



TENDER FOR

**“RELATED WORK OF ENHANCEMENT OF POWER SYSTEM
NEAR SUBSTATION AREA” AT HARISH-CHANDRA
RESEARCH INSTITUTE, CHHATNAG ROAD,
JHUNSI, ALLAHABAD -211 019”**

PART- 1 (TECHNICAL BID)

TENDER NOTICE NO. HRI/01/2017

Harish-Chandra Research Institute

Chhatnag Road, Jhunsi, Allahabad

INVITING TENDER FOR

**“RELATED WORK OF ENHANCEMENT OF POWER SYSTEM NEAR SUBSTATION AREA”
AT HARISH-CHANDRA RESEARCH INSTITUTE, ALLAHABAD**

Bid Reference No. : NIT– HRI/01/2017
Last date and time for submission of bids : 17.03.2017 up-to 1500 Hrs.
Date and time of opening of Bid : 17.03.2017 up-to 1530 Hrs.
Place of Opening of Bids : Harish-Chandra Research Institute
Chhatnag Road, Jhunsi, Allahabad-
211019

The dates for submission and opening of the tender mentioned above are final. In case some other dates for these are mentioned elsewhere in the tender document, the above shall prevail over them.

Address for any clarification/communication : Mr. Ajay Srivastava SO-C,
0532-2274332,
ajay@hri.res.in),
Mr. Manish Sharma SO-D,
0532-227 4358,
manish@hri.res.in)

ENGINEERING SECTION,
HARISH-CHANDRA RESEARCH
INSTITUTE, ALLAHABAD

This document contains : 45 Pages

It will be the responsibility of the bidders to check website www.hri.res.in for any amendment through corrigendum in the tender document. In case of any amendment, bidders will have to incorporate the amendments in their bid accordingly.

Sd/-
Seal & Signature of Registrar

Harish-Chandra Research Institute
Chhatnag Road, Jhunsi, Allahabad

Name of work: “Related work of enhancement of power system near Substation area” at Harish-Chandra Research Institute, Allahabad

Tender Notice No.: HRI/01/2017

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Harish-Chandra Research Institute

Chhatnag Road, Jhunsi, Allahabad

Check list

<i>Sl. No.</i>	<i>Description</i>	<i>Party has to specify whether they have submitted the relevant details with their technical bid in YES or NO</i>
1.	Proof of valid 'A' class Electrical license....(Ref. point no. 6a of terms & conditions)	
2.	Latest solvency certificate(Ref. point no. 6b of terms & conditions)	
3.	Proof of average annual turnover(Ref. point no. 6c of terms & conditions)	
4.	Experience of having successfully completed works(Ref. point no. 6d of terms & conditions)	
5.	Attested copy of PAN, TIN & Service Tax registration(Ref. point no. 6f & 8 of terms & conditions)	
6.	Earnest Money Deposit of Rs. 62,000/-(Ref. point no. 14 of terms & conditions)	

Signature of the tenderer
Address & Seal

SECTION - I

NOTICE INVITING TENDERS

HARISH-CHANDRA RESEARCH INSTITUTE
CHHATNAG, ROAD, JHUNSI, ALLAHABAD – 211 019

TENDER NOTICE NO. HRI/01/2017

On behalf of the Director, Harish-Chandra Research Institute, sealed tenders are invited (**in Two bids**) from eligible ‘A’ Class approved **Electrical License** contractors up to **3.00 p.m.** on **17.03.2017** and only technical bid shall be opened at **3.30 p.m.** on the same day for the work of “**Related work of enhancement of power system near substation area**” at Harish-Chandra Research Institute, Allahabad.

Estimated Cost	EMD	Performance Security	Security Deposit	Time of Completion	Tender Cost
Rs. 31.00 lakh	Rs. 62,000/-	@ 5% of tendered amount as per the tender condition	@ 5% of tendered amount as per the tender condition	04 months	Rs. 520/

Interested parties may collect the Tender documents from the Accounts Officer, HRI on recommendation of Engineer, HRI on payment of tender cost (non Refundable) in cash from **15.02.2017** to **16.03.2017** during working days (11.00 a.m. to 4.00 p.m.).

The party may also download the tender document from HRI web-site address: www.hri.res.in
In that case they have to submit a Demand draft of the tender cost alongwith the technical bid of the tender. Without tender cost, tender will not be considered.

Director, HRI reserves the right to accept or reject any or all the Tenders without assigning any reason.

Sd/-
Registrar
HRI, Allahabad.

SECTION - II

TERMS & CONDITIONS

“Related work of enhancement of power system near Substation area” at Harish-Chandra Research Institute, Allahabad

TERMS & CONDITIONS

Following instructions should be strictly followed while submitting your tender.

1. Your offer should valid for a period of **120 days** from the date of opening of technical bid.
2. **Price quoted by you should be Net (Inclusive all the Taxes) & remain firm throughout the period of contract.**
3. Please note that your tender will not be considered unless it is received in sealed envelope super scribed with tender number and due date. It should be put in the Tender Box kept at Reception of Institute building, Harish-Chandra Research Institute at Chhatnag Road, Jhunsi, Allahabad – 211 019. It should be noted that the delay of receiving of tender by Post will not be entertained.
4. Deadline for receipt of tenders (Part-1 & Part-2) is **3.00 p.m.** on or before **17.03.2017**. Late submission will not be entertained on any account. Part-1 (Technical bid) and part-2 (Price bid) will be in two separate envelop.
5. The Part-I of tender will be opened at the above office at **3.30 p.m.** on **17.03.2017** and your authorized representatives can be present at the time when the tenders are so opened and opening time of Part-2 (Price Bid) will be intimated later on to qualified bidder of Part-1 only. If on the day of opening of tender, holiday is declared in HRI then tender will be opened on next working day at same time.
6. Tenderer has to submit the following with the technical bid.
 - a. Proof of valid ‘A’ class Electrical license.
 - b. Latest solvency certificate of minimum Rs. 12.0 lakh from any scheduled bank.
 - c. Proof of average annual turnover of not less than Rs. 31.0 lakh during last three years ending 31.03.2016
 - (i) Year 2013-2014
 - (ii) Year 2014-2015
 - (iii) Year 2015-2016
 - d. Experience of having successfully completed works during last seven years ending 31.01.2017. The party has to submit work order copy, Performance and completion certificate of the concerned work. Without required experience party will not be considered in this tender:
 - 3 similar works completed costing not less than Rs. 12.0 lakh each OR
 - 2 similar works completed costing not less than Rs. 19.0 lakh each OR
 - 1 similar works completed costing not less than Rs. 25.0 lakhSimilar work shall mean: Electrical work. The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of application for tenders.

and

One completed similar work (either part of (c) or a separate one) costing not less than Rs. 12.0 lakh with some Central/State Government Organization/Central Autonomous Body/Central Public Sector undertaking during last seven years ending 31.01.2017.
 - e. Full address of firm along with /Telephone no./Fax no./E-mail address :
 - f. Attested copy of PAN, TIN of the Firm
7. Tender containing erasures or alterations will not be considered.
8. The party should be registered under Service tax. They have to submit a proof of Registration with their technical bid otherwise they will not be considered in this tender.

9. If bidder do not quote rate of any item under schedule of quantities or left the rate column blank then their bid will be treated as unresponsive & not be considered.
10. The tender must be signed by the authorized persons only (Proprietor/Power of attorney/By all partners etc. as applicable).
11. All labour regulation applicable by the central Labour Commissioner of Govt. of India shall be adhered to strictly.
12. The completion period of work is 04 month and will be considered from 7 days of issue of work order.
13. **In case the contractor leaves the work or shows unwillingness to do work within stipulated contract period then EMD, Performance security & Security money deposited by party will be forfeited to HRI.**
14. A deposit at call Receipt or Demand Draft/FDR of scheduled Bank guaranteed by the Reserve Bank of India for the **Earnest Money Deposit of Rs. 62,000/-** in favour of Registrar, HRI, Allahabad is to be enclosed with the Tender Document (part-1) at the time of submission. No exemption in earnest money shall be given. All tenders submitted without requisite amount of earnest money shall be rejected.
15. An amount equal to 5% of tendered value towards Security Deposit shall be recovered. This amount will be recovered @ 10% from your each bill till the amount deducted is equal to concerned security deposit amount. The security money will be returned after 12 months from the date of completion of work and submission of certificate by contractor that there is no statutory liability (taxes etc.) due on him for this work. In addition the contractor shall be required to deposit an amount equal to 5% of the tendered value of the contract as performance security within the period prescribed for commencement of the work in the letter of award issued to contractor and will be released alongwith the final bill.
16. The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor. The work shall throughout the stipulated period of the contract be proceeded with all due diligence. For delay in work, the contractor shall pay a compensation an amount equal to 0.25 percent of the order value per week from the end of stipulated period or (extended the period if any) of contract till the actual completion of work. The penalty so impose should not be more than 10% value of order. If it is found that party is not taking interest during delay period for completing the work then competent authority of Institute may also take decision for terminating the order/contract of concerned work. In this case, their Performance security and any other Security money may also be forfeited.
17. Contractor has to make their own arrangement for supply of water at their site. If contractor use Institute's water for their work then 0.5% of work order value will deducted from their bill. However, necessary arrangement for supply of water at their site from source of water supply will be done by contractor separately. Similarly if power of Institute is taken by contractor then an electricity meter will be installed and charges for electricity consumed will be recovered as per UPPCL tariff for Institute will be deducted from their bill.
18. The schedule of quantity is indicative are tentative. Actual quantity will vary based on the actual requirement.
19. Contractor has to make their own arrangement for staying their labourers as Institute will not allow any labourers inside the campus after working period.
20. The financial bid will be opened only of the qualified bidder under technical bids. The selection criteria under financial bid will be based on lowest total quoted amount of the party. However Director, HRI may change this clause on special condition with justified reason.

