

## INDEX

**Name of Work:** Replacement of old battery charger and 55 no's 2V, 100 AH batteries installed at 33 KV substation (under buy back of old equipments).

Sl. No.	Description	Page
	Index Page	<b>1</b>
	<b>PART-A</b>	<b>2</b>
1	Information and e-Tendering for Contractors	<b>3-5</b>
2	Notice Inviting Tenderers (Form CPWD-6)	<b>6-9</b>
3	Tender (Form CPWD-7)	<b>10-16</b>
4	Salient/Mandatory requirement for tender	<b>17</b>
	<b>PART-B</b>	<b>18</b>
5	Quality Assurance of the work	<b>19-20</b>
6	Additional terms and conditions	<b>21-22</b>
7	Special Condition for Safety at the work Site	<b>23-24</b>
8	Special Terms & conditions	<b>25-30</b>
9	Additional Specifications for Electrical Works	<b>31-59</b>
10	List of approved make	<b>60-62</b>

**NIT amounting to Rs. 4,70,573/- (Rupees Four Lacs Seventy Thousand Five Hundred Seventy Three Only) is approved.**

**[Certified that this N.I.T. contains 61 ( Sixty Nine pages only)].**

**Executive Engineer  
I.W.D. Elect. Division  
I.I.T., Kanpur**

# ***PART-A***

**INDIAN INSTITUTE OF TECHNOLOGY KANPUR  
INSTITUTE WORKS DEPARTMENT  
ELECTRICAL DIVISION  
E-TENDER NOTICE**

NIT No. 80 /IWD/ED/293

Dated: 12.10.2020

The Executive Engineer, IWD, I.I.T., Kanpur on behalf of Board of Governors of IIT Kanpur invites online item rate tender from empanelled contractor of IIT, Kanpur for the following electrical work:-

Sl. No	Name of work and location	Estimated cost put to tender (In Rs.)	Earnest Money (In Rs.)	Period of Completion	Last date & time of submission of tender	Period during which EMD, Cost of Tender Document, e-Tender Processing Fee and other Documents shall be submitted	Time & date of opening of tender
1	Replacement of old battery charger and 55 no's 2V, 100 AH batteries installed at 33 KV substation (under buy back of old equipments).	4,70,573/-	9,411/-	02 Month	Upto 3:00 PM on 19.10.2020	After last date and time of sub-mission of tender and upto 3:00 PM on 20.10.2020	At 3:30 PM on 21.10.2020

*The e-tender documents is available on [www.tenderwizard.com/IIT](http://www.tenderwizard.com/IIT)*

(Raghvendra Singh)  
Executive Engineer (Elect.)

Copy to:

1. Institute website: [www.iitk.ac.in/iwd/tenderhall.htm](http://www.iitk.ac.in/iwd/tenderhall.htm)
2. Notice Board

*The enlistment of the contractors should be valid on the last date of submission of tenders.*

In case the last date of submission of tender is extended, the enlistment of contractor should be valid on the original date of submission of tenders.

1. The intending tenderer must read the terms and conditions of FORM-6 for e-Tendering carefully. He should only submit his tender if he considers himself eligible and he is in possession of all the documents required.
2. Information and Instructions for tenderer posted on website shall form part of tender document.
3. The tender document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from website [www.tenderwizard.com/IIT](http://www.tenderwizard.com/IIT) or [www.iitk.ac.in](http://www.iitk.ac.in) free of cost.
4. But the tender can only be submitted after uploading the mandatory scanned documents as per list given below.
5. The intending tenderer has to fill all the details such as Banker's name, Demand Draft/Fixed Deposit Receipt /Pay Order/ Banker's Cheque/Bank Guarantee number, amount and date.

The amount of EMD can be paid by multiple Demand Draft / Pay Order / Banker's Cheque / Deposit at call receipt / Fixed Deposit Receipts along with multiple Bank Guarantee of any Scheduled Bank if EMD is also acceptable in the form of Bank Guarantee.

6. Those contractors not registered on the website mentioned above, are required to get registered beforehand. If needed they can be imparted training on online bidding process as per details available on the website.
7. The intending tenderer must have valid class-III digital signature to submit the tender.
8. On opening date, the contractor can login and see the tender opening process. After opening of tenders he will receive the competitor tender sheets.
9. Contractor can upload documents in the form of JPG format and PDF format.
10. Contractor must ensure to quote rate of each item. The column meant for quoting rate in figures appears in pink colour and the moment rate is entered, it turns sky blue.

In addition to this, while selecting any of the cells a warning appears that if any cell is left blank the same shall be treated as "0".

Therefore, if any cell is left blank and no rate is quoted by the tenderer, rate of such item shall be treated as "0" (ZERO).

**List of Documents to be scanned and uploaded within the period of tender submission:**

- Enlistment Order of the Contractor.
- Certificates of Work Experience and EPF No. & ESI
- Copy of valid electrical licence

## • **FORM -6 FOR e-Tendering**

*The Executive Engineer, IWD, I.I.T., Kanpur on behalf of Board of Governors of IIT Kanpur invites online item rate tenders from approved and eligible empanelled contractors of IITK for the following works: **Replacement of old battery charger and 55 no's 2V, 100 AH batteries installed at 33 KV substation (under buy back of old equipments).***

- 1.1 The work is estimated to cost **Rs. 4,70,573/-** This estimate, however, is given merely as a rough guide.
- 1.2 The authority competent to approve NIT for the combined cost and belonging to the major discipline will consolidate NITs for calling the tenders. He will also nominate Division which will deal with all matters relating to the invitation of tenders.

### **2 Criteria of eligibility**

**The empanelled contractors for Electrical of IIT Kanpur are eligible to submit their tender.**

3. Agreement shall be drawn with the successful tenderers on prescribed Form No. CPWD 7 (or other Standard Form as mentioned) which is available as a Govt. of India Publication and also available on website [www.iitk.ac.in](http://www.iitk.ac.in) Tenderers shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.
4. The time allowed for carrying out the work will be **02 Months** from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the tender documents.
5. The site for the work is available.\*
6. The tender document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents except Standard General Conditions of Contract Form can be seen on website [www.tenderwizard.com/IIT](http://www.tenderwizard.com/IIT) or [www.iitk.ac.in](http://www.iitk.ac.in) other necessary documents also can be seen in the office of the EE , IWD Electrical, IIT, Kanpur between hours of 11:00 AM to 3:30 PM from **12.10.2020 to 19.10.2020** every day except on Sundays and Public Holidays in free of cost.
7. After submission of the tender the contractor can re-submit revised tender any number of times but before last time and date of submission of tender as notified.
8. While submitting the revised tender, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of tender as notified.
9. When tenders are invited in three stage system and if it is desired to submit revised financial tender then it shall be mandatory to submit revised financial tender. If not submitted then the tender submitted earlier shall become invalid.
10. Earnest Money can be paid in the form of Treasury Challan or Demand Draft or Pay order or Banker`s Cheque or Deposit at Call Receipt or Fixed Deposit Receipt (drawn in favour of Director, IIT, Kanpur along with Bank Guarantee of any Scheduled Bank wherever applicable.

A part of earnest money is acceptable in the form of bank guarantee also. In such case, 50% of earnest money or Rs. 20 lac, whichever is less, will have to be deposited in shape prescribed above, and balance in shape of Bank Guarantee of any scheduled bank.

- (i) **Cost of Tender Document – Rs. NIL (Including GST)** drawn in favour of the Director IIT, Kanpur through e payment.
- (ii) **e-Tender Processing Fee – Rs. 885/- (Including GST)** drawn in favour of "ITI Limited" payable at Delhi through e payment.

Treasury Challan or Demand Draft or Pay Order or Banker`s Cheque or Deposit at Call Receipt or FDR or Bank Guarantee against EMD, Cost of Tender Document and Cost of Tender Processing Fee shall be placed in single sealed envelope superscripted as "Earnest Money, Cost of Tender Document and Cost of Tender Processing Fee" with name of work and due date of opening of the tender also mentioned thereon.

Copy of Enlistment Order and certificate of work experience wherever applicable and other documents if required and specified in this bid document shall be scanned and uploaded to the e-Tendering website within the period of tender submission and certified copy of each shall be deposited in a separate envelop marked as "Other Documents".

Both the envelopes shall be placed in another envelope with due mention of Name of work, date & time of opening of tenders and to be submitted in the office of Executive Engineer after last date & time of submission of tender and up to 3:30: PM **on 19.10.2020**. The documents submitted shall be opened at 03:30 PM on **20.10.2020**.

Online tender documents submitted by intending tenderers shall be opened only of those tenderers, whose Earnest Money Deposit, Cost of Tender Document and e- Tender Processing Fee and other documents placed in the envelope are found in order.

The tender submitted shall be opened at 03:30 PM on **21.10.2020**.

11. The tender submitted shall become invalid and cost of tender & e-Tender processing fee shall not be refunded if:
- (i) The tenderers is found ineligible.
- (ii) The tenderers does not upload all the documents as stipulated in the tender document.
- (iii) If any discrepancy is noticed between the documents as uploaded at the time of submission of tender and hard copies as submitted physically in the office of tender opening authority.
12. The contractor whose tender is accepted will be required to furnish performance guarantee of 5% (Five Percent) of the tendered amount within the period specified in Schedule F. This guarantee shall be in the form of cash (in case guarantee amount is less than ` 10000/-) or Deposit at Call receipt of any scheduled bank/Banker`s cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay order of any Scheduled Bank of any scheduled bank (in case guarantee amount is less than ` 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form. **In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F', including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor.**
13. Intending Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderers shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The tenderers shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity

access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderers implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work and local conditions and other factors having a bearing on the execution of the work.

14. The competent authority on behalf of the Board of Governors, IIT, Kanpur does not bind itself to accept the lowest or any other tender and reserves to itself the authority to reject any or all the tenders received without the assignment of any reason. All tenders in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the tenderers shall be summarily rejected.
15. Canvassing whether directly or indirectly, in connection with tenderers is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable for rejection.
16. The competent authority on behalf of Board of Governors, IIT, Kanpur reserves to himself the right of accepting the whole or any part of the tender and the tenderers shall be bound to perform the same at the rate quoted.
17. The contractor shall not be permitted to tender for works in the IIT Kanpur responsible for award and execution of contracts, in which his near relative is posted a Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted officer in the IIT Kanpur. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department.
18. No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the contractor's service.
19. The tender for the works shall remain open for acceptance for a period of **ninety (90) days** from the date of opening of tenders if any tenderer withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the tenderers shall not be allowed to participate in the retendering process of the work.
20. This Notice Inviting Tender shall form a part of the contract document. The successful tenderers/contractor, on acceptance of his tender by the Accepting Authority shall within 15 days from the stipulated date of start of the work, sign the contract consisting of:-
  - a) The Notice Inviting Tender, all the documents including additional conditions, specifications and drawings, if any, forming part of the tender as uploaded at the time of invitation of tender and the rates quoted online at the time of submission of tender and acceptance thereof together with any correspondence leading thereto.
  - b) Standard C.P.W.D. Form 7 or other Standard C.P.W.D. Form as applicable.

20.1.1 The tender document will include following three components:

**Part A:-**



CPWD-6, CPWD-7 including schedule A to F for the major component of the work, Standard General Conditions of Contract for CPWD 2014 as amended/modified up to **19.10.2020**.

**Part B:-**

General/specific conditions, specifications and schedule of quantities applicable to major component of the work.

**Part C:-**

Schedule A to F for minor component of the work. (SE/EE in charge of major component shall also be competent authority under clause 2 and clause 5 as mentioned in schedule A to F for major components), General/specific conditions, specifications and schedule of quantities applicable to minor component(s) of the work.

- 20.1.2 The tenderers must associate himself, with agencies of the appropriate class eligible to tender for each of the minor component individually.
- 20.1.3 The eligible tenderers shall quote rates for all items of major component as well as for all items of minor components of work.
- 20.1.4 Entire work under the scope of composite tender including major and all minor components shall be executed under one agreement.
- 20.1.5 Security Deposit will be worked out separately for each component corresponding to the estimated cost of the respective component of works. The Earnest Money will become part of the security deposit of the major components of work.
- 21. The EPF & ESI contribution paid to the contract worker shall be reimbursed on actual basis.

**Superintending Engineer  
For & on behalf of the Board of Governors, IIT, Kanpur**

## ITEM RATE TENDER AND CONTRACT FOR WORK

(A) Tender for the work of:	Replacement of old battery charger and 55 no's 2V, 100 AH batteries installed at 33 KV substation (under buy back of old equipments).
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### TENDER

I/We have read and examined the Notice Inviting tender, schedule, A,B,C,D,E&F. Specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, Special conditions, Schedule of Rate & other documents and rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the Board of Governors, IIT, Kanpur within the time specified in Schedule 'F', viz., schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender **open for (90) ninety days from the date of opening of tender** and not to make any modifications in its terms and conditions.

