



ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

SCPV: BOS: ITB - Rev 01

INSTRUCTIONS TO BIDDERS (ITB)

Bidders are requested to read the instructions carefully and submit their quotations covering all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: SCPV: BOS: ITB – Rev 01), General Conditions of Contract (document reference: SCPV: BOS: GCC - Rev 01) and Special Conditions of Contract (document reference: SCPV: BOS: SCC: I - Rev 01/ SCPV: BOS: SCC: F - Rev 01), if any, of the enquiry.
2. Any deviations from or additions to the “General Conditions of Contract” or “Special Conditions of Contract” require BHEL’s express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be preferred. However, if the OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily the following documents:
 - a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
 - b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
 - c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages / damages / replacement / repair of imported scope till system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
8. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport / Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment. Warehousing charges due to incomplete or missing documentation will be recovered from the supplier’s bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**
9. 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 the banned firms is available on BHEL website: **www.bhel.com**.

10. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices / misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, poor quality, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike / lockout for a long period.

B. GUIDELINES FOR PREPARATION OF OFFER:

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
 - **SINGLE PART BID:** Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
 - **TWO PART BID:** Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid" without the prices** should be enclosed in one cover and the cover must be super scribed "**Techno-commercial offer** and Priced offer i.e. "Price Bid" containing price summary in a separate sealed envelope and must be super scribed "**Price Bid**". Both these envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number, due date of tender and any other details as called for in the tender document.
 - **THREE PART BID:** Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.

If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission at the venue/place specified or if any part of the offer is incomplete the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to super scribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid". Please ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.
3. BHEL standard Commercial Terms and Conditions shall be duly filled, signed & stamped and must accompany Technical-Commercial offer without fail and should be submitted in original only. Photocopy will not be accepted. All documents submitted along with the offer shall be signed and stamped in each page by authorized representative of the bidder.
4. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without any deviation.
5. Deviation to this specification / item description, if any, shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail, as a part of Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.
6. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and / or any other relevant documents called in purchase specification as part of Technical Bid.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all applicable taxes and duties, packing & forwarding charges (if applicable), freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.
8. In addition, bidder shall also quote for erection & commissioning charges (I&C charges), documentation charges, service charges, testing charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega

Power Projects, Export Projects, MNRE Concession or other similar projects wherein supplies are eligible for customs duty /Excise duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.

11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totaling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure VI** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. GUIDELINES FOR OFFER SUBMISSION:

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE." Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer. **(This clause will not be applicable for e-tenders).**
2. E-Mail / Internet / EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email IDs within time of submission of tender.
3. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over to purchase officers.
4. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor will be solely responsible:
 - a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
 - b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
 - c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box or if the tender document is handed over to the wrong person BHEL will not be responsible for any such delays.
 - d. For offers received through email/courier etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time.
 - e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.
Service provider: M-junction
Website address: <https://bheleps.buyjunction.in/>
Helpline no.: 033-66106426/6217/6013/6046/6176 (9:30 am to 5:30 pm)
9163348283/9163348284/9163348285/9163348286/8584008116 (5:30 pm to 8:30 pm)

Purchase Executive / BHEL will not be responsible for any of the activities relating to submission of offer.

D. PROCESSING OFFERS RECEIVED:

1. Any discount / revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid). The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes / revisions are requested by BHEL.
3. In case there is no change in the technical scope and / or specifications and / or commercial terms & conditions by BHEL, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening of Part-1 Bid).

4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from vendors, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid. Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening. Impact price means only for those items which have been impacted by addition / deletion / changes in the technical specifications or commercial conditions. The impact may be +/- incremental value of the currency in which originally quoted. The impact price bid to be submitted on the cut-off date, time & venue as specified by BHEL. The impact price bid shall be opened along with original price bid.
5. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
6. After receipt of Purchase Order, supplier should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and / or any other relevant documents as per Specification / Purchase Order, as and when required by BHEL / Customer.
7. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order.
8. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL"). As per RFQ terms. "Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and duties, inspection charges, freight charges, test charges, insurance, service tax for services, any other cost indicated by vendor for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions). Benefits arising out of Nil Import Duty on Mega Projects, Physical Imports or such 100% exemptions & MNRE Exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (Wherever applicable and as indicated in SCC document of tender)
9. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

Single part bids:	Date of tender opening
Two/three part bids:	Date of Part-I bid opening
Reverse Auction:	Date of Part-I bid opening

In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.
10. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers and on the basis or evaluation of Total Cost to BHEL.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format (**Refer Annexure IV**) for receiving all payments through NEFT. (Applicable for Indian vendors only)
2. Statutory deductions, if any, will be made and the deduction certificate shall be issued. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act. (Applicable for Indian vendors only). Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
3. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN**Purchase Orders for indigenous procurement****(a) SUPPLY WITH I&C/SUPERVISION:****Supply:**

- 1) 80% of basic Supply value + 100% of taxes, duties and freight charges will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later.
- 2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any).
- 3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank.

I&C/Supervision: 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis.

O&M: 100% O&M charges are payable as per RFQ terms against report certified by BHEL.

(b) SUPPLY ONLY:

- 1) 100% of Basic value with taxes, duties and freight will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later)+ submission of PBG valid for Warranty Period+ 3 months Claim Period from BHEL Consortium Bank ,if applicable.

Purchase orders for import procurement:**(c) SUPPLY WITH I&C/SUPERVISION:****Supply:**

- 1) 80% of the basic value (excluding I&C charges) will be paid with 45 days credit, against Sight draft, from the date of AWB/BOL on submission of complete set of documents as in PO.
- 2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any).
- 3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank.

I&C: 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis.

(d) SUPPLY ONLY:

- 1) 100% of PO value will be paid against Sight draft with 45 days Credit from the date of dispatch or 15 days credit from the date of submission of complete set of documents whichever is later)+ submission of PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank ,if applicable.

Note for (a), (b), (c) and (d): In exceptional cases, if vendor fails to submit PBG after supplies, vendors can also accept for the final 10% payment, payable after the warranty period + 3 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable) as PBG is linked to Warranty period.

G. LOADING FACTORS FOR PAYMENT TERMS & DELAYED DELIVERY:

Loading factors as detailed below will be added to the quoted price (basic) to evaluate the lowest quote for non-compliance of BHEL standard commercial term.

SI No	Deviation on	Nature of Deviation / Offered Terms	Loading %
1.	Payment Terms	For Purchase within India :-	
		1) Credit period less than 45 days	15
		* For Foreign Purchase :-	
		1) Payment through At Sight Letter of Credit	10
		2) Payment through Letter of Credit with usance credit of 45 days	5
		3) Sight Draft with credit period less than 45 days	5
2.	Penalty for Delayed Delivery	1) Non – Acceptance	10
		2) Partial Acceptance (X%)	(10 – X)

*** All bank charges shall be to seller's account. If bank charges of BHEL banker are to BHEL's account then additional loading of 2% on the quoted basic value is applicable.**

Offer/s with payment terms other than the standard payment terms indicated at Clause No.F or Deviated Payment Terms with loading indicated at Clause No.G above are liable for rejection.

NOTES:

1. ADVANCE PAYMENT/LC: Quotations with "Advance payment/Inland LC" shall be rejected.
2. Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight and I&C charges (wherever applicable).
3. Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 10% (as applicable) of both purchase order values put together.
4. Non-Compliance of Warranty terms. Offers not complying with Warranty terms as per RFQ Terms is liable for rejection.
5. SALE IN TRANSIT/ LOCAL VAT: Sale in transit under section 6(2) of CST is allowed if movement of goods is interstate. In case intra state movement of goods, benefit of sale in transit is not available.
6. In case of intrastate movement i.e. supply within same state and VAT is applicable, the vendor shall furnish the respective BHEL's nodal agency TIN no. and address in their invoice. (Refer **Annexure IX**)

H. BANK GUARANTEE (BG) / PERFORMANCE BANK GUARANTEE (PBG):

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents. Such PBG shall be valid for a period of Warranty Period + claim period of 3 months for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
 - a. PBG shall be from any of the BHEL consortium of bankers (**refer Annexure V**).
 - b. PBGs from nationalized banks are also acceptable.

- c. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order. PBG should be in the format indicated. **(Refer Annexure III)**. No deviation to these formats will be allowed.
- d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).
- e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.
- f. In case vendor does not accept for submission of PBG, the vendor is liable for rejection on commercial grounds.

I. DOCUMENTS (TRIPLICATE COPIES) REQUIRED AT THE TIME OF DISPATCH FOR PROCESSING OF BILL:

1. FOR INDIGENOUS SCOPE OF SUPPLY:

For Supply: Invoice in Triplicate, Lorry receipt (LR) copy, Packing List, PSI Call Letter Copy, Proof of delivery such as MRC (Material Receipt Certificate)/ original acknowledged LR, Insurance intimation Letter and Warranty Certificate. Note that document pertaining to Proof of delivery shall clearly mention number of boxes/panels etc which shall be in line with the Packing list.

For I&C: Supplementary Invoice in Triplicate with copy of I&C Certificate (Proof of Completion of I&C).

For PBG: Supplementary Invoice in Triplicate with copy of PBG. However, PBG should reach concerned Purchase Officer directly from the Bank.

2. FOR IMPORTED SCOPE OF SUPPLY:

For Supply: Invoice in Triplicate, Air Way Bill/Bill of Lading, Packing List, PSI Call Letter Copy, and Warranty Certificate.

For I&C: Supplementary Invoice in Triplicate with copy of I&C Certificate (Proof of Completion of I&C).

For PBG: Supplementary Invoice in Triplicate with copy of PBG. Both PBG & supplementary invoice should reach concerned Purchase Officer directly from the Bank.

J. PROVISIONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES)

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit any of the following documents along with the tender documents in the Part I / Technical bid cover to avail the applicable benefits.

- a. Valid NSIC certificate or
- b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).
- c. EM II certificate with CA certificate **(in the prescribed format given in Annexure VIII)** applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.
- d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

PURCHASE PREFERENCE FOR MSE VENDORS:

- e. ~~MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 20% of the requirement against this tender provided.~~
 - 1. ~~The MSE vendor matches the L1 price.~~
 - 2. ~~L1 price is from a non-MSE vendor.~~
 - 3. ~~L1 price will be offered to the nearest vendor nearest to L1 in terms of price ranking (L2 nearest to L1). In case of non-acceptance by the MSE vendor (L2) next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).~~
 - 4. ~~20% of the 20% (i.e. 4% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) and (2) are fulfilled.~~
 - 5. ~~In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 4% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.~~

- ~~6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity / items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split will be indicated in the SCC.~~

K. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL:

BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.

2. Commitment by Bidder(s)/ Contractor(s):

- a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
- b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
- c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. 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 BHEL as part of business relationship.
- d. 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 and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

L. FRAUD PREVENTION POLICY:

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. Fraud Prevention policy and List of Nodal Officers shall be hosted on BHEL website, vendor portals of Units/regions intranet.

PURCHASE EXECUTIVE



ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड

Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division

PB 2606 , Mysore Road Bangalore , 560026 INDIA

SCPV: BOS: GCC - Rev 01

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT (GCC)

These 'General Commercial Conditions for Contract for Purchase' hereinafter referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects / customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

- a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
- b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
- c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent / acceptance / award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection / Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
- d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.
- e) "Bidder" shall mean duly established reputed organisation, manufacturer etc. having requisite financial and technical capability and experience of participating in the bid invited by the purchaser for the tender.
- f) Bid- The term "bid" or "bidding" can also relate to the documented Offer submitted in response to a request for quotation (RFQ) /Tender.

Interpretation:

In the contract, except where the context requires otherwise:

- a) words indicating one gender include all genders;
- b) words indicating the singular also include the plural and words indicating the plural also include the singular;
- c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
- d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. **Price Basis:** All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.
2. **Validity:** The offer will be valid for a period of 90 days from the date of technical bid opening date. Validity beyond 90 days, if required, will be specified in the SCC (special conditions of contract).
3. **Taxes & Duties:** Taxes as mentioned in the Contract Price or Price Schedule shall be paid to the Contractor subject to the Contractor complying with all the statutory requirements and furnishing the relevant documents including error free invoices containing detailed break-up of the taxes. Any duties, levies or taxes not mentioned in Contract Price or Price Schedule but applicable as per any statute(s) shall be deemed to be included in the Contract price and shall be to the account of the Contractor.
The Contractor shall bear and pay all the costs, liabilities, levies, interest, penalties in respect of non-compliances of any legal requirements as per various statutory provisions. The contractor shall keep the owner indemnified at all times from any tax liability, interest, penalties or assessments that may be imposed by the statutory authorities for non-compliances or non-observation of any statutory requirements by the Contractor.
4. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head within two weeks from the date of Purchase Order or such other period as specified / agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
The purchase order will be deemed to have been accepted if no communication to the contrary is received within two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.
5. **Documentation:** After receipt of Purchase Order, vendor should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents /specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.
6. **TERMS OF DELIVERY:**
FOR IMPORTED PURCHASE:
Price offered shall be for goods packed and delivered CIF Seaport/ International Airport (FCA) including packing, forwarding, Handling, Ancillary charges like processing of Sight Draft, negotiation charges of bank, Export declaration, Certificate of origin etc.
Packing shall be Air/Sea worthy, best suitable for trans-shipment and to take care of transit damages. If containerized, no. of containers & size of container shall be mentioned. Packing weight (gross & net) Packing dimensions shall be given prior to shipment to ascertain whether the consignment can be carried on standard cargo in contract or as ODC.
Wooden packing material for all the foreign consignments should be treated as per ISPM-15 & Fumigation / Phytosanitary certificate to be submitted to the freight forwarders/ BHEL along with the invoice, B/L, packing list etc.
Vendors shall indicate the name of International Airport/Seaport. The consignment shall be handed over to BHEL approved freight forwarder as mentioned in PO.

FOR INDIGENOUS PURCHASE:

Equipment shall be delivered on "FOR SITE" basis, inclusive of freight, packing, insurance & forwarding charges.

Packing shall be Road / Rail / Air / Sea worthy, best suitable for transshipment and to take care of transit damages. Smaller consignments can be dispatched through Courier services/ RPP with the prior approval of the purchasing Executive.

Deviation for the delivery term is liable for rejection.

7. Penalty:

For delay in delivery: In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

Penalty for delayed delivery, if applicable, shall be deducted at the time of first payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted.

8. **Contract variations (Increase or decrease in the scope of supply):** BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be applied to such additional work. Vendor shall not perform additional work before BHEL has issued written instructions / amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.
9. **Reverse Auction:** BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non- consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite

action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

10. **Pre Shipment Inspection:** Prior written notice of at least one week shall be given along with internal test certificates / COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification / acceptance for issue of dispatch clearance.
All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.
11. **Transit Insurance:** Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.
12. **Packaging and dispatch:** The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea / Air / Rail / Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures / hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw / solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitary / Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (L x B x H) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated.
Separate packing & identification of items should be as follows.
 1. Main Scope - All items must be tagged with part no. & item description.
 2. Commissioning spares - All items must be tagged with part no. & item description.
 3. Mandatory spares - All items must be tagged with part no. & item description.
13. **Assignment of Rights & Obligations; Subcontracting:** Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.
14. **Progress report:** Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.
15. **Non-disclosure and Information Obligations: Vendor** shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract &

its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.

16. **Cancellation / Termination of contract:** BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so, on account of any decline, diminution, curtailment or stoppage of the business.
17. **Risk Purchase Clause:** In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services NOT supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
In case of items demanding services at site like erection and commissioning, vendor should send his servicemen /representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase / service including additional handling charges due to the change.
18. **Shortages:** In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost.
Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, Supplier shall make good of all such damages within a reasonable time from such intimation by BHEL.
19. **Remedial work:** Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.
20. **Indemnity Clause:** Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.
21. **Product Information, Drawings and Documents:** Drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.
Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.
All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.
22. **Intellectual Property Rights, Licenses:** If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods / related service) or accompanying documentation shall be the exclusive

property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

23. **Force Majeure:** Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.

A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

24. **Guarantee / Warranty:** Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. The guarantee / warranty period as described shall apply afresh to replaced, repaired or re-executed parts of a delivery. If the vendor fails to take proper corrective action to repair/replace defects satisfactorily within a reasonable period, Purchaser shall be free to take corrective action as may be deemed necessary at vendor's risk and cost after giving notice to the vendor, including arranging supply of goods from elsewhere at the sole risk and cost of the vendor. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable guarantee / warranty period.

25. **Limitation of Liability:** Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.

The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

26. **Liability during guarantee / warranty:** Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor.

In case, defects attributable to vendor are detected during first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.

27. **Liability after guarantee / warranty period:** At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues noticed after the guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / as specified in RFQ.

28. **Compliance with Laws:** Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.
29. **Settlement of Disputes:** Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).
30. **Arbitration Clause:** In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract. Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.
31. **Applicable Laws and Jurisdiction of Courts:** Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in BANGALORE alone shall have jurisdiction to consider over any matters touching upon this contract.
32. **General Terms:** That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.
That the headings used in this agreement are for convenience of reference only.
That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.

ANNEXURE - I
LIST OF INTERNATIONAL GATEWAY AIRPORTS

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
D06	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE - II
REQUEST FOR C FORM

NAME OF VENDOR :

VENDOR CODE ALLOTTED BY BHEL :

E mail id for c form correspondence :

BHEL PO NO	INVOICE NO	INVOICE DATE	INVOICE AMOUNT	SUPPLY FROM - STATE	SUPPLY TO - STATE	CST TIN NUMBER (SUPPLIER)	INVOICE AMOUNT EXCLUDING FREIGHT	C FORM QTR	YEAR	SUPPLY TO BHEL EDN / SITE
---------------	---------------	-----------------	-------------------	---------------------------	-------------------------	-------------------------------------	---	---------------	------	---------------------------------

Please note that one 'C' form will be issued for a quarter.

Any modification and cancellation of c form is not possible from our end since it is generated online therefore include all invoices pertaining to quarter in your request
Also check the data are correct in all respect

General Instruction:

1. C form request should be given only in this file.
2. Amount should be 100% of Invoice value but should Not include freight, Insurance etc.
3. PO No. should be numeric, starting with 4 and has 10 digits
4. For every quarter separate file to be provided
5. All Invoices pertaining to the relevant quarter to be included.
6. No corrections will be entertained once c-form is issued.

ANNEXURE-III

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited ¹ (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____ through its Unit at.....(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at _____ ² hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated³ valued at Rs.....⁴ (Rupees -----)/FC.....(in words.....) for⁵ (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to% (.... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we,, (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs ----- (Rupees -----) without any demur, immediately on a demand from the Employer, .

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We thebank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including.....⁶ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the⁷ we shall be discharged from all liabilities under this guarantee thereafter.

We, BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁸
- b) This Guarantee shall be valid up to⁹
- c) Unless the Bank is served a written claim or demand on or before¹⁰ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

² NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

⁴ PROJECT/SUPPLY DETAILS

⁵ BG AMOUNT IN FIGURES AND WORDS

⁶ VALIDITY DATE

⁷ DATE OF EXPIRY OF CLAIM PERIOD

⁸ BG AMOUNT IN FIGURES AND WORDS.

⁹ VALIDITY DATE

¹⁰ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. In Case of Bank Guarantees submitted by Foreign Vendors-

- a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
- b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2 **In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank** (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
 - b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

ANNEXURE - IV

Electronic Funds Transfer (EFT) OR Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.

TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:	
Company Name :	
Permanent Account Number(PAN):	
Address	

City: _____	PINCODE _____	STATE _____
-------------	---------------	-------------

Contact Person(s)	
Telephone No:	
Fax No:	
e-mail id:	

1 Bank Name:	
2 Bank Address:	
3 Bank Telephone No:	
4 Bank Account No:	
5 Account Type: Savings/Cash Credit	
6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank	
7 Bank swift Code(applicable for EFT only)	
8 Bank IFSC code(applicable for RTGS)	
9 Bank IFSC code(applicable for NEFT)	

- A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.
- B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transferring Bank responsible.
- C This authority remains in full force until BHEL, EDN, Bangalore receives written notification requesting a change or cancellation.
- D I have read the contents of the covering letter and agree to discharge the responsibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:

Designation:

Telephone NO. with STD Code

Company Seal

Bank Certificate

We certify that _____ has an Account No _____ with us and we confirm that the bank details given above are correct as per our records.

Date: _____ (.....)

Place: _____ Signature

Please return completed form along with a blank cancelled cheque or photocopy thereof to:

Bharath Heavy Electricals Ltd,

Attn:

Electronics Division, Mysore Road,

BANGALORE - 560 026

In case of any Query, please call : 080-26998xxx / 2674xxxx or fax no. 080-2674xxxx

ANNEXURE-V
BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

BANK GUARANTEE (BG) SHALL BE ISSUED FROM THE FOLLOWING BANKS ONLY:

	Nationalised Banks		Nationalised Banks
1	Allahabad Bank	19	Vijaya Bank
2	Andhra Bank		Public Sector Banks
3	Bank of Baroda	20	IDBI
4	Canara Bank		Foreign Banks
5	Corporation Bank	21	CITI Bank N.A
6	Central Bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental Bank of Commerce		
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		Private Banks
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC Bank
15	State Bank of Travancore	30	Kotak Mahindra Bank Ltd
16	UCO Bank	31	ICICI Bank
17	Union Bank of India	32	IndusInd Bank
18	United Bank of India	33	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- BHEL may accept BG from other Nationalised Banks also which are not listed above.
- BG will not be accepted from Scheduled Banks and Co-operative Banks.
- In case BG is issued from a bank located outside Indian territory and is issued in foreign currency, the BG must be routed through and confirmed by any one of the above mentioned consortium banks or any of the Indian Public Sector Banks.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.

ANNEXURE - VI

DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

- (a) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.
- (b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and
- (c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.
- (d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE - VII

BENEFITS FOR MSE SUPPLIERS AS PER MSMED ACT 2006 AND PUBLIC PROCUREMENT POLICY 2012

MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of Acknowledgement in EM II).

Or

Valid NSIC certificate or EM II certificate along with attested copy of CA certificate (Format enclosed: ANNEXURE VIII) where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited).

Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid).

Non-submission of such documents will lead to consideration of their bid at par with other bidders.

No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazette officer.

ANNEXURE - VIII
CERTIFICATE BY CHARTERED ACCOUNTANT ON LETTER HEAD

This is to certify that M/s
.....(Hereinafter referred to as 'Company') having
its registered office at is registered under MSMED Act 2006, (Entrepreneur
Memorandum No ((Part-II) dtd Category:
(Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the
latest audited financial year **as per MSMED Act 2006 is as follows:**

1. For Manufacturing Enterprises: Investment in plant and machinery (i.e., original cost excluding land
and building and the items specified by the Ministry of Small Industries vide its notification No.S.O.1722
(E) dated October 5, 2006:

Rs.Lacs.

2. For Service Enterprises: Investment in equipment (original cost excluding land and building
and furniture, fittings and other items not directly related to the service rendered or as may be
notified under the MSMED Act, 2006:

Rs.Lacs.

The above investment of Rs. Lacs in within permissible limit of Rs..... Lacs
for.....Micro / Small (Strike off which is not applicable) Category under MSMED
Act 2006.

(or)

The company has been graduated from its original category (Micro/Small) (Strike off which is not
applicable) and the date of graduation of such enterprise from its original category is
.....(dd/mm/yy) which is within the period of 3 years from the date of graduation of such enterprise
from its original category as notified vide S.O.No.3322(E) dated 01.11.2013 published in the gazette
notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name -

Membership Number -

Seal of Chartered Accountant

ANNEXURE - IX

In case of intrastate movement i.e. supply within same state and VAT is applicable, the vendor shall furnish the respective BHEL™s nodal agency TIN no. and address in their invoice.