21. **Payment terms:** Payment will be made as per following:
 - a) 75% against the imperishable material received at site, valued at item rates given in ‘Schedule of Quantities’ attached.
 - b) Balance as per monthly running bills subject to proportionate adjustment of advance for materials as at (a) above and maximum limit of 95% of work order value.
 - c) Remaining 5% after completion of work duly certified by the competent authority on submission of final bill subject to deductions on account of taxes, security deposits etc.
 - d) TDS and VAT will be deducted from their due payment for which certificate will be issued to contractor. If any other statutory taxes are deducted from payment then concerned certificate will also be issued to party.
22. **In case any discrepancy between terms & conditions and General condition of tender then terms & condition of tender shall take precedence.**
23. Party has to ensure gate entry (at Security gate, HRI) for any material before bringing at site. In this connection, they have to submit challan copy of materials in Engineering office at HRI for records.
24. Don’t detach any paper from the tender document and put the signature & seal at all the papers of the tender document.
25. For any information/clarification in this tender, you may contact Engineering Section, HARISH-CHANDRA RESEARCH INSTITUTE, during office hrs. (9.00 a.m. to 5.30 p.m.) on any working days.
26. Decision of the Director of the Institute will be final & binding for all concerned.
27. Director, Harish-Chandra Research Institute reserves the right to reject any or all tenders without assigning any reason whatsoever. Harish-Chandra Research Institute would not be under any obligation to give any clarifications to those contractors whose tenders are rejected.
28. All disputes will be subject to Allahabad jurisdiction.

Note: The contractor should acknowledge that he has satisfied himself as to the nature and location of the work before submitting the tender. They should also acknowledge that they are quoting their rate properly after knowing all terms & conditions of tender.

DECLARATION BY THE CONTRACTOR

It is hereby declared that I/We the undersigned, have read and examined all the terms and conditions etc. of the tender document for which I/We have signed and submitted the tender under proper lawful Power of Attorney. It is also certified that all the terms and conditions of the tender document are fully acceptable to me/us and I/We will abide by the conditions from serial no. 1 to 28. This is also certified that I/We/our principal manufacturing firms have no objection in signing the contract if the opportunity for the items against this tender is given to me/us.

Date:

Signature:

Address:

Name:

Designation:

On behalf of company Seal:

SECTION - III

GENERAL RULES AND DIRECTIONS

GENERAL RULES AND DIRECTIONS

1. In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power-of attorney authorising him to do so, such power of attorney to be produced with the tender and it must disclose that the firm is duly registered under the Indian Partnership Act.
2. Receipts for payments made on account of work when executed by a firm must also be signed by the several partners except where the contractors are described in their tender as a firm in which case the receipts must be signed in the name of the partners or by some other person having authority to give effectual receipts for the firm.
3. Any person who submits a tender shall fill up the usual printed form, stating at what rate he is willing to undertake each item of the work. Tenders, which propose any alteration in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other condition of any sort including conditional rebates, will be summarily rejected. However, tenders with unconditional rebates(s) will be acceptable. Tenders shall have the name and of the works to which they refer, written on the envelopes.
4. The officer inviting tenders shall have the right of rejecting all or any of the tenders and will not be bound to accept the lowest tender.
5. If it is found that the tender is not submitted in proper manner or contains too much corrections and/or absurd rates or amount, it would be open for the officer inviting tenders to take suitable disciplinary action against the contractor. The tenderers shall sign a declaration under the official Secret Act for maintaining secrecy of the tender documents, drawings or any other records connected with the work given to them. The unsuccessful tenderers shall return all the drawings given to them.

CLAUSES OF CONTRACT

CLAUSE 1: PERFORMANCE GUARANTEE

- i The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and/or without prejudice to any other provisions in the contract) within 15 days of issue of letter of intent and / or work order. This period can be further extended by the Engineer-in-charge upto a maximum period of 7 days on written request of the contractor stating the reason for delays in procuring the bank Guarantee, to the satisfaction of the Engineer-in-charge. This guarantee shall be in the form of Government Securities or fixed deposit receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the HRI to make good the deficit.
- ii A letter of intent shall be issued in the first instance informing the successful tenderer of the decision of the competent authority to accept his tender and the award letter shall be issued only after the performance Guarantee in any of the prescribed form is received. In case of failure by the contractor to furnish the performance guarantee within the specified period. Director, HRI shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money absolutely.

- iii The performance Guarantee shall be initially valid upto the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest.

CLAUSE 1-A: RECOVERY OF SECURITY DEPOSIT

The person (s) whose tender(s) may be accepted (hereinafter called the contractor) shall permit HRI at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 10% of the gross amount to each running bill till the sum alongwith the sum already deposited as earnest money, will amount to security deposit of 5% of the tendered value of the work. Such deductions will be made and held by HRI by way of Security Deposit unless he has / they have deposited the amount of Security at the rate mentioned above in cash or in the form of Government Securities or fixed Deposit Receipts. In case a fixed deposit receipt of any bank is furnished by the contractor to the Government as part of the security deposit and the bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the to the HRI to make good the deficit.

All compensation or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from or from any sums which may be due to or may become due to the contractor by HRI or any account whatsoever and in the events of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or flexed deposit receipt tendered by the state Bank of India or by scheduled banks or Government Securities (if deposited for more than 12 months) endorsed in favour the Accounts Officer, HRI any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof. The security deposit shall be collected from the running bills of the contractor at the rates mentioned above and the Earnest money if deposited in cash at the time of tenders will be treated a part of the Security Deposit.

CLAUSE 2: COMPENSATION FOR DELAY AND BUFFER PERIOD:

The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor. The work shall throughout the stipulated period of the contract be proceeded with all due diligence. For delay in work, the contractor shall pay a compensation an amount equal to 0.25 percent of the order value per week from the end of stipulated period or (extended the period if any) of contract till the actual completion of work. If it is found that party is not taking interest during delay period for completing the work then competent authority of Institute may also take decision for terminating the order/contract of concerned work. In this case, their Performance security and any other Security money may also be forfeited.

BUFFER PERIOD:

Compensation will be recovered from the contractor if the work is not completed within 10 days after due date of completion. The buffer period of 10 days relates to only to the final completion of the work as whole and does not apply to the interim schedule of progress. In the event of the work being completed beyond the period of 10 days after the date of completion specified in the tender, the entire period inclusive of the buffer period shall be taken into account for calculating the amount of compensation.

CLAUSE-3: DETERMINATION OF CONTRACT: POWERS OF ENGINEERS –IN-CHARGE.

Subject to other provisions contained in this clause, the Engineer-in-charge may, without prejudice to his any other right or remedy against the contractor in respect of any delay, inferior workmanship, otherwise or to any rights or remedies under any of the provisions of this contract or otherwise and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

- i. If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in any inefficient or otherwise improper or un-workman-like manner shall omit to comply with the requirements of such notice for a period of seven days thereafter or if the contractor shall delay or suspend the execution of the work so that either in the judgment of the Engineer-in-charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion or he has already failed to complete the work by that date.
- ii. If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or creditor to appoint a receiver or a manager or which entitle the court to make a winding up order.
- iii. If the contractor commits breach of any of the terms and conditions of this contract.
- iv. If the contractor commits any acts mentioned in Clause 2 hereof.

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the Director, HRI have powers:

- a. To determine or rescind the contract as aforesaid (of which termination or rescission notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination or rescission, the Earnest Money Deposit, the Security Deposit already recovered and Performance Guarantee under the contract, shall be liable to be forfeited, and shall be absolutely at the disposal of the HRI.
- b. To employee labour paid by the HRI and to supply materials to carry out the work or any part of the work debiting the contractor with the cost of the labour and the price of the materials (of the amount of which cost and price certified by the Engineer-in-charge shall be final and conclusive against the contractor) and crediting him with the value of the work done in all respect in the same manner and at the same rates as if it has been carried out by the contractor under the terms of his contract. The certificate of the Engineer-in-Charge as to the value of the work done shall be final and conclusive against the contractor, provided always that action under the sub-clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the Department are less than the amount payable to the contractor at his agreement rates, the difference should not be paid to the contractor.
- c. After giving notice to the contractor to measure up the work of the contractor and to take such part thereof as shall be unexecuted out of his hands and to give it to another contract to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor if the whole work had been executed by him (of the amount of which excess the certificate in writing of the Engineer-in-Charge shall be final and conclusive) shall be borne and paid by the original contractor and may be deducted from any money due to him by HRI under this contract or on any other account whatsoever or from his security deposit or the proceeds of sales thereof or a sufficient part thereof as the case may be.

In the event of any one or more of the above courses being adopted by the Engineer-in-charges the contractor shall have no claim to compensation for any loss sustained by him reason of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And incase action is taken under any of the provisions aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereto for actually performed under this contract unless and until the Engineer-in-charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE 3A: In case the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work, either party may close the contract. In such eventuality, the Earnest Money Deposit and the Performance Guarantee of the contractor shall be refunded, but no payment on account of interest, loss of profit or damages etc. shall be payable at all.

CLAUSE 4: Contractor liable to pay compensation even if action not taken under Clause 3:

In any case in which any of the powers conferred upon the Engineer-in-Charge by clause 3 thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of or (at sole discretion of the Engineer-in-Charge which shall be final) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge all or any tools, plant, materials and stores, in or upon the works, or the site thereof, belonging to the contractor, or allowing for the same in account at the contract rates, or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-charge whose certificate thereof shall be final, otherwise the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificates of the Engineer-in-Charge as to the expense of any such removal and the amount of the proceeds and expense of any such sale shall be final and conclusive against the contractor.

