M C N		D** 10 11	

Note: 1) Lighting fixtures supplier to ensure that constructional features of the lighting fixture (conventional & LED type) are as per NTPC specification requirements
 2) Lighting fixture supplier to maintain all quality control records identified in this QP whether it is identified for NTPC verification or witness or not.

Conventional type Lighting Fixture									
S.No	Component & Operations	Characteristics / Instruments	Class of Check	Type of Check	Quantum of Check	Reference Document	Conforming to Code	Reviewed By	Approved By
A	Bought out items / in-process checks								
1	Lamps	Make, rating & type	Major	Visual	1 sample per type	NTPC specification requirements for rating & type, Make to be BIS approved with CML number	NTPC specification requirements for rating & type, Make to be BIS approved with CML number	V - -	
1.1	Electronic Ballast (if applicable)	a Certificate of compliance	Major	Visual	-	NTPC specification requirements	Certificate of compliance by ballast manufacturer / lighting fixture supplier that ballast meets all NTPC specification requirements	V - -	
		b THD and pf check	Major	Electrical	Mnfr std.	NTPC specification requirements	THD <= 10%, pf >= 0.9 for FH type and pf >= 0.95 for other type of fluorescent lighting fixtures	P/ V *	P/V * - means test will be performed either by lighting fi supplier or their sub-vendor as Verified by lighting fixture sup
1.2	Castings	Freedom from defects	Major	Visual	Mnfr std.	NTPC specification requirements	Castings shall be free from any defects such as blow holes, surface blisters, cracks and cavities etc.	P/ V *	P/V * - means test will be performed either by lighting fi supplier or their sub-vendor as Verified by lighting fixture sup
1.3	Sheet metal forming and fabrication	Freedom from defects	Major	Visual	Mnfr std.	NTPC specification requirements	sheet metal fabrication / forming etc should be as per manufacturer drgs	P/ V *	P/V * - means test will be performed either by lighting fi supplier or their sub-vendor as Verified by lighting fixture sup
1.4	Pre-treatment and powder coating	Pre-treatment process checks, Powder coating finish, thickness, uniformity of coating and adhesion	major	Visual, chemical & mech	Mnfr std.	Mnfr standard, NTPC specification requirements	Nominal coating thickness 50 microns or more	P/ V *	P/V * - means test will be performed either by lighting fi supplier or their sub-vendor as Verified by lighting fixture sup

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (V) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER / SUB-SUPPLIER: C: MAINS SUPPLIER, N: NT
 P: PERFORM W: WITNESS AND V: VERIFICATION. CHP: CUSTOMER HOLD POINT BY NTPC SHALL BE IDENTIFIED UNDER AGENCY COLUMN "N" AS 'W'.
 Format No.: QS-01-QAI-P-10/F3-R0
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SI No	COMPONENT & OPERATIONS	ITEM: LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN				REVIEWED BY SWAPNESWAR MISHRA VIKRAM TALWAR SUNIL MALANI	APPROVED BY 		
		CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK	CONFORMING TO CODE: As applicable		REFERENCE DOCUMENT	ACCEPTANCE NORMS			FORMAT OF RECORD	REMARKS
				TYPE OF CHECK	QUANTUM OF CHECK						
3	Acceptance Tests on conventional Lighting fixture			5		7					
		3	4	Visual		lighting fixture supplier to submit the details of lot offered for NTPC inspection (Type of lighting fixtures, their batch number, sub-vendor name, quantity)	COC	List	The list may be used by NTPC for sample selection		
		a	Major	Visual	100%	100%	Make to be BIS approved with CML number	Certificate of compliance			
		b	Major	Visual	1 sample per type	1 sample per type	NTPC specification and approved data sheet/drg.	Inspection report			
		c	Major	Visual	1 sample per type	1 sample per type	NTPC specification and approved data sheet/drg.	Inspection report			
		d	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	At lighting fixture supplier test lab		
		e	Major	Mechanical	1 sample per type	1 sample per type	IS 10322 Part 1	Inspection report			
		f	Major	optical	Mnfr std.	Mnfr std	Certificate of compliance	Certificate of compliance	P/V * - means test will be performed either by lighting fixture supplier or their sub-vendor and Verified by lighting fixture supplier		
		f	Major	optical	Mnfr std.	Mnfr std	Certificate of compliance for the batch : that offered lighting fixture LOR is not be less than 90% (refer IS 16107) with reference to type test reports	Certificate of compliance	P/V * - means test will be performed either by lighting fixture supplier or their sub-vendor and Verified by lighting fixture supplier		
		g	Major	Visual	1 sample per type	1 sample per type	NTPC specification and approved data sheet/drg.	Inspection report			
		h	Major	Visual	#	#	IS 10322 part 1	Inspection report	# As per Table 1 (inspection Level S2) and Table 2C AQL 2.5 of IS 2:500		