A sum of **Rs 9,411/-** is hereby forwarded in Cash/Receipt Treasury Challan/Deposit at call Receipt of a Scheduled Bank/Fixed deposit receipt of scheduled bank/demand draft of a scheduled bank/bank guarantee issued by scheduled bank as earnest money. If I/we, fail to furnish the prescribed performance guarantee or fail to commence the work within prescribed period I/we agree that the said Board of Governors, IIT, Kanpur or his successors in office shall without prejudice to any other right or remedy be at liberty to forfeit the said earnest money absolutely. Further, if I/we fail of commence work as specified, I/we agree that Board of Governors, IIT, Kanpur or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, up to maximum of the percentage mentioned in Schedule 'F' and those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form.

Further, I/We agree that in case of forfeiture of earnest money or both Earnest Money & Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/ have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in IIT, Kanpur in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

I/We hereby declare that I/we shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information derived therefrom to any person other than a person to whom I/we am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated \_\_\_\_\_ \*\* \_\_\_\_\_

Witness: \*\*  
Address: \*\*  
Occupation: \*\*

\*\*  
Signature of contractor  
Postal Address \*\*

## ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the Board of Governors, IIT, Kanpur for a sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_)

The letters referred to below shall form part of this contract Agreement:-

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_

For & on behalf of the Board of Governors, IIT,  
Kanpur

Dated \_\_\_\_\_

Signature \_\_\_\_\_  
Designation \_\_\_\_\_

**Operative schedules shall be supplied separately to each intending tenderer)**

**SCHEDULE 'A'**

Schedule of Quantities :

**SCHEDULE 'B'**

Schedule of materials to be issued to the contractor:

S. No.	Description of item	Quantity	Rates in figures & words at which the material will be charged to the contractor	Place of issue
1	2	3	4	5
-----NIL -----				

**SCHEDULE 'C'**

Schedule of Tools and Plants to be hired to the contractor

S. No.	Description	Hire charges per day	Place of issue
1	2	3	4
-----NIL -----			

**SCHEDULE 'D'**

Extra schedule for specific requirements/document for the work, if any: **As attached in tender form.**

**SCHEDULE 'E'**

Schedule of component of other Materials, Labour, POL etc. for price escalation : **N.A.**

**SCHEDULE 'F'**

Reference to General Conditions of contract.

<b>Name of Work:</b>	<b>Replacement of old battery charger and 55 no's 2V, 100 AH batteries installed at 33 KV substation (under buy back of old equipments).</b>		
<b>Estimated cost of the work:</b>	Electrical Items of Work	<b>Rs. 4,70,573/-</b>	
<b>Earnest money</b>	<b>Rs. 9,411/-</b>		
<b>Performance Guarantee</b>	5% of the tendered value of the work		
<b>Security Deposit</b>	2.5% of the tendered value of the work		

**General rules and direction:**


**Definitions:**

2(v)	<b>Engineer-in-Charge</b>	
	For Electrical items of work	<b>Executive Engineer, Institute Works Department IIT, Kanpur</b>
2(vi)	Accepting Authority	<b>Superintending Engineer, Institute Works Department IIT, Kanpur</b>
2(vii)	Percentage on cost of materials and labour to cover all overheads and profits	15%
2(viii)	<b>Standard Schedule of Rates:</b>	
	Electrical Items of Work:	D.S.R. 2018 with up to date correction slips
2(ix)	Department:	Central Public Works Department
2(x)	Standard CPWD contract Form:	GCC 2014, CPWD <b>form-7</b> as modified & corrected up to <b>19.10.2020</b> (Whether correction vide latest circulars are incorporated or not in this document).
<b>Clause 1</b>	i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance	15 Days
	ii) Maximum allowable extension beyond the period as provided in i) above	7 Days
<b>Clause 2</b>	Authority for fixing Compensation under Clause 2	<b>Superintending Engineer, Institute Works Department IIT, Kanpur. Or successor thereof</b>
<b>Clause 2 A</b>	Whether Clause 2A shall be applicable	No
<b>Clause 5</b>	i) Number of days from the date of issue of letter of acceptance for reckoning date of start	<b>22 Days</b>
	ii) Time allowed for execution of work	<b>02 (Months)</b>
<b>Authority to decide</b>	<b>Extension of time</b>	<b>Superintending Engineer, Institute Works Department IIT, Kanpur</b>

**Clause 6/ 6A** **Only clause 6 applicable.**

**Clause 7** Gross work to be done together with net payment/Adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment **Not applicable**

**Clause 10A** Material to be provided by the contractor. **Applicable**  
**Clause 10B (ii), (iii)** Whether clause 10-B (ii) and 10-B (iii) shall be applicable. **Not Applicable**

**Clause 10 C** Component of labour expressed as percentage of value of work ---

**Clause 10 CA** Materials covered under this clause. Nearest material(**other than cement, reinforcement bars and structural steel**) for which All India Whole sale price Index is to be followed. Base price of all the materials covered under clause 10 CA

1. Cement (PPC)	<b>Nil</b>	<b>NIL</b>
2. Steel	<b>Nil</b>	<b>Nil</b>

**Clause 10 CC** Increase/Decrease in Price of materials/wages **Not Applicable**

**Clause 11** **Specification to be followed for execution of work:**

**For electrical works** **CPWD specifications 2013 internal and 1994 external electrical works**

For Civil items of work CPWD Specifications 2009 Vol. 1 and Vol. 2 with up to date correction slips.(Hereinafter called CPWD specifications also)

**Clause 12**

12.2 & 12.3 Deviation limit beyond which clause 12.2 & 12.3 shall apply for building work ---

12.5 Deviation limit beyond which clause 12.2 & 12.3 shall apply for foundation work **50%**

**Clause 16** **Competent Authority for Deciding reduced rates:**

For electrical/civil items of work	<b>Superintending Engineer, Institute Works Department IIT, Kanpur</b>
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**Clause 18** List of mandatory machinery, tools & plants to be deployed by the contractor at site. **Ladders, drill machine, crimping tools, chase cutting tools , cable jointing tools, blower**

**Clause 36 (i)** **Requirement of technical Representative(s)**

For supervision of civil as well as electrical items of work, technical representatives of the respective disciplines will be required to be deployed.

**Clause  
42**

- i) a) Schedule/ statement for determining theoretical quantity of cement & bitumen on the basis of Delhi Schedule of Rates 2018 printed by CPWD **D.S.R. 2018 (with up to date correction slips)**
- ii) **Variations permissible on theoretical quantities**
  - a) Cement for works with estimated cost put to tender not more than Rs. 5 lakhs. **3% plus/minus**  
For works with estimated cost put to Tender is more than Rs. 5 lakhs **2% plus/minus**
  - b) Bitumen all works **2.5% plus only & nil on minus side.**
  - c) Steel reinforcement and structural steel Sections for diameter, section and category. **2% plus/minus.**
  - d) All other materials ***Nil***

**RECOVERY RATES FOR QUANTITIES BEYOND PERMISSIBLE VARIATION**

SI No	Description of items	Rates in figures and words at which recovery shall be made from the contractor	
		Excess beyond permissible variation	Less use beyond the permissible variation
1.	Cement (PPC)	<b>N. A</b>	<b>NIL</b>
2.	Steel reinforcement (TMT Bars)		<b>NIL</b>



# SALIENT/MANDATORY REQUIREMENTS FOR THE TENDER

**Name of Work:** Replacement of old battery charger and 55 no's 2V, 100 AH batteries installed at 33 KV substation (under buy back of old equipments).

- 1 The tenderer is advised to read and examine the tender documents for the work and the set of drawings available with Engineer-in-charge. He should inspect and examine the site and its surroundings by himself before submitting his tender.
- 2 Separate schedule of quantity is included in this tender for civil and electrical items of work. If the tenderer wants to offer any unconditional rebates on their rates, the same should also be offered in the respective components of civil and electrical schedule separately. The contractor shall quote the Item rates in figures and words accurately so that there is no discrepancy in rates written in figures and words.
- 3 Time allowed for the execution of work is **02 (Months)**.
- 4 The contractor(s) shall submit a detailed program of execution in accordance with the master programme/milestone within ten days from the date of issue of award letter.
- 5 Contractor has to arrange and install field laboratory during the currency of work and nothing extra will be paid on this account.
- 6 Quality of the project is of utmost importance. This shall be adhered to in accordance with the provisions of CPWD specifications and guidelines given in the relevant paras.
- 7 Contractor has to deploy required Plant and machinery on the project. In case the contractor fails to deploy the plant and machinery whenever required and as per the direction of the Engineer-in-charge, he (Engineer-in-charge) shall be at a liberty to get the same deployed at the risk and cost of the contractor.
- 8 The contractor shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the contract and the Superintending Engineer/Executive Engineer may in his discretion, without prejudice to any other right or remedy available in law, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.
- 9 Temporary Electric connection shall be issued as per request and the water charges shall be recovered as per rule.

# ***PART-B***

## **QUALITY ASSURANCE OF THE WORK**

1. The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance programme within two weeks of the award of work. The quality assurance programme should include method statement for various items of work to be executed along with check lists to enforce quality control.
2. The contractor shall get the source of all other materials, not specified else where in the document, approved from the Engineer-in-Charge. The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of the Engineer-in-Charge for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Engineer-in-Charge along with samples and once approved, he shall stick to it.

### **3. Other Laboratories :**

1. The contractor shall arrange carrying out of all tests required under the agreement through the laboratory as approved by the Engineer-in-Charge and shall bear all charges in connection therewith including fee for testing. The said cost of tests shall be borne by the contractor/department in the manner indicated below.
  - i) By the contractor, if the results show that the test does not conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents
  - ii) By the department, if the results conforms to relevant CPWD Specifications / BIS code or specification mentioned else where in the documents.
2. If the tests, which were to be conducted in the site laboratory are conducted in other laboratories for what ever the reasons, the cost of such tests shall be borne by the contractor.

### **Sampling of Materials :**

1. Sample of building materials fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge. Articles manufactured by companies of repute and approved by the Engineer-in-Charge shall only be used. Articles bearing BIS certification mark shall be used in case the above are not available, the quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work.
2. The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge.
3. BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/materials. Wherever BIS marked materials are brought to the site of work, the contractor shall if required, by the Engineer-in-Charge furnish manufacturers test certificate or test certificate from approved testing laboratory to establish that the material produced by the contractor for incorporation in the work satisfies the provisions of BIS codes relevant to the material and/or the work done.
4. The contractor shall procure all the materials at least in advance so that there is sufficient time to testing and approving of the materials and clearance of the same before use in work.

5. All materials brought by the contractor for use in the work shall be got checked from the Engineer-in-Charge or his authorised representative of the work on receipt of the same at site before use.
6. The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system.

## ADDITIONAL TERMS AND CONDITIONS

- 1 Unless otherwise provided in the Schedule of Quantities/Specifications, the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the work and nothing extra shall be payable to him on account of the same. Extra payment for centering/shuttering, if required to be done for heights greater than 3.5 m shall however be admissible at the rates arrived at in accordance with clause 12 of the agreement, if not already specified.
- 2 Other agencies doing works related with this project may also simultaneously execute their works and the contractor shall afford necessary facilities for the same. The contractor shall leave such necessary holes, openings etc. for laying/burying in the work, pipes cables, conduits, clamps, boxes and hooks for fan clamps etc. as may be required for the other agencies. Nothing extra over the Agreement rates shall be paid for doing these.
- 3 Some restrictions may be imposed by the security staff etc. on the working and for movement of labour, materials etc. The contractor shall be bound to follow all such restrictions/instructions and nothing extra shall be payable on account of the same.
4. The contractor shall fully comply with all legal orders and directions of the Public or local authorities or municipality and abide by their rules and regulations and pay all fees and charges for which he may be liable in this regard. Nothing extra shall be paid/reimbursed for the same.
5. The building work shall be carried out in the manner complying in all respects with the requirements of the relevant bylaws and regulations of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-charge and nothing extra shall be paid on this account.
6. If as per local Municipal regulations, huts for labour are not to be erected at the site of work, the contractor shall be required to provide such accommodation at a place as is acceptable to the local body and nothing extra shall be paid on this account.
7. The structural and architectural drawings shall at all times be properly co-related before executing any work. However, in case of any discrepancy in the item given in the schedule of quantities appended with the tender and Architectural drawings relating to the relevant item, the former shall prevail unless otherwise given in writing by the Engineer-in-charge.
8. For the purpose of recording measurements and preparing running account bills, the abbreviated nomenclature indicated in the publications Abbreviated Nomenclature of Items of DSR 2018 shall be accepted. The abbreviated nomenclature shall be taken to cover all the materials and operations as per the complete nomenclature of the relevant items in the agreement and relevant specifications.
9. In case of items for which abbreviated nomenclature is not available in the aforesaid publication and also in case of extra and substituted items for which abbreviated nomenclature are not provided for in the agreement, full nomenclature of item shall be reproduced in the measurement books and bill forms for running account bills.
10. For the final bill, however, full nomenclature of all the items shall be adopted in preparing abstract in the measurement books and in the bill forms.
11. The contractor shall take instructions from the Engineer-in-charge for stacking of materials. No excavated earth or building materials etc. shall be stacked/collected in areas where other buildings, roads, services, compound walls etc. are to be constructed.
12. Any trenching and digging for laying sewer lines/water lines/cables etc. shall be commenced by the contractor only when all men, machinery's and materials have been

arranged and closing of the trench(s) thereafter shall be ensured within the least possible time.