CLAUSE 5: TIME EXTENSION AND FOR DELAY:

The time allowed for execution of the works as stipulated in the NIT / Tender documents, or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in letter of acceptance or from the date of handing over of the site whichever is later. If the contractor commits default in commencing the execution of the work as aforesaid, HRI shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money performance guarantee absolutely.

5.1 As soon as possible after the contract is concluded the Contractor shall submit a Time and Progress Chart for each mile stone and get it approved by the Department. The Chart shall be prepared in direct relation to the time stated in the contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge an the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones mutually agreed as above.

5.2 If the works (s) be delayed by:

- (i) Force majeure, or
- (ii) Abnormally bad weather, or
- (iii) Serious loss or damage by fire, or
- (iv) Civil commotion, local commotion of workmen, strike or lock out, affecting any of the trades employed on the work, or
- (v) Delay on the part of other contractors or tradesmen engaged by Engineer-in-Charge in executing work not forming part of the Contract, or
- (vi) Non availability or break down of tools and plant to be supplied or supplied by HRI or
- (vii) Non-availability or break down of tools and plant to be supplied or supplied by HRI or
- (viii) Any other cause which, in the absolute discretion of the Engineer-in-Charge is beyond the Contractor's control.

Then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

5.3 Request for rescheduling of Mile stones and extension of time, to be eligible for consideration, shall be made by the contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired.

In any such case the Engineer-in- Charge may give a fair and reasonable extension of time and reschedule the mile stones for completion of work. Such extension shall be communicated to the Contractor by the Engineer-in-Charge in writing, within 3 months of the date of receipt of such request. Non application by the contractor for extension of time shall not be a bar for giving a fair and reasonable extension by the engineer-in-Charge and this shall be binding on the contractor.

CLAUSE 6: COMPLETION CERTIFICATE & COMPLETION PLANS.

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge. On the receipt of such notice the Engineer-in-Charge shall inspect the work, and if there is no defect in the work shall furnish the contractor with a certificate of completion otherwise a provisional certificate of completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued but no certificate of completion, provisional or otherwise, shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed, all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements, required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows walls, floors or other parts of any building, in upon or about which the work is to be executed or of which he may have had possession for the purpose of the execution thereof, and not until the work shall have been measured by the Engineer-in-charge. If the contractor shall fail to comply with the requirements of this clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of the work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish, etc, and dispose off the same as he thinks fit and clean off such dirt as aforesaid; and the contractor shall have no claim in respect of any such scaffolding or surplus material as aforesaid except for any sum actually realized by the sale thereof.

6. A: CONTRACTOR TO KEEP SITE CLEAN: When the work is carried out, the splashes and droppings from white washing, colour washing, painting etc. on wall, floors, doors, windows etc. shall be removed and the surface cleaned simultaneously with the completion of these item of work in the individual rooms, quarters or premises etc. where the work is done without waiting for the actual completion of all other items of work in contract. In case the contractor fails to comply with the requirements of this clause, the Engineer-in-Charge shall have the right to get this work done at the cost of the contractor either departmentally or through another agency. Before taking such action, the Engineer-in-Charge shall give two days notice in writing to the contractor.

CLAUSE 7: MEASUREMENTS OF WORK & SUBMISSION OF BILLS:

A bill shall be submitted by the contractor each month on or before the date fixed by the Engineer-in-Charge for all works executed in the previous months, and the Engineer-in-Charge shall take or cause to be taken the requisite measurement for the purpose of having the same verified and the claim, as far as admissible, adjusted as far as possible, before the expiry of ten days from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer-in-Charge may depute within 7 days of the date fixed as aforesaid, a subordinate to measure up the said work in the presence of the contractor whose countersignature to the measurement list will be sufficient warrant; and the Engineer-in-Charge at his discretion on the basis of a certificate from the Engineer to the effect that the work has been completed upto the level in question.

CLAUSE 7A: MEASUREMENT IN ABSENCE OF THE CONTRACTOR:

Before taking any measurement of any work as has been referred in above clause thereof, the Engineer-in-Charge or a subordinate deputed by him shall give reasonable notice to the contractor. If the contractor fails to attend at the measurements after such notice or fails to countersign or to record the difference within a week from the date of measurement in the manner required by the Engineer-in-Charge then in any such event the measurements taken by the Engineer-in-Charge or by subordinate deputed by the him as the case may be shall be final and binding on the contractor and the contractor shall have no right to dispute the same.

CAUSE 8: EXCAVATED /DISMANTLED MATERIALS WILL BE GOVT. PROPERTY: The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work etc. as HRI property and such materials shall be disposed off to the best advantage of HRI according to the instructions in writing issued by the Engineer-in-Charge.

CLAUSE 9: WORK TO BE EXECUTED AS PER SPECIFICATIONS, DRAWINGS, ORDERS, ETC:

The contractor shall execute the whole and every part of the work in the most substantial and otherwise in every respect in strict accordance with the specifications.

SECTION IV
TECHNICAL SPECIFICATION & GUIDE LINES

SPECIFIC REQUIREMENTS AND SCOPE OF WORK

1.0 Intent of Specification

2.0 Project Date

Purchaser	:	Harish Chandra Research Institute
Project site location	:	Jhunsi, Allahabad, UP.
Climatic conditions	:	The climate is very hot and very cold.
Ambient Air Temperature	:	Varying from 5 Deg. C to 50 Deg. C Depending upon season.

3.0 Storing Handling and Transport facilities at Site

The Contractor shall be responsible for storing, handling and transporting of all parts of equipment and material (unless otherwise specified) conversed in this contract including loading and unloading of material as required and specified in subsequent sections. Contractor shall make his own arrangement for storage of these material and equipment before and during execution.

4.0 Standards and Specifications

All materials and equipment should conform to latest IS specifications. Where IS a specification do not exist, the relevant BS/IEC specifications shall be applicable. Wherever supply is envisaged by the Contractor, only material of approved by the Engineer-in Charge before effecting the bulk supply/taking up the bulk fabrication. Wherever necessary, detailed drawings shall be prepared and got approved before purchase/execution of work.

5.0 Testing (Pre- dispatch in factory & After Installation at HRI)

All items will be inspected & tested at the manufacturer's works in presence of the Department Engineer. Sufficient advance intimation shall be given by the Contractor for this purpose. The Contractor shall carry out tests on different equipment as specified in the subsequent section to enable Engineer –in-Charge to determine whether the work complies with the specifications.

The Contractor shall arrange his own testing equipment required for the tests to be carried out at site as per test schedules/format enclosed to this specification on all the equipment. Approval from CEA shall be obtained by the Contractor before commissioning the system.

6.0 Time Schedule

Total time allowed for work will be 04 months as stipulated in the tender notice.

The Contractor will plan the various activities to ensure stage wise completion as per time schedule and as per the priorities to be decided by the Department.

7.0 Scope of work and Equipment Description

The items of work covered in the schedule of quantities are detailed here. The work shall be carried out meeting the requirements in this section and the general specifications in section VI and tested in accordance with the test schedule.

8.0 Supply, Installation, Testing and Commissioning of Misc. electrical panels equipments

The scope of work includes transporting and installing the Electrical panels equipments at suitable locations for distributing power to the various facilities as directed by the Engineer-in-Charge.

The Electrical panels shall be suitably identified. Danger boards shall be fixed on the Electrical panels and also outside the door.

9.0 Supply, installation, testing and commissioning of Cables

The contractor shall supply all the cables as per agreement/SOQ. He will install, lay, dress and clamp different sizes of all the 1100 Volts grade Aluminium/Copper conductor, PVC/XLPE insulated, power, control and jelly filled telephone armoured Cables.

Cable ends shall never be left open. 1.1 KV cables shall be sealed with heat shrinkable endcaps and other cables by other accepted means. All the cables, GI clamps and all necessary tools and materials for completing the cable laying work shall be supplied by the Contractor.

PVC bushes, cable identification tags and all other consumable items, tools, plants, etc. required for the satisfactory completion of the job shall be provided by the Contractor.

10.0 Installation of cables, in ground

The scope of work shall include transporting the cable from place of storage to the laying location, laying the cable in the excavated trench, covering with river sand and table moulded chamber bricks including supply of river sand and bricks, testing and commissioning.

All the MV power cables/telephone cables shall be laid at a depth of 750mm from ground level. The trench for MV cable shall have a depth of 825mm and sufficient width. In the excavated cable trench, river sand shall be filled up for 75mm height and the top levels of the river sand bed shall be 750 mm for MV cable. Before filling the river sand bed, the bottom of the trench should be carefully leveled and shall be free from stones, but if gradients and changes of depth are unavoidable, they should be gradual.

Cables shall be laid using suitable rollers and enough care shall be taken not to damage the cables. The cable shall be laid on the river sand bed, straightened and dressed neatly and covered on sides with standard table moulded brick. River sand will be filled up on sides and top of the cable (750 mm all around the cable). Then cable shall be covered with standard brick on all sides.

The cables shall be grouped and installed as per the drawing enclosed. Cable markers as approved by the Engineer-in-Charge shall be provided at location as directed by Engineer –in-Charge which will be measured separately. Each cable shall be laid separately and no cables to be combined in one compartment. Adjacent cables of same class can share a common side brick.

After the cables have been laid and before the trench is filled in, all joints and cable positions should be carefully plotted. The requisite protective covering will then be provided. The Excavated soil shall be refilled and it is advisable to leave a crown of earth not less than 50 mm in the centre and tapering towards the sides of the trench. This allows for subsidence. The Crown of earth should not exceed, however 0.1 Mtr. as it would then be hazardous to vehicular traffic.

11.0 Installation of cable in trench, on RCC pole, etc.

The scope of work includes transporting the cable from place of storage to the laying location, installing the cable in built up trench, on brick and RCC walls, on RCC poles, embedded pipes and supply of clamps and fixing materials.