List of Statewise Nodal Officers with Contact Details

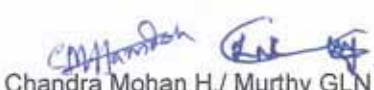
Region	State	Nodal Unit responsible for all other units except those in column 4	Contact Details- Landline No.	E-mail	TIN No.	CST No.
1	2	3		7	8	9
Norther States	Jammu & Kashmir	PSNR	0120-2510488/2416452	rahulb@bhelspsnr.co.in / a.chadha@bhelspsnr.co.in	01291101313	
	Himachal Pradesh	PSNR			02011000622	
	Punjab	PSNR			03451148722	
	Haryana	PSNR			06962606884	
	Rajasthan	PSNR			08232903345	
	Uttar Pradesh	PSNR	0120-2416536	rahulb@bhelspsnr.co.in / smittal@bhelspsnr.co.in	09365800914	
	Uttarakhand	Hardwar	01334-285449	alok@bhelhwr.co.in	05001757277 Dated 30th Sep 2005	5000030 Dated 13/03/1965
	Delhi	TBG	0120-6748429	skjindal@bhel.in	07472001760	07472001760
Western States	Madhya Pradesh	Bhopal	0755-2503231	meeta@bhelbpl.co.in	23573600001 (HEL/05/01/0001/S dated 15/11/1979 under MPCT)	HEL/05/01/0004/C dated 15/11/1979
	Chattisgarh	PSWR	0712-3048609	mgupta@bhelspswr.co.in	22173202974	
	Gujarat	PSWR	0265-2370321	bhavin@bhelspswr.co.in	24190101571	
	Maharashtra	ROD Mumbai	022-22126061/22187850	mahajani@bhel.in	27060300130V	27060300130C
	Daman & Diu	EDN	080-26998724 / 26998830	theerthagiri@bheledn.co.in	25000009902	
Southern States	Orissa	PSSR	044-28286773	sparida@bhelspsr.co.in / lakshmi@bhelspsr.co.in	21031301916	
	Tamil Nadu	Trichy	0431-2577757/ 2577229	msrao@bheltry.co.in / bharaths@bheltry.co.in	33243560005	239383 dt.11.6.91
	Kerala	PSSR	044-28286773	lakshmi@bhelspsr.co.in	32072043622	
	Karnataka	EDN	080-26998724 / 26998830	theerthagiri@bheledn.co.in	29180069268	00850081
	Telangana	HPEP RC, Puram	040-23185406/ 040-23182238	chand@bhelhyd.co.in / sbsv@bhelhyd.co.in	36360151179	
	Andhra Pradesh	HPVP, Vizag	0891-6681298	sarmaass@bhpvl.com	37418632431	
	Puducherry	PSSR				
Eastern States	West Bengal	PSER	033-23216130-3238	amitavac@bhelsper.co.in	19200936019	19200936213
	Bihar	PSER	0612-2231275	rakesh@bhelsper.co.in	10010994046	10010994046
	Jharkhand	PSER	06549-266351(Sh. Parmanand Swaroop)/06534-292179 (Sh. K.K. Ajeet)	pswaroop@bhelsper.co.in (Bokaro) kk.ajit@bhelsper.co.in (Koderma/Abhijeet/North Karanpura) manishk.jain@bhelsper.co.in (Chandrapura)/ kpsubbu@bhelsper.co.in	20352205642 (Bokaro) 20082005255 (Maithon) 20512405410 (Koderma) 20122200394 (Chandrapura) 20620905730(Adhunik) 20650507026(Abhijeet) 20452110016 (North Karanpura)	TG-729(C)
	Mizoram	PSER	033-23216130-3249	anindya@bhelsper.co.in	15501465017	
	Arunachal Pradesh	PSER	033-23216130-3249	anindya@bhelsper.co.in	12020122182	Not Applied
	Assam	PSER	033-23216130-3249	anindya@bhelsper.co.in	18790101415	18179903204
	Tripura	PSER	03821-265209	mkmahato@bhelsper.co.in	16060947071	16060947273
	Sikkim	PSER				
	Meghalaya	PSER				
	Manipur	PSER				
	Nagaland	PSER				

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KWp Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 1 OF 53

COPY RIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Limited.
It must not be used directly or indirectly in anyway detrimental to the interest to the company

Technical specification
for
Design, Supply, Installation, Commissioning, Operation and Maintenance of
1590KWp Solar Photovoltaic Grid-connected Roof-top system
at
Surat Municipal Corporation, Surat, Gujarat

Revision details: R00	Prepared / Checked	Approved:	Date:
	 Chandra Mohan H./ Murthy GLN	 Sreenath	23.03.2017

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 2 OF 53

CONTENTS

1.0	Introduction
1.1	Project outline of 1590KW _p AC solar photovoltaic power plant
2.0	BHEL scope
3.0	Vendor scope (Broad)
4.0	Vendor scope (Deliverables)
5.0	Enclosures to specification
6.0	Instructions to vendors on bid submission
7.0	Technical specification for design/drafting, infrastructure and logistics
7.1	Design and drafting
7.2	Temporary site office for vendor use
7.3	Electrical power/ water for construction, drinking water
7.4	Construction of yards/ sheds for safe storage of vendor supplied items
7.5	Unloading, safe storage and movement of supply items received at site
8.0	Technical specification for supply and erection works
8.1	Preliminary preparation of roof
8.2	Concrete pedestal casting
8.3	Erection of MMS structure
8.4	Erection of SPV modules over the MMS structure
8.5	Series interconnection of SPV modules to form strings
8.6	Installation of string inverters
8.7	Supply and installation of AC combiner boxes
8.8	Interconnection of SPV module strings to string inverters
8.9	Ferruling for 1Cx4 cable
8.10	Routing of 1Cx4 cable below the SPV modules
8.11	Routing of 1Cx4 cable in GI cable trays
8.12	Termination of 1Cx4 (DC side), 3Cx35 (AC side) cables at string inverters & ACCB boxes
8.13	Supply and installation of LTPDB combiner boxes
8.14	Laying and termination of cables from ACCB box to LTPDB box at 11kV yard
8.15	Underground cable trenches and laying of cables from buildings to 11kV switchyard
8.16	Supply and installation of 11kV SF6 Gas insulated VCB breaker panels
8.17	Supply and installation of 1100kVA and 700kVA Oil cooled transformers
8.18	Laying of cables from LTPDB to Transformer and further to VCB breaker panel
8.19	Erection of 11kV switchyards
8.20	Laying and termination of RS485 cables
8.21	Supply and installation of lightning arrestors for roof-top
8.22	Earthing for solar array MMS structures, other electrical panels, lightning arrestors

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 3 OF 53

9.0	Supply and installation of other infrastructure / support systems
9.1	Supply and installation of weather monitoring system
9.2	Supply and installation of lighting system for 11kV switchyards
9.3	Water washing system for SPV modules (module cleaning system)
9.4	Fire fighting systems
9.5	Identification marking of cables using cable tags
9.6	Cable route markers
9.7	Electrical Insulation mat
10.0	Technical specification of 11kV Oil cooled transformers: 1100kVA, 700kVA
11.0	Pre-commissioning inspections/checks/tests on AC side, MRT tests, coordination/liaison with state / central departments/ CEIG etc for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning:
11.1	Pre-commissioning inspections / checks / tests on DC side
11.2	Pre-commissioning inspections/checks/tests on AC side, MRT tests, coordination/liaison with state / central departments/ CEIG etc for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning:
12.0	General conditions applicable during supply, installation and commissioning phase
13.0	Operations and Maintenance
13.1	Date of commencement of operations and maintenance
13.2	O&M personnel
13.3	O&M operations – daily basis
13.4	O&M activities – monthly basis
13.5	O&M activities - quarterly basis
13.6	O&M activities – yearly basis
13.7	O&M activities - as and when required (contextual basis)
14.0	Documents to be submitted for BHEL/SMC approval during detailed engineering

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 4 OF 53

1.0 Introduction

1.1 Project outline of 1590KW_p (AC) solar photovoltaic power plant

(a) Bharat Heavy Electricals Limited (BHEL), Electronics Division, Bangalore is setting up 1590 kW solar photovoltaic (SPV) roof-top system at Surat (Gujarat) for Surat Municipal Corporation.

(b) Address/ contact particulars

Correspondence address

Executive Engineer,
Light & Energy Efficiency Cell,
Room # 117, Main Office Building,
Surat Municipal Corporation,
Muglisara, Surat – 395 003, Gujarat.

Despatch address : Will be intimated before material despatch to respective site.

(c) The 1590kW power plant comprises of two sites at Katargam water works, WW (940kW) and Katargam water distribution system, WDS (650kW).

(d) DC electricity generated by solar PV modules is inverted to AC in the range 270-450V that is further stepped up to 11kV. This site has three buildings A1/ A2/ A3 where solar PV system with string inverters and AC combiner boxes (ACCB) shall be installed on roof-top. AC outputs from the buildings are combined at a LT power distribution board (LTPDB) in the switchyard. The combined LT is further stepped up to 11kV using an oil-filled transformer supported by 11kV SF6 gas insulated vacuum circuit breaker (VCB) panel for line/ transformer protection.

(e) **Vendor shall visit the site prior to submission of bid** so as to make better assessment of site conditions related to the buildings, location of 11kV yard, the surroundings etc.

(f) Basic features as below:

#	Feature	Katargam WW	Katargam WDS
1	Installed capacity	940 kW	650 kW
2	Capacity in A1/ A2/ A3	300 / 300 / 340 kW	300 / 150/ 200 kW
3	String inverter 50kW	6 / 6 / 7 Nos.	5/ 3/ 4 Nos
4	AC combiner box	7-in 1-out: 3 Nos	4-in 1-out: 1 No 5-in 1-out: 1 No 7-in 1-out: 1 No
5	Location of switchyard	~ 400m from A1, and ~ 100m from A3	~ 50m from A1 & A3, and ~ 30m from A2
6	11kV transformer rating	1100kVA	700kV

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 5 OF 53
---	--	--

(g) Other salient features include lightning protection, weather monitoring system, water washing system for SPV modules, ABT metering system, fire protection equipments, earthing system etc.

2.0 BHEL scope

- (a) Supply of SPV modules
- (b) Supply of module mounting structures including related fasteners
- (c) Supply of string inverters with data loggers
- (d) Supply of metering system: ABT metering panel, Metering CTs/ PTs

Note: All other supplies, installation/commissioning activities including BHEL supplies items shall be in vendor scope.

3.0 Vendor scope (broad):

(a) For certain identified DC and AC side activities of the power plant as brought in this specification include but not limited to design, engineering, drafting of drawings, obtaining approval from BHEL/SMC for the drawings, manufacture/ testing/ inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery/unloading at site, storage, civil works, installation, pre-commissioning tests, clearance/approval from Local power Utilities (DISCOM) / GEDA / CEIG etc, plant commissioning as identified under this specification.

(b) Scope also includes operations and maintenance of both the sites for a period of 10 years.

(c) Vendor shall have capability for design of systems such as cable laying/ routing/ dressing/ terminations, underground cable trenches, RCC foundations for switchyard equipments (transformers/ HT panels/ LT panels), water washing system for SPV modules, lightning arrestors, earth mat grids, earth chambers, lighting system for switchyard etc as envisaged under this specification.

(d) In case vendor does not have design/drafting capability as above, they shall tie up with competent design consultants. In such a case, vendor shall submit the credentials of the proposed consultants to BHEL after receiving purchase order from BHEL. Subsequent to approval by BHEL, vendor shall award the work on the consultants. All drawings/ design documents shall be originated by the consultants, endorsed by the vendor clearly stating the name of the project, names of clients (BHEL/SMC), drawing/document number, revision number, number of sheets etc. Details of drawings/ design documents to be submitted are brought out under various sections of this specification.

(e) All civil related works shall be tested as per BHEL/SMC-approved FQP that will be issued during the course of project execution. All third party testing shall be carried out only at NABL accredited laboratories (or) Government laboratories.

(f) Insurance :

- 1) BOS vendor shall be required to affect Insurance to the supplies, Transit, personnel including all third party risks under a comprehensive Transit cum storage cum Erection cum commissioning policy covering third party liability also covering entire duration of contract up to date of handing over of facilities (Plant) to SMC. The transit Insurance shall cover transit of goods from

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 6 OF 53

BHEL works and / or BHEL sub-vendor works, Transit from storage location in Surat to various building sites in Surat city.

- 2) The Insurance policy shall cover loss by theft, destruction or damage by fire, flood, exposure to weather or otherwise viz war, rebellion, violence etc.
- 3) Further a separate comprehensive Insurance policy shall be taken by BOS Vendor for O&M period of 10 Years in the name of SMC.
- 4) Insurance charges, renewal premiums shall be borne by BOS vendor. It is responsibility of BOS vendor to maintain the Insurance policy in force for the entire duration of contract. In case of any loss / claim under the policy, the contractor shall immediately inform the same to BHEL and SMC and lodge the necessary claim and take all measures required for settlement of claim and protect the interest of BHEL, SMC. In case of any delay / lapse on the part of BOS vendor, the loss shall be made up by them by replacing the equipment under claim without waiting for Insurance settlement.

(g) Warranty :

The successful bidder shall provide a warranty covering the rectification of all defects in the design of equipment, material and workmanship of manufacturing of equipment for a period of 12 (Twelve) months after satisfactory commissioning.

Note: The above is only a broad outline of vendor scope for the sake of introduction. The detailed vendor scope is elaborated under various other sections of this specification.

4.0 Vendor scope (deliverables)

The table below briefly outlines the vendor scope of work. Vendor shall submit the offer (in two part bids) as per this list and quantity.

#	Item Description	Qty	Unit
1	Concrete pedestal 250X250X160mm(H) with 15 MM coping @1:2:4 ratio	11580	No
2	NITO Bond Epoxy Bonding agent	400	L
3	4 sq.mm Cu, XLPO, FRLS, unarmored DC Cable	14500	m
4	3C X 35sqmm Al, XLPE, armoured cable	1600	m
5	1.1kV, 3CX185 sq.mm Al, XLPE armoured cable	80	m
6	1.1kV, 3CX300 sq.mm Al, XLPE armoured cable	60	m
7	1.1kV, 3CX400 sq.mm Al, XLPE armoured cable	850	m
8	1.1kV, 3CX500 sq.mm Al, XLPE armoured cable	160	m
9	11KV 3Cx185Sqmm Al, XLPE (UE) armoured cable	60	m
10	ACCB 4 In 1 Out	1	No
11	ACCB 5 In 1 Out	1	No
12	ACCB 7 In 1 Out	4	No
13	LTPDB 3 IN 1 Out with MFM	2	No

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat		PS-439-1121
	Rev No: 01		
	PAGE : 7 OF 53		

14	Transformer 700KVA, ONAN, 11KV/415V, Dyn11 vector.	1	No
15	Transformer 1100KVA, ONAN, 11KV/415V, Dyn11 vector.	1	No
16	HT panel 11KV, 1 In 1 Out, outdoor, SF6 Gas insulated VCB 630A, 25KA/1sec, MFM: 0.5s class	2	No
17	Weather proof Male & Female Snap-on (MC4 type) Connectors for 4 sq.mm	650	ST
18	Cable tray 100mm(W)X50mm(H)X2mm(T); Perforated type GI with coupler plate, H/W and cover of 2 mm Thick	2800	m
19	Copper globe type LA with installation arrangement	18	No
20	Chemical earthing Material: Electrodes, backfill compound etc. For LA, MMS, String inverter, ACCB, LTPDB, Transformer, HT Panel earthing (58 nos.)	1	ST
21	Switchyard Fence & Lighting (a) GI chain link fencing with Gate for switchyard area (Approx Size: 10 m X 15 m) - as required, (b) LED Light arrangement for switchyard area (4 lights per SY)	2	ST
22	25X3 mm GI strip for structure earthing	3650	m
23	25 X 6 mm GI strip for Equip earthing	1600	m
24	50 X 6 mm GI strip for Switchyard Equip earthing	200	m
25	Tools & Equipments a) Crimping tool for MC4 type Snap on connectors - 1 no b) Screw Drivers Set – 1 No., c) Plier – 1 No, d) Spanners Set - 1 No., e) Digital Multimeter – 1 No.(1000V AC & DC, 100A range)- Make: Meco/WACO, f) Digital clamp meter- 1 No (AC & DC 100A)- Make: Meco/WACO, g) 11KV grade hand Gloves set - 1 No., h) 11KV Discharge Rod - 1 No, i) Allen keys set - 1 No.	2	ST
26	Data & Communication Accessories (a) Communication cable: RS-485 compatible 2PX0.5 sq.mm copper armoured cable = 2200m, (b) Control Cable 12CX1.5sqmm copper armoured cable = 40m	1	ST
27	Fire Fighting and Safety Equipment (a) Dry powder type Extinguisher (9kg As per IS:13849/IS:15683) - 7 nos, (b) CO2 type Extinguisher (9kg as per IS:2878/IS:15683) - 5 nos, (c) Sand buckets with stand (2 buckets set) - 5nos, (d) Shock Treatment Chart - 6 nos, (e) Rubber Mat 11KV Grade 2.5mm thk black colour 2M X 1M - 10 nos, (f) First Aid Box - 2 nos	1	ST
28	Module Cleaning System a) supply of 2" CPVC Main pipe - 290m, b) Supply of reducers, elbows, T's couplers, ball valves etc - as required, c) Flexi Hose pip, 50m = 2 nos , d) 3 phase 1Hp mono block Pumps - 5 nos,	1	ST

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 8 OF 53

	e) Armoured cable for power supply to pump – 250m		
29	Weather Monitoring Station (WMS) a) Pyranometer for measurement of solar radiation - DWR8101 Dynalab make : 1 No, b) Anemometer for measurement of wind speed : Model:DWA86001, Dynalab, 1 no., c) Temperature Sensor for measurement of ambient temperature: Model:DWT8102, Dynalab -1 no., d) Temperature Sensor for measurement of module temperature -1 no., e) Support structure for installation of all equipment of weather station -1 no., f) Cables (power, sensor and communication) required for integration - as required.	10	ST

30	Data Management and Monitoring Devices	1	ST
	a) Desktop Computer with complete functional licensed software and remote linkage access through service provider for call /email/ data transfer/IP Linkage :- Make (HP/Dell) Intel i7 processor ,1Tb HDD, 4GB RAM, 4USB ports, DVD RW, 19" TFT monitor, Optical Mouse, Modem, Wi-Fi LAN Card with LaserJet printer with minimum 700VA UPS with 20minutes battery backup., - 1 no. b) Laptop make (HP/Dell) with complete functional licensed software and remote linkage access through service provider for call /email/ data transfer/IP Linkage :- Intel i5 processor ,500GB HDD, 4GB RAM, DVD RW, 13" Screen, Optical Mouse - 1 no. c) Smart phone with 32 Gb internal storage 3GB RAM, 5.5 inch touch screen, 13mp and above camera with LED flash, 5mp front camera, HD video recording - 1 no. d) Supply of 14 nos., SIM cards of competent network to support data logging and recharging for 10 years maintenance period.		

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat		PS-439-1121
			Rev No: 01
			PAGE : 9 OF 53

31	Miscellaneous Supply items a) Cable ties: 200mm (6500 nos), 500mm (3300 nos), 710mm (1000 nos) lengths, b) Danger plates with necessary fixtures - 16 nos, c) Marking plates for structures, LAs, Earth pits & cables routing tags for cable tracing - 60 nos, d) Plant name Board - 2 nos., e) Lug for Terminations at LAs, earth rods, LTPDB, Trf, VCB panel etc (relevant make, type, size) - as required, f) Straight through cable joint kit - as required, g) Outdoor HT termination Kits - 8 nos, h) MS Ladder with hand rail on both sides- 7 steps - 6 nos, i) String inverter/ACCB/Datalogger mounting angles with foundation and canopy - 44 nos, j) Ferruls - as required, k) HDPE pipe for laying of communication cable from SY to Datalogger - 150m, l) Rain protection shed for VCB Panels - 2nos. m) 2Cx2.5sqmm Cu, Armoured Cable for Auxiliary power supply to SY lights - as required.	1	ST
32	Spares For ACCB, LTPDB, Transformer, VCB Panel	1	ST
33	Unloading, storing, shifting, I&C of 940KW SPV power plant	1	AU
34	Unloading, storing, shifting, I&C of 650KW SPV power plant	1	AU
35	AMC (O&M) for 10 Years of 940KW & 650KW SPV Power Plants	120	AU

5.0 Enclosures to specification

1	Overall map of project site with Google view
2	Single line diagrams of both the project sites
3	Typical solar PV array layouts for the six buildings
4	GA drawings of SPV module mounting structure (MMS)
5	Datasheet of solar PV module
6	Typical array layout of 11kV switchyard
7	Request for Quotation with instructions, terms and conditions, formats for filling-up etc.

6.0 Instructions to vendors on bid submission

6.1	Offer shall be submitted in two-parts (Two part-bid). Both parts shall be in separate sealed envelopes as per instructions in tender. The individual envelopes shall be enclosed in a common bigger envelope with markings (address etc) on the envelope as per instructions provided in tender.
6.2	First-part shall be techno-commercial bid. Following details shall be furnished: 1. Technical offer with covering letter expressing acceptance to BHEL tender specification 2. Separate list clause-wise in case of deviations, if any 3. Filled-up enclosures as per BHEL formats (meant for first-part) provided in tender

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 10 OF 53
---	--	---

6.3	Second-part shall be price bid with filled up enclosures as per BHEL formats provided in tender.
6.4	In addition to the above instructions, tender document provides detailed instructions for bid submission. Vendor shall submit the bid based on instructions in tender document.

Note: This is a no deviation specification. In case of any clarifications needed in this specification, the same needs to be communicated in writing at least five days prior to the technical bid opening date.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 11 OF 53

7.0 Technical specification for design/drafting , infrastructure and logistics

#	BHEL specification Note: Design and drafting and logistics vide this section 7.0 is not a separate billing item. Charges for all these activities shall be deemed to be absorbed in the related supply and I&C items.
7.1	Design and drafting Vendor shall either have in-house design/drafting expertise (or) shall outsource consultancy in case of inadequacy of internal expertise. Vendor/ their consultant shall carry out electrical/mechanical / civil design computations wherever applicable. Typical design/drafting areas are as listed below: (1) RCC foundations for the oil-filled transformer: design calculations (2) Outdoor/underground cable trench layouts/cross sections: LT/HT/Control cables (3) Layout of lightning arrestors with area coverage / protection calculations (4) RCC foundation for lightning arrestor masts: design calculations (5) Water cleaning system for SPV modules with pressure/discharge/sizing calculations (6) Sizing/ design calculations for storage tank and pumps for water cleaning (7) Earth mat/grid calculations for DC solar arrays of each building (8) Earth mat/grid calculations for the 11kV switchyards (9) Earth chambers: design The above list is indicative and not exhaustive. Wherever BHEL/SMC finds it relevant and applicable, vendor shall carry out design and submit documents viz. GA drawings / datasheets / GTP / MQP/ type test reports etc for BHEL/SMC/CEIG/GEDA approval.
7.2	Temporary site office for vendor use Vendor shall make necessary office arrangements such as porta cabin, furniture, electrical points/ fittings etc on their own for their use/ occupation at site during the period of project execution.
7.3	Electrical power / water for construction/ drinking water (a) Vendor shall organize, on their own, necessary electrical power supply such as DG sets etc required for construction activities and also for porta cabin offices meant for their use. (b) Water is available at site. Vendor shall utilize water for civil activities. (c) Vendor shall arrange drinking water for their staff as well as for BHEL/SMC staff.
7.4	Construction of yards/sheds for safe storage of vendor supplied items (a) Vendor shall, at a suitable location at site, as decided based on discussions with BHEL site engineer, construct closed sheds for safe storage of items such as string inverters, ACCB boxes, LTPDB boxes, VCB panels, cables etc and other miscellaneous items such as tools, measuring instruments, cable glands/ lugs/ markers, safety gadgets, insulation mats, sign boards etc.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 12 OF 53

	(b) These sheds shall have suitable water-proof roof and side walls so to ensure that there are no pin holes or joints through which rain water entry is possible. Also, these sheds shall be designed to withstand heavy wind loads. Lockable door shall be provided to ensure safety of these items. (c) Separate closed shed shall be constructed for storage of civil construction items such as cement bags etc. (d) Similarly, open yards shall be constructed with suitable fencing all around and lockable gate for storage of solar PV modules, MMS structure items, stone aggregate, sand, bricks, steel materials such as GI chain link fence/ gate for switchyard etc. (e) Area of all storage yards/sheds shall be selected based on sizes of items. Vendor shall, at the time of starting their activities at site, submit drawings/ sketches/ dimensions etc to obtain approval from BHEL. (f) Wherever applicable, suitable raised platforms / arrangements shall be provided to ensure that the items are not affected by water at the ground level during rain, storm, flood etc. (g) Storage yards/sheds shall be provided with adequate clearance (within the yard) to facilitate movement of concerned transportation vehicles/ equipments such as forklifts, hydra, trucks etc as applicable. (h) Safety of all the vendor-supplied items shall be within vendor scope. Accordingly, vendor shall ensure adequate security watch and ward for these items round the clock.
7.5	Unloading, safe storage and movement of supply items received at site: (1) Vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc) for unloading the vendor-supplied items received at site and subsequent movement to storage yards/sheds. (2) Similar arrangements shall also be made by vendor for movement of the stored items from storage yards/sheds to the exact construction locations within the project site. (3) Vendor shall maintain proper registers/ files/ records of invoices, LRs, delivery challans, material receipt certificates etc. Also, proper records shall be maintained to keep track of material entry (for storage) and material issue (for construction). (4) All such documents shall be suitably preserved for further handing over to BHEL. (5) Safety of items shall be in vendor scope. Accordingly, suitable watch and ward shall be deployed round-the-clock basis.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 13 OF 53
---	--	---