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COMPONENT & OPERATIONS		ITEM : LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN				REVIEWED BY		APPROVED BY	
Sl No	2	Acceptance Tests on LED Lighting fixture	CLASS OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS	Dt.....
					6.M	6.CN					
			4	5	-	7	lighting fixture supplier to submit the details of lot offered for NTPC inspection (Type of lighting fixtures, their batch number, sub-vendor name, quantity)	8	9		
	a	Details of lot offered and Certificate of compliance that lighting fixture supplier has inspected the offered lot as per their own standard	Major	Visual	-	-	lighting fixture supplier to submit the details of lot offered for NTPC inspection (Type of lighting fixtures, their batch number, sub-vendor name, quantity)	-	List		The list may be tested by NTPC for sample selection
	b	LED chip make	Major	Visual	-	-	NTPC accepted type test reports (LM80/LM79) report	Certificate of compliance	Certificate of compliance	V	V
	c	Constructional features including: Internal wiring, terminal block, earthing terminal, safety chain (if applicable)	Major	Visual	1 sample per type	1 sample per type	NTPC specification and NTPC approved data sheet/drg.	NTPC specification and approved data sheet/drg.	Inspection report	P	W
	e	Resistance to moisture test in case of lighting fixtures having IP X4 and above rating	Major	Mechanical	1 sample per type	1 sample per type	NTPC approved data Sheet	IS 10322 Part 1	Inspection report	P	W
	f	Resistance to dust (applicable if IP5X and above)	Major	optical	Mnfr std.	Mnfr std	NTPC accepted type test reports	Certificate of compliance	Certificate of compliance	P/ V *	V
	f	Photometry check	Major	optical	Mnfr std.	Mnfr std	NTPC accepted type test reports, LM 79, IS 16106, IS 16107	Certificate of compliance for the batch: that offered lighting fixture LOR and lighting fixture efficacy is not be less than 90% (refer IS 16107) with reference to type test reports	Certificate of compliance	P/ V *	V

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Sl No	COMPONENT & OPERATIONS	ITEM : LIGHTING FIXTURES (Conventional and LED type)		STANDARD QUALITY PLAN				REVIEWED BY	APPROVED BY
		CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT		
					6-M	6-CN			
1	2			5		7			
	g	Dimensions	Major	Visual	1 sample per type	1 sample per type	NTPC specification and approved data sheet/drg.	Inspection report	P W W
	i	LED driver: THD and pf check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	P W W
	j	LED driver: Precision current control check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	P W W
	k	LED driver: Open circuit protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	P W W
	l	LED driver: Short circuit protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	P W W
	m	LED driver: Over temperature protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	P W W
	n	LED driver: Overload protection simulation check	Major	Electrical	1 sample per type	1 sample per type	NTPC specification	Inspection report	P W W
	o	LED driver: Surge protection compliance check	Major	Electrical	-	-	NTPC specification	Certificate of compliance that surge protection is provided	V V V

Note : Packing shall be witnessed as per Annexure-C to section-1

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