In built up trenches, cables shall be installed on cable supports/ racks. Fabrication of cable racks/supports will be measured separately.

The cable shall be properly dressed and clamps and spacers shall be of hot Dipped Galvanised. Clamps shall be made out of 25 x 3 mm flats and spacers shall be 6 mm thick.

Wherever cable passes through hume pipes, after pulling the cables the pipe ends shall be sealed. Where the cable pass through the floor of chambers and in such other situation, the Contractor shall seal cable holes in a manner approved by engineer- in –charge.

12.0 MV power cable terminations

The medium voltage cables shall be terminated using tinned bras single compression glands and crimping type lugs. Supply of glands and lugs is included in the scope of termination work. Aluminium cables and copper lugs for copper cables shall only be used.

Necessary modifications shall be done in the glanding arrangement by way of provision of gland plate supports wherever necessary.

Glands shall be earthed with 14SWG tinned copper earth wire and earth clips of adequate size and thickness as approved by Engineer – in –Charge.

The rate quoted for end termination of medium voltage power cables shall include dressing the cable at the termination end, terminating the cable, conduit, earth clip, 14 SWG copper wire and other consumables required for termination end, terminating the cable and gland earthing as per this specification for work and the material specification.

13.0 Supply and Installation of Earthing conductor

The earthing conductor / flats /wire shall be installed in built trenches/wall, etc. or laid 1 Mtr. below ground. The scope of work includes excavation and back filling of soil, connections and providing GI spacers and clamps and the cost of supply, transportation and installation of materials like earth conductor/flats/wire, brass bolts, tinned copper crimping lugs for termination etc.

The conductors/flats/wire will connect the various equipment body to the earth pits. They will also interconnect the earth pits. Tinned copper crimping type terminals will be used for end terminations of ACSR conductors/wires. Straight jointing if required shall also be through crimping type tinned copper ferrules.

In case of flats all the joints shall be bolted type using bras bolts. All the materials required for jointing shall be provided by the Contractor. The jointing surface shall be tinned.

14.0 Supply, installation and termination of conduits & accessories

The scope of work shall include supply, transportation and installation of conduits along with all accessories like round junction boxes, bends, elbows, checknuts, nipples, reducers and couplings.

The contractor shall install MS conduit/sleeves through the brick walls in all the locations. as directed by engineer-in-charge at site.

Conduits shall first be installed as a complete system connected to all boxes without cables.

In order to minimize condensation or sweating inside, the conduit system shall be properly drained and ventilated in such a manner as to prevent the entry of insects.

Bends in conduit runs as far as possible shall be made with a conduit bending machine. The radius of inner side of any bend shall not be less than 75 mm and no length of conduit shall have more than the equivalent of four quarter bends from outlet to outlet, the bends at the outlet not being counted. Standard long solid bends are permitted.

For exposed installation conduits shall be clamped to 6mm thick GI spacers at 1000mm intervals. For concealed installation chipping RCC or brick surface and replastering for making good the surface shall be done by the Contractor.

The chases in the walls shall be neatly made and be of ample dimensions to permit the conduits to be fixed in the manner desired. The contractor shall get the chase filling up neatly after laying the conduit to be embedded in reinforcement before the concrete is poured.

The conduit pipe shall be black stove enamelled and heavy gauge as specified. Unless otherwise stated, 50 mm deep CI junction boxes shall be used for exposed conduiting.

Conduit junction boxes and other conduit accessories will not be measured separately but will be treated as included in the run of conduit.

All open ends of conduit shall be fixed with a conduit coupler and shall be plugged to prevent entry of concrete.

15.0 MS frame/supports

MS frame and supports shall be fabricated, painted and installed for cable racks, equipment supports, etc. wherever required. Suitable approved MS sections like channels, angles, flats, etc. shall be supplied by the contractor as approved by the contractor as approved by Engineer-in-Charge. All the materials shall be go good quality. Rerolled MS items should not be used.

The weight of the fabricated parts will be calculated from the dimensions and the standard weights of the sections. Weights of bolts nuts and other fasteners to be provided by the contractor will not be considered.

All fabricated parts shall be given one coat of red oxide paint and two coats of aircraft grey enamel paint or as approved by Engineer-in-Charge at site. Installation includes welding to the EPs available, chapping, chasing and grouting and fixing with anchor fasteners on RCC and brick surface including floor for frame embodiments, depending on the site condition.

Gas cutting of angles and flats are not recommended and in case this is employed, the sharp edges should be ground smooth. Electric arc welding only should be used for fabricating the supports. Tack welding is not allowed.

GI clamps and spacers required for clamping the cables, pipes, etc. form part of the respective items of the schedule and will not be measured under this item.

16.0 Supply and Installation of Class B GI Pipes

The GI pipe of suitable size and suitable length as instructed by the Engineer-in-Charge shall be fixed for protecting the cable with suitable GI spacers and clamps, bolts and nuts. The GI clamps shall be of 25x3 mm flat. Spacers will be 6mm thick.

Wherever the cable rises from ground through the wall, it shall be protected with GI pipe which will be embedded in the wall wherever feasible. One coat of red oxide primer and one coat of grey paint shall be applied to the GI pipes.

The rate quoted for supply and installation of class B GI pipe shall include transporting, cutting to the required size, fixing, embedding including chipping/chasing and replastering the surface, painting and supply of GI clamps, bolt and nuts, paint, and other fixing and finishing materials.

17.0 Supply installation, testing and commissioning of Terminal Boxes

Terminal boxes will be made out of 14 SWG MS sheet and embedded partly/fully in brick masonry.

18.0 APPLICABLE STANDARD

1. IS CODES

The switchboard as well as the equipment and components used shall comply with the latest amendments of the following relevant Standards:

Fuse switch units	:	IS 4064 (AC 23 duty)
Contactors	:	IS 2959, IEC 158-1, VDE 660 (AC duty)
Fuse fittings	:	2500 (AC duty)
Fuses	:	IS 1300
Rotary control switches	:	IS 4047 or IS 6875
Current transformers	:	IS 2705
Switchboard Assembly	:	IS 8623
Cubicle protection	:	IS 2147
Aluminium bus bars	:	IS 5082 (grade E 91E)
PVC insulated cable	:	IS 694
Meters (indicating instruments)	:	IS 1248
CEIG Regulations		

2 Circuit Breakers

a) Type	:	Trip free, Air break, horizontal isolation and horizontal draw out type with anti-pumping device.
b) Symmetrical breaking	:	50 KA RMS
c) Power factor at which CB shall interrupt specified symmetrical current and all values of associated asymmetrical current at 415V+10%	:	0.25
d) Operating duty	:	B-3 Mts-MB-3 Mts-MB
e) Making capacity	:	105 KA Peek
f) Number of poles	:	Four
g) Rated continuous current	:	1600A
h) Operations	:	Electrical
i) Protective devices	:	As per bill of material.
j) Operating mechanism	:	Spring charging motor type.

3. Bus Bars

- a) Material
 - i) Main and neutral bus bar : Aluminium
 - ii) Ground bus bar

b) <u>Bus Bar Size</u>		<u>Main bus</u>	<u>Dropper Bus</u>
i)	Phase. Panel MP	2500sq.mm.	Based on feeder rating 1A/sq.mm, min. 300sq.mm.
	Other Panels	1000 sq.mm.	Based on feeder rating 1A/sq.mm, min. 300sq.mm.
ii)	Neutral Half of Phase Bus but minimum 1250 sq.mm		

4.1 Fuse Switches

Fuse switches shall be rated for continuous operation at nominal current and rated maximum Voltage of 440 Volts. They will have an overload breaking capacity of 8 times the rated nominal current and a making capacity (0.35 PF) of 6 times the rated nominal current. They will be suitable for motor duty (AC 23 category IS 4064). The moving bridge will carry the HRC fuses.

The double break fuse switch unit shall preferably have a withdrawable fuse carrier which will be driven by the operating mechanism.

The operating mechanism shall be mounted on panel door.

The TPN fuse switch unit shall have an easily removable neutral link.

The contacts shall be silver plated copper. Moving contacts shall be self-aligning type. It shall be possible to inspect, replace the contacts easily.

Complete phase/phase and contact / contact segregation shall be provided. The moulded insulation shall have high temperature and are withstand capacity.

It should be possible to lock the switch in either position.

Door interlock shall be provided to ensure that the cubicle door can be opened only when the switch is in OFF position.

It shall be possible to close the switch only when the door is closed.

Fuse switches shall be complete with HRC fuses of ratings indicated elsewhere.

4.2 Contactor

Contactors shall be electromagnetically operated air break type suitable for AC 23 duty at specified rating and coils shall be preferably epoxy encapsulated. The Contactors will be able to break and make 8 times the rated current.

The double break Contactors shall be designed for bounce free operation with long life of 30,000 switching cycles. The Contactors will preferably be of silver alloy. Deionization chambers will be provided for contactors rated 30A and above.

Power and auxiliary Contacts will easily accessible for inspection, termination and replacement. Terminals will have self-rising washers for easy termination and replacement. Auxiliary contactors will be dust proof. Separate terminal supply.

All power Contactors will have 2 NO and 2 NC auxiliary contacts rated for 10Amps.

All power and auxiliary Contactors will have epoxy cast plug in type no volt coil suitable for 240V, 50 HZ, AC unless specified otherwise.

Suitable mechanical built in visible indication to identify whether energised or not will be available on all power and auxiliary Contactors.

Contactors will be chatter free with the core and armature specially alloyed/treated to avoid rusting.