8.0 Technical specification for supply and erection works

8.1	Preliminary preparation of roof Vendor shall carry out all the tasks such as cleaning/ scratching/ roughening/ smoothening etc required to prepare the floor for effective bonding with the concrete pedestal of the module mounting structures (MMS). Vendor shall take prior approval from BHEL/SMC site engineers for the procedure adopted.
8.2	Concrete pedestal casting (1) Foundation pedestals for the MMS structures shall be of 1:2:4 concrete mix as per IS: 456 pedestals of size minimum 250x 250 x 160 (h) mm with 15 mm coping. (2) Cement shall be OPC 43 grade as per IS: 8112 (3) Aggregate 20mm downgraded and sand shall be as per IS: 383 (4) Nito bond: two-part epoxy compound shall be applied between the floor and pedestal surfaces to facilitate effecting bonding; Vendor shall submit the datasheet of Nito bond for BHEL/SMC approval prior to procurement. (5) Concrete pedestal shall be casted in situ with the MMS column post at the center as per BHEL drawing. Vendor shall take prior approval from BHEL/SMC for the proposed template arrangements used for centering, positioning, alignment, uprightness of column etc. (6) Following documents shall be maintained at site and further submitted to BHEL: (a) Manufacturer's test certificate (MTC) for the cement consignments (b) Sieve analysis report for sand (fine aggregate) (c) Royalty slips for fine (sand) and coarse aggregates (d) Sieve analysis report for coarse aggregate (e) Design mix report (if applicable) (f) Silt content test (for sand) (g) Slump test register (h) Cement test register (i) Cube test register (j) Cement consumption register (k) Pour card checklists (7) Vendor shall take prior approval from BHEL/SMC for (a) the type of mixer machine used for preparation of concrete mix (b) the type/size of vibrator needle used during casting (c) the shuttering materials as per applicable IS standards; shuttering material shall be selected to achieve smooth finish of the outer surface of the pedestal so that no plastering is required

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No : 01
		PAGE : 14 OF 53

8.3	Erection of MMS structure Vendor shall erect the MMS structure using the GI components and the fasteners supplied by BHEL and as per BHEL GA drawings.
8.4	Erection of SPV modules over the MMS structure Vendor shall mount the SPV modules supplied by BHEL over the erected MMS structure using the fasteners supplied by BHEL and as per BHEL GA drawings.
8.5	Series interconnection of SPV modules to form strings Supply of SPV modules is in BHEL scope. Vendor shall interconnect the SPV modules as follows: (a) Each module is fitted integrally with a junction box having positive and negative polarity cables (4 sq-mm). (b) Positive cable of one module shall be connected to the negative cable of adjacent module. The cables have MC4 type of connectors. One polarity cable has male type connector, while the other has female type connector. (c) This way, 20 modules shall be connected in series. Each set of connections is called as a series string. (d) After placing the purchase order on vendor, BHEL will provide layout drawings that will describe the exact way in which the series strings are formed. Vendor shall implement the interconnection as per these drawings.
8.6	Installation of string inverters (1) Supply of string inverters in BHEL scope. Approximate weight of inverter 50 Kg. (2) Vendor shall install the inverters using 1:2:4 concrete pedestals of appropriate size. This shall be a two-column structure with two independent pedestals of size minimum 250x 250 x 160 (h) mm with 15 mm coping. The structure shall be made of GI ISA / cold-formed angles of minimum 3mm thick as per IS: 2062, IS: 811, IS: 808 as applicable. (3) Minimum ground clearance shall be 500mm. (4) Structure shall have canopy (as rain shade) made of GI sheet of minimum 2mm thick. (5) All galvanizing shall be minimum 80 microns and as per IS: 4759, IS: 2629, IS: 2633 (6) Vendor shall submit GA of the mounting structure along with stability calculations (STAAD.pro etc) for BHEL/SMC approval during detailed engineering. (7) All structure/pedestal items including hardware shall be in vendor scope of supply.
8.7	Supply and installation of AC combiner boxes (1) AC combiner boxes, ACCB, one box per roof combining the 3-phase AC outputs of the string inverters at the roof-top, shall be in vendor scope of supply and installation. (2) ACCB shall be 3-phase, 50Hz, 415VAC, 1.1kV system voltage, outdoor, with canopy, IP55, neoprene gasket for doors/ frame joints, CRCA sheets 2mm (frame)/ 1.6mm (door)/ 3mm (removable gland plate bottom side), painting seven tank process, colour RAL 7032, base frame with section 75mm min/ black painted, panel lifting hooks, Al bus bars as per SLD, RYB colour coded heat-shrinkable sleeves for bus bars, SMC/DMC insulator supports, Al earth bus, accessible live parts shrouded with FRP/polycarbonate sheets, MCCBs for i/c

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 15 OF 53

	feeders, 25mm min phase to phase clearance, LED indicators for RYB at o/g, colour coded Cu-cable AC/DC wiring (1.5/2.5 mm² as applicable) etc. For the incoming and outgoing power cables, nickel plated brass double compression glands, Al cable lugs, SS304 plain/spring washers shall be provided. (3) Extra feeders (including two spare feeders) shall be provided to meet the various auxiliary supply requirements at the roof-top such as WMS, module washing pumps, data loggers etc. (4) MCCB/ MCB shall be L&T/C&S/Siemens/ABB/ Schneider or reputed equivalent subject BHEL approval. (5) Indicator lamps shall be L&T/ C&S or reputed equivalent subject to BHEL approval (6) Vendor shall submit the detailed GA, SLD, BOM, MQP etc of ACCBs for BHEL/SMC approval during detailed engineering. (7) Spare shall be supplied as follows: (a) MCCB: 5 Nos each type (b) LED indicators: 3 Nos each type (8) Vendor shall install the ACCB boxes using 1:2:4 concrete pedestals of appropriate size. This shall be a two-column structure with two independent pedestals of size minimum 200x 200 x 150 (h) mm. The structure shall be made of GI ISA / cold-formed angles of minimum 3mm thick as per IS: 2062, IS: 811, IS: 808 as applicable. (9) Minimum ground clearance shall be 500mm. (10) All galvanizing shall be minimum 80 microns and as per IS: 4759, IS: 2629, IS: 2633 (11) Vendor shall submit GA of the mounting structure along with stability calculations (STAAD.pro etc) for BHEL/SMC approval during detailed engineering. (12) All structure/pedestal items including hardware shall be in vendor scope of supply.
8.8	Interconnection of SPV module strings to string inverters (1) Vendor shall connect each series string of 20 SPV modules to the string inverter using 1Cx 4 cable, copper, XLPO, unarmoured as per TUV 2pfg 1169/08.2007. (2) Cable shall be vendor scope of supply. (3) Vendor shall also supply plug connectors of MC4 type, each set having a pair of male and female parts, to join both the cables. (4) MC4 connectors shall have rating of 1000VDC (IEC), rated current of 30A, Type approved by TUV Rheinland for product safety. (5) Make: Multicontact, Bizlink, Sunlont or other reputed equivalent subject to BHEL/SMC approval during detailed engineering. (6) Two sets of tool kits (with box enclosure) shall be supplied. This shall include crimping plier MC4, open end spanner set MC4, stripping plier MC4, socket wrench insert to tighten, socket wrench insert to secure etc.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 16 OF 53

8.9	Ferruling for 1Cx4 cable 1) For 1Cx4 DC solar array cable, vendor shall provide UV resistant ferrules printed with source/destination identification of cable connection. Printing details shall be submitted for BHEL/SMC approval during detailed engineering. Printing shall be of appropriate size to ensure readability. 2) Ferrules shall be provided on both the termination ends: module end, inverter end. 3) Supply of ferrule shall be in vendor scope. Make shall be reputed brand. Approval for make/ type/ colour/ dimension etc shall be obtained from BHEL/SMC prior to procurement.
8.10	Routing of 1Cx4 cable below the SPV modules (1) 1Cx4 cables connecting the SPV module strings to inverters shall be suitably routed below the SPV modules and along the horizontal purlin member of MMS structure. Also, the cables shall be fastened to the purlin using UV resistant cable ties that shall be in vendor scope of supply. (2) Spacing between two adjacent cable ties shall be so chosen as to ensure that there is no loose hanging of cables. (3) Cable ties, nylon polyamide 6.6 UV stabilized black, UL94 flammability rating V2, operating temperature up to 85 deg C, shall be used to arrest any possibility of movement or sagging. Make: 3M, Phoenix contact, Weidmuller, Hellermannntyton, Panduit or other reputed equivalent subject to BHEL/SMC. Width of the cable ties shall be minimum 4.5 mm. Length shall be so chosen as to ensure that the bunched cables are held firmly to the MMS structure. During detailed engineering, BHEL/SMC approval shall be obtained for the selected brand and sizes of cable tie.
8.11	Routing of 1Cx4 cable in GI cable trays (1) Where 1Cx4 cables run between two adjacent rows of structure and also where the cables run on the roof-floor up to string inverters, routing shall be on GI cable trays Wx H x t = 100x 50x 2 mm, perforated type, with GI cover of minimum 2mm thick, coupler plates, GI hardware as per relevant IS standard. (2) Vendor shall submit the make, part number, GA, BoM, datasheet etc of the cable trays for BHEL/SMC approval during detailed engineering.
8.12	Termination of 1Cx4 (DC side), 3Cx35 (AC side) cables at string inverters & ACCB boxes (1) 1Cx4 cables of positive and negative polarities originating from SPV module strings shall be terminated at the DC input side of string inverters using MC4 connectors that are in vendor scope of supply for both ends. (2) For AC side connection at string inverters and ACCB boxes, 3Cx35 cable, 1.1kV, Al, XLPE, armoured as per IS: 7098 part-1, together with nickel plated brass double compression cable glands, Al cable lugs, SS304 bolts/ nuts/ plain and spring washers shall be in vendor scope of supply. Termination shall be carried out using appropriate tools and torque setting as per BHEL/SMC approval.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 17 OF 53

8.13	Supply and installation of LTPDB combiner boxes (1) LTPDB, two panels, 940kVA and 650kVA, one per 11kV switchyard, combining the 3-phase AC outputs from the three roof-top ACCB boxes shall be in vendor scope of supply and installation. (2) LTPDB 3-in/ 1-out shall be 3-phase, 50Hz, 415VAC, 1.1kV system voltage, outdoor, with canopy, cubicle design, compartmentalized (Breaker/ control box/ CTPT chamber etc), floor mounted, free standing IP55, neoprene gasket for doors/ frame joints, CRCA sheets 2mm (main frame)/ 1.6mm (door)/ 3mm (removable gland plate bottom side), painting seven tank process, colour RAL 7032, MS base channel 75x40x6 min/ black painted, panel lifting hooks, Al bus bars as per SLD, RYB colour coded heat-shrinkable sleeves for bus bars, SMC/DMC insulator supports, Al earth bus, accessible live parts shrouded with FRP/polycarbonate sheets, 50kA MCCBs as per SLD for i/c feeders, 50kA EDO ACB as per SLD and with microprocessor based controls and motor operated for o/g feeders, SPDs, 25mm min phase to phase clearance, LED indicators for RYB at o/g, digital MFM cl:0.5 with RS485 port at o/g , colour coded AC/DC wiring (1.5/2.5 mm2 as applicable), panel illumination lamp, space heater, thermostat etc. For the incoming and outgoing power cables, nickel plated brass double compression glands, Al cable lugs, SS304 plain/ spring washers shall be provided. (3) Extra feeders (including one spare feeder) shall be provided for lighting system of 11kV switchyard. (4) Digital MFM shall be EM6300 of Schneider (5) MCCB, ACB shall be ABB/ Schneider (6) MCB: L&T/ C&S/ ABB/ Siemens/ Schneider or reputed equivalent subject to BHEL approval (7) Indicator lamps shall be L&T/ C&S or reputed equivalent subject to BHEL approval (8) Vendor shall submit the detailed GA, SLD, BOM, MQP etc of LTPDBs for BHEL/SMC approval during detailed engineering. (9) Spares shall be supplied as follows: (a) MCCB: 1 No each type (b) SPD: 2 Nos each type (c) LED indicators: 3 Nos each type (10) Vendor shall install the LTPDB panels in 11kV switchyard using RCC foundation for which design/ GA shall be submitted for BHEL/SMC approval during detailed engineering.
8.14	Laying and termination of cables from ACCB box to LTPDB box at 11kV yard (1) 3C (x185, x240, x400, x500) cables as per SLD, 1.1kV, Al, XLPE, armoured as per IS: 7098 part-1 shall be in vendor scope of supply and installation: for laying between ACCB to LTPDB. (2) Nickel plated brass double compression cable glands, Al cable lugs, SS304 bolts/ nuts/ plain and spring washers shall be in vendor scope of supply. Termination shall be carried out using appropriate tools and torque setting as per BHEL/SMC approval. (3) These cables shall be routed using the same type of GI cable trays/ accessories/ hardware used for 1Cx4 cables up to the ground level outside the buildings.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 18 OF 53
---	--	---

8.15

Underground cable trenches and laying of cables from buildings to 11kV switchyard

All power, control, communication cables running from buildings shall be routed from the building point to the 11kV switchyard through underground cable trench (direct burying) as per IS: 1255.

Typical trench details/dimensions are below only for tender purpose. During detailed engineering, cable trench layouts and cross section drawings as per IS: 1255 shall be submitted for BHEL/SMC approval.

(a) Total trench depth = 750 mm minimum

(b) Trench width = As per number of cables/ HDPE pipes

(c) Trench shall have layers one over the other as below (from bottom to top):

1. Bottom layer shall be sand of IS: 383 with 75mm minimum thick.
2. 3C power cables shall be laid over the sand layer.
3. Another layer of sand of 75 mm minimum thick.
4. Single layer of brick as protective cover
5. Layer of sand of IS:383 with 75mm minimum thick
6. All communication cables shall be laid within HDPE pipe
7. Layer of sand of IS:383 with 75mm minimum thick
8. Single layer of brick as protective cover
9. Trench shall, then, be filled with refill soil and compacted

Communication cables shall be routed through HDPE pipe of PE63 grade, pressure rating PN6, appropriate nominal diameter and as per IS: 4984 (1995). It shall be ensured that a max of 60% of inner space shall be occupied by the cables. Communication cables and HDPE pipe shall be in vendor scope of supply. Vendor shall submit GTP/ make/ part number of the HDPE pipe, accessories and tools for BHEL/SMC approval during detailed engineering.

Bending radii for cables shall be as per IS: 1255.

At pathway/road/drain/trench crossings, cables shall be routed through GI pipe of appropriate size that shall be in vendor scope of supply and technical details / brand etc shall be submitted for BHEL/SMS approval. It shall be ensured that a maximum of 60% of inner space of GI pipe shall be occupied by cables.

Vendor shall take utmost care in laying the cables in order to prevent damages on outer sheath and inner insulation. In case cables found to be damaged/ cut after the laying in trenches, vendor shall remove the damaged portion and join the cut pieces using appropriate cable jointing kits that shall be in vendor scope of supply.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 19 OF 53

8.16

Supply and installation of SF6 Gas insulated 11kV VCB breaker panels

(1) 11kV SF6 Gas insulated VCB breaker panels, 2 Nos, 1100kVA and 700kVA, for the 11kV switchyards, for line protection (OCEF, OVUV) and protection of 1100kVA and 700kVA transformers shall be in vendor scope of supply and installation.

(2) SF⁶ gas insulated VCB breaker panel, outdoor, cubicle design, compartmentalized (Breaker/control box/ CTPT chamber etc), floor mounted, free standing, IP55, 3-pole, 50 Hz, 12kV/630A, 25kA/3sec, 3-pole draw-out VCB interrupters, as per IS: 13118 / IEC: 62271-100, rated TRV as per the above IS/IEC, rated insulation level 12kV/28kV/75kVp, operating sequence O-0.3s-CO-3min-CO, 1-ph PTs two cores as per SLD and IS:3156; 11kV/V3/ 110V/V3; 110V/V3; as per SLD, 11kV HT fuses, 1-ph CTs two cores as per SLD and IS: 2705; digital MFM programmable & with RS485 MODBUS port, 50/51 RYBN numerical non-directional OCEF relay with RS485 MODBUS port, 27/59 numerical combined OVUV relay with RS485 MODBUS port, three-element aux relay for transformer faults (Buchholz/ WT/ OT/ PRV alarm & trip, LOLA) or electromagnetic relays, master trip 86, 80DC, trip circuit supervision relay 95, 12-window annunciator 30, trip/close coils, anti-pumping contactor relay 94, spring charge motor, indicator lamps for ON/OFF/ spring charged, PBs for local trip/close, manual/electrical spring release, push-to-trip provision, manual spring charge handle, auxiliary contacts as required plus 6 NO + 6 NC as spares, metering/ protection relay circuits, MCBs/ fuses/ links/ TBs as required, TNC BCS switch, space heater/ thermostat, panel illumination lamp, door switch, 3-pin power socket with ON/OFF switch etc.

(3) Panel construction with CRCA sheets 2mm (main frame, door)/ 3mm (removable gland plate bottom side), neoprene gasket for doors/ frame joints, painting seven tank process, colour RAL 7032, MS base channel 75x40x6 mm min/ black painted, panel lifting hooks, Al bus bar with rating as per design calculations, RYB colour coded heat-shrinkable sleeves for bus bars, SMC/DMC insulator supports, Al earth bus, accessible live parts shrouded with FRP/polycarbonate sheets, anodized Al sheet name plate, earthing rack, ramp for rack-out of VCB, rack-out handle, panel keys etc.

(4) Digital MFM shall be equivalent to EM6300 of Schneider and subject to BHEL approval

(5) Numerical relays shall be ABB/ Schneider/ Megawin or equivalent subject to BHEL approval

(6) MCB shall be L&T/ C&S/ ABB/ Schneider or reputed equivalent subject to BHEL approval

(7) Indicator lamps, PBs shall be L&T/ C&S or reputed equivalent subject to BHEL approval

(8) Vendor shall submit the detailed GA, SLD, BOM, MQP etc of VCB panels with rating calculations for BHEL/SMC approval during detailed engineering.

(9) Spares shall be supplied as follows:

- (a) HT 11kV fuse: 5 Nos
- (b) LT fuse: 5 Nos each type
- (c) MCB: 3 Nos each type
- (d) CT: 2 Nos
- (e) PT: 2 Nos
- (f) Tripping coil: 3 Nos
- (g) Closing coil: 3 Nos

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 20 OF 53

	(h) Spring charge motor: 1 Nos (i) LED indicators: 3 Nos each type (10) Vendor shall install the VCB panels in 11kV switchyards using RCC foundation for which design/ GA shall be submitted for BHEL/SMC approval during detailed engineering.
8.17	Supply and installation of 1100kVA and 700kVA transformers (1) Vendor shall supply two ONAN 11kV/415V transformers (1100kVA and 700kVA) and install them in the 11kV switchyards of the WW and WDS sites. (2) Technical specification of the transformer is detailed in a separate section. (3) Spares for each of the two types transformer: (a) HV bushings with metal parts and gaskets: 1 set (3 Nos) (b) LV bushings with metal parts and gaskets: 1 set (3 Nos) (c) Neutral bushings with metal parts and gaskets: 1 set (2 Nos) (d) Isolation valves of all types: 1 set (e) Pressure relief device with alarm/trip contacts: 1 No (f) Winding temperature indicator with alarm and trip contacts: 1 No (g) Oil temperature indicator with alarm and trip contacts: 1 No (h) Buchholz relay – complete unit: 1 No (i) MOG: 1 No (j) Silica gel breather with charge: 1 set (k) Diaphragm of explosion vent: 1 No (l) Oil in sealed drums: 650L (4) Vendor shall erect the transformer on RCC foundation for which design/ GA shall be submitted for BHEL/SMC during detailed engineering.
8.18	Laying of cables from LTPDB to Transformer and further to VCB breaker panel (1) 3Rx 3C (x300, x500) cables as per SLD, 1.1kV, Al, XLPE, armoured as per IS: 7098 part-1 shall be in vendor scope of supply and installation: for laying between LTPDB and LV side of transformer through underground cable trench as per IS: 1255 and with same trench cross section as for the cables from the building point to 11kV switchyard. (2) Nickel plated brass double compression cable glands, Al cable lugs, SS304 bolts/ nuts/ plain and spring washers for above cable terminations shall be in vendor scope of supply. Termination shall be carried out using appropriate tools and torque setting as per BHEL/SMC approval. (3) 3Cx 185 cable, as per SLD, 11kV, Al, XLPE, armoured as per IS: 7098 part-2 shall be in vendor scope of supply and installation: for laying between transformer and VCB panel. (4) 11kV HT termination kits (indoor/ outdoor as applicable) shall be 3M/ Raychem or reputed brand subject to BHEL/SMC approval. HT termination shall be carried out by certified jointers. Credentials / certification of experience from 3M/ Raychem etc for the proposed jointers shall be submitted for BHEL/SMC approval during detailed engineering.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 21 OF 53

8.19 Erection of 11kV switchyards

- (1) Vendor shall design and construct RCC foundations for transformers as per relevant clauses of “**General civil works**” of this specification, geotechnical investigation report (vendor scope), weight / dimensions etc. In addition, following points shall be taken into account.
- Foundation shall include appropriate layers of PCC, sand, boulders, RCC portions etc as per design requirements.
 - Foundation depth shall be as per design requirements.
 - Foundation pedestal height above the finished ground level 500 mm minimum.
 - Pedestal shall be finished with cement plaster and water proof cement paint of BHEL approved colour all around as per applicable standards.
- (2) Stone gravels, fencing foundation, fencing posts, GI chain link fence, steel gates, finishing works such as plastering/ painting etc shall be as per relevant clauses of the “**General civil works**” of this specification and as per relevant IS standards / CBIP/ CEIG requirements etc. All items shall be in vendor scope of supply.
- (3) Hardware arrangements (transformer track rails, angles, steel bolts, plates, nuts, washers etc), which will be part of foundation pedestal, shall be provided as per design requirement.
- (4) Outdoor shed with an appropriately slanted Galvalum sheet roof, RCC foundation shall be constructed for placement of LTPDB, VCB, ABT metering panels. Shed shall be designed with columns, rafters, purlins etc made of steel sections such as pipes, channels, angles, sheets as per relevant IS standards. All MS sections shall be suitably red-oxide coated and painted for anti-corrosive protection.
- (5) Erection of panels and transformers shall include all activities but not limited to:
- Placement of panels and transformers on foundation pedestals
 - Assembly of parts/ accessories of transformer
 - Cable laying and terminations at LV/HV/Marshalling boxes of transformers, LTPDB, VCB and ABT metering panels. All cables together with accessories such as glands, lugs, ferrules, ties, trays etc shall be as per in vendor scope of supply: (1) 12Cx 1.5, copper, PVC, armoured, IS: 1554 for transformer to VCB panel, (2) 2Cx 2.5, copper, PVC, armoured, IS: 1554 for auxiliary AC supplies.
 - All activities applicable to oil filling and filtration for the transformer including measurement of oil BDV and PPM in NABL accredited laboratory. Oil filtration shall be carried out at site to such an extent as to obtain the desired BDV and PPM values as per IS standards. Filtering machine of appropriate heating/ vacuum/ oil circulation capacity shall be arranged at site. Credentials of filtration agency with above details of the machine shall be submitted for BHEL/SMC approval during detailed engineering.
- (6) After installation of the panels and transformers at 11kV yards, vendor shall level/compact the ground with an appropriate magnitude and direction of slope to facilitate draining of rain water away from transformer yard. Accordingly, to prevent stagnation of water within the yard, vendor shall implement suitable civil works in and around the yard. This shall include cutting/ filling-up the land (wherever necessary) with suitable soil and compact the filled-up portions either manually or with rollers, as applicable, as per site conditions, to

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 22 OF 53
	achieve required compaction/slope. Also, PVC pipes shall be provided at appropriate locations along the periphery of yard fencing for draining out water from the yard. PVC pipe of appropriate size shall be in vendor scope of supply. (7) Vendor shall provide applicable earthing connections to the electrical panels and transformers, fence / gates/ cable trays etc in the yard as per relevant IS/IEEE standards. (8) All other items (if any, other than the above) that are required to meet the technical requirements of transformer yard as per applicable standards / electricity rules shall be incorporated by the vendor. (9) Vendor shall submit (a) GA drawings / design calculations of RCC foundations, (b) GA/ layout/ scheme of 11kV yard (with position of panels, transformer, earth chambers, appropriate overall size/ dimensions/ clearances etc), (c) GA with STAAD.pro calculation for outdoor shed with RCC foundation calculations, (d) GA/BoM of fence, (e) GA/BoM of yard gate etc for BHEL/SMC approval during detailed engineering.	
8.20		Laying and termination of RS485 cables Vendor shall supply and install RS485 cable, copper, 2Px0.5, twisted pair, screened, armoured in daisy chain loops (a) from data loggers to string inverters and (b) from MFM meters of VCB breaker panels to data loggers, (c) from weather monitoring system to data loggers. All cable accessories such as glands, lugs, ties, ferrules, tags, trays etc shall be in vendor scope of supply. These cable shall be routed in conduit pipes with necessary bends/elbows wherever necessary.
8.21	Supply and installation of lightning arrestors for roof-top Vendor shall supply, install and commission copper globe type lightning arrestors at the roof-tops. GA/GTP of LA, GI 25x6 down conductors and suitable mounting arrangement for LA, suitable routing arrangement for down conductors, earth electrode/ chamber provisions shall be submitted for BHEL/SMC approval during detailed engineering. All items in vendor scope of supply and installation.	
8.22		Earthing for solar array MMS structures, other electrical panels, lightning arrestors Solar array MMS structures, string inverters, data loggers, ACCB boxes, LTPDB, Transformers, VCB panels, ABT metering panel, lightning arrestors etc shall be provided with appropriate earthing for protection against faults as guided by IEC 60364. Earthing system shall be designed with consideration of the soil resistivity of the project site. Unless otherwise specified, earthing system shall be in accordance with IS: 3043 and IEEE 80, Indian Electricity Rules, Codes of practice and regulations existing in the location where the system is being installed. Vendor shall submit design calculations for earth grids/ system for roof-top equipments, 11kV switchyard and lightning arrestors for BHEL/SMC approval during detailed engineering. Chemical earthing electrodes of 3m minimum long, 50 mm minimum diameter, perforated GI pipe, chemical compound filled, double walled shall be installed at the ground level outside the buildings. For each electrode, earth chamber shall be constructed using brick masonry.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 23 OF 53

Electrodes shall be of reputed brand such as Ashlok, Balaji Metacast Industries or any other equivalent subject to BHEL/SMC approval during detailed engineering.