13. It shall be ensured by the contractor that no electric live wire is left exposed or unattended to avoid any accidents in this regard.
14. In case the supply of timber/steel frames/shutters for doors, windows etc. is made by some other agency, the contractor shall make necessary arrangements for their safe custody on the direction of the Engineer-in-charge till the same are fixed in position by him & nothing extra shall be paid on this account.
15. The contractor shall maintain in perfect condition, all portions executed till completion of the entire work allotted to him. Where however phased delivery of work is contemplated these provisions shall apply separately to each phase.
16. The entire royalty at the prevalent rates shall have to be paid by the contractor on all the boulders, metals, shingle sand etc. collected by him for execution of the work, directly to the Revenue authority or authorized agents of the State Government concerned or the Central Government, as the case may be.
17. The contractor shall bear all incidental charges for cartage, storage and safe custody of materials issued by the departments and shall construct suitable godowns, yards at the site of work for storing all materials as to be safe against damage by sun, rain, dampness, fire, theft etc. at his own cost and also employ necessary watch and ward establishment for the purpose, at his own cost. Materials to be charged directly to work and stipulated for issue free of cost shall also be issued to the contractor as soon as those are received at site or at the stipulated place of issue. The provision of this para shall apply equally and fully to those as well.
18. All materials obtained from the Institute Works Department store or otherwise on receipt shall be got checked by the Engineer-in-charge of the work or his representations before use.
19. Registers for the materials to be issued by the department shall be maintained as required by the Engineer-in-charge and these shall be signed by the contractor or his authorized agent and representative of Engineer-in-charge on each day of transactions.

## **Special condition for Safety at the Work Site**

The contractor will identify one of the supervisors for taking care of implementation of Safety systems.

The Contractor should follow the following General Guidelines governing the safety rules as laid down under:

1. Smoking is strictly prohibited at workplace.
2. Nobody is allowed to work without wearing safety helmet. Chinstrap of safety helmet shall be always on. Drivers, helpers and operators are no exception.
3. No one is allowed to work at or more than three meters height without wearing safety belt and anchoring the lanyard of safety belt to firm support preferably at shoulder level.
4. No one is allowed to work without adequate foot protection.
5. Usage of eye protection equipment shall be ensured when workmen are engaged for grinding, chipping, welding and gas-cutting. For other jobs as and when site safety co-ordinator insists eye protection has to be provided.
6. All safety appliances like Safety shoes, Safety gloves, Safety helmet, Safety belt, Safety goggles etc. shall be arranged before starting the job.
7. All excavated pits shall be barricaded & barricading to be maintained till the backfilling is done. Safe approach to be ensured into every excavation.
8. Adequate illumination at workplace shall be ensured before starting the job at night.
9. All the dangerous moving parts of the portable / fixed machinery being used shall be adequately guarded.
10. Ladders being used at site shall be adequately secured at bottom and top. Ladders shall not be used as work platforms.
11. Material shall not be thrown from the height. If required, the area shall be barricaded and one person shall be posted outside the barricading for preventing the tre-passers from entering the area.
12. Other than electricians no one is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.
13. All electrical connections shall be made using 3 or 5 core cables, having a earth wire.
14. Inserting of bare wires for tapping the power from electrical sockets is completely prohibited.

15. A tools and tackles inspection register must be maintained and updated regularly.
16. Debris, scrap and other materials to be cleared from time to time from the workplace and at the time of closing of work everyday.
17. All the unsafe conditions, unsafe acts identified by contractors, reported by site supervisors and / or safety personnel to be corrected on priority basis.
18. No children shall be allowed to enter the workplace.
19. All the lifting tools and tackles shall be stored properly when not in use.
20. Clamps shall be used on Return cables to ensure proper earthing for welding works.
21. Return cables shall be used for earthing.
22. All the pressure gauges used in gas cutting apparatus shall be in good working condition.
23. Proper eye washing facilities shall be made in areas where chemicals are handled.
24. Connectors and hose clamps are used for making welding hose connections.
25. All underground cables for supplying construction power shall be routed using conduit pipes.
26. Spill trays shall be used to contain the oil spills while transferring / storing them.
27. Tapping of power by cutting electric cables in between must be avoided. Proper junction boxes must be used.

Superintending Engineer



## **SPECIAL TERMS & CONDITIONS**

1. In the Contract (as hereinafter defined) the following definitions words and expressions shall have the meaning hereby assigned to them except where the context otherwise required.
  - i) Institute shall mean the Indian Institute of Technology (IIT), Kanpur
  - ii) The President shall mean the Board of Governor, IIT Kanpur.
  - iii) The Engineers In-charge, who shall administer the work jointly, shall mean the Executive Engineer (Electrical) for electrical works.
  - iv) Government or Govt. of India shall mean the Indian Institute of Technology represented by its Director.
  - v) The term Director General of Works shall mean the Chairman, Building & Works Committee of the Institute.
  - vi) Accepting authority shall mean the Director, IIT Kanpur or his authorized representative.
  - vii) Superintending Engineer shall mean the Superintending Engineer of the Institute, who as overall In-charge and head of the Institute Works Department, shall direct the contract.
  - viii) Site Engineers shall mean the Assistant Engineer & Jr. Engineer (Electrical) for Electrical & Air-conditioning works, appointed by the Institute Works Department.
  
2. **Duties & Powers :**
  - i) Site Engineers :

The duties of the Site Engineer(s) are to watch and supervise the works and the workmanship employed in connection with the works, and to test and examine any materials to be used. He shall have no authority to relieve the contractor of any of his duties or obligations under the contract nor, except as expressly provided here under, to order any work involving delay or any extra payment by the Institute, nor to make any variation in the works.

The Engineer-in-charge, from time to time in writing, delegate to the Site Engineer (s) any of the powers and authorities vested in them. Any written instruction or written approval given by the Site Engineer (s) to the contractor within the terms of such delegation (but not otherwise) shall bind the contractor and the Institute as though it had been given by the Engineer-in-charge / Architect provided always as follows :

    - a) Failure of the Site Engineer (s) to disapprove any work or materials shall not prejudice the power of the Engineer In-charge / Architect to subsequently disapprove such work or materials and to order the pulling down, removal or breaking up thereof.
    - b) If the contractor is dissatisfied by reason of any decision of the Site Engineer (s), he shall be entitled to refer the matter to the Engineer-in-charge / Architect, who shall thereupon confirm reverse or vary such decision.
  
3. The scope of contract comprises the construction, completion and maintenance of the works for (12) months after the completion and the provision of all labour, materials, construction of plant equipment and transpiration, temporary works and everything, whether of temporary or permanent

nature required in and for such construction, completion and maintenance so far as the necessity for providing the same is specified in or reasonably be inferred from the contract. The contractors shall make his own arrangements for the store storage of materials, accommodation for his staff etc. and no claim for the temporary accommodation from the contractor shall be entertained.

The contractor shall carry out and complete the said work in every respect in accordance with this contract and as per the directions and to the satisfaction of the Engineer-in-charge/Architect. Issue of further drawings and /or written instructions, detailed directions and explanations which are hereinafter collectively referred to as instructions of the engineer-in-charge/ Architect's in regards to:-

- a. The variation or modification of the design, quality or quantity of works or the addition or omission or substitution of any work.
- b. Any discrepancy in the drawings or between the schedule of quantities and /or drawings and/or specifications.
- c. The removal from the site of any materials brought thereon by the contractor and the substitution of any other material thereof.
- d. The dismissal from the works of any persons employed thereupon.
- e. The opening up for inspection of any work covered up.
- f. The amending /making good of any defects.

The contractor shall forthwith comply with and duly execute any instructions of work comprised in such engineers-in-charge instructions, provided always that the verbal instructions and explanations given to the contractor or his representative upon the works shall, if involving a variation , be confirmed in writing by the contractor within seven days and is not dissented in writing within a further seven days by the Engineer-In-Charge/Architect, such shall be deemed to be instructions of the Engineer-In-charge/Architect within the scope of the contract.

#### 4. **Contract Document:**

- 4.1 The several documents, forming the contract, are to be taken as mutually explanatory of one another and in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer-In-Charge who shall thereupon issue to the contractor its interpretation directing in what manner the work is to be carried out. In case the contractor feels aggrieved by the interpretation of the Institute then the matter shall be referred to the Superintending Engineer and his decision shall be final, conclusive and bind on both parties.
- 4.2 The drawings etc. shall remain in the custody of the Institute. Two complete sets of drawings, specification and bill of quantities shall be furnished by the Engineer-In-Charge to the contractor in such time which must not delay the progress of the construction and the Institute shall furnish copies of any additional drawings, which in their opinion may be necessary for the execution of any part of the work. One complete set shall be kept on the work site and the Engineer-In-Charge and his representatives shall be, at all reasonable times, have access to the same. The contractor shall study the drawings thoroughly before the commencement of work. In case of any discrepancy, the contractor shall seek clarification before proceeding with the works. Figured dimensions are in all case to be accepted in preference to the scaled sizes. Large scale details shall taken preference over small scale one.

The contractor shall give adequate notice in writing to the Engineer-in-charge of any further drawings or specification that may be required for the execution of the works or otherwise under the contract.

The Engineer-in-charge shall have full powers and authority to supply the contractor from time to time during the progress of the work such drawings and instructions as shall be necessary for proper execution and the contractor shall carry out and be bound by the same.

- 4.3 The successful tenderer shall be required to enter into an agreement with the Institute. The Bill of Quantities & rates filled by the successful tenderer in, the General Condition of the Contract for CPWD works 2014, CPWD specifications for Civil, Electrical & Air-conditioning works, the special conditions, additional specifications, negotiation letter and the award letter etc. shall form part of the agreement to be signed by the successful tenderer. The cost of stamp paper and stamp duty, required for the agreement, shall be borne by the contractor.

#### 5. **Contract Agreement:**

The contractor shall, when called upon to do so, enter into and execute a contract agreement in the form annexed as annexure 'A' with such modifications as may be necessary. The contract agreement, inclusive of its enclosures, shall remain in the custody of the Superintending Engineer, Institute Works Department, IIT Kanpur and the made available him as and when required contractor shall however be supplied, an attested copy there free of cost.

6. All tenders are required to deposit earnest money in the form of FDR/CDR in the only duly endorsed in favour of Director, IIT Kanpur. Earnest money should be enclosed in a separate sealed envelope and tender documents should be enclosed in a another envelope superscribed “**EARNEST MONEY- NAME OF WORK “ ITEM RATE-TENDER-NAME OF WORK”**” on the top of envelope. At the time of opening of tender earnest money envelope will be opened first and in case earnest money is not found in the requisite from or amount envelope containing item rate tender of the party concerned shall be opened and will be summarily rejected and documents submitted will be confiscated by the Institute.
7. Canvassing in connection with tenders is prohibited and the tenders, submitted by the tenderers who resort to canvassing, are liable for rejection.
8. Tenderers shall have to sign the attached declaration (Appendix B) and if the declaration is not found to represent a true statement of facts the contract is liable to be cancelled, earnest money forfeited and the contactor shall have no claim on the Institute.
9. Tenderes are not allow to make additions and alterations in the tender document. Any additions and alternations, if incorporated in the tender, shall be at the tender's risk since the modified tender is liable for rejection.

Conditional tenders violative of the sprit and the scope or the terms & conditions of the tender, are liable to be rejected without assigning any reasons. Tenders with any form of rebate shall be rejected summarily.

10. Water and electricity required for electrical & air-conditioning works shall be supplied free of charge.

11. Stamps duty on the security money shall also be the born by contractor as per prevailing notification of U.P Govt.

**12. Conditions for Electrical and Air-conditioning Works:-**

- i. All chase cuttings in the wall, for recessed conduits & boxes and drilling the holes shall be done with power operated machines only. No chase shall be allowed to be cut manually with the use of hammer & chisel.
- ii. All cuttings in cement plaster and brick shall be made good by using cement mortar 1:3 (1 part cement, 3 part coarse sand)
- iii. The cut surfaces shall be repaired by an experienced mason only so as to match the repaired plaster with the original.
- iv. All such repaired surfaces shall be cured for 3 to 4 days to keep the surfaces wet, using water spray machine (hand/motor operated) and avoid unnecessary flooding of the area.

**13. Payment shall be regulated as under**

- a.) 75% of the tendered rate on receipt of materials at site.
- b.) 15% of the tendered rate on installation and connection.
- c.) 10% of the tendered rate on testing and commissioning.