4.3 Time Switch

Type	:	Electronic (Quartz controlled).
Voltage	:	240 V (+ 10% -15%)
Frequency	:	45 Hz-65 Hz
Power Consumption	:	3 VA
Accuracy	:	+/- 30 min/year
Running reserve	:	²⁸ approx 150 hrs
Clock starting	:	1 minute after voltage is applied
Dials	:	2 x24 h
Minimum switching period	:	20/30 minutes
Programmable in steps of	:	10/15 minutes
No of changeover contacts	:	2

4.4. Rotary Switches

All control switches (Ammeter and voltmeter selector switches, etc.) shall be rotary type.

The switches shall have self-aligning, silver plate, double break (air break) wiping contacts.

Control switches shall have pistol grip handles and shall be flush mounted on the device panel.

All rotary switches shall be provided with function and position engraved indicating plates.

Ammeter and voltmeter selector switch shall be 3 positions and OFF type.

4.5 Fuse fittings/Fuse units

Fuses for Fuse switch units shall preferably be counted in the moving bridge.

Fuse fittings shall be of non-hygroscopic and non-inflammable phenolic moulding. The fuse fitting shall be robust and shall be designed for high contact pressure.

Fuse fitting shall comprise of carrier and base, the base, receiving the connection terminals and the easily removable bridge carrying the HRC fuse.

The contacts shall be rivetted properly and aligned perfectly to avoid loose contacts and loose terminations.

It shall be possible to visibly identify blown fuse without removing the carrier.

Fuse fittings shall be complete with HRC fuses of ratings to be confirmed later.

4.6 Fuse

Fuse shall be of high rupturing capacity, link or bolted type.

The non-deteriorating HRC fuse shall have a minimum rupturing capacity or 50 KA RMs symmetrical at 440 Volts.

The fuse shall give clearly visible indication after operation.

The fuse housing shall be designed to withstand the stresses developed while breaking fault current. The fuses shall have low cut off value.

Normal ambient temperature variations should not affect the characteristics of the fuses.

5.0 **BILL OF MATERIALS**

The bill of material will be generally as specified in the Schedule of Quantities.

6.0 **CONTROL PROTECTION AND METERING**

6.1 The following provision will be made in panel MP:

i) Indication circuit 240V tapped from respective feeder, upstream of the switching device.

ii) Trip bus 24 V DC

iii) Closing circuit 240V, tapped from respective feeder, upstream of the switching device.

1 No. 2 pole rotary switches & HRC fuses of adequate rating shall be provided to receive 24 V DC supply for the trip buses in any convenient place. Indication, control/protection and closing coil circuits will be individually protected with HRC fuses at the feeders.

240 V AC supply will be used for heater and for driving the spring charging motor.

6.2 **Current transformers**

Current transformers shall be bar primary epoxy resin cast type.

Current transformers for metering shall be of class 1 accuracy and of specified VA rating & Ratio.

Current transformers for earth fault relay shall be 50/5A, 15 VA, CI. 10 P 10.

The current transformers shall be capable of withstanding the thermal and mechanical stresses resulting from the maximum short circuit and momentary current ratings of the switchgear.

6.3 **Meters**

Meters shall be Moving iron type and shall be flush mounted on panel.

Ammeter and voltmeter shall be of class 1.5 accuracy and shall have 90 Deg. dial with adequate damping facility. The size of Ammeter and voltmeter and voltmeter shall be 96 mm.

Voltmeter shall have range of 0-500V. Ammeter ranges will be as indicated in the Schedule of Quantities.

Voltmeter Selector switch shall have R_Y, Y-B, B-R and OFF positions. Ammeter Selector switch shall have R, Y, B and OFF positions.

All voltmeter circuits shall have HRC fuse protection.

The 3 phase 4 wire flush mounted induction type current transformer operated energy meter (KWHr. meter) shall have the following specifications.

Rated Voltage	3 x 240
Rated Current	5 Amps
Rated frequency	50 Hz
Continuous overland capacity	125% of rated current
Starting current	Below 0.5% of Rated
Current	
Creeping Voltage	110% of Rate Voltage
Insulation resistance	More than 10 M-Ohms
Current coil watt loss	less than 2 watts/element
Dielectric strength	Withstand AC 200 V, RMS
For 1 Minute.	

7.0 INTERLOCKING

7.1 Safety Interlocks in each Circuit breaker

The following safety and functional interlocks will be provided interlocks will be provided in all feeders preferably through mechanical devices.

- i) The breaker shall not be closed in any intermediate position other than the service, test and isolated positions.
- ii) Electrical closing will be possible only in service and test positions.
- iii) In test, isolated positions interlocks with other feeders will be bypassed.
- iv) It shall not be possible to open the hinged front door when the breaker is closed. Hinged door can be opened only when the breaker is racked out to the isolated position.
- v) Racking in of the breaker from isolated position shall be possible only when the compartment door is closed. Provisions may be made to bypass this interlock by the skilled personnel thereby enabling the circuit breaker to be moved to the test position with the door open.
- vi) Racking in or out of circuit breaker shall be possible only when the circuit breaker is off.

7.2 Functional Interlocks for Panel MP

- a) 1 set of mechanical interlocks among Mains Incomer and Bus coupler such that ANY TWO only can be CLOSED at a time.
- b) 1 Set of electrical interlocks between DG and Mains incomers in the same bus section such that ONLY ONE can be CLOSED at a time
- c) Bus coupler will have auxiliary switch with adequate contacts to interlock in such a way that DG incomer contactors can close only if Bus coupler or the other DG incomer and Mains incomer are open. .

7.3 CIRCUIT BREAKER FEEDER (Basic Components)

Each circuit breaker feeder shall consist of the following :

- i) 4 pole trip free draw out type air circuit breaker complete with following:
 - 1) Set of safety shutter automatically operated with necessary interlock and with padlocking facility.
 - 2) Motor wound spring charge closing mechanism. Spring charging motor shall be suitable for 240V AC and closing coil for 24V DC.
 - 3) Auxiliary switch with 2 No +2 NC spare contacts over and above the operational and interlocking requirements.
 - 4) Shunt-trip suitable for 24V DC.
 - 5) S/C, O/C & U/V releases
 - 6) 1 No. Earth Fault Relay IDMT (CDG 11 or equivalent)
 - 7) Local/remote selector switch-lockable.
 - 8) Trip-neutral-close control switch.

- 9) 1-RE 'CB close' – indication lamp
- 10) 1-Green 'CB open'-indication lamp
- 11) 1-Amber 'Trip on fault' –indication lamp
- 12) Interlocking provisions
- ii) Space heater rated for 240V AC with thermostat and control switch.
- iii) Circuits and devices for protection, closing, tripping and indication.
- iv) Termination facilities for power and control cabling shall be provided as per drawing (Control wiring for remote operation of incomer and bus coupler feeders and remote, trip indication of all feeders will be extended upto the marshalling panel).

The electrically operated breakers shall be suitable for the local and remote controlling. a mechanical trip lever shall be on the circuit breaker to allow trippings of the breaker. Provision shall be made for manual spring charging and manual closing of breaker.

Sequence type strain free interlocking will be provided between the various stages of operation to ensure safe and correct breaker operation.

8.0 **RELAYS/RELEASES**

The various types of protection of different breakers are indicated in the bill of materials.

All fault detecting relays shall be of draw out type and suitable for flush mounting on steal panels. It shall be possible to completely test and calibrate a draw out type relay in its plugged in position with the help of test plug provided for this purpose

Tripping relays and timing relays used in protection circuits shall be of flush type.

A list of releases and relays proposed to be provided shall be given with the offer. Full particulars of the proposed releases and relays shall be furnished. Relays shall be hand reset type with flush indicators.

9.0 **CONSTRUCTIONAL FEATURES**

9.1 **ASSEMBLY**

The switchgear assembly shall constitute a number of vertical sections. Each vertical section shall house circuit breakers in the front. The breaker feeders shall be arranged in single tier formation. The circuit breaker shall be mounted in separate sub-enclosure so that operational stress will not distort the switchboard. Separate compartment shall be provided for the bus bars and cable terminations. Each circuit breaker enclosure shall be provided with a hinged steel door with proper cutouts to facilitate all the operation of the circuit breakers, without opening the door. It shall be possible to close the door

with breaker in service, test or isolated (fully drawn out) positions. It shall be possible to achieve the same degree of protection by closing the door even when the circuit breaker is removed. The door shall be provided with fasteners of captive screw type. The rear compartment shall be provided with full size steel door with concealed hinges. The protection provided by the enclosure shall be of type IP 52 as per IS: 2147. The switchgear assembly shall be extensible type with facilities for extension in future by adding breaker or fuse switch feeders.

All the equipment offered shall be tropicalized to suit the atmospheric conditions at site which are humid and conducive to rust and fungus growth.

9.2 **BUS BARS**

9.2.1 **MAIN BUS BARS**

The main bus bars and the vertical tap offs shall be insulated by PVC sleeves. The metallic barriers between the vertical sections of the switchgear assembly shall preferably be provided with through bushing for main bus bar runs. Bus bar joints shall be shrouded. The bus bar shall be supported on bus insulators. The spacing between supports shall not be greater than the one used during short Circuit. The bus bars shall be totally enclosed. The temperature of the bus bar. While carrying current at rated frequency shall not exceed 80 Deg. 0 for an ambient room temperature of 45Deg. 0. The maximum hot spot temperature of 45 Deg. 0. The maximum hot spot temperate at breaker contact shall not exceed 120 Deg. C for an ambient temperature of 45 Deg. C. The test certificate for the temperature rise shall be furnished. Conducting, insulating and mechanical parts shall not be impaired by the temperature rise. The arrangement of bus bar enclosures shall be subject to approval of the Purchases.