Earth chamber shall have features as follows:

- (a) Square sized with 450 x 450mm minimum inner opening. Exact size shall be chosen to ensure ease of maintenance operation using spanners etc.
- (b) Brick wall thickness all around = 230mm minimum
- (c) Depth of chamber = 500 mm minimum below FGL.
- (d) Projection of chamber above FGL = 150mm minimum
- (e) Top of electrode shall have minimum clearance of 100 mm below cover plate.
- (f) Cover plate, cast iron of 5mm minimum thickness, square shaped to fit the opening of chamber, painted with red oxide and two coatings of black paint both sides.
- (g) Cover plate shall have suitable lifting hooks and padlocking arrangement.
- (h) Both the outer and inner walls of the brick wall shall be plastered and painted as per relevant clauses of “**General civil works**” of this specification.
- (i) Supply and installation of all materials shall be in vendor scope.

GI flat earthing:

- (a) 25x3 mm for MMS structures: (1) structure to structure, (2) interconnection of structures of all rows, (3) from top of buildings to the chemical electrodes at ground level.
- (b) 25x6 mm for string inverters, data loggers, ACCB box, lightning arrestors at roof-top
- (c) 50x6 mm for switchyard panels, transformers, yard fence, gate

General points:

- (a) All items related to earthing viz electrodes, GI flats, hardware etc in vendor scope of supply.
- (b) GI bolts, nuts, plain washers shall be used. Spring washers shall be zinc/epoxy coated.
- (c) Wherever applicable, welding for GI flats shall be carried out using electric arc welding. Both the flats shall be overlapped for the full width where they are in perpendicular direction in same plane. Where the connection is along same line, both flats shall be overlapped for a minimum of 50mm. L-bend with weld length of 50mm minimum shall be adopted wherever overlap length to be ensured.
- (d) Resistance of welded joint shall not be more than that of GI flat.
- (e) Welds shall be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection.
- (f) While laying earthing electrodes, adding/mixing of chemical compound and water around the electrode in the dug hole shall be as per instructions of OEM. Vendor shall ensure visit of OEM engineer to site at the time of installation for proper guidance/ supervision.
- (g) Other applicable standards:
 - IS: 2629: Recommended practice for hot dip galvanizing of iron and steel
 - IS: 2633: Method for testing uniformity of coating on zinc coated articles
 - IS: 6745: Methods for determination of mass of zinc coating on zinc coated iron and steel articles.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 24 OF 53

	- IS: 513: Cold rolled low carbon steel sheets and strips - IS: 3063: Fasteners single coil rectangular section spring washers (h) In compliance to Rule 11 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.
--	---

9.0 Supply and installation of other infrastructure / support systems

9.1

Supply and installation of weather monitoring system

As part of weather monitoring system (WMS), vendor shall supply, install and commission the following measuring instruments with all necessary software, data loggers, aux power supply cables, communication cables, WMS mounting structure with hardware etc.

Scope of vendor shall also include supply and erection of all the mounting arrangements including all necessary civil works/ foundations etc. RS485 cables shall be laid and terminated at both the data loggers of string inverters and WMS. Similarly, aux power supply cables shall be laid from ACCB.

Exact location of the weather monitoring station on the roof-top shall be decided during detailed engineering. Vendor shall submit all necessary GTP/ GA drawings of instruments and installation arrangement, installation manual, make/ model number/ part number etc for BHEL/SMC approval during detailed engineering.

Pyranometer: 1 No; Make Dynalab; Model DWR8101

Specification of the pyranometer shall be as follows:

1	Spectral range	0.3 to 3 micro meters
2	Sensitivity	Min 4 micro-volt / kW/ m2
3	Sensor	72 Element Thermopile
4	Time constant	Less than 22 Seconds
5	Maximum Intensity	Greater than 200 mW/SQ.CM
6	Output	Millivolts

Each instrument shall be supplied with necessary cables. Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. The signal cable length shall not exceed 20m. Vendor shall provide Instrument manual in hard and soft form.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 25 OF 53
---	--	---

Thermometers

Vendor shall provide two thermometers (one for ambient temperature measurement with shielding case and the other for SPV module temperature measurement). The thermometers shall be RTD/ semiconductor type measuring instrument. Instrument shall have provision for 0 oC to 80 oC. The instrument shall have valid calibration certificate.

Anemometer

Vendor shall provide one anemometer with wind vane of rotating cup type. Anemometer shall be mounted on a mast without shadowing on SPV modules.

1) Velocity range with accuracy limit	+/- 0.11 m/s up to 10.1 m/s +/- 1.1% of true when more than 10.1 m/s
2) Wind direction range with accuracy limit	0 to 360 deg with accuracy +/- 4 deg.

9.2

Supply and installation of lighting system for 11kV switchyards

Vendor shall supply, install and commission lighting system for the two 11kV switchyards. Scope includes all necessary items such as luminaires, LED lamps, GI poles, bend pipes, junction boxes with MCBs/TBs/ glands/ provisions for earthing, conduit pipes for aux supply cables above ground level up to junction box for light poles, conduit pipes for cables above ground level up to luminaire for fence-mounted lighting, casing/capping wherever applicable, GI earth wires, aux supply cables (multicore, 1.1kV, Al/Cu, PVC, armoured, PVC FRLS as per IS:1554, appropriate sizing) up to junction box, cables (1.1kV, Al/Cu, PVC, unarmoured, unsheathed, as per IS: 694, appropriate sizing) from junction box to luminaires, cable glands, cable lugs, termination hardware etc. Lighting poles shall be fixed on the fencing posts.

Cables shall be laid underground as per IS: 1255 with reference the section “**cable installation methodology**” of this specification. Cables shall be terminated at both the lighting end and LTPDB panel end. Spacing between poles/lamps shall satisfy the lux requirements of the respective areas.

Vendor shall submit lux calculations, lighting layout, single line diagram for aux supply from LTPDB panels, GA drawings of lighting poles/ fence-mounted systems, bill of materials with make/ GTPs/ model number/ part number/ rating/ applicable IS standards/ quantity etc for BHEL/SMC approval during detailed engineering. For all the items, reputed brand shall be procured after approval from BHEL/SMC. Cable schedule shall also be submitted.

20 lux minimum shall be taken as the requirement for switchyard illumination.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 26 OF 53

General technical requirements:

- (1) All LED luminaires shall be supplied with proper diffuser to avoid direct visibility of LED with proposer thermal management for longer life.
- (2) The lighting level shall take into account appropriate light output ratio of luminaires, coefficient of utilization maintenance factor (of 0.7 or less) to take into account deterioration with time and dust deposition.

(3) LED luminaires shall meet the following parameters

1	Input voltage	170-260V
2	Input frequency	50 +/- 1 Hz
3	Power factor	0.95 minimum
4	Power efficiency	>96%
5	LED efficacy	>130 lumens per watt
6	Dispersion angle	Minimum 120 deg
7	Usage hours	Dusk to dawn
8	Total harmonic distortion	<15%
9	Working temperature	-5 deg to +50 deg C
10	Working humidity	10% - 90% RH (preferably hermetically sealed unit)
11	Index of protection level	Minimum IP65
12	Lamp casing	Powder coated metal/ Aluminium
13	Life	> 50,000 Hrs
14	LED type	Power LEDs from reputed make
15	Colour temperature	2800 deg K / 3000 deg K
16	Colour rendering	>75
17	Junction temperature	< 60 deg C
18	Electrical connector	Lead wire with 2m long (or) as required by customer at site
19	Expected life of components	Passive electronic components life greater than > 1,00,000 hrs
20	Moisture protection in case of casing damage	IP 65 (preferably totally encapsulated)

(4) Luminaire EMC specification

EN 61000-3-2: Electromagnetic compatibility (EMC). Limits for harmonic current emissions (Equipment input current < 16 A per phase)
EN 61000-3-3: Limitation of voltage fluctuation and flicker in low voltage supply systems for equipment with rated current < = 16 A

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 27 OF 53

(5) Additional information for LED luminaire

The LED luminaire housing, heat sink, pole mounting bracket, individual LED reflectors and front heat resistant tempered glass should be provided.

The LED luminaire housing should be made of non-corrosive high pressure die cast aluminium and the housing should be power coated grey, so as to ensure good weatherability.

Each individual LED source should be provided with asymmetrical distribution high reflectance aluminized reflector, which should ensure that the light distribution of the luminaire is suitable for road lighting applications (wide beam distribution) and should ensure high pole to pole spacing.

The luminaire should be provided with in built power unit and electronic driver. The luminaire should be so constructed to ensure that the gear and LED modules are replaceable, if required.

The luminaire should be suitable for both standard street light poles with a typical pole diameter of 50 mm – 60 mm and should be suitable for both side entry and bottom entry (post top).

(6) Junction Boxes, Conduits, Fitting & Accessories

Junction boxes for street lighting poles, lighting mast, wall-mounted, fence-mounted as applicable shall be deep drawn or fabricated type made of min 1.6 mm thick CRCA Sheet. The box shall be hot dip galvanized. The degree of protection shall be IP55.

All switches and receptacles up to 16A shall be modular type. These shall be provided with pre-galvanized/ galvanized modular switchbox & plate.

Conduits, Pipes and Accessories Galvanized heavy duty steel conduits for normal area and galvanised heavy duty steel conduits with an additional epoxy coating for corrosive area shall be offered. Alternatively glass reinforced epoxy conduits with comparable compressive and impact strength with that of heavy duty steel conduits may be offered.

Rigid steel conduits shall be heavy duty type, hot dip galvanized conforming to IS: 9537 Part-I & II shall be suitable for heavy mechanical stresses, threaded on both sides and threaded length shall be protected by zinc rich paint. Conduits shall be smooth from inside and outside.

Flexible conduit shall be water proof and rust proof made of heat resistant lead coated steel.

Pull out boxes shall be provided at suitable interval in a conduit run. Boxes shall be suitable for mounting on Walls, Columns, Structures etc. Pull-out boxes shall have cover with screw and shall be provided with good quality gasket lining. Pull out boxes used outdoor shall be weather proof type suitable for IP55 degree of protection and those used indoor shall be suitable for IP52 degree of protection. Pull out box & its cover shall be hot dip galvanized.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 28 OF 53

	(7) Earthing Lighting poles etc shall be earthed by two separate and distinct connections with earthing system. Distribution boards, junction boxes, lighting fixtures etc shall be earthed by means of separate earth continuity conductor. The earth continuity conductor 14 SWG GI wire shall be run along with each conduit run. Cable armours shall be connected to earthing system at both the ends.
9.3	Water washing system for SPV modules (Module cleaning system) 1) Vendor shall supply, install and commission permanent arrangement for module washing at the roof-top taking into account site conditions. 2) Water source for cleaning available at WW and WDS sites. 3) The system shall essentially include the following minimum components: a) Surface pump (booster pump) of appropriate size/ rating shall be installed at roof-top. Both sites put together, 5 pumps required. Suitable RCC civil pedestal and housing chamber shall be constructed for this arrangement. Chamber shall have necessary canopy (for prevention of water entry), door/lock provision, steel sections/ steel sheets to withstand wind load etc, corrosion protection painting, fasteners etc. Vendor shall submit drawings for BHEL/SMC approval during detailed engineering. b) Vendor shall employ armoured electrical cables of suitable size/rating for all electrical connections. Cables with cable accessories (glands/ lugs/ termination hardware etc) shall be in vendor scope of supply and installation. Cabling to the pumps shall be from ACCB. Cables shall be laid/routed through GI cable trays. All cable terminations including the ones at ACCB panels shall be in vendor scope. c) UPVC pipes as per relevant IS standards, heavy duty, 6 Kg/sqcm: pump suction/ header pipes (40NB minimum), Feeder pipes (25NB minimum). d) UPVC elbows, Tees, bends, couplers as applicable, as per relevant IS standards, for jointing and leak-proof pressurized pipe fittings. e) UPVC raiser pipes with ball valves (25NB minimum, metal body, IS marked) and reducer nozzles for fitting hose pipes, at every delivery point. Every raiser pipe shall be fixed on the roof using concrete (PCC) pedestal construction. f) Delivery points shall be made available as per solar array layout and space provisions at roof-top. Accordingly, number of delivery points shall be provided for cleaning of the entire solar array. g) Air release valve fittings (metal body, IS marked) for header pipes at suitable locations. h) Air release valve fittings (metal body, IS marked) for feeder pipes at suitable locations. i) Control gate valve for header pipes; for maintenance (IS marked) at suitable locations. j) Control gate valve for feeder pipes; for maintenance (IS marked) at suitable locations. k) Non-returnable valves (NRV) shall be provided wherever applicable. l) Hose pipes, heavy duty 25NB minimum m) All necessary hardware items such as GI clamps/ screws/ bolts/ nuts/ plain washers/

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 29 OF 53

	spring washers etc wherever applicable. (4) Any other items as required to complete the technical/ operational requirements of module washing system. (5) Vendor shall design and submit the piping and instrumentation diagram P&ID of water washing arrangement including the physical sequence of branches, reducers, valves, pressure gauge, delivery points and location of pumps and water storage tanks for BHEL/SMC approval during detailed engineering. The diagram shall show locations of water source, pipelines, valves, delivery points etc as superimposed on the solar array layout, Bill of materials (item-wise description, type / rating, make, model number / part number, quantity) of water washing arrangement with necessary calculations of water flow / pressure / discharge etc for BHEL/SMC approval during detailed engineering. (6) All necessary labour, machinery, tools, instruments shall be in vendor scope.
9.4	Fire fighting systems: Fire extinguishers and sand buckets Vendor shall provide fire extinguishers/ sand buckets as follows for fighting fire of oils, solvents, gases, paints, varnishes, electrical wiring, live machinery fires and flammable liquid/ gas as per recommendation by relevant fire safety authority and as per relevant standards IS: 2171 and IS: 10658 marked. Make shall be Safex/ Ceasefire/ Vintex/ Unicare fire safety or any other reputed equivalent subject to BHEL/SMC approval. ▪ DCP type (ABC) 9Kg designed/tested IS 15683/ IS: 13849 with safety release valve, NRV and CE approved valve. Dry powder IS 14609 with standard accessories. ▪ CO2 type Hand 9 Kg with wheel. Designed/tested IS 2878 complete with hose, screw valve, CO2 gas IS 1522, cylinder IS 7285, valve IS 3224. Tested at 250 Kg/cm2. ▪ Sand bucket should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS: 2546 at strategic locations. Quantity shall be as per vendor scope of supply (deliverables) in this specification.
9.5	Identification marking of cables using cable tags 1. Cable tags shall be provided at both ends of the cables: at SPV modules, string Inverters, data loggers, ACCB boxes, LTPDB panels, transformers, VCB panels and so on. 2. Cable tag shall be of rectangular shape. 3. Cable tag shall be of 2mm thick aluminium with number punched (embossed) on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. 4. Reference shall be made to “Cable installation methodology” of this specification. Vendor shall submit the technical details of cable tags, ID numbering scheme for BHEL/ SMC approval during detailed engineering.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 30 OF 53

9.6	Cable route markers Cable route markers and joint markers for underground cables shall be provided along the route of the cables as per section “ Cable installation methodology ” of this specification.
9.7	Electrical insulation mat (1) Vendor shall supply electrical insulating mats as follows: (a) Reputed make as shall be approved by BHEL/ SMC (b) As per IS: 15652:2006 (c) Class B (d) Thickness 2.5 mm minimum (e) Size = 2m x 1m minimum, exact size shall be as approved by BHEL/SMC during detailed engineering. (f) Colour: to be approved by BHEL/SMC (g) Max use voltage = 11 kV (h) Marking of IS standard on the mat (2) Test certificate shall be provided by vendor (3) Vendor shall lay the mats in front of all the electrical panels in switchyard. (4) Quantity shall be as per vendor scope (deliverables) list in this specification.

10.0 Technical specification of 11kV transformers: 1100kVA, 700kVA

1.0 Technical specification		
#	Technical parameter	BHEL specification
1	Transformer type	Outdoor, oil-immersion type
2	IP class	Transformer, including the cable box and marshalling box shall be of IP55. Transformer will be placed directly under sunlight without any shelter or shade. Hence, the significance for IP55 class.
3	Type of cooling	ONAN
4	Governing Standard	IS: 2026, IS:6600, IEC:60076, CBIP
5	Rating in KVA	1100 kVA (1 No.), 700 kVA (1 No.)
6	No. of phases	3
7	Frequency	50 Hz, +/- 3%
8	HV winding	One 3-phase winding with Delta connection. HV: 11kV

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 31 OF 53

9	LV windings	One 3-phase winding with Star connection. LV: 415kV
10	Winding material	Electrolytic grade copper for both HV and LV windings
11	Winding Insulation	Class A
12	Neutral on LV side	Neutral terminals of both the windings shall be brought out separately to facilitate earthing connections.
13	Vector Group	Dyn11
14	Short circuit withstand time (thermal)	2 sec
15	% Impedance	5% as per IS: 2026
16	Termination HV/LV/Orientation	Air insulated cable box with disconnecting chamber, for both HV and LV sides. Cable box / Cable box / 180°.
17	Cable entry on HV side	Bottom entry
18	Cable entry on LV side	Bottom entry
19	Tapping on HV winding	Off circuit tap changer (OCTC) switch with five tap positions: +5%, +2.5%, 0, -2.5%, -5%.
20	Loading Capability	Continuous operation at rated MVA on any tap with voltage variation of +/-10%. Transformer shall be capable of being loaded in accordance with IS: 6600 / IEC 60076-7.
21	Ambient temperature	Max 50 deg C
22	Temperature rise	For top oil: Max. 50 deg C by thermometer method. For winding: Max. 55 deg C, by resistance method. Both rises shall be over an ambient temperature of 50 deg C irrespective of tap position.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 32 OF 53

23	Flux density	Not to exceed 1.9 Wb/sq.m at any tap position with +/-10% voltage variation from voltage corresponding to the tap. Transformer shall also withstand following over-fluxing conditions due to combined voltage and frequency fluctuations: a) 110% for continuous rating b) 125% for at least one minute c) 140% for at least five seconds Vendor shall furnish over-fluxing characteristics up to 150%
24	Air Clearance	As per CBIP
25	Load loss principal tap at 75°C, with IS tolerance	This shall be provided by vendor.
26	No Load loss at rated voltage on principal tapping and at rated frequency, with IS tolerance	This shall be provided by vendor.
27	No load current at rated voltage and rated frequency	This shall be provided by vendor. To be indicated as percentage.
28	Efficiency at 75°C, UPF	Minimum 98% at full load (100%). Efficiencies at 75% and 50% loads to be indicated by vendor.
29	Regulation at full load, 75 °C	< 3 % for UPF For 0.8 PF lagging, to be indicated by vendor.
30	Harmonics	Shall be designed to suppress harmonics especially 3 rd & 5 th .
31	Vibration & noise	Noise level shall be according to NEMA TR-1 standard
32	Highest system voltage	LV side: 1.1kV HV side: 12 kV
33	Insulation levels as per IS:2026	LV side: NA / 3 kV rms HV side: 75kVp / 28kV rms

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 33 OF 53

	Rated Lightning Impulse withstand voltage / Short duration power frequency withstand voltage	
34	Overall dimensions in mm Length x Breadth x Height	This shall be provided by vendor.
35	Oil capacity (in Litres)	This shall be provided by vendor.
36	Weight of transformer in Kg	This shall be provided by vendor.
37	Painting	Paint shade shall be informed by BHEL during drawing approval stage.
38	Constructional features	As per relevant clause of this specification
39	Fittings and accessories	As per relevant clause of this specification

2.0 Constructional features and details of transformer components

2.0	Transformer shall be constructed in accordance with IS: 2026 and IS: 3639 or equivalent international standard. All materials / components used shall be of best quality and class most suitable for working under the conditions specified. These shall withstand the variations of temperature and atmospheric conditions, overload, over-excitation, short-circuits as per specified standards without distortion or deterioration, without development of stresses in any part and also without affecting the strength and suitability of the various parts for the work that they have to perform.
-----	--

2.1 Tank

2.1.1	The transformer tank and cover shall be fabricated from high grade low carbon plate steel of tested quality. The tank and cover shall be of welded construction and there should be provision for lifting by crane.
2.1.2	Suitable inspection hole(s) with welded flange(s) and bolted cover(s) shall be provided on the tank cover. The inspection hole(s) shall be sufficient size to afford easy access to the lower ends of the bushings, terminals etc.
2.1.3	The exterior of tank and other steel surfaces exposed to the weather shall be thoroughly cleaned and have a priming coat of zinc chromate applied. The second coat shall be of an oil and weather-resistant nature, preferably of distinct colour from the prime and

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 34 OF 53

	finish coats. The final coat shall be of a glossy, oil and weather resistant non-fading paint of specified shade.
2.1.4	The interior of the tank shall be cleaned by sand blasting and painted with two coats of heat resistant and oil insoluble paint.
2.1.5	Steel bolts and nuts exposed to atmosphere shall be galvanized. All bolted connections to the tank shall be fitted with suitable oil-tight gaskets that shall give satisfactory service under the operating conditions for complete life of the transformer, if not opened for maintenance at site.
2.1.6	The tank together with radiators, conservator, bushings and other fittings shall be designed to withstand the following conditions without permanent distortion: (i) Full vacuum of 760 mm of Hg, for filling with oil by vacuum. Internal gas pressure of 0.35 Kg/cm² (5 lbs/sq.in) with oil as at operating level. (ii) The transformer shall have conservator tank of adequate capacity to accommodate oil preservation system and volumetric expansion of total transformer oil. The conservator shall be bolted into position so that it can be removed for cleaning purposes. (iii) The conservator shall be of single compartment type. The top of the conservator shall be connected to the atmosphere through a transparent type silica gel breather. (iv) The tank cover shall be suitably sloped so that it does not retain rain water. The material used for gaskets shall be cork, neoprene or approved equivalent.

2.2 Core

2.2.1	The magnetic circuit shall be of core type. The core shall be constructed from non-ageing, cold rolled, super grain oriented silicon steel laminations (CRGOS) equivalent to M4 grade steels or better.
2.2.2	The insulation structure of the core to clamp plates shall be such that it withstands a voltage of 2kV (rms) for one minute in air.
2.2.3	Adequate lifting lugs will be provided to enable the core & windings to be lifted.

2.3 Windings

2.3.1	Windings shall be of electrolytic grade copper free from scales and burrs.
-------	--

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 35 OF 53

2.3.2	Windings shall be subjected to a shrinking and seasoning process so that no further shrinkage occurs during service.
2.3.3	Windings shall have uniform insulation.
2.3.4	Tapping shall be so arranged as to preserve the magnetic balance of the transformer at all voltage ratios.
2.3.5	The completed core and coil assembly shall be dried in vacuum and shall be immediately impregnated with oil after the drying process to ensure elimination of air and moisture within the insulation.
2.3.6	Windings shall be made in dust proof and conditioned atmosphere. Vendor shall indicate those details of facilities (as available at the winding works) that will ensure meeting this requirement.