14. Drawings/Data required prior to commencement of electrical/air-conditioning works:-

14.1 The following drawings shall be provided by the Architect/Engineer-In-Charge of the work:-

1. Conduit layout for lights, fans, socket outlets, telephone outlets, network & fire alarm system and sub mains showing size of conduits, no. of wires and size of wires in each run, location and size of accessories like junction boxes, ceiling boxes for hooks, draw boxes and switch boxed etc.
2. Cable routing drawings showing details of size, type and no. of cables and mode of installation.
3. Ducting /chilled water pipe line/drain pipe etc., drawing showing details of size, type and mode of installation.

14.2 Following drawings shall be furnished by the contractor for the approval of the Engineer-In-charge.

- a. G.A and schematic drawings of MV switchgear/distribution /Plant/AHU/ FCU/Fire Alarm panel showing material and size of sheet steel/bus bars / inter connections and make and ratings of switchgear i/c details of protection, metering, indicating and inter lock etc.
- b. Ducting /chilled water pipe line/drain pipe etc., drawing showing details of size, type and mode of installation.

15. **Completion drawings:**

On completion of works and before issuance of completion certificate, the contractor submit completion drawings in the form of three complete set of originals (reproducible) .

- i) As built GA and schematic drawings of MV panels, distributions boards, fire alarm panels, Plant, AHU & FCU etc. showing material and size of sheet steel/bus bars/ connections and make and rating of switchgear i/c details of protection, meter indicating and interlocks etc.
- ii) Technical literature, test certificates and operation and maintenance manuals required.

16. **Works Inspection and Testing of Equipment:**

Prior to dispatch of equipment the Institute reserves the right to inspect the same at the manufacturer's works and the contractor shall provide and secure every reasonable access and facility at the manufacturers works for inspection, for witness of all acceptance and routine tests as per relevant Indian Standards. Contractor shall give a reasonable notice of about 15 days for the purpose of test, and witness of all major equipments.

- a.) Pre-commissioning test: All routine tests shall be carried out on the electrical & air-conditioning equipment. Protective & measuring devices should be checked for calibration of Plant AHU & FCU's should be checked for air quantities. All grills/diffusers should be checked for balanced air quantities.

17. **Rates:** The work shall be treated as on works contract basis and the rates tendered shall be for complete item of work and all charges for items contingent to the work, such as packing, forwarding, insurance, freight and delivery at site for the materials to be supplied by the contractor, watch and ward of all materials at the site, labour related expenses as per relevant labour laws, testing of materials/ samples etc excluding Goods and Service Tax (GST).

18. **Taxes & Duties:**

**21.1** Being an indivisible works contract, no other tax is payable other than GST. The GST shall be as applicable to IIT Kanpur as per Government rules.

19. The earnest money of the unsuccessful tenderers shall be refunded on written request, within 1(one) month of the award of work. The earnest money of the successful tenderer shall however be adjusted towards the security deposit.
20. The tender document & drawings in respect of the work can be seen in the o/o Executive Engineer (Electrical).
21. The tender document contains \_\_\_\_\_ pages. No page of the tender document shall be removed, mutilated, detached or cancelled.
22. Rates for finished works shall be given for each items separately, both in words & figures. In the event of non compliance the tender shall be deemed incomplete and liable for rejection.
23. All entries by the tenderer should be made in one ink and one hand writing only. Tenders should be filled in legible hand writing and should not contain erasures, corrections and overwriting as far as possible. However if it becomes necessary, each correction etc. should be properly attested under dated signature.
24. The work shall be executed on the basis of the following CPWD specifications:
  - i) Electrical Works :
    - General specifications for Electrical Works Part-1 (Internal) 2014 with up to date corrections.
    - General specifications for electrical works (external) 1994 with upto date corrections.
    - General specifications for electrical works Part-VII (DG set) 2014 with upto date corrections.

- General specifications for electrical works Part-IV Sub-station- 2014 with upto date corrections.
  - General specifications of HVAC works 2004 with upto date corrections.
25. For the purpose of clause 12 of the General conditions of contract the following schedule of rates shall be applicable.
    - i) Electrical Works: Based upon prevailing market rates.
  26. The special conditions listed above shall take precedence over all above provisions of the contract. The General Condition of contract for CPWD works shall be generally followed including the clause 21 i.e. work shall not be sublet.
  27. The contractor shall have to execute the work in such place and condition where other agencies will also be engaged for other works such as site grading, filling and leveling, interiors, landscape, and electrical and mechanical engineering works, etc. No claim shall be entertained due to work being executed in the above circumstances.
  28. No contractor, to whom the provisions of the BOCW Act apply, shall be allowed to commence work on the campus unless he has produced the 'Registration Certificate' issued by the office of Dy. CLC (Central).
  29. The contractor shall engage only such workers who are registered as beneficiaries with U.P. BOCW Welfare Board and in case of engagement of new workers, he shall ensure the submission of applications for registration of such workmen within appropriate time.
  30. A certificate for administrative convenience shall be obtained from the contractor covered under BOCW Act whether he has engaged 10 or more workmen while working in the Institute and only thereafter, Cess @1% from the bills raised by him shall be deducted at source for all running works. Cess, so deducted shall be deposited with the BOCW Welfare Board.
  31. As per clause 36 (I) of GCC : It should be noted that license wire man shall only be allowed for the wiring work.

# Specification E-01

## DATA SHEET FOR 110V SINGLE FLOAT CUM BOOST CHARGER SUITABLE FOR VRLA BATTERY

Sr. No.	Parameter	Specification (Class C-C : C – Analog Controller, C – Class F Insulation)
✓ 1	AC input voltage:	415VAC with permissible variation: +/-10%
✓ 2	AC input frequency:	50Hz with permissible variation: +/-5%
✓ 3	Operating Temperature:	0-50° C
4	DC output voltage setting:	Nominal: 110V      Float: 124V      Boost: 126.5V
✓ 5	Total current Limit :	20A
✓ 6	Power Conversion:	AC to DC by means of a Three phase full wave full controlled bridge consisting of Thyristors
✓ 7	Output Voltage Regulation:	+/-1% of set voltage for +/-10% input variations, 0-100% load variations (before blocker diode)
✓ 8	Ripple voltage:	≤ 2% RMS without battery connected
✓ 9	Power factor :	0.8 Lag at maximum output parameters & at nominal AC input voltage
✓ 10	Efficiency :	≥ 80% at maximum output parameters & at nominal AC input voltage
11	Switchgear:	
	a) Input side :	Input ON/OFF MCB + HRC Fuses up to 40A & Input ON/OFF MCCB from 50A and above
	b) Output side :	Output ON/OFF MCCB
✓ 12	Protection:	a) Soft start feature b) Current Limit c) Control circuit & voltmeter fuses d) Rectifier protection fuses e) Filter capacitor fuse
✓ 13	Meters :	Analog Meters of size 96x96 Sq. mm, having 90° deflection & Cl.1 accuracy a) AC input Voltmeter with selector switch b) DC Output Voltmeter c) DC output Ammeter d) Battery Discharge / Charge Ammeter
14	Indications :	"AC Supply ON" LED "DC ON" LED
✓ 15	Alarms :	FCBC AC Mains fail ✓ FCBC Rectifier fuse blown ✓ FCBC Filter fuse blown ✓ Load DC Under Voltage ✓ Load DC Over Voltage ✓ DC Earth Leakage ✓
	Potential Free Contact:	Summary Potential Free Contact for charger trouble will be

*Lead.*

16 Panel :

	Rating	Length (mm)	Wjdtth (mm)	Height (mm)
a) Charger Dimensions :	110V/20A	600	600	1600
b) Protection Grade :	IP 42			
c) Cooling :	Forced air cooling			
d) Paint shade for Panel :	Interior and Exterior RAL 7032			
e) Paint shade for Mounting Plate, Channels etc.	Light Orange Shade No 557 of IS:5			
f) Sheet Steel thickness	Frame Structure - 2mm, All Panels/Covers - 1.6mm, Cable Gland Plate - 3mm CRCA			

17 Magnetics :

a) Average winding temp. Rise Over ambient :	90 Deg. C (above ambient)
b) Insulation class :	F
c) Insulation break down Voltage :	2KV for 1 Min.

18 Cables :

650V/1100V grade PVC insulated, copper, Multistrand.  
Ferrules will be provided at both ends of each wire for identification

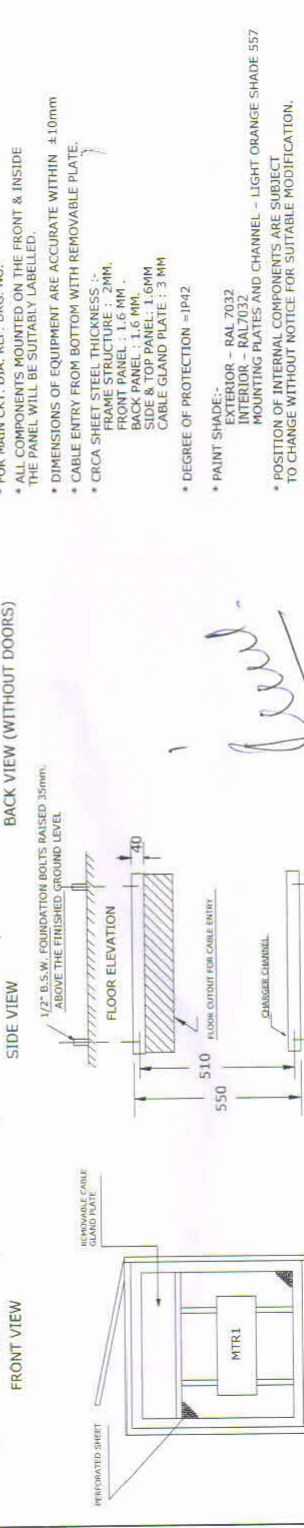
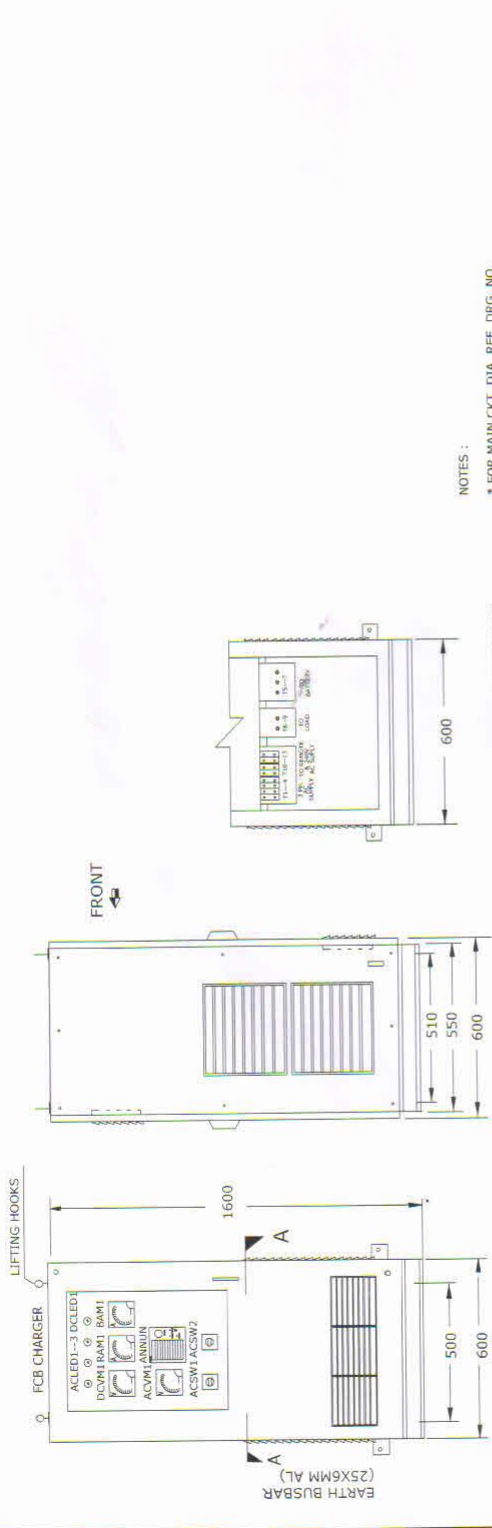
a) For Electronics Circuit -	0.5Sqmm.
b) For Control Circuit -	1.5Sqmm.
c) For Power Circuit -	As per system current requirement.