9.2.2 **GROUND BUS**

The copper ground bus having a minimum section of 50 x 6 mm shall be provided in approved location, extending over the entire length of the switchgear, bolted to the frame work and suitably braced to withstand mechanical stresses. Each ground bus shall be provided with two clamp type connector at either end for connections. All non-current carrying metallic parts of equipment within each switchgear cubicle shall be permanently grounded through the ground bus. All bus joints shall be tinned.

9.2.3 **NEUTRAL BUS**

One PVC insulated neutral bus with one half of the cross section of the main bus shall be provided wherever specified.

It shall be suitably braced/supported to withstand the mechanical stresses corresponding to the momentary duty specified in this section.

The neutral bus shall be insulated from other grounded parts in the switchgear. Neutral will be earthed at transformer end.

The neutral bus shall be insulated from other grounded parts in the switchgear. Neutral will be earthed at transformer in the switchgear. Neutral will be earthed at transformer end.

9.3.1 **CONNECTIONS OF BUS, POWER AND CONTROL CABLES**

Facility for taking cables from top/bottom will be provided on all feeders.

Arrangement shall be provided in the switchgear to receive, clamp and terminate aluminium/copper conductor PVC insulated armoured cable for all outgoing circuits. Removable gasketed gland plates of sheet steel shall be provided to receive the cables are used.

Arrangement shall be provided on the side walls of the compartment for supporting power cables. The arrangement shall be suitable for top and/or bottom entry of cables as per requirement.

9.3.2 **TERMINAL BLOCKS AND WIRING**

Power and control wiring shall be with 1100V grade PVC insulated copper Conductor cables or copper/aluminium bars with 1100V grade PVC sleeving.

The type of Terminal blocks offered shall be clearly stated. These shall be subjected to Purchaser's approval.

Power and Control terminal blocks for connection of power and Control cables shall be suitably shrouded and shall be mounted on the side walls or other approved locations on each circuit breaker compartment and relay panel.

Terminals with jumpers shall be provided to receive incoming supply cables for various control buses formed in the switchgear assembly and for subsequent distribution to various relays and circuit breakers. These shall be located in the auxiliary compartments.

Separate Terminal block with shorting and grounding facilities, shall be provided for current transformers.

All terminals shall be identified with engraved identification plates defining the feeder and the function. All wiring shall be identified with indelible ferrules at both ends.

Terminal blocks for control wiring shall be single piece moulded type with bolted terminals. 10% spare terminals for future use shall be provided.

Wiring shall be done neatly and bunched in such a way as to facilitate tracing. Control wiring shall be segregated from power wiring and interpanel wiring shall be through wire ways.

9.4 **EQUIPMENT IDENTIFICATION**

Engraved metal name plates shall be provided on the door of each breaker compartment. The name plates shall be provided on the front, on the corresponding door on the rear side, and on the draw out cubicle. Inside a compartment name plate shall be provided for each equipment having equipment designation. These name plates shall bear brief description of equipment, which will be furnished later and the equipment designation. Each transport section of the switchboard will have engraved metal plate with switchboard number and the section number. These details will be prominently painted outside the crate after packing.

9.5 **SURFACE TREATMENT AND FINISH**

All sheet metal components shall undergo the following treatments before painting:

- i) Degreasing
- ii) Pickling
- iii) Phosphating
- iv) Passivating

Within 24 hours of metal treatment, high luster zinc chromate primer shall be air sprayed and then stoved. Blemishes shall be covered by applying putty and baking. Extra putty shall be removed by sanding, and a second coat of primer applied. The final coat of synthetic enamel (IS5 shade 631) shall be sprayed and stoved.

Steel components in the switch boards shall be phosphated, stained and oiled. Fasteners shall be electro-galvanised.

9.6 **NAME PLATES AND LEGENDS**

The switch board shall have name plates carrying the following data:

- i) Manufacturer.
- ii) Type, designation and serial number.
- iii) Year of Manufacture.
- iv) Rated continuous current, voltage and frequency.
- v) Weight of complete panel.

Panel designation shall be displayed prominently in one or more locations. Shipping sections shall be designated and identified clearly.

Separate name plates shall be provided on compartment furnishing the following with minimum letter size of 12 mm.

- i) Feeder rating.
- ii) Function.
- iii) Feeder number.

9.7 **DANGER BOARDS AND CAUTION BOARDS**

The switchboard shall have standard Danger boards of appropriate size complete with system voltage, skull earth, etc. with letters in English and Hindi.

Caution boards with appropriate warning shall be provided whenever required.

9.8 **DRAWINGS**

The Tenderer shall submit drawings showing plan, front/side elevation and foundation details of distribution pillar and the masonry housing along with the quotation itself.

The supplier shall supply the final fabrication drawing showing the component layout, cleanness, support details and the overall/internal dimensions for approval before fabrication.

9.9 **INSPECTION**

The Manufacturer's works shall be accessible for the Purchaser's representatives for stage inspections as and when required. Test schedule for the equipment shall be finalised in consultation with the Purchaser and 15 days advance intimation shall be given to enable the Purchaser's representative to witness the test.

9.10 **TESTS AND TEST CERTIFICATES**

The Tenderer shall indicate his Standard routine test. All the routine tests specified in the relevant standards shall be conducted at works in the presence of the Purchaser be conducted at works in the presence of the Purchaser representative on all components and the assembled units.

The following tests shall be conducted in addition to/as part of routine tests at the works.

- (i) Dimensional checks.
- (ii) Physical verification of components.
- (iii) Insulation resistance of Power and control circuits.
- (iv) High Voltage test on power and control wiring -2.5 KV for 1 minute on power circuit and 2 KV for 1 minute on control circuits with all meters, relays and instrument transformers in circuit.
- (v) Functional test including sequence of operation.
- (vi) Calibration of meters and relays (including bimetal overload relays). This may be done prior to assembly.
- (vii) Continuity and polarity test on all coils and circuits.
- (viii) Ratio test on current transformers.

At least 4 copies of test report shall be submitted for the Purchaser's approval and record.

9.11. **DEVIATIONS**

Deviations contemplated by the Tenderer, if any, from other specifications shall be spelt out clause wise clearly in the offer.

Wherever deviations are not clearly mentioned it will be deemed that the offered equipment will fully comply with the equipment specifications irrespective of whether the literature enclosed with the offer agrees or not.

10.0 **SPECIFICATION FOR CABLES**

10.1 **SCOPE**

This specification covers the design, manufacture, testing at manufacture's works and delivery by road at site properly packed in drums, of aluminium stranded conductor PVC insulated, PVC sheathed, armoured cables, suitable for solidly grounded system as specified herein under.

10.2 **Standards**

The cables covered by this specification unless otherwise stated be designed in accordance with the latest editions of the following standards:

- a. IS 1554 - Specification for XLPE insulated (heavy duty) (Part I)
- b. IS 5831 - Specification for XLPE insulation and sheath of electrical cables.
- c. IS 3975 - Specification for MS wires, strips and tapes for armouring cables.
- d. IS 613 - Specification for copper conductor for insulated cables.
- e. IS 694 - Specification Copper conductor XLPE insulated cables.

10.3 **Technical Particulars**

Following are the Technical particulars for the cables.

Rated system voltage	-	415 volts
System grounding	-	Solidly grounded
Type of cable	-	Copper conductor, XLPE insulated, unarmored and armoured cable
Voltage grade	-	1100 volts grade

10.4 **Design Particulars**

10.4.1 **General**

The cables supplied under this specification shall be annealed, tinned copper stranded conductor, XLPE armoured. Adequate insulation shall be provided for the cables to operate continuously at the specified voltage with a high degree of safety and reliability throughout the life of the cables. The sheathing material shall be high quality XLPE based compound. The construction of cable shall be as per IS: 1554 (Part I).

10.4.2 **Conductor**

The conductor shall be made from high conductivity copper rods complying with IS 613. The conductor shall be circular in section, smooth, uniform in quality and free from scale, inequalities, sprills, spits and other defects. The conductor shall have appropriate dimensions and resistance as per relevant Indian Standard. Number of strands and strand dia for each size of cable shall be indicated.

Not more than two joints shall be allowed in any strand forming every complete length of conductor and no such joints shall be within 300 M of any other joint in the same layer. Strand joints shall be preferably fusion welded. No. joint shall be made in the conductor after it has been stranded.

10.4.3 **Insulation**

The insulation shall be of Compounded Polyvinyl Chloride or suitable co-polymers of which major constituent shall be Vinyl Chloride.

The average thickness of insulation when measured in accordance with Clause 9.8 of IS: 1554 (Part I) shall not be less than the values specified therein. The Contractor shall clearly indicate the colour scheme to identify each core separately under clause 3.27 of section D.

10.4.4 **Inner sheath**

The inner sheath shall be (PVC Type 4 as specified in IS 5831-1970) soft thermoplastic material which shall be applied by extrusion. The thickness of the inner sheath shall be as per IS: 1554 (Part I).

10.4.5 **Armouring**

The armouring arranged over the inner sheath shall consist of one layer of galvanization steep wire. The armour wire being put on the cable shall conform to IS 3975 for all requirements. The direction of lay of armour shall be opposite to that of the cores. The zinc coating on the galvanised steel wires will comply with relevant Standards.

10.4.6 **Outer sheath**

Extruded outer sheath shall be provided over the armouring. The material used for sheathing shall be PVC type ST 2 as specified in IS 5831- 1984. The colour of the outer sheath shall be black. The thickness of outer sheath shall be as per Table 6 of IS: 1554 (Part I)

10.5 **Inspection**

The Purchaser's representative shall have at all reasonable time access to the supplier's or sub-Supplier's works for the purpose of witnessing the tests and to ascertain that the cable being manufactured conforms to the requirements of this specification. The Tenderer shall be given at least 30 days advance notice prior to the commencement of testing so that Purchaser's representative can plan to witness the test. All the tests indicated in the test clause of this specification shall be carried out in the presence of Purchaser's representative by the manufacturer and shall provide all the equipment for testing. Six copies of the test certificate shall be furnished to the Purchaser for approval prior to dispatch of cables from factory.