2.4 Internal earthing

2.4.1	The frame work and clamping arrangements of core and coil shall be securely earthed inside the tank by copper strip connection to the tank.
-------	---

2.5 Bushings

2.5.1	Bushings shall be designed and tested to comply with the applicable standards. If type test certificates are not available, these tests shall also be carried out in addition to the routine tests. Bushings rated for 400A and above shall have non-ferrous flanges and hardware. Bushings shall be supplied with terminal connector clamp suitable for connecting the cables.
-------	---

2.6 Cables boxes and disconnecting chambers

2.6.1	Cable boxes shall be supplied with gland plates having holes to suit BHEL specified cables.
2.6.2	Cable boxes / disconnecting chambers shall be provided with body earth terminals.
2.6.3	LV cable boxes shall be provided with necessary LV bushings, bus bars, bus bar supports for making cable terminations.
2.6.4	HV cable boxes shall be provided with necessary HV bushings and terminals for making cable terminations.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 36 OF 53

2.6.5	Cable boxes shall be provided with suitable gaskets to ensure the specified protection class requirement (IP55).
2.6.6	Cable boxes / disconnecting chambers shall be provided with necessary arrangements to prevent entry of rain water into the same.
2.6.7	Disconnecting chambers: (1) Disconnecting chambers shall be provided to enable the transformer to be removed without unsealing the cables or draining oil from the main tank. (2) Disconnecting chamber shall be air insulated and complete with seal-off bushings, removable flexible connectors / links and removable covers. (3) Phase-to-phase and Phase-to-ground clearances within the chamber shall be such as to enable either the transformer or cable to be subject separately to HV tests. Clearances shall be subject to BHEL approval.

2.7 Neutral bushings

2.7.1	The neutrals of the star-connected LV windings shall be brought out to separate bushing terminals. The neutral bushings shall be provided on the tank at such a location that facilitates connecting earth conductor down to the ground level. Tank-mounted pin-type support insulators shall be provided for supporting the neutral earthing bar of specified section, along its run from the neutral bushing to ground level.
-------	--

2.8 Marshalling box

2.8.1	Vendor shall provide a marshalling box and marshal to it all the contacts / terminals of electrical devices mounted on the transformer.
2.8.2	It shall be in the vendor scope to provide the interconnection cabling between the marshalling box and all the accessory devices of transformer by either PVC insulated unarmoured cables routed through GI conduit (or) PVC insulated, armoured cables.
2.8.3	Necessary cable glands shall be provided at the marshalling box for the above mentioned cables as well as for terminating the incoming cables from remote panels.
2.8.4	Marshalling box shall be tank mounted, outdoor and weather/vermin/dust proof (protection class IP55), sheet-steel (2mm thick minimum) enclosure, with hinged door

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 37 OF 53

having padlocking facility and painted. All doors, covers and plates shall be fitted with neoprene gaskets. Bottom shall be at least 1600 mm above floor level and provided with gland plate and cable glands as required. Top surface shall be sloped to drain off water falling on the box.

2.9 Transformer oil

2.9.1	Transformers shall be supplied complete with transformer oil. The new insulating oil before pouring into the transformer shall conform to the requirement of IS: 335. No inhibitors shall be used in the oil. The oil samples taken from the transformer at site shall conform to requirements of IS: 1866.
2.9.2	10% extra oil, in non-returnable sealed containers, shall be sent along with main consignment to avoid any shortage of oil at the time of topping up of oil at the site. This oil quantity shall be over and above the specified mandatory spares requirement.

2.10 Fittings and accessories

Following fittings per transformer shall be provided.

#	Nomenclature of fitting / accessory	Qty
1	Oil conservator with equalizer pipe	1 set
2	HV cable box	1 set
3	HV disconnecting chamber	1 set
4	LV cable box	1 set
5	LV disconnecting chamber	1 set
6	Off circuit tap changing switch (OCTC) with operating knob, tap position marking and locking facility, with warning plate "Tap switch to be operated only with the transformer de-energized".	1 set
7	Neutral bushings for earthing of LV windings	1 No
8	Earthing terminals with hardware suitable for connecting 50x6 GI earth strips. Separate terminals shall be provided for cable boxes, tank etc.	1 set
9	Radiators (detachable type) with drain valve at the bottom, relief valve at the top, air plug, shut-off valves at every point of connection to the tank and lifting lugs.	4 sets

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 38 OF 53

10	Double float Buchholz relay with alarm and trip contact. The relay shall be provided with a test cock suitable for a flexible pipe connection for checking its operation. Buchholz relay shall be provided with one shut-off valve on conservator side of size 50 mm for transformer rating up to 10MVA and 80 mm for rating 10MVA and above.	1 set
11	Provision for collecting gas and oil from Buchholz relay	1 set
12	Silica gel dehydrating breather with oil cup	1 set
13	Magnetic oil level gauge (MOG), dial type, with alarm contact, minimum and maximum filling level markings. Contact shall be suitable for 110V/220V DC. The oil level at 30 deg C shall be marked on the gauge.	1 set
14	Prismatic / toughened glass oil level gauge for transformer and tap changer chamber with min and max markings.	1 set
15	Spring operated Pressure relief valve with alarm/trip contacts. Location of this valve shall be such that hot oil discharge shall not fall on transformer or any of its parts. This shall include all necessary arrangements to facilitate proper discharge of PRV through pipes away from the transformer.	1 set
16	Explosion vent (double diaphragm) with sight glasses and equalizing pipe connection to conservator	1 set
17	Thermometer pocket for OTI	1 No
18	Temperature sensor for OTI	1 No
19	Thermometer pocket for WTI	1 No
20	CT for WTI	1 No
21	Oil temperature indicator, 150 mm dial type, with alarm and trip contacts, maximum reading pointer & resetting device. Oil temperature range: -40 to 150 deg C (resolution 1 deg C) Oil temperature accuracy: +/- 2 deg C RTD PT-100 temperature sensor for OTI (IEC 751). Two analog outputs of 4-20mA for remote indication of OTI.	1 No
22	Winding temperature indicator, 150-mm dial type, with alarm and trip contacts, maximum reading pointer & resetting device. Winding temperature range: -40 to 200 deg C (resolution 1 deg C) Winding temperature accuracy: +/- 2 deg C Two analog outputs of 4-20mA for remote indication of WTI.	1 No
23	Marshalling box (IP55) shall be provided with removable gland plates and glands for cable entry from bottom side.	1 set

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 39 OF 53

	Marshalling box shall be provided with OTI, WTI, transmitters (for 4-20mA output of OTI and WTI), space heater, thermostat, lamp, MCBs, power socket, switch for WTI, terminal connectors and all other attachments that are necessary to meet its functional aspects. Terminal connectors for the following signals / connections shall be made available. Number of terminal connectors for each case shall be as per connection requirements: PT-100 sensor from thermometer pocket 1) 4-20mA output for OTI 2) 4-20mA output for WTI 3) WTI CT secondary 4) Alarm contact of WTI 5) Trip contact of WTI 6) Alarm contact of OTI 7) Trip contact of OTI 8) Buchholz relay alarm 9) Buchholz relay trip 10) Magnetic oil level gauge alarm 11) Pressure relief valve alarm 12) 90-260V DC power supply (external source) 13) 240V AC supply (external source) 14) Spare connectors: Eight terminals Note: Alarm and trip contacts shall be rated for 220V DC.	
24	Inspection window with cover	1 set
25	Cover lifting lugs / eyes	2 Nos
26	Core and winding lifting lugs / eyes	2 Nos
27	Tank lifting lugs / eyes for the entire transformer	2 Nos
28	Jacking pad with hauling eyes, to enable transformer with oil to be raised or lowered using hydraulic or screw jacks.	4 sets
29	LV cable box supports with mounting plates	1 set
30	HV cable box supports with mounting plates	1 set
31	Bi-directional flat rollers	4 Nos
32	Base channel with towing holes / lugs	2 Nos
33	Air release hole with plug	1 No

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 40 OF 53

34	Oil filling hole with cap	1 No
35	Top filter valve with threaded male adapter (blanking plug)	1 No
36	Bottom filter valve with threaded male adapter (blanking plug)	1 No
37	Drain valve for the tank, with blanking plug	1 No
38	Drain valve for conservator, with blanking plug	1 No
39	Shut-off valves for conservator	2 Nos
40	Sampling valve, with blanking plug	1 No
41	Shut-off valves for radiators, with open and close markings	8 Nos
42	Sludge valve at bottom most point of tank to be provided for easy flush out / removal of sludge during maintenance	1 No
43	Valve schedule plate made of stainless steel or aluminium (anodized)	1 No
44	Rating and diagram plates made of stainless steel or anodized aluminium.	1 No
45	Terminal marking plates	1 Set
46	Protected type Mercury or alcohol in glass thermometer	1 No

3.0 Inspection and testing of transformers at vendor works

3.0	Vendor shall provide inspection call to BHEL for the type and routine tests. Prior to the call, vendor shall submit the detailed quality plan in Manufacturing Quality Plan (MQP) format for approval.
-----	--

3.1 Routine tests

3.1	Following routine tests shall be carried out on 100% basis. BHEL and SMC shall witness these tests at vendor works. 1) Measurement of voltage ratio and phase displacement as per IEC 60076-1 2) Measurement of winding resistance on all the taps as per IEC 60076-1 3) Vector group check as per IEC 60076-1 4) Polarity check as per IEC 60076-1 5) Magnetic balance and magnetizing current test 6) Measurement of no-load current with 415V, 50Hz AC supply 7) Measurement of no-load losses and current at 90%, 100% and 110% of rated voltage as per IEC 60076-1
-----	--

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 41 OF 53

- 8) Measurement of impedance voltage / short-circuit impedance, load loss on principal and extreme taps
- 9) Measurement of insulation resistance as per IEC 60076-1
- 10) Separate source voltage withstand test as per IEC 60076-3:
- 11) Oil leakage test on completely assembled transformer along with unit coolers / radiators:
All tank and oil filled compartment shall be tested for oil tightness by being completely filled with oil of viscosity not greater than that of specified oil at the ambient temperature and applying pressure equal to the normal pressure plus 35 kN/sq-m measured at the base of the tank. The pressure shall be maintained for a period of not less than 6 hours during which time no sweating shall occur. This test shall be repeated as pre-commissioning test at site with test duration of 24 hours.
- 12) Jacking test followed by DP test
- 13) Frequency Response Analysis test
- 14) Marhallinging box / Cable box: IP Class test (IP55):
It shall not be possible to insert a thin sheet of paper under gaskets and through enclosure joints.
- 15) IR measurement on wiring of Marhallinging Box.
- 16) BDV test on oil as per IS:335-1993: Test certificate shall be submitted to BHEL.

3.2 Temperature rise test as per IS: 2026 (Type test on 1 No. of transformer)

This test shall be performed as a type test on the transformer and witnessed by BHEL/SMC. The test shall be carried out at a tap corresponding to maximum losses as per IS: 2026. Gas chromatography shall be conducted, as per relevant standard, on oil sample taken before and immediately after temperature rise test. Test report shall be furnished to BHEL.

3.3 Tank vacuum and pressure test as per CBIP norms. (In process inspection)

3.4 Other type tests:

In case reports of following type tests are available for transformers of similar rating, the same shall be acceptable to BHEL. Else, these tests shall be carried out as with BHEL witness.

- (a) Zero sequence impedance measurement test
- (b) Measurement of harmonics of no load current
- (c) Measurement of acoustic noise level as per NEMA TR-1
- (d) Lightning impulse (full and chopped wave) test on HV & LV windings

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 42 OF 53
---	--	---

4.0 Reference standards

4.1	Following shall be the list of standards to be adopted: <table border="1"> <tr> <td data-bbox="459 419 573 1262">Power Transformer</td><td data-bbox="459 419 573 620">IS: 2026 IS: 6600 IEC: 60076</td></tr> <tr> <td data-bbox="573 419 611 1262">Fittings and Accessories</td><td data-bbox="573 419 611 620">IS: 3639</td></tr> <tr> <td data-bbox="611 419 649 1262">Loading of oil immersed transformer</td><td data-bbox="611 419 649 620">IS: 6600</td></tr> <tr> <td data-bbox="649 419 687 1262">Oil</td><td data-bbox="649 419 687 620">IS: 335</td></tr> <tr> <td data-bbox="687 419 725 1262">Bushing for >1000 V AC</td><td data-bbox="687 419 725 620">IS: 2099</td></tr> <tr> <td data-bbox="725 419 763 1262">Bushing for <1000 V AC</td><td data-bbox="725 419 763 620">IS: 7421</td></tr> <tr> <td data-bbox="763 419 801 1262">Degree of protection</td><td data-bbox="763 419 801 620">IS: 2147</td></tr> <tr> <td data-bbox="801 419 840 1262">Tests and tolerance of guaranteed particulars</td><td data-bbox="801 419 840 620">IS: 2147</td></tr> <tr> <td data-bbox="840 419 878 1262">Buchholz relay</td><td data-bbox="840 419 878 620">IS: 3637</td></tr> <tr> <td data-bbox="878 419 960 1262">Electrical insulation classified by thermal stability</td><td data-bbox="878 419 960 620">IS: 1271</td></tr> <tr> <td data-bbox="960 419 1001 1262">Climate proofing</td><td data-bbox="960 419 1001 620">IS: 3202</td></tr> </table>	Power Transformer	IS: 2026 IS: 6600 IEC: 60076	Fittings and Accessories	IS: 3639	Loading of oil immersed transformer	IS: 6600	Oil	IS: 335	Bushing for >1000 V AC	IS: 2099	Bushing for <1000 V AC	IS: 7421	Degree of protection	IS: 2147	Tests and tolerance of guaranteed particulars	IS: 2147	Buchholz relay	IS: 3637	Electrical insulation classified by thermal stability	IS: 1271	Climate proofing	IS: 3202
Power Transformer	IS: 2026 IS: 6600 IEC: 60076																						
Fittings and Accessories	IS: 3639																						
Loading of oil immersed transformer	IS: 6600																						
Oil	IS: 335																						
Bushing for >1000 V AC	IS: 2099																						
Bushing for <1000 V AC	IS: 7421																						
Degree of protection	IS: 2147																						
Tests and tolerance of guaranteed particulars	IS: 2147																						
Buchholz relay	IS: 3637																						
Electrical insulation classified by thermal stability	IS: 1271																						
Climate proofing	IS: 3202																						

11.0 Pre-commissioning inspections/checks/tests on AC side, MRT tests, coordination/liaison with state / central departments/ CEIG etc for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning:

11.1	Pre-commissioning inspections / checks / tests on DC side Vendor shall carry out following minimum pre-commissioning checks: (1) Verification of firmness of SPV module interconnections (MC4) (2) Verification of firmness of DC cable terminations at string inverters using torque wrench (for the specified torque values) (3) Verification of firmness of RS485 cable terminations (4) Verification of firmness of all earthing connections (5) Cable megger/ continuity check for all DC power cables (6) Measurement of open circuit voltage of individual strings (7) Measurement of earth resistance at individual earth pits of solar array: (a) as disconnected from earth mat grid and also, (b) as connected to earth mat grid (8) Submission of test reports for BHEL/SMC approval
------	--

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 43 OF 53

11.2

Pre-commissioning inspections/checks/tests on AC side, MRT tests, coordination/liaison with state / central departments/ CEIG etc for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning:

Pre-commissioning inspections / checks / tests, MRT tests and coordination / liaison activities with state / central departments / DISCOM/ CEIG etc for necessary approvals / clearances for commissioning, synchronization with grid and post-commissioning operation of the plant. (Clearances shall include obtaining prior approvals for all applicable drawings/ documents etc from concerned state / central departments / DISCOM/ CEIG etc.)

A	Basic checks
A1	Tightness checks:
	1) Terminations of AC power cables at string inverters, data loggers, ACCB box, LTPDB, transformers, VCB panels, ABT metering panels
	2) Terminations of Control/ Instrumentation/ Data/ Communication cables wherever applicable.
	3) Terminations of earthing at all electrical equipments/ panels.
	4) Terminations of earthing of transformers
	5) Terminations of earth chambers of vendor scope
A2	Electrical continuity checks
A3	Megger (5kV) checks for all HT (11kV) cables
A4	Hi-pot testing for all HT (11kV) cables prior to connection to the panels/ transformers.
A5	Megger (1kV) checks for all 1.1kV grade cables
A6	AC/DC supply checks at TBs of all electrical panels/ DBs/ Transformers.
B	Pre-commissioning electrical tests:
B1	String inverters
	1) DC side open circuit voltage
	2) Vendor to provide technician support to service engineer of string inverters for all other pre-commissioning tests as per OEM checklist
B2	11kV/415V Transformers at switchyards: 1100kVA, 700kVA
	1) Oil filtration: Equipment of adequate evacuation/ heating/ oil circulation capacity shall be deployed at site for this purpose. Filtration shall be carried out adequately in order to achieve the BDV, ppm, tan delta values within the limits as per relevant standards and as measured by NABL accredited laboratory. The machine shall have built-in BDV measuring set up for in-situ checking of BDV during filtration process.
	2) IR tests LV-HV, HV-E, LV-E
	3) Vector group
	4) Voltage ratio
	5) Magnetizing current

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 44 OF 53

	6) Magnetic balance 7) Winding resistance at all taps 8) Fault simulation checks (at VCB breaker panels): Buchholz, OTI, WTI, PRV, LOLA etc 9) Alarm, trip settings (S1, S2) for WTI, OTI 10) Oil level at conservator (to be topped up, if required)
B3	Indoor CTs 11kV
	1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Ratio tests / primary injection
B4	Indoor PTs 11kV including Bus PTs
	1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Voltage ratio test 3) Polarity test
B5	VCB breakers 11kV
	1) IR tests 2) Contact resistance measurement (CRM) 3) Timing test: close/ open/ close-open 4) Functional checks: breaker open/close, spring-charged motor 5) Remote operation from SCADA panels: open/close, command/status, lamp indications
B6	Numerical relays at VCB breaker panels
	1) Relay calibration using applicable kit/ software 2) IDMT, DT curves with timing/pickup settings in all relays based on gradation from downstream to upstream taking into account settings at STU substation 3) Overcurrent/ earth fault pickup/ tripping time tests
B7	CT ratio / PT ratio to be set in meters/relays
	1) MFM meters 2) Trivector meters 3) ABT meters 4) Protection relays
B8	ACB breaker settings (if applicable)
	1) Over load, Short time fault, ground fault
B9	Earth resistance measurements for all chambers of vendor scope
	1) With electrode connected to grid 2) Without connecting electrode to grid
C	Testing agency
	Credentials of testing agency shall be submitted to BHEL for approval prior to awarding of work.
D	Coordination and Liaison activities to be carried out by vendor:
	1) Liaison responsibility for getting the above approvals rests with vendor. 2) Following are the areas of approval, as applicable, for the SPV-side portions including solar array and up to 11kV side connection point to metering yard.

	Technical specification for		PS-439-1121
	Design, supply, installation and commissioning, O&M		Rev No: 01
	of 1590KW _p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat		PAGE : 45 OF 53

		(a) Schemes/ layouts/ calculations such as earth mat design, solar array layout, lighting arrestor layout, module cleaning system, cable trench layout, plant lighting system, fire alarm system etc. (b) GTP/ datasheets/ GA drawings/ Bill of materials, MQP etc of supply items. (c) GA drawings of installation such as foundation/ oil pits of inverter transformers / auxiliary transformer etc. (d) Factory test reports of supply items including BHEL-supplied items. (e) Site test reports of transformers, transformer oil, VCB breakers, CTs, PTs, resistance of earth mat grids etc (f) Interaction with supervising/ inspection agency such as MRT departments, Transco, CEIG, CEA etc, as applicable, for applying to them/ inviting them for supervision/ inspection at site. (g) Interaction/ coordination with customer (SMC) in the above process as and when required. (h) All necessary testing kits/ instruments shall be arranged as per the requirements of inspection agency. Basic instruments such as digital multimeter, 5kV digital megger with PI feature, earth resistance meter, VCB open/close timing test kit, clamp meters etc shall be organized at site at the time of inspection. Competent electrical technician shall also be made available at the site. (i) Subsequent to site inspection by the concerned agency, vendor shall support the upstream 11kV transmission line/ switchyard contractor in following-up with them to obtain their clearance for line charging/ grid synchronization. (j) Vendor shall implement all the observations of CEIG related to SPV-side portion including solar array and up to 11kV connection point to metering yard at plant end.
E	Commissioning of power plant	
		1) Vendor shall be cable of extempore trouble-shooting in case of any technical problems encountered with roof-top as well as 11kV installations. 2) Vendor shall organize all necessary tools/ measuring instruments required to operate the various electrical equipments at the time of commissioning: Digital megger 5KV with PI feature, Earth resistance tester, Phase sequence meter, Clamp meters etc, discharge rods, PPE safety gadgets (helmets, shoes etc).

12.0 General conditions applicable during supply, installation and commissioning phase

12.1	As already mentioned in previous clauses, vendor shall organize construction power supply on their own. Accordingly, DG sets of suitable capacity shall be deployed by the vendor for construction works.
------	---

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 46 OF 53

12.2	Similarly, water required for construction works is available at site. This can be utilised for civil work.
12.3	All machinery such as cranes, hydra, JCBs, forklifts, transport trucks, trolleys etc necessary for movement and installation of materials / panels / equipment etc shall be organized by the vendor.
12.4	All necessary tools and tackles such as crimping tool (including heavy duty tools for crimping copper/ aluminium cables up to 300 sq-mm), screw driver set, power screw drivers, cutting pliers, nose pliers, spanner sets, adjustable spanners, hole-saw cutter set, bending tools, torque wrenches, hack saw blades, pipe wrenches, flat / round files, HV termination tools, drilling machines, welding machines, concrete mixers, steel bar bending tools / templates/ shuttering materials for RCC works, spade, shovel, hammer etc shall be organized by the vendor.
12.5	All necessary measuring instruments such as measuring tapes, digital multimeters, vernier calipers, electrical testers, digital meggers (1kV, 2.5kV, 5kV), lamp load testers for solar array string measurements, earth resistance meters, weighing machines, water level indicators etc shall be organized by the vendor.
12.6	In case project is not completed as per BHEL scope due to reasons arising out of materials from BHEL end/vendor's end, contractor has to complete the job at later stage without any extra charges. No overrun charges shall be paid in case of extension of project schedules
12.7	Vendor shall make their own arrangements for necessary food, drinking water and accommodation for their labour and employees posted at the site. Similarly, food and drinking water required at the site, during the construction operations, shall also be in scope of vendor.
12.8	Vendor shall organize all necessary steps to meet statutory requirements such as labour license, PF, ESI etc and also ensure compliance with relevant acts such as minimum wages act, income tax act, employee insurance act etc for their labour deployed at site.
12.9	Vendor shall maintain updated labour register, with name, age, qualification, salary, attendance details etc at the site.
12.10	Vendor shall use danger boards, wherever required, to ensure safety of the persons during the work at site.
12.11	Vendor shall adhere to all necessary safety norms such as use of helmet, goggles, hand gloves, gumboots, aprons etc. It is the ultimate responsibility of the vendor in all respect to prevent accidents at the site and safeguard their labour from accidents.
12.12	Vendor shall, at the completion of every work, clear off the debris, which resulted out of the work. In case of excavation work such as earth mat trench, cable trench etc, vendor shall finish the land neatly with necessary leveling, rolling etc.
12.13	Vendor shall carry out the work without causing inconvenience to other contract groups at the site. In case of conflicts with other groups, vendor shall ensure that the matter is resolved at once amicably so that the progress of work is not affected.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 47 OF 53

12.14	Any damages on the building, structures etc attributable to the acts of labour / employees of vendor shall be rectified and made good by the vendor at their own cost.
12.15	No child labour shall be employed for execution of the present contract.
12.16	Any miscellaneous materials, which are found essential for technical completion of the contract but not mentioned explicitly in this specification, shall be deemed to be included in the specification. Accordingly, such materials shall be included by the vendor as part of the offer.
12.17	Special instruction for earthing: In compliance with Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode. Accordingly, all cases such as cable support structures, cable ladders, cable trays etc as applicable shall be earthed.
12.18	BHEL/SMC shall witness routine/ acceptance/ type tests performed at manufacturer works for the items supplied by vendor. Vendor shall accordingly provide inspection call to BHEL with submission of quality assurance plan in advance. For the items bought out from dealers, test certificates, as per relevant IS / IEC standards, as issued by manufacturer shall be submitted to BHEL. However, prior approval shall be obtained from BHEL/SMC for procurement of the item from dealers.
12.19	Field Quality Plan / Quality control system Vendor shall set up a field quality control laboratory with full set up to facilitate testing of all construction materials in accordance with FQP (Field quality control plan) as approved by BHEL/SMC. Vendor shall deploy a well experienced quality control engineer to monitor all QC activities at site as per approved FQP. Specifically with reference to civil works, vendor shall submit all concrete mix designs and bituminous mix designs for BHEL/SMC approval before starting of the work. All the third party testing should be conducted in NABL approved laboratories only. Vendor shall submit the FQP for the civil construction works before starting of the works for approval of BHEL/SMC.
12.20	Any deviations shall be discussed with BHEL/SMC site engineers and implementation shall be taken up only after approval from BHEL /SMC.
12.21	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL on the progress of the contract.
12.22	Vendor shall, as and when required by BHEL/SMC, participate in the review meetings conducted by BHEL/SMC at project site, BHEL-EDN (Bangalore), BHEL-Corporate office (New Delhi), SMC office (Surat) etc.
12.23	General Guidelines a) Any civil or electrical work which is not mentioned or included in this tender document but necessary for functional requirements of the plant shall be carried out by vendor.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 48 OF 53

	b) Vendor shall prepare all designs / drawings based on the specifications given in the tender and in light of relevant BIS/IS/ equivalent standard. c) Vendor shall provide type test reports and datasheet/ GTP for all equipments covered under vendor scope of supply. d) All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed thereunder and as amended from time to time.
12.24	Vendor has to pay the plant electricity consumption charges, internet & telephone charges etc during the O&M period.
12.25	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL on the progress of the contract.