1  
Control.



Work Order No.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40



- NOTES :
- \* FOR MAIN CKT DIA. REF. DRG. NO.
  - \* ALL COMPONENTS MOUNTED ON THE FRONT & INSIDE THE PANEL WILL BE SUITABLY LABELLED.
  - \* DIMENSIONS OF EQUIPMENT ARE ACCURATE WITHIN ±1.0mm
  - \* CABLE ENTRY FROM BOTTOM WITH REMOVABLE PLATE.
  - \* CIRCA SHEET STEEL THICKNESS :-  
 FRONT PANEL : 2MM.  
 BACK PANEL : 1.6 MM.  
 SIDE & TOP PANEL : 1.6MM  
 CABLE GLAND PLATE : 3 MM
  - \* DEGREE OF PROTECTION = IP42
  - \* PAINT SHADE :-  
 EXTERIOR - RAL 7032  
 INTERIOR - RAL7032  
 MOUNTING PLATES AND CHANNEL - LIGHT ORANGE SHADE 557
  - \* POSITION OF INTERNAL COMPONENTS ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR SUITABLE MODIFICATION.
  - \* FILTER GRIL SIZE :-  
 FOR FRONT PANEL : 147X147mm  
 FOR BACK PANEL : 147X147mm  
 FOR SIDE PANEL : 325X325mm
  - \* NOT TO SCALE

*Handwritten signature*

## SPECIFICATION E-02.

For over 70 years, Exide Industries Limited, has pioneered battery technology in India. It is the only company in South and South-East Asia which designs and manufactures lead acid batteries from 2.5 Ah to 20400 Ah. Exide offers the latest series of Tubular batteries manufactured in its state of the art ISO 9001:2008 and ISO 14001:2004 certified factories to fulfill the growing demand both in domestic and export market. Exide NDP tubular cells conform to BIS specification no. IS. 1651-2013.

### PRODUCT FEATURES

- PP Container • Tubular Positive Plates • Pasted Negative Plates • Highly Tensile, Acid Resistant Polyester Gauntlets • High Porosity Envelope Separators • Electrolyte Level Indicator • Microporous Ceramic Vent Plug • Low Maintenance

### TORR TUBULAR TECHNOLOGY


Exide Tubular Batteries have the spines or positive plate support cast at high pressure (100 Bar) in imported HADI machine which ensures void free structure and consistent grain orientation and can protect the plate support from anodic corrosion. This in turn ensures higher reliability and longer life. Exide Torr Tubular Plates are also cast with low antimony content which reduces the topping up frequency, making the batteries low maintenance type. This also keeps the float charging current at a lower value, thus minimises the total energy requirement needed to keep the battery in charged condition during float application.

**APPLICATIONS:** • Power Plants • Substations • UPS systems • Process Industries • C & I • Emergency Lighting • Solar • Railway Signaling • Telecommunication

### Technical Data for Exide NDP Tubular Cells

Type of Cell	Capacity at 10 Hrs rate (Ah)	Charging current (A)		Weight of cell +/- 5% (KG)		Approx qty of acid 1.190 Sp. Gr. (Litres)	Overall Cell Dimensions +/- 3 mm			Trickle Charge current (mA)		Corresponding cell centres (mm)
		Starting rate	Finishing rate	Without Acid	With Acid		Length	Width	Height*	Min	Max	
T880P	80	9.6	4.8	4.5	7.4	2.5	108	177	358	80	320	114
TV100P-MARKI	100	12	6	6.4	10	3.1	111	159	364	100	400	122
TM150P-MARKI	150	18	9	8.4	12.9	3.8	111	159	432	150	600	122
TM200P	200	24	12	11.8	19.2	6.2	160	177	445	200	800	185
TM250P	250	30	15	14.9	22	5.9	160	177	445	250	1000	185
TMS300P	300	36	18	16.9	23.8	5.8	160	177	445	300	1200	185
TM400P	400	48	24	21.6	33.5	10	251	178	445	400	1600	186
TM450P	450	54	27	24	34.7	9	251	178	445	450	1800	186
TMS500P	500	60	30	27.5	38.2	9	251	178	445	500	2000	186
TH600P	600	72	36	36.9	53.7	14	327	177	675	600	2400	185
TH700P	700	84	42	42.6	61.8	16	327	177	675	700	2800	185
TH800P	800	96	48	49.5	74.1	20.5	327	177	675	800	3200	185
TH900P	900	108	54	54.1	76.9	19	327	177	675	900	3600	185
TH1000P	1000	120	60	57.5	81.3	19.8	327	177	675	1000	4000	185

\*Tolerance for Overall Height : +/-5mm

Go For  • Spines cast in HADI machine at 100 Bar • Higher reliability, longer life



\*Applied for

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All live parts inside the switch fuse units shall be shrouded to prevent any accidental contact.

All the terminals shall be liberally designed. All units above 100 A shall be provided with integral cable sockets.

All switch units shall be provided with suitable interlocks such that the door of the switchboard panel shall not open unless the switch is in OFF position. Provision for padlocking the switch in OFF position shall also be provided.

Routine and type tests as per IS 13947 : 1993 shall be conducted at works and test certificates furnished.

### **3. MOULDED CASE CIRCUIT BREAKERS**

- i) Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.
- ii) MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal/magnetic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Thermal/magnetic tripping device shall have IDMT characteristics for sustained over loads and short circuits.
- iii) Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.
- iv) MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities :
  - Under voltage trip
  - Shunt trip
  - Alarm switch
  - Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

### **4. METERING, INSTRUMENTATION AND PROTECTION.**

The switchboard shall have required current and potential transformers as per schedule of quantities for metering and protection. The transformers shall comply to relevant ISS and class of accuracy required for metering and protection. Separate sets of CTs shall be provided for metering and protection.

#### **4.1 Current Transformers**

C/Ts shall confirm to IS 2705 (part -I, II and III) in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV. C/Ts shall have rated primary current, rated burden and class

of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class 0.5 to 1 and for protection class SP 10. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 31 MVA on medium voltage. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating:

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

#### **4.2 Potential Transformer**

PTs shall conform to IS 3156 (Part-I,II and III) in all respects.

#### **4.3 Measuring Instruments**

Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10° C and +50°C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from out side. Direction of deflection shall be from left to right. Suitable selector switches shall be provided for ammeters and volt meters used in three phase system. The rating type and quantity of meters, instruments and protective device shall be as per Schedule of Quantities /drawings

##### **4.3.1 Ammeters**

Ammeters shall be of moving iron type. Moving part assembly shall be with jewel bearings. Jewel bearings shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. Ammeters shall be manufacture and calibrated as per IS 1248

Ammeters shall normally be suitable for 5 A secondary of current transformers.

Ammeters shall be capable of carrying substantial over loads during fault conditions.

##### **4.3.2 Voltmeters**

Voltmeters shall be moving iron type range of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection fuse.

##### **4.3.3 Watt meter**

Wattmeter shall be of 3 phase electro dynamic type and shall be provided with a maximum demand indicator if required.

##### **4.3.4 Power factor meters**

3 phase power factor meters shall be of electro dynamic type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be calibrated for 50% lag - 100% - 50% readings. Phase angle accuracy shall be +4°.

##### **4.3.5 Energy and reactive power meters**

Trivector meters shall be two element, integrating type, KWH, KVA, KVARH meters. Meters shall conform to IEC 170 in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy consumption of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

#### **4.4 Relays**

Protection relays shall be provided with flag type indicators to indicate cause of tripping. Flag indicators shall remain in position till they are reset by hand reset. Relays shall be designed to make or break the normal circuit current with which they are associated. Relay contacts shall be of silver or platinum alloy and shall be designed to withstand repeated operation without damage. Relays shall be of draw out type to facilitate testing and maintenance. Draw out case shall be dust tight. Relays shall be capable of disconnecting faulty section of network without causing interruption to remaining sections. Analysis of setting shall be made considering relay errors, pickup and overshoot errors and shall be submitted to Engineer in charge for approval.

##### **4.4.1 Over current relays**

Over current relays shall be induction type with inverse definite minimum time lag characteristics. Relays shall be provided with adjustable current and time settings. Setting for current shall be 50 to 200 % in steps of 25%. The IDMT relay shall have time lag (delay) of 0 to 3 seconds. The time setting multiplier shall be adjustable from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5 Amps.

##### **4.4.2 Earth fault relay**

Same as over current relay excepting the current setting shall be 10% to 40% in steps of 10%.

##### **4.4.3 Under voltage relay**

Under voltage relays shall be of induction type and shall have inverse limit operation characteristics with pickup voltage range of 50 to 90% of the rated voltage.

#### **4.5 Power factor correction capacitors**

Power factor correction capacitors shall conform to IS 2834 in all respects. Approval of insurance association of India shall be obtained if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 5,10,15,20,25 and 50 kVAR sizes as per requirements. Capacitor shall be usable for indoor use, permissible overloads being as below.

- Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.
- Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.
- Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacitory unit shall be provided with its own built in silvered fuse. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnates. The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitor terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

## **5.0 MEDIUM VOLTAGE SWITCH BOARDS**

### **5.1 GENERAL**

- All medium voltage switchboards shall be suitable for operation at three phase/three phase 4 wire, 415 volt, 50 Hz, neutral grounded at transformer system with a short circuit level withstand of 31 MVA at 415 volts or as per schedule of quantities.

- The Switch Boards shall comply with the latest edition with upto date amendments of relevant Indian Standards and Indian Electricity Rules and Regulations.

## **5.2 SWITCH BOARD CONFIGURATION**

- The Switch Board shall be configured with Air Circuit Breakers, MCCB's, and other equipment as called for in the Schedule of Quantities.
- The MCCB's shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance.
- The Switch Boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

## **5.3 EQUIPMENT SPECIFICATIONS**

All equipment used to configure the Switch Board shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and to the detailed technical Specifications as included in this tender document.

## **5.4 CONSTRUCTIONAL FEATURES**

- The Switch Boards shall be metal enclosed, sheet steel cubicle pattern, extensible, dead front, floor mounting type and suitable for indoor mounting.
- The Switch Boards shall be totally enclosed, completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 42. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.
- The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.
- All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.
- Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

## **5.5 SWITCHBOARD DIMENSIONAL LIMITATIONS**

- A base channel 75 mm x 5 mm thick shall be provided at the bottom.
- A minimum of 200 mm blank space between the floor of switch board and bottom most unit shall be provided.
- The overall height of the Switch Board shall be limited to 2300 mm
- The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1800 mm from finished floor level.

## **5.6 SWITCH BOARD COMPARTMENTALIZATION**

The Switch Board shall be divided into distinct separate compartments comprising

- A completely enclosed ventilated dust and vermin proof bus bar compartment for the horizontal and vertical busbars.
- Each circuit breaker, and MCCB shall be housed in separate compartments enclosed on all sides.
- Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker/switch fuse unit in "on" and "off" position.
- For all Circuit Breakers separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control fuses etc.

These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.

- A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
- Separate cable compartments running the height of the Switch Board in the case of front access Boards shall be provided for incoming and outgoing cables.
- Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top.
- Adequate and proper support shall be provided in cable compartments to support cables.

Following minimum clearances to be maintained after taking into consideration connecting bolts, clamps etc.

i)	Between phases	32 mm
ii)	Between phases and neutral	26 mm
iii)	Between phases and earth	26 mm
vi)	Between neutral and earth	26 mm

### **5.7 SWITCH BOARD BUS BARS**

- The Bus Bar and interconnections shall be of electrolytic Copper/Aluminium and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bar. The maximum current density for copper shall be 1.2 amps per sq. mm. and for Aluminium shall be 0.8 amp per Sq. mm. and suitable to withstand the stresses of a 31 MVA fault level or at 415 volts for 1 second or as per schedule of quantities.
- The bus bars and interconnections shall be insulated with insulation tape/ fiber glass.
- The bus bars shall be extensible on either side of the Switch Board.
- The bus bars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising from a fault level of 31 MVA at 415 volts for 1 second.
- All bus bars shall be colour coded.
- All bus bar connections in Switch Boards shall be bolted with brass bolts, washers and nuts.

### **5.8 SWITCH BOARD INTERCONNECTIONS**

- All connections between the bus bars/Breakers/ shall be through solid copper strips of adequate size to carry full rated current and PVC/fibre glass insulated.

### **5.9 DRAW-OUT FEATURES**

Air Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self aligning and self isolating contacts. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards. The MCCB's shall be provided in fixed type cubicles.

### **5.10 INSTRUMENT ACCOMMODATION**

- Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switch Board.
- For MCCB's instruments and indicating lamps can be provided on the compartment doors.
- The current transformers for metering and for protection shall be mounted on the solid copper/aluminium busbars with proper supports.

### **5.11 WIRING**



All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq. mm.

#### **5.12 CABLE TERMINATIONS**

- The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located at the rear of the panel.
- The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switch Boards.
- The Switch Boards shall be complete with gland plates

#### **5.13 SPACE HEATERS**

The Switch Board shall have in each panel thermostatically controlled space heaters with a controlling 15 amp 230 volt switch socket outlet to eliminate condensation.

#### **5.14 EARTHING**

A main earth bar of G.I shall be provided throughout the full length of the Switch Board with a provision to make connections to earth stations on both sides.

#### **5.15 SHEET STEEL TREATMENT AND PAINTING**

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process or by using sand blasting method. The steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.
- All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall be adequate.