10.6 **Tests**

All the tests specified below including repeated tests shall be carried out in accordance with the Indian Standards by the manufacturer in the presence of purchaser's representative. If the cable fails to pass the test specified, the purchaser shall have the option to reject it. Shipping release shall be obtained from the Purchaser's representative prior to dispatch.

10.7.1 **Routine Test**

The following routine tests shall be carried out on each and every length of the cable in the presence of Purchaser's representative at manufacture's works.

- a. Resistance test for conductors.
- b. Insulation resistance (Dry) test
- c. High voltage test
- d. Type & thickness of insulation, inner sheath & outer sheath.

10.7.2 **Type Tests**

The following type tests shall be carried out on samples taken out from the production lot.

- a. Conductor Resistance test
- b. Test for thickness of insulation and sheath
- c. Physical test for insulation and sheath
- d. Fire resistance test
- e. Test for bleeding and blooming pigments
- f. Insulation resistance test
- g. High voltage test (Water immersion test)
- h. Tests on armour wires

The Purchaser at his opinion may waive all or any of the type tests provided type test certificates carried out on exactly identical cable are furnished by the manufacturer.

10.7.3 Acceptance Test

Apart from the above test, the following shall be carried out as acceptance test. These tests shall be carried out from samples of the delivery lot.

- a. Insulation Resistance test
- b. Conductor Resistance test
- c. High voltage test (Water immersion test)
- d. Insulation Resistance test

10.8 Guarantee

The cable shall be guaranteed against any type of defects and for trouble free operation conforming to this specification for a period of at least 12 months from the date of commissioning or 18 months from the date of dispatch from the supplier's works whichever is earlier.

10.9 Instruction Manual

The Supplier shall give his recommendations for handling, storage, laying and making joints and termination for the cables in the form of Instruction manual. Ten copies of the Instruction manual shall be supplied by the manufacturer along with test certificate.

10.10 Identification Marks

The manufacturer shall be identified throughout the length of the cable by the manufacturer's name or trade mark indented or embossed on the outer sheath of the cable. The conductor size and number of cores of the cables shall be identified at regular intervals of not more than 5 meters.

10.11 Packing and Marking

Cables shall be delivered in non-returnable wooden drums. The cable shall be wound on a drum of suitable material and size; packed and marked the packing shall be such that it can withstand rough handling during transport and ensure that no damage will be caused to the cable during transit. The cables shall be supplied in lengths not less than 500 m. The markings done on the drums shall have the following information:

- a. Trade mark or trade name, if any.
- b. Name of the manufacturer
- c. Nominal sectional area of the conductor of the cable.
- d. Length of the cable on the drum.
- e. Voltage grade and type of the cable.
- f. Length of the cable on the drum.
- g. Direction of rotation of the drum (an arrow)
- h. Weight

Both the ends of the cable in the drum shall be sealed by means of non-hygroscopic sealing materials and brought out to facilitate testing of cable in the drum such as measurement of Insulation Resistance, etc. without opening the drum.

Inspection and Testing

19.0 Scope

This section is part of complete electrical specification and covers only the inspection and testing of all electrical equipment included in the schedule of Quantities.

1.1 Cables.

1.1.1 Grounding and lightening protection system

1.1.2 Switchboards and service boards.

1.2 General

The inspection and testing of different equipment shall be carried out generally as per the relevant standards and codes of practice of Indian Standards.

For all the tests carried out at the manufacture's premises, the Contractor shall submit the Test Certificates in quadruplicate for approval.

It is the responsibility of the Contractor to provide all testing equipment, meters/ instruments, loads, etc. required for the testing of the various equipment.

Site test results will be furnished in approved formats.

1.3 Cables

Test during laying and before and after jointing.

- a. The cable cores should be tested before laying.
 - i. Continuity.
 - ii. Insulation resistance.
- b. The cable cores should be tested before jointing.
 - i. Continuity
 - ii. Absence of cross phasing.
 - iii. Insulation resistance to earth and between conductors.
- c. The cable cores should be tested after jointing.
 - i. Physical verification of crimping of lugs and joints.
 - ii. Continuity checking.
 - iii. Insulation resistance measurement.
 - vi. High voltage test on 11KV cables.
 - v. Loop resistance of pairs of core (with other ends shorted), after Laying, Jointing and crimping of end terminals.

On successful completion of the above tests, the cables tested shall be accepted and taken over as a complete bunch per system

Earthing / Lightning Protection system

- a. Inspection: For these systems the following checks shall be made.
 - i. The installation of the system is as per the specifications and drawings.
 - ii. All the joints are made mechanically tight and electrically bonded.
 - iii. Important connections are protected from mechanical damage.
- b. Earth resistance of each earth station shall be measured.
- c. Copper Plates, strips and wires shall be of Electrolytic grade. Test certificate for copper purity will be furnished from Independent test laboratory.

20.0 General instructions

1.1 For all materials and equipment in general IS specifications and standards should apply.

Where ISS and standards do not exist, the relevant BSS ST A or ASA etc. should apply. All specifications, standards, publication etc. specified mean the latest. Electrical installation should conform to the following with their latest amendments wherever.

- a) Regulation for electrical equipments in building by IEE London.
- b) The Indian Electricity Act, 1960.
- c) The Indian Electricity Rules, 1959
- d) The Regulation for electrical equipment in building issued by Regional Council of Insurance.
- e) The Factory Act, 1948
- f) IS: 732-1963 Code of Practice for electrical wiring and fittings in buildings for low and medium voltage.
- g) IS: 1946-1961
- h) BS Code of practice CP 1003 Part 1, 1964
- i) IS: 1953-1963.
- j) IS: 1944-1961
- k) C.P 1004 Part 1- 1952 or Relevant I.S.
- l) IS: 3043-1966- Code of Practice for earthing
- m) IS: 1554 (Part I- 1964 Specifications for PVC insulated Heavy Duty) cables.
- n) IS: 694 (Part II) 1964 specifications for PVC insulated cables. (F or voltage upto 1100V).
- o) IS: 2026-1962

1.2 FOUNDATION BOLTS

All the plant and equipment should be supplied with a complete set of foundation bolts. washers, bolts and all other materials required for installation of the plant and equipment in position.

1.3. TESTING

Contractor should carry out the tests on different equipment as specified in Section V with the conditions thereof, in order to enable the Engineer to determine whether the plants and works comply with the specifications, tests conditions are in normal workings. The contractor should arrange his own testing equipment required for tests to be carried out at site on any of the equipment.

1.4. INSURANCE

The tenderer should insure at his own cost all the materials during transit from his factory to site as well as during storage at site till the equipment are commissioned and handed over to the Engineer.

1.5. CONTRACTOR'S SUPERINTENDANCE

The contractor shall give or provide all necessary superintendence during the execution of the works and as long thereafter as the Engineer any consider necessary for the proper full of the contractor's obligations under the contract. The contractor or a competency and authorized agent or representative approved in writing by the Engineer (which approval may at any time be withdrawn) is to be constantly on the works and shall give his whole time to the superintendence of the same. If such approval shall be withdrawn by the Engineer, the contractor shall as soon as is practicable (having regard to the requirement of replacing him as hereinafter mentioned) after receiving written notice of such withdrawn remove the agent from site and shall not therefore employs him again on site in any capacity and shall replace within a period of seven days by another agent approved by the Engineer Such authorized agent or representative shall receive on behalf of the Contractor directions and instructions from the Engineer.

1.6. CONTRACTOR'S EMPLOYEES

The contractor shall provide and employ on the site in connection with the execution and maintenance of works:

- a) Only such technical assistants as are skilled and experienced in their respective callings and such sub-agents, Foremen and leading hands as are competent to give proper supervision to the work, they are required to supervise.
- b) Such skilled, semi-skilled and unskilled labour as necessary for power and timely execution and maintenance of works.
- c) The Engineer shall be at liberty to object to and require the Contractor to removed forthwith from the works any employed persons by the contractor in or about the execution or maintenance of the works who in the opinion of the Engineer misconducts himself or is incompetent or negligent in the proper performance of his duties of whose employment is otherwise considered by the Engineer to be undesirable and such person shall not be again employed upon the works without the written permission of the Engineer. Any persons so removed from the works shall be replacing as soon as possible by a competent substitute approved by the Engineer.

1.7. EXTRAORDINARY TRAFFIC

The contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the routes to the site from being damaged injured by any traffic of the contractor or any of his sub-contractors and in particular shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of plant and materials from and to the site be limited as far as reasonably possible so that no unnecessary damage, or injury may be occasioned to such highways and bridges.

1.8. OPPROUITIES FOR OTHER CONTRACTORS

The contractor shall in accordance with the requirements of the Engineer afford reasonable opportunities for carrying out the work to any other contractors employed by the Engineer or to the engineer himself and of any other duly constituted authorities who may be employed in the execution on or near the site of any work not included in the contract of any contractor which the President may enter into in connection with and / or ancillary to the works. The Government will not entertain any claims from the Contractor for delay on account of lack of coordination with on another and also the contractor whose work is delayed due to lack of coordination from any other contractor can claim damages from the delaying contractor if the same is duly certified by the Engineer.

1.9. QUALITY OF MATERIALS AND WORKMANSHIP AND TESTS.

All materials and workmanship shall be of the respective kinds, described in the contract and in accordance with the Engineer's instructions and shall be subject from time to time to such tests as the Engineer may direct at the place of manufacture of fabrication or the site or at all or any of such places. The contractor shall provide such assistance, instruments, machines; labour and materials used and shall supply samples of materials as are normally required for examining, measuring and testing all work and the quality. Weight or quality of materials before incorporation in the works for testing as may be selected and required by the Engineer. The cost of such tests shall be borne by the contractor.