13.0 Operations and Maintenance

13.1	Date of commencement & Scope of operations and maintenance Zero date for O&M shall be the actual date on which the power plant is commissioned with synchronization of string inverters to grid / export of power for full 1590MW (AC). O&M shall be for 10 years with scope covering both the solar side and the 11kV yard including ABT metering. O&M Bills shall be submitted by Vendor on Quarterly basis . All the vendor supplied equipment shall be provided with comprehensive Maintenance for 10 years against unsatisfactory performance and/or break down due to defective design, workmanship of material. The equipment or, components, or any part thereof, so found defective during Comprehensive Maintenance period shall be forthwith repaired or replaced free of cost to the satisfaction of the Engineer in-charge.
13.2	O&M personnel 1. Vendor shall deploy following minimum personnel: (a) Technical / administrative / office personnel • One technical-cum-administrative in-charge having graduation in electrical/electronics engineering and experience with overall responsibility for complete plant operations. The in-charge shall have competence to deftly handle technical and operational / crisis problems. • Two working level staff with ITI / diploma level qualifications in engineering with competence for operating electrical/ electronics/ mechanical equipment, taking measurements, data logging / maintaining registers, preparation of reports in computer. • In addition to the above, separate set of persons shall be deployed for water cleaning of SPV modules on daily basis. Number of persons shall be decided considering maximum 10 days per cleaning cycle.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 49 OF 53
---	--	---

	• Note: At least one among the technical personnel shall essentially have certification/ license for HT operations (11kV minimum) issued by reputed government agency. Evidence documents shall be submitted for BHEL/SMC approval during detailed engineering. 2. Vendor shall provide uniforms for the O&M staff. 3. Similarly, O&M personnel shall be provided with raincoats, toolsets, earthing rods, safety gloves, safety harness, safety goggles, gumboots, helmets and all other personal protective equipment (PPE) that will be relevant to ensure human safety. 4. Names, qualification, work responsibility of personnel shall be listed on a display board at an appropriate location as suggested by the end customer. 5. Attendance registers shall be maintained for all the staff, workmen and security guards. 6. Vendor shall ensure statutory requirements such as ESI, PF, labour license, BOCW etc as applicable for their O&M personnel posted at site. 7. BHEL/SMC shall have right to disallow any O&M employee, if found unfit to perform. BHEL instructions issued in writing shall be binding on vendor who shall replace the person. 8. O&M personnel at site shall conform to general regulations in force at site and to any special instructions from BHEL/SMC administration. 9. O&M personnel at site shall be deemed to be aware of damages and risks incidental to conditions of ordnance factory land & works from time to time and BHEL/SMC shall not be responsible for any injury to personnel arising there from. 10. Training to O&M personnel It is the absolute responsibility of vendor to ensure imparting of necessary training to their O&M personnel to get them acquainted with the operations of various electrical and mechanical equipment of the power plant. For this purpose, vendor shall identify the O&M personnel well in advance and involve them during installation and commissioning stages so that they become well versed with various functional aspects of the power plant. 11. Availability of O&M personnel at power plant (a) Vendor shall ensure that operating staff are present in the power plant during 7:30 AM – 6:30 PM every day.
--	---

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 50 OF 53

	(b) Vendor shall ensure that certain minimum operating staff are present at the power plant even on festivals, public holidays and any other unique occasions so that the plant is run under competent supervision on all days. 12. O&M personnel shall, strictly, not use any part of the power plant for their personal / residential purposes. Their presence at the plant shall, strictly, be meant only for the purpose of operation and maintenance of plant.
13.3	O&M operations – daily basis (1) Water cleaning of SPV modules with one cycle of cleaning of all the modules of the power plant not exceeding 10 days. In order to fulfil this requirement, vendor shall organize all necessary resources such as (a) manpower (number of persons for the cleaning work), (b) number of simultaneously-operating teams, (c) machinery/ materials/ accessories such as pressurised water pumps, hose pipes, nozzles etc. Whenever the integral module washing system of the plant is not operational due to reasons of any kind, vendor shall make alternate arrangements such as water tankers, water delivery mechanisms (pumps, hoses, nozzles and other fittings), operating personnel etc required to fulfil the above specified cleaning of max 10 days/cycle. (2) Logging of DC, AC, grid parameters (current, voltage, power, energy etc) at string inverters/ LTPDB/ VCB panels/ ABT metering panels, transformer temperatures, equipment tripping/ breakdown, grid outage etc as per BHEL formats.
13.4	O&M activities – monthly basis (1) Inspection of fire extinguishers (weight, pressure indication, physical status etc) followed by refilling actions, if necessary, based on indications. Report to be submitted as per BHEL approved recording formats. (2) Earthing resistance measurements for solar array structures, various equipment, switchyard equipment and lightning arrestors: measured values shall be recorded in registers and reported to BHEL as per BHEL approved recording formats. (3) Submission of values / status of plant parameters and events for the corresponding month, as below, as per BHEL approved formats: - Daily values of solar array at string inverters, ACCB, LTPDB, VCB panel levels - Daily values of weather parameters (solar energy, wind speed, ambient temperature) - Daily energy generation at ABT metering level - Events (with date, time) of faults / tripping / breakdown of equipment - Events (with date, time) of grid outage - Events (with date, time) of equipment damages, accidents and thefts - Activities of module cleaning (4) Monthly reports shall be submitted to BHEL for all the above data. (5) Energy generation / meter reading report to be prepared and submitted to the concerned state/central department. Signatures from BHEL/SMC representatives shall be obtained wherever required.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 51 OF 53

13.5	O&M activities - quarterly basis (1) Cleaning of string inverters, ACCB, LTPDB, VCB panels etc to remove accumulated dust. (2) Monitoring and status review, followed by rectification/ calibration/ replenishment/ replacement actions as necessary and applicable for following: (a) Spare items of all electrical equipment (b) First aid box items - medicines and accessories (c) Safety gadgets (d) Tool kits and measuring instruments (e) Yard lights (f) Pumps, starters (3) Submission of quarterly report on above activities to BHEL.
13.6	O&M activities – yearly basis (1) BDV measurements for oil samples from all transformers and submission of report to BHEL/ SMC. (2) Filtration of oil to be arranged, if required based on BDV measurement report. Any top up required during O&M period, shall be arranged by Vendor. (3) Dissolved gas analysis (DGA) shall be performed and the report shall be submitted to BHEL. (4) Lubrication of moving contacts (VCBs etc) with appropriate grease etc (5) Painting of switchyard gate/ fencing, lighting poles, earthing chambers etc if required based on conditions of rusting. (6) Checking tightness of hardware in MMS structures and tightening wherever required. (7) Checking tightness of power cable terminations in SPV modules (MC4), string inverters, ACCB, LTPDB, VCB panels, transformers etc.
13.7	O&M activities - as and when required (contextual basis) (1) Monitoring and operation of plant electrical equipment as and when required: (a) VCB on/off: local operations from VCB panels (b) Settings of numerical relays in VCB panels: review/ revision in consultation with BHEL. (c) ACB and MCCB on/off operations on LT side (d) String inverter operations: review/selection of settings, monitoring the DC/AC/ event/ fault status parameters (e) Water pumping operations (2) Removal of garbage from solar array field, switchyard, sand buckets; logging in registers with signatures of operating persons and in-charge. (3) Coordinating and liasoning, on behalf of BHEL, and obtaining renewal of statutory licenses, clearances and approvals from state departments such as electricity boards, CEA/CEIG etc. (4) Repair and replacement of vendor-supplied items, by vendor, with urgent action plans and implementation, when the items are found non-working / damaged. The same shall be reported to BHEL within 12 hours from time of observation.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121 Rev No: 01 PAGE : 52 OF 53
---	---	---

	(5) Reporting, on an immediate basis (within max 2 hours) of functional problems / damages in BHEL-supplied items to facilitate repair / replacement by BHEL. Further, vendor shall correspond / coordinate with respective equipment vendors / service centers, on behalf of BHEL, for getting the service engineers to the site. Later, coordinating with the service engineers during their visit to site, and assisting them in the trouble shooting process until the problem is resolved. Vendor shall report to BHEL (within max 2 hours) immediately after the problem is resolved. (6) Vendor shall keep updating the spares inventory at the site every time there is consumption of spare items towards replacement. In case of shortage of spares, the same shall be reported on an urgent basis (with max 2 hours) to BHEL. (7) Coordinating with sub-station upon grid failures, line problems etc and implementing the needful steps to restore the plant to normal operation. (8) Theft incidents: immediate reporting to BHEL, filing FIRs with police stations on behalf of BHEL, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records. (9) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (data, time) and maintaining records. (10) Procurement of all O&M consumables viz stationary items like aluminium paint, moping sticks, hose pipes, detergents, broom stick, dust bin, writing pad, A4 printer paper etc for fulfilling the activities detailed above will be in the scope of Vendor. (List mentioned here is indicative, however all necessary instruments and materials will be in the scope of Vendor).
--	--

14.0 Documents to be submitted for BHEL/SMC approval during detailed engineering

14.1	BHEL/SMC approval shall be obtained for the following technical documents, which shall be submitted to BHEL in phased manner based on priority sequence of activities during detailed engineering (after receipt of purchase order from BHEL).
14.2	Name of vendor / make, model number / part number, specification / sizes / dimensions / drawings / datasheets shall be submitted for all the vendor supplied items.
14.3	GA / SLD / GTP / datasheets / schemes / layouts / BoM/ design calculations etc, as applicable, shall be submitted for the following: (1) MC4 connectors (2) All cables that are in vendor scope of supply (3) ACCB, LTPDB, VCB panels (4) 1100kVA, 700kVA transformers 11kV/415V (5) Cable glands, cable lugs, cable ties, GI cable trays of all types (6) Routing layout for 1Cx4, 3Cx35 cables with locations of string inverters, data loggers, ACCB (7) Underground trenches: routing layout/ trench cross sections etc. (8) Concrete foundations for string inverters, ACCB boxes (9) RCC foundations for 1100kVA & 700kVA transformers: design calculations, GA (10) Outdoor shed with RCC foundations for LTPDB, VCB panels, ABT metering panels: design calculations, GA, BoM etc.

	Technical specification for Design, supply, installation and commissioning, O&M of 1590KW_p Solar PV roof-top system at Surat Municipal Corporation, Surat, Gujarat	PS-439-1121
		Rev No: 01
		PAGE : 53 OF 53

	(11) Steel mounting structures for string inverters, ACCB boxes: GA, BoM etc. (12) Lightning arrestors system: foundations, layouts, GA, BoM etc. (13) Module cleaning system: design calculations, layouts, BoM, electrical circuit diagram, water circuit diagram, pump sizing calculation etc. (14) LT straight through jointing kits, 11kV termination kits, 11kV straight through jointing kits (15) Earth grid for solar array: design calculations, layout, BoM, cross sections etc. (16) Earth chambers: GA/BoM, layout, cross section etc. (17) Earth mat grid for 11kV switchyard: design calculations, layout, BoM etc. (18) Lighting system for switchyards: lux calculations, lighting layouts, GA of fence-mounted lighting poles, SLD, BoM, GTP/ datasheets etc. (19) Fire extinguishers: GTP/datasheets etc. (20) WMS: pyranometer, anemometer, thermometers, data loggers, mounting arrangement (21) Any other designs/ schemes/ layouts etc as applicable as per BHEL/SMC requirements during detailed engineering.
14.4	Manufacturing Quality Plans for all the vendor supplied items
14.5	Field quality plan for the field work: civil works, electrical works
14.6	Detailed activity-time chart for project implementation
14.7	Detailed manpower deployment schedule
14.8	Installation/ O&M manuals for MC4 connectors, chemical earthing electrodes, lightning arrestors, submersible pumps, surface pumps, fire extinguishers etc.



Katargam Water works





COPYRIGHT AND CONFIDENTIAL

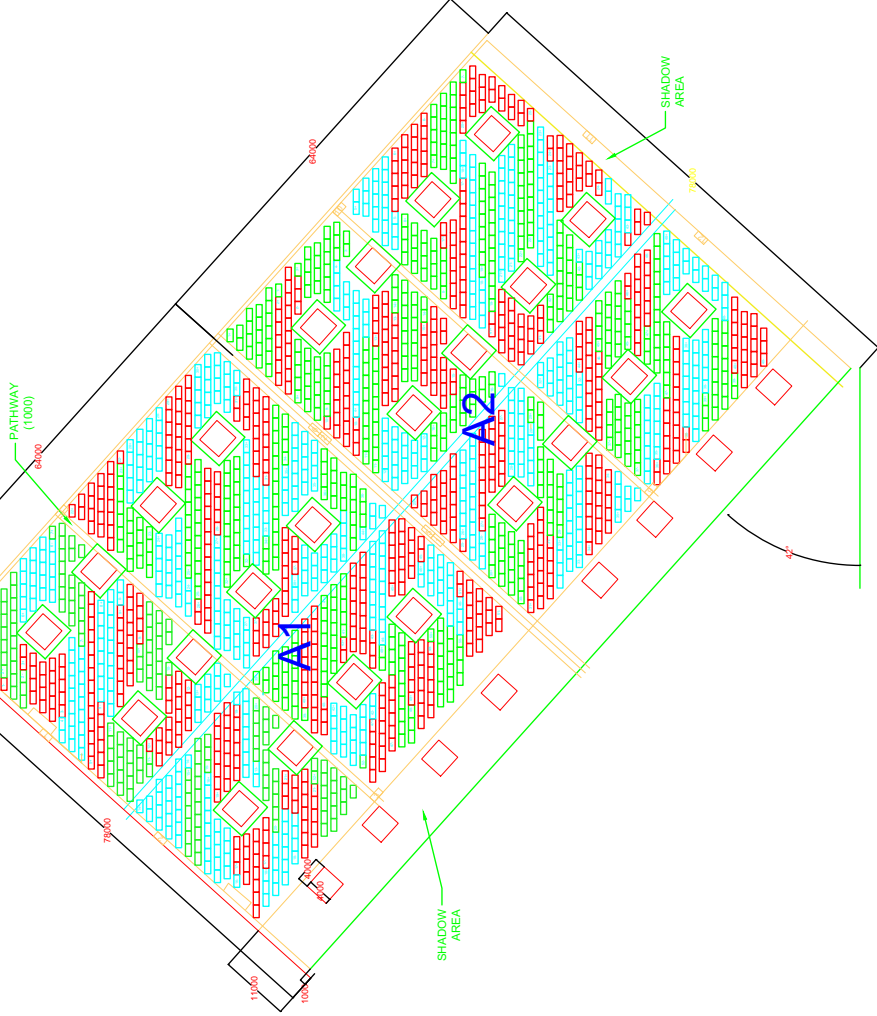
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

REF. DRG. No.

SIGN. & DATE

INVENTORY No.

BUILDING A1= 992 MODULES

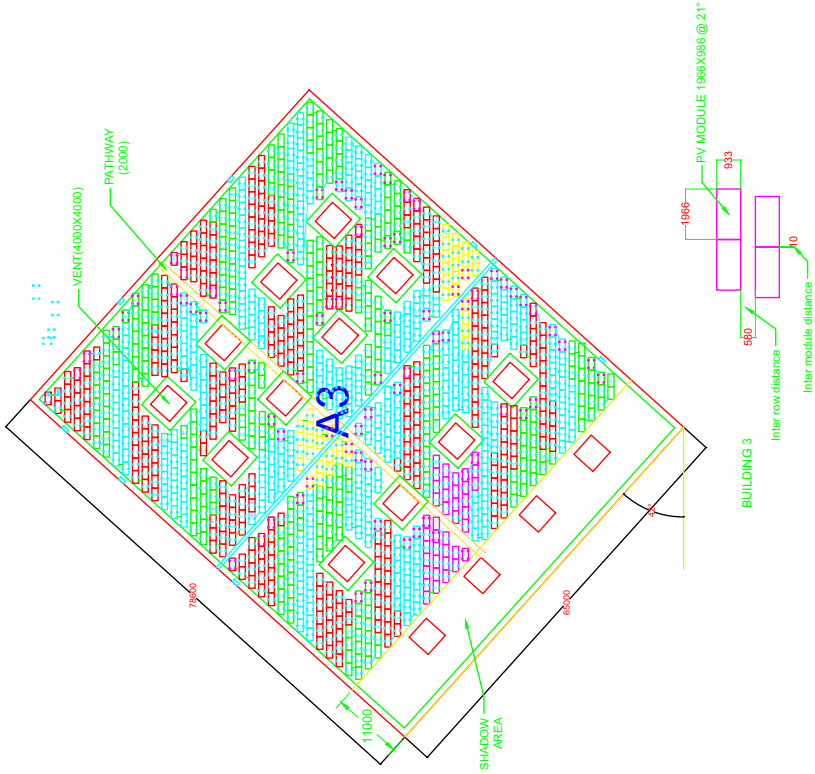


BUILDING A2= 960 MODULES

BUILDING 1&2

KATARGAM WATER WORKS (940 kWp)

BUILDING A3= 1080 MODULES



Typical module arrangement

PROJECT : 3.6 MW SOLAR POWER PLANT.
CUSTOMER : SMC SURAT, GUJARAT.

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: KATARGAM WATERWORKS 940 kWp TENTATIVE ARRAY LAYOUT.

No. OF SHEETS	10
SHEET No.	01
REV	01

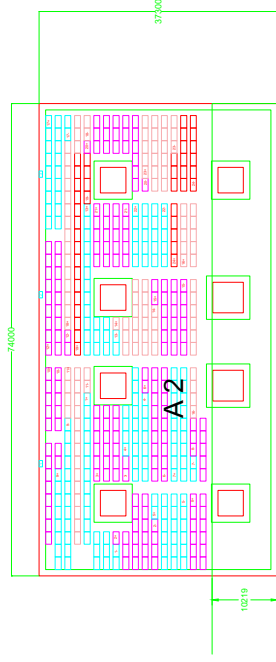
REV.	DATE	ALTERED	CHECKED	APPROVED	REV.	DATE	ALTERED	CHECKED	APPROVED	NAME	SIGN	DATE
01	20/02/17	CHECKED	CHECKED	APPROVED						NY		20/02/17
										PM		20/02/17
										MS		20/02/17
ARRAY LAYOUT REVISED										DISTRIBUTION OF PRINTS		
										DEPT. CODE		
										SC&PV 439		
										BHEL DRG. No.		
										3-679-05-00872		

	REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED									
			APPROVED			APPROVED									
						DRAWN							NY	20/02/17	
						CHECKED							PM	20/02/17	
						APPROVED							MS	20/02/17	
						DISTRIBUTION OF PRINTS							DEPT.	CODE	
													SC&PV	439	

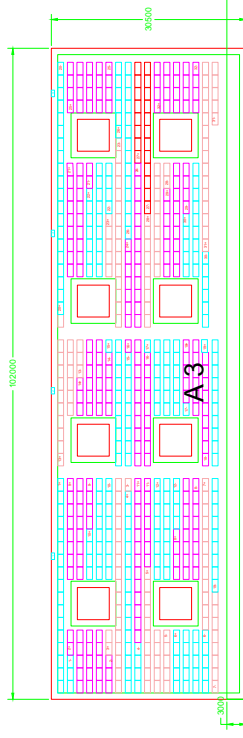
BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE:
KATARGAM (WDS) (650 Kwp) TENTATIVE ARRAY LAYOUT.

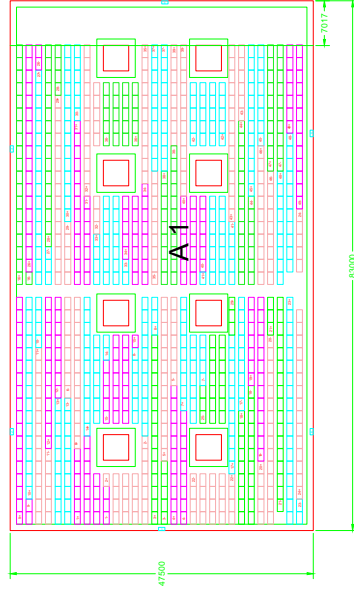
PROJECT : 3.6 MW SOLAR POWER PLANT.
CUSTOMER : SMC SURAT,GUJARAT.



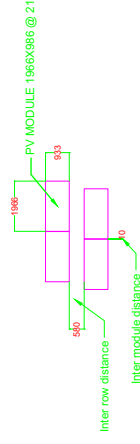
Building A2 = 480 Modules



Building A3 = 640 Modules



Building A1 = 980 Modules



Typical module arrangement

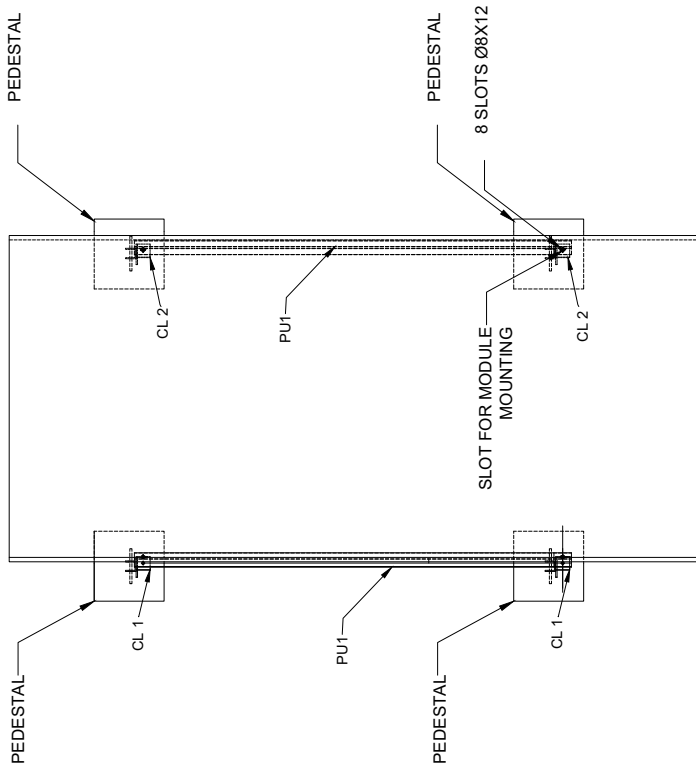
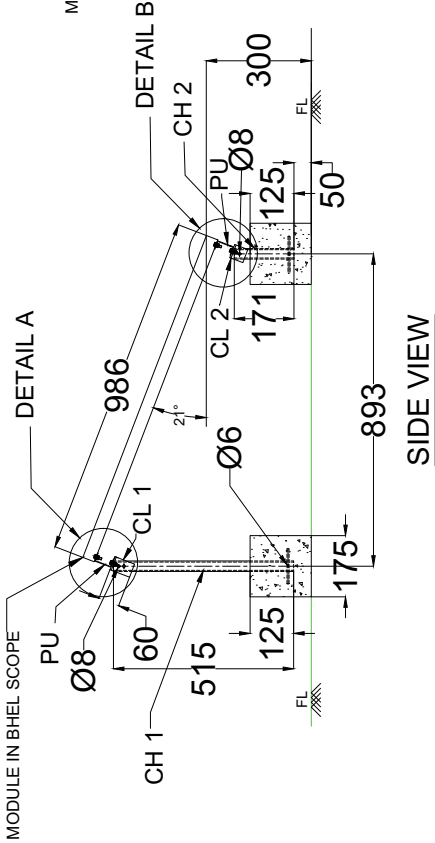
KATARGAM WATER DISTRIBUTION STATION (WDS) (650 kwp)

COPYRIGHT AND CONFIDENTIAL
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

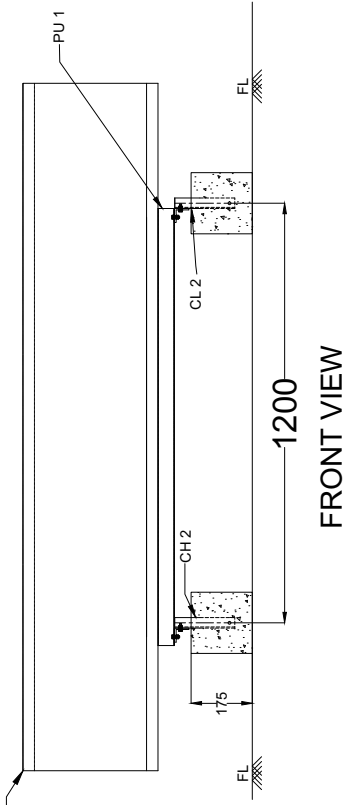
REF. DRG. No.