#### **5.16 NAME PLATES AND LABELS**

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

### **6. INSTALLATION**

The foundations prepared as per the manufacturers drawings shall be levelled, checked for accuracy and the Switch Board installed. All bus bar connections shall be checked with a feeler gauge after installation. The cable end boxes shall be sealed to prevent entry of moisture. The main earth bar shall be connected to the sub-station earths.

A 15 mm thick rubber matting of approved make on a 100 mm high timber platform shall be provided in front of and along the full length of the Switch Board. The width of the matting shall be 1000 mm. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.

After installation the Switch Board shall be tested as required prior to commissioning.

### **7. OUTDOOR TYPE DISTRIBUTION FEEDER PILLARS**

The feeder pillar shall be of the floor mounting type, totally enclosed, and weather proof, conforming to ISI IP 54 incorporating phenolic moulded fuse fittings with high rupturing capacity cartridge fuse links having a certified rupturing capacity of not less than 35 MVA at 433 volts. The feeder pillar shall be suitable for 440 volts 3 phase 4 wires, 50 cycles AC supply.

The cubicle should be fabricated out of heavy gauge sheet steel of thickness not less than 2 mm thick with suitable side frame and stiffeners. Hinged doors of not less than 1.6 mm thick should be provided at the front and rear of the cubicle to provide access for installation, operation, tests and inspection. The rear door is provided to facilitate cable termination and the front door for inspection of fuses, to switch 'ON' and 'OFF' the switch as and when required. All doors should be fitted with dust excluding neoprene gaskets. The doors should also be fitted with suitable locking arrangement with lock to prevent unauthorized opening. The cubicle should be designed

for mounting over cement concrete plinths by the roadside, and should be of substantial construction capable of withstanding the vibrations normally experienced due to vehicular traffic. The top of the feeder pillar is of slanting construction in all directions to prevent any collection of water due to rain. A gland plate is provided at the bottom of the feeder pillar (removable) for mounting the cable glands. The feeder pillar shall be fitted on an angle iron pedestal at the bottom covered with sheet metal from all the four sides which facilitates cable bending etc specially with aluminium cables. Two lifting hooks shall be provided at the top. A door switch shall be provided in the feeder pillar so as to switch 'ON' and 'OFF' the lamp fixed in the brass batten holder below the top sheet of the pillar.

The sheet steel materials used in the construction of the cubicle should have undergone a rigorous rust proofing process comprising alkaline degreasing, descaling in dilute sulfuric acid solution and recognised phosphating process. After metal treatment, the interior of the cubicle should be painted with two coats of air-drying red lead primer followed by two coats of air drying anti-condensation paint. The exterior of the cubicle should be painted with two coats of staving red oxide primer followed by one coats of epoxy finishing paint. One final spray of epoxy paint shall be applied at the time of handing over the installation.

All the nuts, bolts shall be cadmium plated with spring washers. A minimum spacing from cable connection to the bottom of gland plate shall be 300mm.

The bus bars should be of electrical grade copper. They should be air insulated with adequate clearances between conductors and between conductors and earth. These should be colour coded to enable immediate identification of the phases and neutral. The current density for bus bars shall not be more than 1.0 amps per square mm. All bus bar joints and tapings should be of the clamped type as far as possible thereby avoiding drilling of holes on bus bars. The bus bars should be carried on supports made out of a suitable non-inflammable and non-hygroscopic material such as Hylam, Permali or Formics. Suitable insulating phase barriers should be provided to prevent accidental short-circuits during operation.

The fuse base contacts should be of copper comprising one top contact for bolting to the bus bar, one bottom contact for terminating the incoming or outgoing cable and a cable lug. The bottom contacts should be so designed that the cable tail from the cable gland to the cable lug is vertical and does not foul with any live parts in its run. The spacing between the respective fuse bases should not be less than 40mm.

The fuse carriers should be fitted as standard to all fuses to minimize accidental contact with live metal during inspection or maintenance. The carriers should be phenolic moulded, designed to accommodate HRC fuse-links and should incorporate a wedge action device for tightening the fuse-link to the base contact. This wedge action should be operated externally by insulated thumb screws giving uniformly high pressure contact and ensuring cool running under full load conditions, with positive location of the fuse-link tags on the base contact. The fuse-link shall not work loose due to vibration occurring from vehicular traffic.

A viewing aperture should be provided on the carrier to facilitate location of a 'blown' fuse. The fuse carriers should also be easily withdrawable in service. The design of the carrier should be such that carrier components do not carry any current and the contact is decidedly between fuse-link tag and base contact.

When incoming links are called for it should be possible to fit the carriers with solid links in lieu of fuses.

The neutral bus bar shall be rated at 100 % of the phase bus bars. The design should allow for neutral cable sockets to be fitted directly to the bus bars. A GI earth bar of size 40x5mm together with two cable eyes shall be provided for connections to earth pits. All the cables shall be terminated at ELEMEX terminal block and therefrom wiring shall be

done with PVC insulated aluminum conductor cable to fuse units. The wiring shall be neatly bunched and shall be secured to wiring cradles.

A circuit cardholder to be made inside the front door and the card duly engraved / painted on aluminum / hylam sheet, Identification ferrules shall be used for incoming and out going cables.

**INDIAN INSTITUTE OF TECHNOLOGY - KANPUR**  
**ADDITIONAL SPECIFICATIONS FOR ELECTRICAL WORKS**

**SPECIFICATION FOR LT PANEL/ SWITCHGEAR**

**1. CONSTRUCTION:-**

- i. Switchgear enclosure shall conform to the degree of protection IP4x minimum thickness of sheet metal used shall be 2 mm.
- ii. The switchgear shall comprise a continuous line up of single / Multi-tire cubicles. The installations of circuit breakers however shall be limited to the bottom two tires only.
- iii. The design shall be of fully compartmentalized execution with metal/ insulating portions. Working height shall be limited between 750 mm to 1800 mm from the floor level.
- iv. Each breaker shall be housed in a separate cubicle, complete with an individual front access door; each vertical section shall have a removable back cover. All doors & covers shall be gasketed.
- v. Switchgear cubicle shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position.
- vi. All switchgear, lamps & indicating instruments shall be flush mounted on the respective cubicle door whereas relays & other auxiliary devices of any may be mounted on a separate cubical.

**2. BUS AND BUS TAPS:-**

- i. The main buses & connections shall be of high conductivity aluminium alloy, as per IS : 5082 sized for specification current rating with maximum temperature limited to 85 degree C ( i.e., 35 degree C rise over 50 degree C ambient). Bus bars shall be designed for a maximum current density of 0.8A/ sqmm.
- ii. All bus connections shall have adequate contact pressure which should be ensure by means of two bolt connections with plain & spring washers locknuts. Bimetallic connections between dissimilar metals.
- iii. Bus connections shall be fully insulated for working voltage with adequate phase / ground clearances.

Insulating sleeves for bus bars & surrounds for joints shall be provided.

Bus insulator shall be flame-retardant, track resistant type with high creep age surface.

- iv. All buses & connections shall be supported & braced to with stand the stresses due to maximum short circuit current & also to take care of any thermal expansion.
- v. Bus-bars shall be sleeved in colour coded manner for easy identification & so located that the sequence RYB shall be from left to right, top to bottom of front to rear, when viewed from the front of switchgear assembly.
- vi. Bolted disconnected links shall be provided from all incoming & outgoing feeders for isolation of neutral, if necessary.

### **3. CIRCUIT BREAKER**

- i. Circuit breaker shall be three poles, single throw, air breaker type with stored energy, trip free mechanism & shunt trip. The circuit breaker of the outgoing feeder shall have an in built microprocessor base release, short circuit, over current & earth fault protection release.
- ii. Circuit breakers shall be draw out type, having SERVICE, TEST & ISOLATED position with positive indication for each position along with in built relay unit.
- iii. Circuit breaker of identical rating shall be physically & electrically interchangeable.
- iv. Circuit breaker shall be motor wound spring charged mechanism, motor voltage should be 240 V AC. For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open close-open operation of the circuit breaker shall be possible after failure of power supply to the motor. Power supply for this motor shall be taken from the output of auto changeover.
- v. Mechanical safety interlocking shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.
- vi. Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.
- vii. Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter & mechanism charge/ discharge indicator.
- viii. In addition to the auxiliary contacts required for normal breaker operation & indication, each breaker shall be provided with following for interlocking purpose:-
  - a) Position/ cell switch with 4 NO. + 4 NC contacts. These shall be available as spare for automation work.  
Control Supply: - 230V AC for closing,  
Tripping & indication lamps.
  - b) Auxiliary switch, with 6 NO+ NC contact, mounted on the stationary portion of the switchgear & operated mechanically by a sliding level from the breaker, in SERVICE position. These shall be available as spare for automation work.
- ix. Limit / auxiliary switches shall be convertible type, that is, suitable for changing NO contact to NC & Vice-Versa.

### **4. MOULDED CASE CIRCUIT BREAKERS**

- i. Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of microprocessor based electronic type provided on each pole and connected by a common tripe

bar such that tripping of any one pole causes three poles to open simultaneously. Electronic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities :

- Shunt trip
- Alarm switch
- Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

- ii. MCCB shall be triple pole air break.
- iii. The MCCB shall have a quick - make, quick - break mechanism operated by a suitable external rotary handle, complete with position indicator this handle shall have provision for pad locking in ON & OFF position.
- iv. MCCB should have microprocessor base electronic release with over current, earth fault & short circuit protection equivalent to L&T 'D' since with RC-10 release.

## **5. CONTROL & INDICATION :-**

The circuit breaker shall be wired up for both local & remote operation. A local- remote selector switch shall be provided for this purpose. Each breaking cubicle shall be equipped with following:-

- i. One (1) Test- neutral - service selector switch stay put type with test/ service position pistol grip handle & key interlock for breaker marked 'E'.
- ii. Two (2) heavy duty, oil tight push buttons for TRIP & CLOSE.
- iii. Three (7) LED indicating lights on front of compartment :-  
GREEN : breaker open & spring charged  
RED : Breaker close  
AMBER : Trip / circuit healthy condition  
WHITE : Control supply failure  
Phase indication : One Red, One Blue & One Yellow

O & 1 NC should be provided for status monitoring of the remote / local position.

- iv. Lamps shall be low watt, LED type lamp & lens shall be replaceable from the front.
- v. The general scheme of connections for control, interlock & protection shall got approved before fabrication of panel.

## **6. FUSES :-**

- i. Fuses shall be HRC, preferably link type with a minimum interrupting capacity equal to the short circuit current.
- ii. Fuses shall be furnished complete with fuse base & fittings of such as to permit easy & safe replacement of fuse element. Visible indicated indication shall be provided on blowing of the fuse.

## **7. CURRENT TRANSFORMER :-**

Current transformer shall be cast- resin type. All secondary connections shall be brought out to terminal blocks where or delta connection will be made.

### **i. Ratings :**

- for incomers and buscoupler

1500-750/5+5 : 3 sets

- For out goings :

800-400/5+5 : 4 sets

600-300/5+5 : 4 sets

400-200/ 5+5 : 2 sets

- ii. Accuracy class of the current transformers shall be :-
  - a.) Class 5P10 for other relaying (protection).
  - b.) Class 1.0, ISF < 5 for metering.

## **8. RELAYS :-**

- i. Relays shall be of drawout design with built in testing facilities. Small auxiliary relays may be in non drawout execution.
- ii. Relay shall be rated for operation on 5 Amp secondary current & 110 / 220 V secondary voltage; number & rating of relay contacts shall suit the job requirements.
- iii. The contractor shall furnish, install & co-ordinate all relays to suit the requirements of protection & interlock & as broadly indicated in the annexure & drawings.

## **9. METERS (DIGITAL DISPLAY):-**

- i. Indicating instruments shall be switch board type & accuracy class of 2% .
- ii. All Digital Watt-hour meter shall be provided, Alternatively, they may have test block to facilitate testing of meter without disturbing C.T. or V.T. secondary connections.
- iii. Each breaker shall be with volt meter, amp meter with selector switches & KWH meters. Only out going feeders will be relaxed from voltmeters.

## **10. SECONDARY WIRING :-**

- i. The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection, & interlocking schemes.
- ii. Fuses & links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches & other devices shall be wired upto terminal blocks.
- iii. Wiring shall be done with FRLS PVC flexible, 650V grade, PVC insulated switchboard wires with solid copper conductors of 2.5 sqmm for voltage circuits alongwith numbered ferrules.

- iv. Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per contractors wiring diagrams.
- v. Wire terminations shall be made with crimping type connectors with insulating sleeves. Wire shall not be spliced between terminals.

#### **11 TERMINAL BLOCKS**

- i. Terminal blocks shall be 660V grade box clamp type with marking strips, similar to ELMEX 10 sqmm of equal. Terminals for C.T. secondary leads shall have provision for shorting.
- ii. Not more than two wires shall be connected to any terminals equal in number to 20% active terminals shall be furnished.
- iii. Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

#### **12 CABLE TERMINATION :-**

- i. Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for each of termination & connection.
- ii. All provision & accessories shall be furnished for termination & connection of cables, including removable gland plates, cable supports, crimp type tinned copper/ aluminium lugs, brass compression gland with tapered washer (power cable only) & terminal block.
- iii. Gland plate shall be minimum 4 mm thick.