1.10. SITE INVESTIGATION AND REPRESENTATIVES

The contractor shall satisfy himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handing and storage of materials, availability of labour, water, electric power, roads and uncertainties of weather of similar physical conditions of the ground, the character, quality and quantity of surface and sub-surface materials to be encountered, including the sub-soil water levels, the character of equipment and facilities needed preliminary to and during the progress of the work and all other matter, which can in any way, affect the work or the cost thereof under this contract.

1.11. STAKING OUT BASE LINES AND LEVELS

The contractor shall layout his work from base lines and grades established by the Engineer, and shall be responsible for all measurements in connection therewith. The contractor shall at his own expense, furnish all stakes, templates, platforms, equipment ranges and labour that may be required in setting or layout any part of the work. The contractor shall be held for proper execution of the work to such lines and specifications. The contractor shall check the bench marks and benches existing at the site for laying out lines and levels. The Contractor is to construct and maintain proper, benches at the inter section of all main walls in order that the lines and levels, may be accurately checked at all time. The doilies, levels, prismatic compass, chain, steel and metalloid tapes and all other surveying instruments found necessary on the works shall to provide by the contractor at his cost.

1.12. GUARANTEE

The performance of all the equipment and the installation should be guaranteed at least for a minimum period of one year. Date of warranty shall be counted from the final commissioning report signed by the engineer in charge/ Engineer of HRI.

1.13. The installation drawing should be submitted to the Engineer within 4 weeks from the date of the award of the contract. At the first instance the contractor will forward a set of the foundation drawings for all the equipment so as to enable the building contractor, make provision of that. He will also suggest, any modifications if required, on the structural aspects of the building to accommodate the electrical equipment.

1.14. After completion of the work the drawings will be returned by the tenderers to the HRI. Final payment will be made only after the drawings have been received by the HRI.

1.15. No. foreign exchange will be made available by the HRI for any other equipment covered in the tender specifications. However, where it is unavoidable imported items can be included. The tenderer should clearly indicate materials, quantity rate and amount of such imported items and also the country from which it is proposed to import the materials.

21.0 Power distribution electrical safety

1.1 The Department will provide 415V, 3 phases, 4 wire supply at one location as indicated in the drawing. The energy consumption will be metered and charge as specified.

1.2 The Contractor will make arrangements for receiving the power supply. He will have a distribution switchboard with one number incoming switch HRC fuses and sufficient number of outgoing feeders, properly with HRC fuse protection. Sub-distribution boards may be provided and wired from the distribution boards may be provided and wired from the distribution board by the Contractor. Cabling from the meter and supply point to the distribution board will be done by the contractor. The distribution board and other locations shall be provided with danger boards with skull mark.

- 1.3 Single phase loads will be connected such that the loads and the 3 phases are balanced.
- 1.4 All distribution boards and sub-distribution board will be properly grounded with 2 ground connections and each board will have one independent pipe earth electrodes.
- 1.5 All electrical equipment like switches, motors and power outlets shall be properly grounded and shall be sell protected from weather (rain and dust)
- 1.6 Equipment with electric prime movers will be installed in permanent manner as far as possible with fixed cabling. Insulated wires in metallic conduits can substitute for armoured cables, if required.
- 1.7 Portable lights and equipment (limited to unavoidable tools like vibrators, drills and polishing machine) will be connected using metal clad sockets and plugs to avoid mechanical damages.
- 1.8 Insertion of wires in sockets will not be permitted.
- 1.9 All portable appliances shall be properly grounded.
- 1.10 All portable electrical tools will be tested and certified by authorised staff. Contractor's Electrical Supervisor may be authorised for this work by the Department at its discretion.
- 1.11 Cabling and wiring will be run underground with proper mechanical protection or overhead beyond normal human reason so as to avoid hindrance to movement of men and materials. Cable route indicators shall be provided as directed by Engineer-in-Charge wherever cables are run underground.
- 1.12 For temporary connections 3 core insulated and sheathed cables will be used for single phase and 4 core insulated and sheathed cables will be used for 3 phase wiring. Armoured cables will be preferred.
- 1.13 Unarmored cables will not be tied to metal supports using metal wires.
- 1.14 All wires used shall be healthy and joints shall be minimum the joints shall be properly insulated and shall be approved by Departmental Engineer. Joints shall be properly supported and positioned above normal human reach. Joints shall not be permitted in wet areas. Loose wiring will not be allowed on floor. Extra length of wires and cables shall be properly.
- 1.15 Electrical works including temporary connections and extensions will be carried out by licensed electricians only. All electrical installations will be energized only after authorization by the Department.
- 1.16 List of electrical staff to be posted at site will be furnished by the Contractor before the commencement of Contract.
- 1.17 Adequate area lighting will be provided by the Contractor to ensure safe working.
- 1.18 Departmental electrical staff will be available at site for rectification of faults upto metered point during normal working hours on normal working days. Contractor's qualified work staff will maintain the Contractor's electrical installations.
- 1.19 Excavation in any area shall be taken up only with the approval of the concerned Engineer to avoid accident and injury/ damage to cables and services lines.

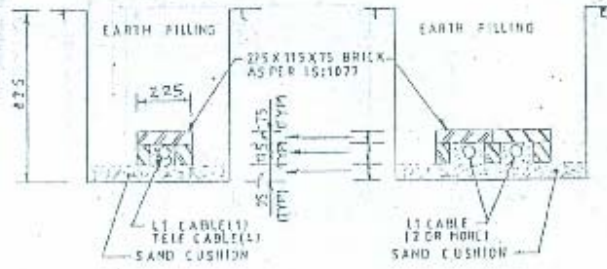
PREFERRED MAKE OF MATERIAL

XLPE Cable	:	Universal/ICI/Havells
Panels	:	Alstom/GE
CT & PT	:	AE/Gilbert/Precise/L&T
SFU	:	L&T/GE/Schneider
Selector switch	:	Kaycee/Sulzer – L&T/C&S/Siemens
Meter	:	Donzerv(E nercon) L&T/Secure/Trinity
Bus bar	:	Hindalco/Jindal/Century
Fuse	:	GE/L&T/Siemens
ACB (Bus Coupler)	:	GE/L&T – U Power/ABB
Protective Relay	:	L&T/Siemens/ABB/Neptune
Indicating Lamp	:	L&T/Trinity/ABB

LIST OF DRAWINGS

<u>Sl. No.</u>	<u>Drawing No.</u>	<u>Details</u>
1.	IGC/ES/EL/HRI-01	Pipe earthing details

REACTOR RESEARCH CENTRE KALPAKKAM



DESIGNER	DATE	TITLE	SHEET
CAN. 17	10-10-73	M2 - ALLAHABAD HOUSING	CF
CHEK.	DATE	TYPICAL DETAILS OF CABLE LAYING	
APPD.	DATE	GENERAL INT.	REV. NO.
SCALE	N.T.S.	REV.	
PROJECTION	1st Angle	DRG. NO.	No. 1

HRI/Elect./E/01

TENDER FOR

**“RELATED WORK OF ENHANCEMENT OF POWER SYSTEM
NEAR SUBSTATION AREA” AT HARISH-CHANDRA
RESEARCH INSTITUTE, CHHATNAG ROAD,
JHUNSI, ALLAHABAD -211 019”**

PART- 2 (FINANCIAL)

Name of work: “Related work of enhancement of power system near Substation area” at HRI, Allahabad.

SCHEDULE OF QUANTITIES

Sl. No.	Specification	Qty.	Unit	Rate in figures & words (including all taxes)		Total Amount	
				Rs.	Ps.	Rs.	Ps.
A	B	C	D	E		F = (C x E)	
1.0	Laying of one number PVC insulated and PVC sheathed/XLPE power cable of 1.1 KV grade of size not exceeding 400 sq.mm direct in ground including excavation sand, cushioning, protective covering with bricks and refilling the trench etc. as required.	450	RM				
2.0	Supply, testing and commissioning of 1100 V grade PVC insulated PVC sheathed and armoured aluminium conductor power cable to IS 1554.						
2.1	3.5Cx 400 sq.mm. Aluminium conductor cable XLPE (installation included item no.1)	500	RM				
3.0	Supplying and making indoor end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed/XLPE aluminium conductor cable of 1.1 KV grade as required.						
3.1	3.5C x 400 sq.mm. Aluminium conductor cable XLPE (installation included item no.1)	14	Nos.				
4.0	33KV Double Break Horizontal type isolator 630Amp with earth switch (line) with Structure.	2	Nos.				
5.0	Upgradation of 415 V TPN cubicle type main switchboard Main panel (including Supply item)	1	Set				

Sl. No.	Specification	Qty.	Unit	Rate in figures & words (including all taxes)		Total Amount	
				Rs.	Ps.	Rs.	Ps.
A	B	C	D	E		F = (C x E)	
a	2 Nos mains incomer feeders with +1no. Bus coupler						
b	2 Nos electrically operated draw out type 1600 Ampe air circuit breaker with short circuit overload and under voltage protection SC current protection should 50 KV						
c	3 Nos 1600/800/5A, 5VA class 1CTs						
d	1 No. 0-500 V voltmeter with selector switch complete with 3 nos. L&T make fuse based & carrier with 6 Amp HRC fuse link.						
e	1 No. 800/1600 Amp Ammeter with selector Switch.						
f	1 No. IDMT relay (20-80%) setting with 1 no. 15 VA CI 10P 10CT mounted on Neutral) for Earth fault protection.						
g	1 Set ON, OFF and AUTO TRIP indication lamp.						
Total							

(Total amount in words Rupees)

Signature of the tenderer
Address & Seal