SIGN. & DATE

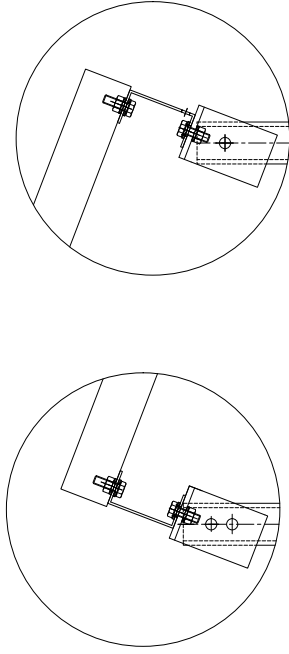
INVENTORY No.



TOP VIEW



FRONT VIEW



DETAIL A

DETAIL B

PROJECT : 3.6 MWp ROOF TOP.
CUSTOMER : SURAT MUNICIPAL CORPORATION.

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: GA OF 1 MODULE STRUCTURE

SMC DRG NO.	BHEL-SWC-DD-MMS-010	BHEL DRG. No.	3 679 05 00871
No. OF SHEETS	01	No. OF SHEETS	01
REV	00	REV	00



DEPT.	CODE
SC&PV	439

NAME	DATE
NY	8/02/17
PM	8/02/17
MS	8/02/17

CHECKED	APPROVED	DISTRIBUTION OF PRINTS

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

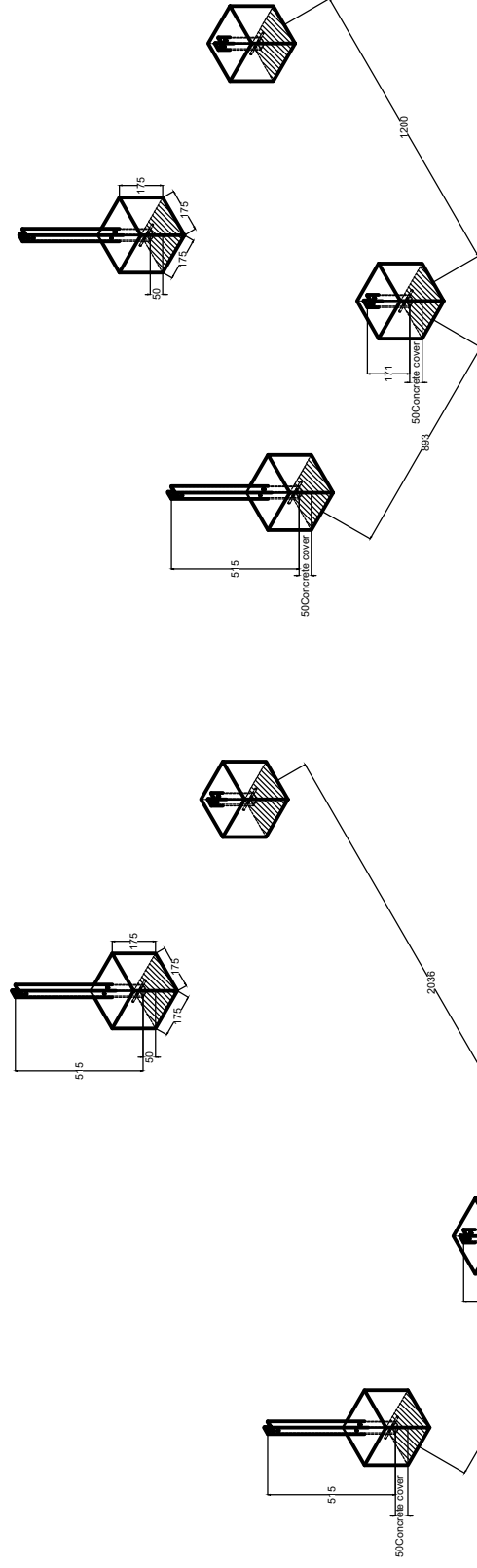
PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

PEDESTAL	PU 1	PU 2	CL 1	CL 2

COPYRIGHT AND CONFIDENTIAL

INVENTORY NO.	SIGN. & DATE	REF. DRG. NO.
---------------	--------------	---------------



ISOMETRIC VIEW FOR 2 MODULE STRUCTURE

Nitro bond to be applied as shown in hatched area

Note:

1. Provision is given for earthing holes on columns at a distance of 25 mm from the top of pedestal. These holes can be used for holding columns for making the template for pedestal.
2. All dimensions are in mm.
3. Do not scale the drawing only written dimensions to be read.

PROJECT : ROOF TOP SURAT
CUSTOMER : SURAT MUNICIPAL CORPORATION

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: ISOMETRIC VIEW OF PEDESTAL

No. OF SHEETS	01
SHEET No.	01
REV	00

SMC DRG NO.	BHEL-SMC-DD-MMS-010	BHEL DRG. No.	3 679 05 00871
----------------	---------------------	---------------	----------------

Typical Procedure for In-Situ Casting of Pedestals.

1. Marking of Pedestals as per the Array layout footing.
2. The area marked for the base of the pedestal has to be roughed and then cleaned properly with a brush.
3. Nito bond has to be prepared as per data sheet.
4. Nito bond to be applied on the base of pedestal and then the template for pedestal to be placed on the base and the Channel to be placed as shown in the MMS drawing.
5. The template has to be prepared by the vendor in sufficient nos and template to ensure proper position of channel in it.
6. PCC foundation blocks are to be made with 1:2:4 cement concrete.
7. After the template is in position and nito bond applied, 1:2:4 concrete to be poured in it and allowed to dry as per IS 456.
8. Physical inspection of mixing of concrete.
9. The concrete can be made with hand mixing or machine mixing, to be done at site itself.
The above procedure has to be applied.

Vendor to submit the following documents for Approval to BHEL:

1. Revised procedure for In-situ Casting of pedestals.
2. Template drawing to be used for In –situ Casting.

Annexures:

1. Nito bond data sheet.
2. Array layout.
3. GA Drawing of Pedestals.

Note:

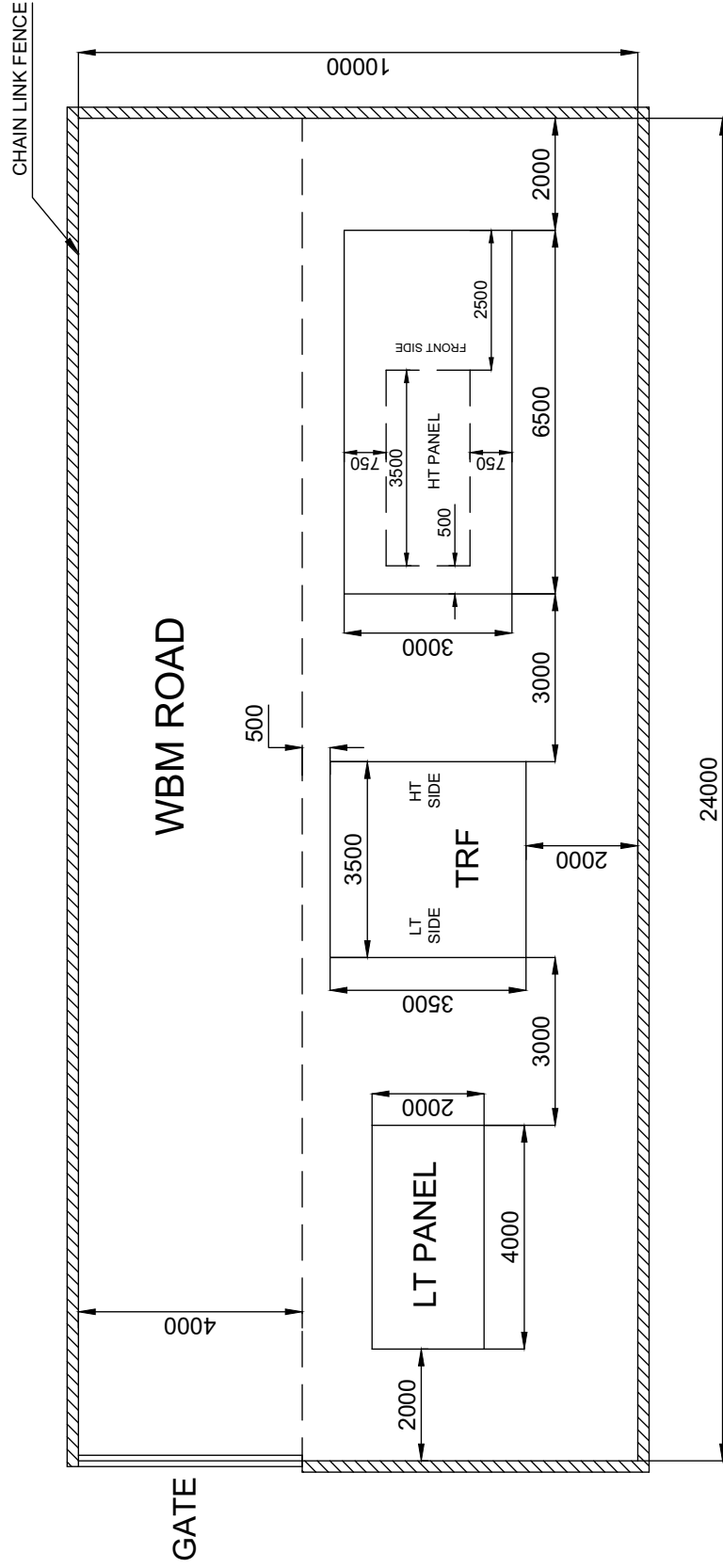
Standard procedures along with relevant IS Codes to be followed for the above procedure.

		बि एच ई एल BHEL		PRODUCT STANDARD ELECTRONICS DIVISION		CD-4-4001- 129	
		A4-10				REV. 00	
						PAGE 01 OF 01	
		TECHNICAL SPECIFICATION FOR PV MODULE L24270P (24 V, 300 WATTS)					
		1. PV MODULE TYPE NO. : L24270P					
		2. CONFIGURATION :SINGLE GLASS LAMINATED TYPE WITH WITH 72 NOS. OF 156-mm MULTI CRYSTALLINE SILICON SOLAR CELLS (12*6) IN SERIES CONFIGURATION.					
		3. OVERALL SIZE : 1966 (±3) * 986 (±2) * 35 (±1) mm					
		4. WEIGHT : 25 Kg. (Typ.)					
		5. PV MODULE FRAME MATERIAL : ANODISED ALUMINIUM					
		6. JUNCTION BOX : IP65 GRADE JUNCTION BOX WITH CABLES AND CONNECTORS					
		7. RFID Tag : As per JNNSM Guidelines					
		8. TYPICAL ELECTRICAL CHARACTERISTICS :					
		8.1 OPEN CIRCUIT VOLTAGE (Voc) : 45.0 V					
		8.2 SHORT CIRCUIT CURRENT (Isc) : 8.7 A					
		8.3 VOLTAGE AT PEAK POWER POINT (Vmp) : 36 V					
		8.4 CURRENT AT PEAK POWER POINT (Imp) : 8.34 A					
		8.5 PEAK POWER OUTPUT (Pmax.) : 300 W (±5%)					
		8.6 CELL EFFICIENCY : 17.1 %					
		8.7 MODULE EFFICIENCY : 15.5 %					
		8.8 FILL FACTOR : ≥ 0.70					
		NOTE :					
		1. Electrical specifications mentioned above are at Standard Test Conditions of 100 mW/sq. cm solar insolation (AM 1.5) and at 25 deg C temperature.					
		2. Measurement repeatability of peak power output: ± 3 %					
		REFER MODULE DRAWING NO. : 3-679-02-00395					
		REVISION : (00)		APPROVED BY :			
				SR			
				PREPARED		ISSUED	
				SM		Engg.	
						DATE	
						18.03.2015	

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

REF. DRG. No.

SIGN. & DATE



- Trenches not indicated.
- All dimensions are in mm.
- Total Area = 240 sqm.

[illegible]

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT (for foreign vendors)				
RFQ No. UPK0000989				
Sl. No.	Terms	Particulars	Confirmation	Deviation/Remarks
1	Pre Qualification Requirement (PQR)	1. Vendor should have executed minimum two numbers of 11 KV or higher KV rated switch yards at power plants or sub-stations in India. As evidence to this, vendor shall submit (a) certification from clients for completion of works (b) copies of Purchase orders from the clients.	Complied	
		2. Vendor shall furnish solvency certificate issued by Nationalized / scheduled banks for minimum worth of Rs.85 Lakhs with date of issue not before six months from the tender opening date.	Complied	
2	Bidding	(a) Bid has to be submitted as Two Part – Techno Commercial Bid (Part-1) & Price Bid (Part-II). Bids shall be submitted through e-Procurement portal https://bheleps.buyjunction.in of M/s. Mjunction Services Limited.	Complied	
		(b) Annexures B & B1 to be submitted along with technical bid (Part-I) & Annexure B2 to be submitted along with Price bid (Part-II).	Complied	
		(c) Clause-wise compliance to BHEL Purchase specification along with all documents as called in Technical specification to be submitted along with technical bid (Part-1).	Complied	
3	Price basis:	Firm i.e., from the date of PO to completion of supply if I&C is not applicable. If I&C is in supplier's scope, then the prices shall remain Firm till commissioning & handing-over of the complete system. (PVC clause not acceptable).	Complied	
4	Evaluation of L1 vendor	Over all L1 of Supply + I&C + O&M on "FOR" basis to site will only be considered. Present Site Location is SMC, SURAT, GUJARAT, INDIA	Complied	
5	Octroi / Entry Tax	Any Entry Tax / Octroi if applicable for supplies to these project location, the same has to borne by the vendor.	Complied	
6	Terms of Delivery:	CIF Seaport/CIF Airport/FCA Airport (Indicate name of Seaport/Airport)	Acceptable / Not acceptable	
7	Delivery Period	(a) Supply: 5 Weeks from document approval Date (b) Drawing Submission: 1 Week from PO Date (c) I&C: 2 Weeks from supply	Acceptable / Not acceptable	

8	Payment Term	FOR SUPPLY: 1) 80% of basic Supply value + 100% of taxes, duties and freight charges will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later. 2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any). 3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3months Claim Period from BHEL Consortium Bank. FOR I&C/Supervision: 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis. FOR O&M: 100% O&M charges shall be done quarterly against report certified by BHEL. Note: In exceptional cases, if vendor fails to submit PBG after supplies, vendors can also accept for the final 10% payment, payable after the warranty period + 3 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable) as PBG is linked to Warranty period.	Acceptable / Not acceptable	
		(b) For any deviation in payment term, the offer will be liable for loading as per Clause G of ITB (Doc Ref : SCPV: BOS: ITB - Rev 01)	Acceptable / Not acceptable	
9	Warranty	(a) Warranty for Supply: 18 Months from Supply or 12 Months from I&C, whichever is earlier. (b) Warranty for Workmanship & I&C: 12 months from I&C (c) O&M: 10 Years	Acceptable / Not acceptable	
10	Pre Shipment Inspection	(a) Pre Shipment Inspection will be carried out by BHEL/Customer for which test report shall be sent one week in advance.	Acceptable / Not acceptable	
		(b) Inspection charges & co-ordination for third party inspection shall be to your account. Please confirm that your quotation for individual item includes inspection charges by any of BHEL approved inspection agencies. In case nothing is mentioned regarding inspection charges, it will be presumed that these are included in quoted prices. Please confirm.	Acceptable / Not acceptable	
11	Penalty	(a) Supply: Penalty of 0.5% per week at the basic price of the good for undelivered quantity of supply portion, subject to a maximum of 10%. For Supply, Pre Shipment Inspection Call Letter Date (Receipt of test report) will be treated as delivery for purpose of penalty.	Acceptable / Not acceptable	
		(b) For any deviation in penalty term, the offer will be liable for loading as per Clause No. G, Point No.(b) of ITB (Doc Ref : SCPV: BOS: ITB - Rev 01)	Acceptable / Not acceptable	
12	PBG	(a) PBG shall be furnished in the BHEL prescribed format. (b) Deviation if any Please specify.	Acceptable / Not acceptable	
13	Validity:	Quotation should remain valid for a period of 90 days from the due date.	Acceptable / Not acceptable	

14	Bank charges (If applicable):	(a) All Bank charges to seller's account	Acceptable / Not acceptable	
		(b) Deviation will be liable for loading as per Cl.G of ITB	Acceptable / Not acceptable	
15	Reverse Auction:	BHEL reserves the right to conduct Reverse auction.Procedure for the same will be informed by BHEL .	Acceptable / Not acceptable	
16	DUN No.	Please mention Dun & Bradstreet No.(DUN No.)	To be furnished if applicable	
17	Consignment Details	Weight and Dimension of consignment with packing	Furnished / To be furnished	

18	Despatch Documents	Despatch documents include AWB, Invoice, Packing list, Warranty certificate, O&M manuals	Acceptable / Not acceptable	
		One copy of Invoice, Packing list and Air Way Bill shall be faxed immediately after despatch. Also one copy of packing list to be kept inside each box for easy identification of material at site.		
19	Other terms & conditions	For any other Terms and Conditions, kindly refer to the following: A: ITB B: GCC	Acceptable / Not acceptable	
20	BOS %	The percentage of Supply and I&C and O&M values shall be in the range indicated below (approximately, with overall tallying to 100%) : (a) Supply: 51 to 55 % (b) I&C: 19 to 23 % (c) O&M: 24 to 28 % Successful bidder shall submit detailed billing break up for BHEL approval after placement of Purchase order.	Acceptable / Not acceptable	
21	Documents Submission	All the documents pertaining to I&C and O&M as per Annexure-C to be submitted as applicable.	Acceptable / Not acceptable	

AUTHORISED SIGNATORY WITH SEAL

TECHNICAL BID ENCLOSURE FOR COMPLIANCE OF QUOTE : UNPRICED BID (Foreign Vendors)							
RFQ No. UPK0000989							
Sl No.	Ref. No.	Material Code	DESCRIPTION	Qty	Unit	Quoted (YES/NO)	Currency
1	S-130	PS0679069321	Concrete pedestal 250X250X160(h)mm	11580	NO	YES / NO	
2	S-150	PS0679069348	4 sq.mm Cu, XLPO, FRLS,	14500	M	YES / NO	
3	S-160	PS0679069356	3C X 35sqmm Al, XLPE, armoured cable	1600	M	YES / NO	
4	S-170	PS0679069364	1.1kV, 3CX185 sq.mm Al, XLPE armoured	80	M	YES / NO	
5	S-180	PS0679069380	1.1kV, 3CX300 sq.mm Al, XLPE armoured	60	M	YES / NO	
6	S-190	PS0679069399	1.1kV, 3CX400 sq.mm Al, XLPE armoured	850	M	YES / NO	
7	S-200	PS0679069402	1.1kV, 3CX500 sq.mm Al, XLPE armoured	160	M	YES / NO	
8	S-210	PS0679069410	11KV 3Cx185Sqmm Al, XLPE (E) armoured	60	M	YES / NO	
9	S-220	PS0679069690	ACCB 4 In 1 Out	1	NO	YES / NO	
10	S-230	PS0679069429	ACCB 5 In 1 Out	1	NO	YES / NO	
11	S-240	PS0679069437	ACCB 7 In 1 Out	4	NO	YES / NO	
12	S-260	PS0679069453	Transformer 700KVA ONAN 11KV/415V Dy	1	NO	YES / NO	
13	S-270	PS0679069461	Transformer 1100KVA ONAN 11KV/415V D	1	NO	YES / NO	
14	S-280	PS0679069470	HT panel 11KV, 1In 1 Out, outdoor, VCB	2	NO	YES / NO	
15	S-290	PS0679069488	Weather proof Male & Female Snap-on	650	ST	YES / NO	
16	S-300	PS0679069496	Cable tray 100mm(W)X50mm(H)X2mm(T)	2800	M	YES / NO	
17	S-310	PS0679069500	Copper globe type LA	18	NO	YES / NO	
18	S-320	PS0679069518	Chemical earthing Material - Electrodesal	1	ST	YES / NO	
19	S-330	PS0679069658	Switcyard Fence & Lighting	1	ST	YES / NO	
20	S-340	PS0679069534	25X3 mm GI strip for structure earthing	3650	M	YES / NO	
21	S-350	PS0679069542	25 X 6 mm GI strip for Equip earthing	1600	M	YES / NO	
22	S-360	PS0679069550	50 X 6 mm GI strip for Switcyard Equip	200	M	YES / NO	
23	S-370	PS0679069569	Tools & Equipments	2	ST	YES / NO	
24	S-380	PS0679069666	Data & Communication Accessories	1	ST	YES / NO	
25	S-390	PS0679069585	Fire Fighting anc Safety Equipment	1	ST	YES / NO	
26	S-400	PS0679069674	Module Cleaning System	1	ST	YES / NO	
27	S-410	PS0679069607	Weather Monitoring Station (WMS)	10	ST	YES / NO	
28	S-420	PS0679069615	Data Management and Monitoring Devices	1	ST	YES / NO	
29	S-430	PS0679069682	Miscellaneous Supply items	1	ST	YES / NO	
30	S-440	PS0679069704	Spares	1	ST	YES / NO	
31	S-450	PS0679069330	NITO Bond Epoxy Bonding agent	400	L	YES / NO	
32	S-460	PS0679070141	LTPDB 3IN 1Out with MFM	2	NO	YES / NO	
33	I-10	PS0679069623	Unloading, storing, shifting, I&C	1	AU	YES / NO	
34	I-20	PS0679069631	Unloading, storing, shifting, I&C of	1	AU	YES / NO	
35	O-30	PS0679069640	AMC for 10 Years	40	AU	YES / NO	

Note:

* The above format is to be used for Unpriced bid. Reproducing on letter head is acceptable.

BHEL is trying to avail Customs Duty & Excise duty exemption. Successful bidder shall support with all relevant documents.