#### **13 BUS DUCT CONNECTION :-**

- i. Bus duct connections, where specified shall be furnished along with transportation of panel. Bus duct connections shall be generally from the top.
- ii. All connecting bus work shall have the same continuous rating as associated switchgear bus & shall be fully braced for the listed short circuit current.
- iii. All provision such as matching flange & other accessories shall be furnished for connection to bus duct if any, being supplied by this purpose will be furnished by contractor.

#### **14 GROUND BUS :-**

- i. A ground bus, rated to carry maximum fault current, shall external full length of the switchgear.
- ii. The ground bus shall be provided with two bolt drilling with GI bolts & nuts at each to receive 50 x 6mm GI flat.
- iii. Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker & drawout VT unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.
- iv. Whenever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus & connected thereto.
- v. C.T. & V.T. secondary neutrals shall be earthed through removable links so removed without disturbing others.

## **15 NAMEPLATES :-**

- i. Nameplates of approved design shall be furnished at each cubicle & at each instrument & device mounted on or inside the cubicle.
- ii. The material shall be lamicoïd or approved equal, 3mm thick with white letter on block background.
- iii. The name plate shall be held self-tapping screws. Nameplate size shall be minimum 20 x 75 mm for instrument device & 40 x 150mm for panels.
- iv. Caution notice suitable metal plate shall be affixed at the back of each vertical panel.

## **16. SPACE HEATERS PLUG SOCKETS :-**

- i. Each vertical section shall be provided with thermostat controlled space heater & 5A, 3 pin plug socket.
- ii. Cubical heater, plug-socket circuit shall have individual switch fuse units.

## **17. A.C. / D.C. POWER SUPPLY :-**

- i. The following power supplied will be made available to the switchgear :  
240 A.C. Supply : Two Feeders  
The DC supply required for control purposes is to be obtained in each module through a rectifier arrangement, which will convert the 250V AC supply to 110V DC. The equipment necessary for this rectification including protective relaying as per the approved drawing are also to be included.
- ii. Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 2-pole, single throw for A.C. & 2-pole, double throw for D.C. Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switch-fuse units shall be provided at each cubicle for AC/DC supplies.
- iii. AC load shall be so distributed as to present a balance loading on three-phase supply system.

## **18. PAINTING :-**

- i. All surface shall be sand blasted, pickled & grounded as required to produce a smooth, clean surface free of scale, grease & rust.
- ii. After cleaning, the surface shall be given a phosphate coating followed by 2 coats of high quality prime & stove after each coat.
- iii. The switchgear shall be finished in light gray ( IS shade # 631 ) with two coats of synthetic enamel paint.
- iv. Sufficient quantity of touch- up paint shall be furnished for application at site.

## **19. SPECIAL TOOLS & TACKLES :-**

- i. A set of special tools & tackle (manual charging handle & operating handle trolley for lifting outside breaker for maintenance) which are necessary or convenient for erection, commissioning, maintenance & overhauling of the equipment shall be supplied.
- ii. The tools shall be shipped in separate containers (Tool Box) clearly marked with the name of the equipment for which they are intended.

## **20. PARES :-**



- i. The bidder shall submit list of recommended spare parts for three (3) years satisfactory & trouble free operation indicating the itemized price of each item of the spares.

**21. DRAWINGS, DATA & MANUALS :-**

- i. To be furnished for approval after award of work.
- a. General arrangement drawing showing constructional features, space required in front for withdrawals, power & control cable entry points etc.
- b. Details of materials with specifications.
- c. Typical foundation plan & loading.
- d. Typical breaker control schematic.
- e. Matching flanges & terminals for the bus termination.
- f. Type test reports on circuit breaker.
- g. Technical leaflet on
- h. Circuit breaker
- i. Instrument transformers
- j. Relays, meters, switches etc.
- k. Single line diagram
- l. Control schematics
- m. Wiring diagram

**22. Instruction manuals of switchgear & individual equipment :-**

The manual shall clearly indicate the installation method, checkup & tests to be carried out before commissioning of the equipment.

- 23.** The bidder may note that the drawings, data & manuals listed here in are minimum requirements only the bidder shall ensure that the other necessary write-ups, curves & information required to fully describe the equipment are submitted with his bid.

**CIRCUIT BREAKER**

Make	- As per approved make.
Type	- Microprocessor release air circuit breaker
Rated voltage	- 415 Volts
Rated frequency	- 50 Hz
Rated current	- <b>1600/( Icu=Icf=1sec 50 kA)</b> <b>800A(Icu=Icf=1sec 50 kA)</b>
No. of pole	- 3
Aux. Voltage for trip/close coil	- 110 V DC
Motor for spring charging Voltage	- 240 V AC
Protection unit	- Equivalent to SR-18G with fault indication & thermal masonry.

Interlocking arrangement electrically & mechanically with bus coupler & incomer.

**PROTECTION (FOR LT SUPPLY 415V PANEL)**

The minimum protection to be provided for different type of circuit are listed below :-

**INCOMING FEEDER :-**

- i. 2 over current +E/F relay microprocessor based alongwith the element of instantaneous o/c & E/F protection.

**BUS COUPLER :-**

3 O/C relay microprocessor based

All inverse time O/C relay shall be 3 sec. Version.

All definite time O/C relay shall have adjustable time range of 0-6 Sec.

Apart from protection relays each breaker shall be provided with auxi. Contact multiplier relay, anti pumping relay, trip supervision relay, lockout relay test terminal block. These relay shall be hand reset.

## **SPECIFICATION FOR ELECTRICAL ERECTION**

### **1.00.00 GENERAL**

- 1.01.00 The tenderer shall furnish & install all materials & equipment which are obviously a part of the completed installation but have not been specifically mentioned in this specification without any additional charge to the Authority.
- 1.02.00 All ladders, platforms, scaffolding, temporary supports, any other facility required for erection at site shall also be provided.
- 1.03.00 The tenderer shall at all times work in close coordination with Engineer-in-charge supervisory personnel & afford them every facility to become familiar with the erection & maintenance of the equipment.
- 1.04.00 The tenderer shall arrange his schedule of work & method of operation to minimize inconvenience to other contractors at the project site. In case of any difference between contractors. The decision of the Owner shall be final & binding on all parties concerned.
- 1.05.00 In case of any hold up due to fault of other contractors or for any other reason, the tenderer shall bring it to the notice of the engineering-in-charge in writing without any delay. Otherwise any delay in completion of his work will be accounted for.
- 1.06.00 In case of any contradiction/ confusion with any other section/ sub-section of this specification, the same shall be referred to the Engineer-in-charge in this respect shall be final & binding.

### **2.00.00 REGULATIONS**

The complete installation shall meet the requirements of the latest edition of the relevant Indian Standard & I.E. Rules.

### **3.00.00 DRAWINGS**

The tenderer shall inform himself fully with the relevant Electrical layout single line diagram & schematic drawings enclosed with the package specification.

The tenderer shall furnish all erection drawings, catalogue data sheets, etc as required to cover specific information for all items.

### **4.00.00 TRANSPORTATION**

The contractor shall be responsible for the transportation to the site of all equipment, materials & supplies to be provided by him according to terms of the contract. The contractor shall be responsible for arranging transportation as advised by Owner depending on requirement & to meet the completion schedule. In the event of the schedule requiring change in the mode of transportation the same shall be arranged by the contractor without any extra cost.

### **5.00.00 UNLOADING**

The contractor shall arrange to unload equipment received at site & also arrange to transport the material from the unloading point to site.

The contractor shall make all necessary arrangement for tools & tackles, men & machinery for unloading of equipment at site & its transportation to site or storage. It is clearly understood that demurrage, whereas & other expenses incurred by the contractor due to delayed clearance of the material or for any other reason, shall be to the contractor's account.

#### **6.00.00 STORAGE AT SITE**

The contractor shall provide coverage of the equipment & material, security arrangement & all other facilities required for proper & safe storage till completion of the work.

#### **7.00.00 PROTECTION OF WORK**

7.01.00 The contractor shall effectively protect his work at his own expense, equipment & material under his custody from theft, damage or tampering.

7.02.00 Finished work where required shall be suitably covered to keep it clean & free from defacement or injury.

7.03.000 For protection of his work contractor shall provide fencing & lighting arrangement connect up space heaters & provide heating arrangement as necessary or directed by Engineer-in-charge.

7.04.00 Contractor shall be responsible for any loss or damage to equipment & material until his work is fully & finally accepted.

#### **8.00.00 OPENING OF CASE, CHECKING AND CLEANING OF PART**

8.01.00 All packing cases or package shall be opened in presence of Owner's representative.

8.02.00 All equipment, accessories & materials i.e. Switchgear, transformer, bus duct, power & control cables etc after receipt at site shall be jointly inspected & checked with packing list & identified with erection drawings.

8.03.00 All claims against loss or damage in transit shall be lodged by the contractor under intimation to Owner. The contractor shall be responsible for processing and settlement of claim including furnishing any information that may be required in this connection.

8.04.00 The contractor shall ensure that insurance formalities are observed & any loss of claim due to the fault of the contractor shall be to the contractor's account.

8.05.00 All parts shall be thoroughly cleaned all rust removed & surface polished as required.

8.06.00 Cleaned & polished parts shall be coated with anti-corrosive paints where necessary & stored with care, ready for erection.

#### **9.00.00 TESTING EQUIPMENT**

The major testing equipment that are required to be arranged by the contractor are listed below:

**a.) Insulation Tests:**

- i) Power operated Meggar - 1 kV & 2.5 kV grade
- ii) Hand operated Meggar - 500 Volt/ 1100 Volt grade
  
- b.) Hand driven earth Resistance Meggar, range 0-1/3/30 Ohms.
- c.) High potential testing set- roller mounted type
- d.) Tong testers of suitable ranges
- e.) Contact resistance measuring set for micro-ohms
- f.) Torque wrench of various sizes.
- g.) Multimeters, test lamp, field telephone with buzzer set, different gauges etc.

**10.00.00 PAINTING**

After completion of the erection, all equipment & materials supplied under this specification shall be given necessary protective painting. The colour of the final coat shall be approved by the Owner.

**11.00.00 ERECTION**

**11.01.00 Method & materials**

- 11.01.01 All work shall be installed in a first class, neat & workman like manner by mechanics skilled in the trade involve. All details on the installation shall be mechanically & electrically correct.
- 11.01.02 All materials shall be brand new & of best available quality without having imperfections & blemishes. Where two or more units of the same manufacture.
- 11.01.03 All conduits & equipment shall be installed in such a manner as to preserve access to any other equipment installed.

**12.00.00 DETAILED REQUIREMENT OF INSTALLATION:**

- 12.01.01 All alignment, leveling, grouting, base channel fixing & anchoring adjustments shall be carried out in accordance with manufacturer's instructions and install necessary floor steel for supporting the panels.
- 12.01.02 All connections, in switchgear shall be completed, checked and adjusted to ensure safety & satisfactory operation of the equipment.
- 12.01.03 In some cases minor modifications may have to be carried out at site in the wiring & mounting of the equipment to meet the requirement of desired control scheme & the contractor shall have to do the same at no extra cost.

**12.02.00 Transformer**

- 12.02.01 The contractor shall place the transformer on its foundation, assemble parts, fabricate & erect & supporting structure for detachable type cable chamber.

12.02.02 H.V. test of transformer oil shall be carried out taking a sample from individual transformer. If the result is not in satisfaction of the purchaser, oil conditioning of that particular transformer shall have to be carried out.

12.03.00 L.T. Bus duct shall be erected duly supported on the soffit on the building by structural member supplied along with the bus duct. The bus duct will pass through separate wall between transformer & switchgear & will reset on two flanges one each at the switchgear & The transformer end. The grounding of the bus duct shall be carried as per the relevant stranded. The flanges supplied alongwith the bus duct shall be erected & terminals end equipment namely transformer & switchgear will be connected to the bus duct. The bus duct shall be erected in straight, vertical or horizontal formation as per the site requirement. The test like mili volt drop on the contacts, insulation resistance value & proper tightness shall be ensured by the contractor.

12.03.01 For draining out of oil a oil soak pit for transformer is to be erected of the suitable capacity.

#### **12.04.00 Miscellaneous items :**

12.04.01 The tenderer shall install miscellaneous minor items to complete the installation of equipment.

12.04.02 These equipment will be generally floor or wall mounted. The exact location will be as decided by the Owner at site or as shown in Final drawings.