AUTHORISED SIGNATORY WITH SEAL

TECHNICAL BID ENCLOSURE FOR COMPLIANCE OF QUOTE : UNPRICED BID (Indigenous Vendors)								
RFQ No. UPK0000989								
Sl No.	Ref No.	Material Code	DESCRIPTION	Total Quantity	Unit	UNIT RATE	Total value (Unit Rate x Quantity)	Currency
1	S-130	PS0679069321	Concrete pedestal 250X250X160(h)mm	11,580	NO			
	Unit Rate in Words:							
2	S-150	PS0679069348	4 sq.mm Cu, XLPO, FRLS,	14,500	M			
	Unit Rate in Words:							
3	S-160	PS0679069356	3C X 35sqmm Al, XLPE, armoured cable	1,600	M			
	Unit Rate in Words:							
4	S-170	PS0679069364	1.1kV, 3CX185 sq.mm Al, XLPE armoured	80	M			
	Unit Rate in Words:							
5	S-180	PS0679069380	1.1kV, 3CX300 sq.mm Al, XLPE armoured	60	M			
	Unit Rate in Words:							
6	S-190	PS0679069399	1.1kV, 3CX400 sq.mm Al, XLPE armoured	850	M			
	Unit Rate in Words:							
7	S-200	PS0679069402	1.1kV, 3CX500 sq.mm Al, XLPE armoured	160	M			
	Unit Rate in Words:							
8	S-210	PS0679069410	11KV 3Cx185Sqmm Al, XLPE (E) armoured	60	M			
	Unit Rate in Words:							
9	S-220	PS0679069690	ACCB 4 In 1 Out	1	NO			
	Unit Rate in Words:							
10	S-230	PS0679069429	ACCB 5 In 1 Out	1	NO			
	Unit Rate in Words:							
11	S-240	PS0679069437	ACCB 7 In 1 Out	4	NO			
	Unit Rate in Words:							
12	S-260	PS0679069453	Transformer 700KVA ONAN 11KV/415V Dyn11	1	NO			
	Unit Rate in Words:							
13	S-270	PS0679069461	Transformer 1100KVA ONAN 11KV/415V Dyn11	1	NO			
	Unit Rate in Words:							
14	S-280	PS0679069470	HT panel 11KV, 1In 1 Out, outdoor, VCB	2	NO			
	Unit Rate in Words:							
15	S-290	PS0679069488	Weather proof Male & Female Snap-on	650	ST			
	Unit Rate in Words:							
16	S-300	PS0679069496	Cable tray 100mm(W)X50mm(H)X2mm(T)	2,800	M			
	Unit Rate in Words:							
17	S-310	PS0679069500	Copper globe type LA	18	NO			
	Unit Rate in Words:							
18	S-320	PS0679069518	Chemical earthing Material - Electrodesal	1	ST			
	Unit Rate in Words:							
19	S-330	PS0679069658	Switcyard Fence & Lighting	1	ST			
	Unit Rate in Words:							
20	S-340	PS0679069534	25X3 mm GI strip for structure earthing	3,650	M			
	Unit Rate in Words:							
21	S-350	PS0679069542	25 X 6 mm GI strip for Equip earthing	1,600	M			
	Unit Rate in Words:							
22	S-360	PS0679069550	50 X 6 mm GI strip for Swichyard Equip	200	M			
	Unit Rate in Words:							
23	S-370	PS0679069569	Tools & Equipments	2	ST			
	Unit Rate in Words:							
24	S-380	PS0679069666	Data & Communication Accessories	1	ST			
	Unit Rate in Words:							
25	S-390	PS0679069585	Fire Fighting anc Safety Equipment	1	ST			
	Unit Rate in Words:							
26	S-400	PS0679069674	Module Cleaning System	1	ST			
	Unit Rate in Words:							
27	S-410	PS0679069607	Weather Monitoring Station (WMS)	10	ST			
	Unit Rate in Words:							
28	S-420	PS0679069615	Data Management and Monitoring Devices	1	ST			
	Unit Rate in Words:							
29	S-430	PS0679069682	Miscellaneous Supply items	1	ST			
	Unit Rate in Words:							
30	S-440	PS0679069704	Spares	1	ST			
	Unit Rate in Words:							
31	S-450	PS0679069330	NITO Bond Epoxy Bonding agent	400	L			
	Unit Rate in Words:							
32	S-460	PS0679070141	LTPDB 3IN 1Out with MFM	2	NO			
	Unit Rate in Words:							
33	I-10	PS0679069623	Unloading, storing, shifting, I&C	1	AU			
	Unit Rate in Words:							
34	I-20	PS0679069631	Unloading, storing, shifting, I&C of	1	AU			
	Unit Rate in Words:							
35	O-30	PS0679069640	AMC for 10 Years	40	AU			
	Unit Rate in Words:							

Note:

* The above format is to be used for Unpriced bid. Reproducing on letter head is acceptable.

BHEL is trying to avail Customs Duty & Excise duty exemption. Successful bidder shall support with all relevant documents.

AUTHORISED SIGNATORY WITH SEAL

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT (SCC) - for indigenous vendors				
RFQ No. UPK0000989				
Sl No.	Terms	BHEL Term	Confirmation	Deviation / Remarks
1	Pre Qualification Requirement (PQR)	1. Vendor should have executed minimum two numbers of 11 KV or higher KV rated switch yards at power plants or sub-stations in India. As evidence to this, vendor shall submit (a) certification from clients for completion of works (b) copies of Purchase orders from the clients.	Complied	
		2. Vendor shall furnish solvency certificate issued by Nationalized / scheduled banks for minimum worth of Rs.85 Lakhs with date of issue not before six months from the tender opening date.	Complied	
2	Bidding	(a) Bid has to be submitted as Two Part – Techno Commercial Bid (Part-1) & Price Bid (Part-II). Bids shall be submitted through e-Procurement portal https://bheleps.buyjunction.in of M/s. Mjunction Services Limited.	Complied	
		(b) Annexure B (SCC) & Annexure B1 to be submitted along with technical bid (Part-I) & Annexure B2 to be submitted along with Price bid (Part-II).	Complied	
		(c) Clause-wise compliance to BHEL Purchase specification along with all documents as called in Technical specification to be submitted along with technical bid(Part-1).	Complied	
3	Price Basis	Firm i.e., from the date of PO to completion of supply if I&C is not applicable. If I&C is in supplier's scope, then the prices shall remain Firm till commissioning & handing-over of the complete system. (PVC clause not acceptable).	Complied	
4	Terms of Delivery	Free On Road Basis to Project site. Present Projects are : SMC, SURAT, GUJARAT	Complied	
5	Delivery Period	(a) Supply: 5 Weeks from document approval Date (b) Drawing Submission: 1 Week from PO Date (c) I&C: 2 Weeks from supply	Acceptable / Not acceptable	

6	Payment Term	FOR SUPPLY: 1) 80% of basic Supply value + 100% of taxes, duties and freight charges will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later. 2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any). 3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3months Claim Period from BHEL Consortium Bank. FOR I&C/Supervision: 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis. FOR O&M: 100% O&M charges shall be done quarterly against report certified by BHEL. Note: In exceptional cases, if vendor fails to submit PBG after supplies, vendors can also accept for the final 10% payment, payable after the warranty period + 3 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable) as PBG is linked to Warranty period.	Acceptable / Not acceptable	
		(b) For any deviation in payment term, the offer will be liable for loading as per Clause G of ITB.	Acceptable / Not acceptable	
7	Excise Duty	(a) To confirm whether applicable. If applicable, indicate prevailing rate of Excise duty.	Applicable / Not applicable	Prevailing rate of Excise duty: %
8	Sales Tax	(a) To confirm whether applicable. If applicable, indicate prevailing rate of Sales Tax without Form C .	Applicable / Not applicable	Prevailing rate of Sales Tax without Form C : %
9	Value Added Tax	Both are in the same State, VAT is applicable please indicate VAT applicable.	Applicable / Not applicable	Prevailing rate of VAT: %
10	Service Tax	To confirm whether applicable, if applicable indicate current rate of Service Tax.	Applicable / Not applicable	Prevailing rate of Service Tax: %
		Furnish Service Tax Regn. No. Confirmation that Service Tax register is maintained.		Service Tax Regn. No. S.Tax Register maintained : Yes/No
11	Evaluation of L1 vendor	Over all L1 of Supply + I&C + O&M on "FOR" basis to site will only be considered.	Complied	
12	Warranty	(a) Warranty for Supply: 18 Months from Supply or 12 Months from I&C, whichever is earlier. (b) Warranty for Workmanship & I&C: 12 months from I&C (c) O&M: 10 Years	Acceptable / Not acceptable	

13	Pre Shipment Inspection	(a) Pre Shipment Inspection will be carried out by BHEL/Customer for which test report shall be sent atleast one week in advance. All documents as per Purchase specification shall be submitted along with PSI Call letter	Acceptable / Not acceptable	
		(b) Pre Shipment Inspection charges , if any, shall be considered while evaluating your offer to arrive at "Total Cost to BHEL". The charges for the same shall be informed to you before Price Bid Opening/Reverse Auction.		
14	Penalty	(a) Supply: Penalty of 0.5% per week at the basic price of the good for undelivered quantity of supply portion, subject to a maximum of 10%. For Supply, Pre Shipment Inspection Call Letter Date (Receipt of test report) will be treated as delivery for purpose of penalty.	Acceptable / Not acceptable	
		(b) For any deviation in penalty term, the offer will be liable for loading as per Clause No. G, Point No.(b) of ITB.	Acceptable / Not acceptable	
15	Road Permit	Road permit if applicable will be given by BHEL before Dispatch of ordered Items.However, vendor shall give request for road permit 24 hours in advance.	Complied	
16	PBG	(a) PBG shall be furnished in the BHEL prescribed format. (b) Deviation if any Please specify.	Acceptable / Not acceptable	
17	Despatch Documents	Complete set of despatch documents in 3 sets shall be forwarded to BHEL directly. Despatch documents include Commercial Invoice, Excise Invoice (if ED is applicable), Lorry receipt (L/R), Packing list, PSI letter Copy, Proof of delivery such as MRC (Material Receipt Certificate)/ original acknowledged LR, Insurance intimation letter and Warranty certificate. One set of Invoice, Packing list and L/R shall be emailed immediately after despatch to BHEL-EDN, Bangalore.	Complied	
18	Reverse Auction	BHEL reserves the right to conduct Reverse auction. Procedure for the same will be informed by BHEL .	Acceptable / Not acceptable	
19	Other terms & conditions	For any other Terms and Conditions, kindly refer to the following: A: ITB (document ref :SCPV: BOS: ITB - Rev 01) B: GCC (document ref: SCPV: BOS: GCC - Rev 01)	Acceptable / Not acceptable	
20	Validity	Quotation should remain valid for a period of 90 days from the due date.	Acceptable / Not acceptable	
21	Shipment	Kindly indicate the state from where the shipment will take place.	State/Place to be mentioned	
22	Documents Submission	All the documents pertaining to I&C and O&M as per Annexure-C to be submitted as applicable.	Acceptable/ Not acceptable	
23	BOS %	The percentage of Supply and I&C and O&M values shall be in the range indicated below (approximately, with overall tallying to 100%) : (a) Supply: 51 to 55 % (b) I&C: 19 to 23 % (c) O&M: 24 to 28 % Successful bidder shall submit detailed billing break up for BHEL approval after placement of Purchase order.	Acceptable/ Not acceptable	

24	Documents Submission	All the documents pertaining to I&C and O&M as per Annexure-C to be submitted as applicable.	Acceptable/ Not acceptable	
25	Octroi / Entry Tax	Octroi/ Entry tax if applicable for supply of material at this project location shall be in scope of vendor.	Acceptable/ Not acceptable	

AUTHORISED SIGNATORY WITH SEAL

TECHNICAL BID ENCLOSURE FOR COMPLIANCE OF QUOTE : UNPRICED BID (Indigenous Vendors)											
RFQ No. UPK0000989											
Sl. No.	Ref. No.	Material Code	DESCRIPTION	QTY	UNIT	QUOTED	TAXES				Remarks
							ED %	CST %	VAT %	S. TAX%	
1	S-130	PS0679069321	Concrete pedestal 250X250X160(h)mm	11580	NO	YES/NO	NA			NA	Taxes Included
2	S-150	PS0679069348	4 sq.mm Cu, XLPO, FRLS,	14500	M	YES/NO	NA			NA	Taxes Included
3	S-160	PS0679069356	3C X 35sqmm Al, XLPE, armoured cable	1600	M	YES/NO	NA			NA	Taxes Included
4	S-170	PS0679069364	1.1kV, 3CX185 sq.mm Al, XLPE armoured	80	M	YES/NO	NA			NA	Taxes Included
5	S-180	PS0679069380	1.1kV, 3CX300 sq.mm Al, XLPE armoured	60	M	YES/NO	NA			NA	Taxes Included
6	S-190	PS0679069399	1.1kV, 3CX400 sq.mm Al, XLPE armoured	850	M	YES/NO	NA			NA	Taxes Included
7	S-200	PS0679069402	1.1kV, 3CX500 sq.mm Al, XLPE armoured	160	M	YES/NO	NA			NA	Taxes Included
8	S-210	PS0679069410	11KV 3Cx185Sqmm Al, XLPE (E) armoured	60	M	YES/NO	NA			NA	Taxes Included
9	S-220	PS0679069690	ACCB 4 In 1 Out	1	NO	YES/NO	NA			NA	Taxes Included
10	S-230	PS0679069429	ACCB 5 In 1 Out	1	NO	YES/NO	NA			NA	Taxes Included
11	S-240	PS0679069437	ACCB 7 In 1 Out	4	NO	YES/NO	NA			NA	Taxes Included
12	S-260	PS0679069453	Transformer 700KVA ONAN 11KV/415V Dyn11	1	NO	YES/NO	NA			NA	Taxes Included
13	S-270	PS0679069461	Transformer 1100KVA ONAN 11KV/415V Dyn11	1	NO	YES/NO	NA			NA	Taxes Included
14	S-280	PS0679069470	HT panel 11KV, 1In 1 Out, outdoor, VCB	2	NO	YES/NO	NA			NA	Taxes Included
15	S-290	PS0679069488	Weather proof Male & Female Snap-on	650	ST	YES/NO	NA			NA	Taxes Included
16	S-300	PS0679069496	Cable tray 100mm(W)X50mm(H)X2mm(T)	2800	M	YES/NO	NA			NA	Taxes Included
17	S-310	PS0679069500	Copper globe type LA	18	NO	YES/NO	NA			NA	Taxes Included
18	S-320	PS0679069518	Chemical earthing Material - Electrodesal	1	ST	YES/NO	NA			NA	Taxes Included
19	S-330	PS0679069658	Switchyard Fence & Lighting	1	ST	YES/NO	NA			NA	Taxes Included
20	S-340	PS0679069534	25X3 mm GI strip for structure earthing	3650	M	YES/NO	NA			NA	Taxes Included
21	S-350	PS0679069542	25 X 6 mm GI strip for Equip earthing	1600	M	YES/NO	NA			NA	Taxes Included
22	S-360	PS0679069550	50 X 6 mm GI strip for Switchyard Equip	200	M	YES/NO	NA			NA	Taxes Included
23	S-370	PS0679069569	Tools & Equipments	2	ST	YES/NO	NA			NA	Taxes Included
24	S-380	PS0679069666	Data & Communication Accessories	1	ST	YES/NO	NA			NA	Taxes Included
25	S-390	PS0679069585	Fire Fighting anc Safety Equipment	1	ST	YES/NO	NA			NA	Taxes Included
26	S-400	PS0679069674	Module Cleaning System	1	ST	YES/NO	NA			NA	Taxes Included
27	S-410	PS0679069607	Weather Monitoring Station (WMS)	10	ST	YES/NO	NA			NA	Taxes Included
28	S-420	PS0679069615	Data Management and Monitoring Devices	1	ST	YES/NO	NA			NA	Taxes Included
29	S-430	PS0679069682	Miscellaneous Supply items	1	ST	YES/NO	NA			NA	Taxes Included
30	S-440	PS0679069704	Spares	1	ST	YES/NO	NA			NA	Taxes Included
31	S-450	PS0679069330	NITO Bond Epoxy Bonding agent	400	L	YES/NO	NA			NA	Taxes Included
32	S-460	PS0679070141	LTPDB 3IN 1Out with MFM	2	NO	YES/NO	NA			NA	Taxes Included
33	I-10	PS0679069623	Unloading, storing, shifting, I&C	1	AU	YES/NO	NA	NA	NA		Taxes Included
34	I-20	PS0679069631	Unloading, storing, shifting, I&C of	1	AU	YES/NO	NA	NA	NA		Taxes Included
35	O-30	PS0679069640	AMC for 10 Years	40	AU	YES/NO	NA	NA	NA		Taxes Included
36		Freight Charge including Service Tax on Freight: Included in Quoted rates									

Note:

1. The quoted prices shall be on "FOR" basis to project site: **SMC, SURAT, GUJARAT**
2. The quoted prices shall be inclusive of all Taxes & Duties, Packing & Forwarding charges and Freight.
3. However, the percentage of taxes considered against each item shall be indicated in the column for Taxes for the purpose of availing Tax Credit.
4. **ED shall not be considered as the project is under MNRE approval. Hence all inclusive rate for Supply is to be quoted without ED for Supply. However, the prevailing rate of ED shall be indicated in SCC (Annexure B). In case any item is rejected by MNRE, ED shall be reimbursed for that item at actuals.
5. The above format only shall be used for compliance. (reproducing on your letter head is acceptable).
6. Insurance will be in BHEL scope.

AUTHORISED SIGNATORY WITH SEAL

TECHNICAL BID ENCLOSURE FOR COMPLIANCE OF QUOTE : UNPRICED BID (Indigenous Vendors)												
RFQ No. UPK0000989												
Sl. No.	Ref. No.	Material Code	DESCRIPTION	QTY	UNIT	Unit Rate (Rs.)	Total Value (Rs.) (Unit Rate x Qty)	TAXES				Remarks
								ED %	CST %	VAT %	S. TAX%	
1	S-130	PS0679069321	Concrete pedestal 250X250X160(h)mm	11,580	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
2	S-150	PS0679069348	4 sq.mm Cu, XLPO, FRLS,	14,500	M			NA			NA	Taxes Included
	Unit Rate in Words:											
3	S-160	PS0679069356	3C X 35sqmm Al, XLPE, armoured cable	1,600	M			NA			NA	Taxes Included
	Unit Rate in Words:											
4	S-170	PS0679069364	1.1kv, 3CX185 sq.mm Al, XLPE armoured	80	M			NA			NA	Taxes Included
	Unit Rate in Words:											
5	S-180	PS0679069380	1.1kv, 3CX300 sq.mm Al, XLPE armoured	60	M			NA			NA	Taxes Included
	Unit Rate in Words:											
6	S-190	PS0679069399	1.1kv, 3CX400 sq.mm Al, XLPE armoured	850	M			NA			NA	Taxes Included
	Unit Rate in Words:											
7	S-200	PS0679069402	1.1kv, 3CX500 sq.mm Al, XLPE armoured	160	M			NA			NA	Taxes Included
	Unit Rate in Words:											
8	S-210	PS0679069410	11KV 3Cx185Sqmm Al, XLPE (E) armoured	60	M			NA			NA	Taxes Included
	Unit Rate in Words:											
9	S-220	PS0679069690	ACCB 4 In 1 Out	1	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
10	S-230	PS0679069429	ACCB 5 In 1 Out	1	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
11	S-240	PS0679069437	ACCB 7 In 1 Out	4	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
12	S-260	PS0679069453	Transformer 700KVA ONAN 11KV/415V Dyn11	1	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
13	S-270	PS0679069461	Transformer 1100KVA ONAN 11KV/415V Dyn11	1	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
14	S-280	PS0679069470	HT panel 11KV, 1In 1 Out, outdoor, VCB	2	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
15	S-290	PS0679069488	Weather proof Male & Female Snap-on	650	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
16	S-300	PS0679069496	Cable tray 100mm(W)X50mm(H)X2mm(T)	2,800	M			NA			NA	Taxes Included
	Unit Rate in Words:											
17	S-310	PS0679069500	Copper globe type LA	18	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
18	S-320	PS0679069518	Chemical earthing Material - Electrodesal	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
19	S-330	PS0679069558	Switchyard Fence & Lighting	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
20	S-340	PS0679069534	25X3 mm GI strip for structure earthing	3,650	M			NA			NA	Taxes Included
	Unit Rate in Words:											
21	S-350	PS0679069542	25 X 6 mm GI strip for Equip earthing	1,600	M			NA			NA	Taxes Included
	Unit Rate in Words:											
22	S-360	PS0679069550	50 X 6 mm GI strip for Switchyard Equip	200	M			NA			NA	Taxes Included
	Unit Rate in Words:											
23	S-370	PS0679069569	Tools & Equipments	2	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
24	S-380	PS0679069666	Data & Communication Accessories	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
25	S-390	PS0679069585	Fire Fighting anc Safety Equipment	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
26	S-400	PS0679069674	Module Cleaning System	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
27	S-410	PS0679069607	Weather Monitoring Station (WMS)	10	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
28	S-420	PS0679069615	Data Management and Monitoring Devices	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
29	S-430	PS0679069682	Miscellaneous Supply items	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
30	S-440	PS0679069704	Spares	1	ST			NA			NA	Taxes Included
	Unit Rate in Words:											
31	S-450	PS0679069330	NITO Bond Epoxy Bonding agent	400	L			NA			NA	Taxes Included
	Unit Rate in Words:											
32	S-460	PS0679070141	LTPDB 3IN 1Out with MFM	2	NO			NA			NA	Taxes Included
	Unit Rate in Words:											
33	I-10	PS0679069623	Unloading, storing, shifting, I&C	1	AU			NA	NA	NA		Taxes Included
	Unit Rate in Words:											
34	I-20	PS0679069631	Unloading, storing, shifting, I&C of	1	AU			NA	NA	NA		Taxes Included
	Unit Rate in Words:											
35	O-30	PS0679069640	AMC for 10 Years	40	AU			NA	NA	NA		Taxes Included
	Unit Rate in Words:											
36	Freight Charge including Service Tax on Freight: Included in Quoted rates											

Note:

- The quoted prices shall be on "FOR" basis to project site: **SMC, SURAT, GUJARAT**
- The quoted prices shall be inclusive of all Taxes & Duties, Packing & Forwarding charges and Freight.
- However, the percentage of taxes considered against each item shall be indicated in the column for Taxes for the purpose of availing Tax Credit.
- **ED shall not be considered as the project is under MNRE approval. Hence all inclusive rate for Supply is to be quoted without ED for Supply. However, the prevailing rate of ED shall be indicated in SCC (Annexure B). In case any item is rejected by MNRE, ED shall be reimbursed for that item at actuals.
- The above format only shall be used for compliance. (reproducing on your letter head is acceptable).
- Insurance will be in BHEL scope.

AUTHORISED SIGNATORY WITH SEA

ANNEXURE - C

List of Documents to be submitted by Vendors/Subcontractors for SPV Contracts.		Confirmation on submission	Deviation / Remarks
IR Documents (Type - A): For all Civil & I&C & O&M			
Sl No.	Documents		
1	Wage Sheet (Form 17)	YES / NO	
2	Attendance Register (w.r.t Sl No.1)	YES / NO	
3	Workman Policy & Additional Insurance (Automotive Liability, Group Servis Insuarance Policy e	YES / NO	
4	PF Challan	YES / NO	
5	ESI (Employee State Insurance)	YES / NO	
6	ECR (Electronic Challan Receipt)	YES / NO	
7	Bank Statement for PF deposit	YES / NO	
8	RCS (Remittance Confirmation Slip)	YES / NO	
Quality Documents (Type - B): For all MMS Civil Works			
Sl No.	Documents		
1	FQA (Field Quality Assuarance)	NA	
2	Field Content, Slump Test	NA	
3	Gradation of Aggregate (10mm, 20mm)	NA	
4	Fine Aggregate Test (for Sand)	NA	
5	Cube Test Registered	NA	
6	Material Test Certificate for Steel & Cement	NA	
7	Consumption Register for Steel & Invoice	NA	
8	Pour Card for Concreting purpose	NA	
9	Royalty Reports (10mm, 20mm, Sand)	NA	
10	Sand Soundess Test Reports	NA	
11	Slump Test Register	NA	
12	Sieve Analysis, Flakiness Index, Elongation Index - Register to be maintained	NA	
13	Moisture Content Coarse and Fine Aggregate - Register to be maintained	NA	
14	Water Test Report for Concrete	NA	
15	Design Mix Report for Concrete	NA	
Quality Documents (Type - B): For all Civil related Works			
Sl No.	Documents		
1	FQA (Field Quality Assuarance)	YES / NO	
2	Field Content, Slump Test	YES / NO	
3	Gradation of Aggregate (10mm, 20mm)	YES / NO	
4	Fine Aggregate Test (for Sand)	YES / NO	
5	Cube Test Registered	YES / NO	
6	Material Test Certificate for Steel & Cement	YES / NO	
7	Consumption Register for Steel & Invoice	YES / NO	
8	Pour Card for Concreting purpose	YES / NO	
9	Royalty Reports (10mm, 20mm, Sand)	YES / NO	
10	Sand Soundess Test Reports	YES / NO	
11	Warpage of Bricks Test Reports	YES / NO	
12	Core Cutting (Compaction Test) - Roads & Pathways	YES / NO	
13	Slump Test Register	YES / NO	
14	Sieve Analysis, Flakiness Index, Elongation Index - Register to be maintained	YES / NO	
15	Moisture Content Coarse and Fine Aggregate - Register to be maintained*	YES / NO	
16	Brick Test Reports	YES / NO	
17	Plastering profile and thickness	YES / NO	
18	Compaction test beneath floor of all buildings. - Reports	YES / NO	
19	Test Certificates for Paint, Glan, Glazing, etc.	YES / NO	
20	Test Certificates Aluminium Section for doors and windows (Anodisation Certificates also)	YES / NO	
21	BBS for Buildings	YES / NO	
22	Water Test Report for Concrete	YES / NO	
23	Design Mix Report for Concrete	YES / NO	
Quality Documents: for Electrical & Mechanical Installation Works (BOS)			
Sl No.	Documents		
1	FQA (Field Quality Assuarance)	YES / NO	
2	Inspection Reports	YES / NO	
3	Guarantee Certificates	YES / NO	
4	Factory Acceptance Test Reports	YES / NO	
5	Commissioning Reports	YES / NO	

NOTE:

* This list of documents is indicative and intended towards all Solar Projects.

* Apart from the above, any other document required by the Customer and which are mandatory for Billing by BHEL to the Customer, the same needs to be provided by the respective vendors.