12.04.03 All support & bracket needed for installation shall be fabricated & painted by the tenderer.

12.04.04 All welding, cutting, chipping & grouting as & when necessary shall be carried out by the contractor.

#### **12.05.00 Handling of cable drum and cable**

12.05.01 Rolling of drum shall be avoided as far practicable. For short distance, the drums may be rolled they are rolled slowly and in proper direction as marked on the drum. In absence of any identification, the drums may be rolled in the same direction as it was rolled during taking up the cable.

12.05.02 For unreeling the cable, the drum shall be mounted on jacks or on cable wheel. The spindle shall be strong enough to carry the weight without bending. The drum shall be rolled on the spindle slowly, so that cable should come out over the drum & not below the drum.

12.05.03 While laying cable, cable shall be used at an interval of 2 meters. The cable shall be pushed over the roller by a gang of people positioned in between rollers. The cable shall not be pulled from the end without laying intermediate pushing arrangement. Bending radius shall not be less than what is specified by manufacturer.

#### **12.06.00 Cable laying :**

Cables shall generally be installed in cable trays except for some short runs in buried formation or in conduit / pipe for protection or crossing. Multi core power cables laid on trays & riser shall be

neatly dressed & clamped with fabricated 25 x 3 mm G.S. flat or cable tray at an interval of maximum 1 meter for vertical / inclined run & 1.50 meter for horizontal run. Control cables may be laid in single layer with touching formation. Power & control cables shall be claimed in separate group. Power & control cables shall not be laid in a common tray excepting in very special case where a gap of 150 mm shall be maintained between power & control cables.

12.06.01 H.T. & L.T. power cables shall be laid in cable tray in single layer & with spacing equal to the diameter of cable.

12.06.02 Control cables can be laid upto a maximum of three layers in each tray.

12.06.03 Both power & control cables shall be clamped to the tray rungs by means of clamp made up of 25 x 3 mm fabricated G.S. flat at an interval of 1500 mm for horizontal run & 1000 mm for vertical / inclined cable run.

12.06.04 The cable trays shall be run with a vertical spacing of 300 mm cable trenches. A minimum of 300 mm clearance shall be provided between the top of tray & beams, cold piping, 500 mm clearance for hot piping/ object to facilitate installation of cables in tray.

12.06.05 Adequate pull boxes shall be provided in conduit run to facilitate. Cable pulling in long runs & also to ensure that there will be no more than 270 degree bend between the pull points.

12.06.06 Cable tray shall be installed to accommodate cable manufacturer's recommended maximum pulling tension & minimum bending radius.

12.06.07 All openings in the floor & wall for cable access shall be sealed after installation of the cable system with non-inflammable materials.

12.06.08 All floor / wall openings for cable entry to the electrical equipment & accessories shall be sealed with non-inflammable material, after completion of cable installation. Thickness of such materials shall be equal to the thickness of floor / wall.

#### **12.07.00 Cables-power & control :**

12.07.01 The tenderer shall install & connect all power & control cable required for complete installation within his scope of work. Type & size of power & control cable shall be as specified & as supplied under a separate sub section for power & control cable.

12.07.02 In general all power & control cable shall be run in cable trays in cable trenches. Isolated runs of control cables shall be run in rigid conduit.

12.07.03 Jointing of power cable should be avoided as far as possible. However, if any splicing of control cable is required to carry out interlock it will be done in junction boxes not in the conduit or in the trays. Such junction boxes shall be in the scope of tenderer.

12.07.04 The contractor shall not install cables with different voltage grade in the same cable tray.

12.07.05 During cable installation care shall be taken so that the actual bending radius of each cable is not less than the one recommended by the cable manufacturer.

12.07.06 For cables buried directly underground there shall be a stone free sand cushion both above & below the cable run being held by brick wall supports on two (2) sides. The

excavated portion above the top sand cushion shall be covered by concrete precast slab supported on the side walls & finally filled up with standard back fill.

12.07.07 Cables shall be pulled into the trenches in strict accordance with the cable manufacture's instruction.

12.07.08 Tenderer shall furnish & install suitable solderless crimping type cable lugs at the termination of all wires & cables if not already furnished with the equipment.

12.07.09 All exposed conduits & armoured cables shall be tagged with the numbers that appear in the conduit & cable schedules as prepared by the tenderer. All conduits & armoured cables shall be tagged at their entrance and/ or exist from any piece of apparatus, junction box or pull box. Aluminium tags shall be used with the number engraved/ punched on the tag. Tag shall be suitable secured to the conduit or armoured cable.

The cable tags shall also be provided at all bends and at interval of 30 M on straight run of cable in order to facilitate the identification.

12.07.00 Laying termination & connection of all control cables for interlock, protection, indication & annunciation.

The tenderer shall prepare cable schedule & interconnection diagram & submit the same for approval of the Authority. Cable laying shall be started with the approval cable schedule & interconnection diagrams. Separate cables for each type of following services/ functions as applicable shall be used & laid along the run for each feeder.

a.) Power - designate as 'P'

b.) Control protection interlock, metering, indication & annunciation designate as 'C'.

### **13.00.00 FIELD TESTING :**

13.01.00 Field Testing shall be required for all the equipment & accessories furnished, installed or connected by the tenderer to ensure proper installation, setting, connection & in accordance with the plans, specifications & manufacturer's recommendations.

Testing shall be conducted in presence of Owner's engineers with prior notice at least 2 weeks before commencement of any test.

13.02.00 Field testing work shall be done as per the latest edition of the relevant standards. All tests recommended by the equipment manufacturer shall be conducted. The tenderer shall submit the list of all field tests to be conducted for all equipment & accessories for review / approval by the Owner.

13.03.00 Testing shall include any additional tests suggested by the Owner that he deems necessary because of field conditions to determine that equipment, materials & system meet requirements of the specification.

13.04.00 The tenderer shall depute qualified personal to conduit all testing & shall provide all labour & testing equipment required for & incidental to testing.

13.05.00 The tenderer shall be responsible for any damage to equipment & material due to improper test procedure or test apparatus & shall replace or restore to original condition of any damaged equipment or material.



13.06.00 The tenderer shall maintain in quadruplicate a written record of all tests showing date, personal making the tests, equipment or material tested, test performed & result. Two copies of test records shall be given to the Authority.

**14.00.00 COMMISSIONING :**

After the satisfactory test are performed the equipment & material shall be put on trial operation by the tenderer. After successful trial operation, the equipment shall be put on performance tests. Initially at no load condition & finally with different loading conditions.

## **SPECIFICATION FOR THE ELECTRICAL INSTALLATION WORK**

The following specifications will apply under all circumstances to the equipment to be installed against this contract and it is to be ensured that the contractor shall obtain for himself at his own expense and on his own responsibility all the information which may be necessary for purpose of making the tender and for entering into a contract keeping in view the specification and inspection of site etc.

The tendered rates shall include for the cost of material erection, connection, commissioning, labour, supervision, tools, transport all taxes, contingencies, breakage, wastage, sundries, scaffolding, maintenance of installations for defect liability period i.e. they should be for an item complete in all respects.

**The general specifications of electrical works for internal-2005 and general specifications for Sub-station works-2007 of CPWD shall be followed.**

**1. SITE CONDITIONS:** the equipment to be erected and commissioned should be suitable for the site conditions, it is estimated that the maximum temperature as site will be 50°C.

### **2. L.S.SPECIFICATIONS:**

The following Indians standard specifications will apply to the equipment and the contract unless specified otherwise.

a)	Transformer	IS 2026-1977 & 1981
b)	Low tension air-circuit breakers and MCCB	IS 2516-1965
c)	Switch fuse unit on cubicle switch boards etc.	IS 4047-1967
d)	Switch fuse unit on industrial boards etc	IS 4064-1967
e)	Switch gear bus bars	IS 375-1963
f)	HRC fuse links	IS 2208-1962
g)	Distribution fuse boards	IS 2675-1966
h)	Degree of protection provided by enclosure For low voltage switchgear	IS 2147-1962
i)	PVC cables.	IS 1954-1962
j)	11,000 volt paper insulated lead sheathed cables	IS 692-1965
k)	Tubular fluorescent lamps for general lighting Service.	IS 2418-1965
l)	Tungsten filament lamps for general service.	IS 418-1963
m)	Ceiling fans	IS 374-1966
n)	Flood light	IS 1947-1961
o)	Well glass flame proof electric light fitting	IS 2206-1962 Part-I
p)	XLPE cables	IS 7098-Part-II
q)	Industrial light fittings with metal reflectors.	IS 1971-1961
r)	Water tight electric light fittings	IS 3533-1966
s)	Fittings for rigid steel conduits	IS 2667-1964
t)	Rigid steel conduits for electrical wiring	IS 1958-1964
u)	Accessories for rigid steel conduit for electrical Wiring.	IS 3873-1966
v)	Switch socket outlets.	IS 4615-1963

- |    |   |                     |
|----|---|---------------------|
| w) | Three pin pug and socket outlets          | IS 1233-1967        |
| x) | Switches for domestic and similar purpose | IS 3858-1966        |
| y) | AC electricity meters                     | IS 722-1977/1980+86 |

## **CODE FOR PRACTIC**

- |                                 |              |
|---------------------------------|--------------|
| Earthing                        | IS 3043-1966 |
| Electrical wiring installations | IS 732-1963  |
| Lighting protection             | IS 2309-1969 |

### Approved Make List

<b>S.No.</b>	<b>Items</b>	<b>Makes</b>
1	MS Conduit (ISI marked)	BEC/AKG/NIC/Steel craft/ M-Key, SK (E.R.W)
2	PVC Conduit and accessories	Polycab/AKG/Asian
3	PVC/XLPE insulated aluminium/Copper conductor armoured/Unarmoured MV Cable upto 1100 V	Havells/Finolex/KEI/Grandlay/ Gloster
4	FRLS PVC insulated copper conductor stranded flexible wire i/c control cables	Havells/Finolex/KEI/Grandlay/RR Kabel/ Gloster
5	Cable Raceway floor/wall mounted and accessories	Schenider/Legrand/Cooper
6	Modular Switch & Socket	Legrand (Myrus)/M.K. (Element)/Schneider (Zencelo India)/Havells/ ABB
7	Metal clad Industrial Socket	Legrand/Siemens/Schneider/C&S/ABB
8	Cat-6 Cable	Beldon/Siemon/Legrand/Penduit (Pannet)
9	Cable Glands	Dowells/Commet/Gripwell/Raychem
10	Crimp Patch Cord	Beldon/Siemon/Legrand/Penuit (Pannet)
11	Protection Device (MCB/RCCB/DB/ELCB)	Siemens (Betagard),/Hager/Schneider / Legrand / C&S / ABB
12	MCCBs	Siemens (3VA)/L&T /Schneider/ Legrand / C&S / ABB
13	Power contactor	Siemens /L&T / Schneider / Legrand / ABB / C&S
14	Surge Protection Devices	Siemens/L&T/Schneider / Legrand
15	Panel Accessories	Siemens /L&T/Schneider / Legrand/Tecnic / ABB/ C&S/Neptune
16	Selector Switch	Salzer/Seimens /BCH/ Kacee
17	Auxiliary Relays	Siemens/L&T/Schneider/Legrand/ABB
18	LED/Metal Halide/Fluorescent Internal Lighting Fixture	Philips/ Vipro/Havells/Crompton/Decon
19	External Lighting Fixture	Philips/ Wipro/Havells/Crompton
20	Emergency Lighting/ Exit Sign boards	Philips/Havells/Lighting Technologies/Trilux/Prolite
21	Ceiling Fan (ISI marked & BEE rated 5 star)	Havells/Almonard/Orient/Usha/Bajaj
22	Paint	Nerolac/Asian/Berger
23	Advance Lighting Protection System (Early Streamer Emission Type)	LPI (Australia)-by allied power/SGI (Duval Messien/satellite (France)- by SGI/Bradlay (USA)- by JMV/Erico (USA)-by security shoppe/ABB
24	GI Pipe	Tata/Jindal/SAIL
25	Main LT Panels/ MCC Panel	(Main LT panel / MCC Panel board should be IEC 61439 part-1 and II manufacturer has to produces the relevant test certificate as per IEC code for the same failing which panel shall be rejected). Tricolite, Delhi /Siemens / Schneider/ Milestone/ Neptune
26	Air Circuit Breaker	Siemens / Schneider /L&T /Legrand/ C&S/ABB
27	Surge Voltage Protection	Siemens /Schneider/L&T/Legrand/ABB
28	Earth fault module	Siemens/Schneider/L&T/Legrand
29	Protection relays	Siemens/Areva/L&T/Legrand
30	C.Ts and PTs	Kappa/AE/Matrix

31	Digital Meters	Siemens (PAC)/ Schneider/ (conzerv) / Secure Enersol / L&T/ Neptune
32	Change Over Switch	L&T/Havells /Socomec/ABB/C&S
33	Indicating lamps	ESBEE/Schneider/Siemens/Vaishno/Neptune
34	Power capacitors	Epcos/ Neptune / Legrand /ABB/ L&T
35	Automatic Power factor correction relay/controller	Epcos/Siemens (PAC) /Schneider (Conzerv)/L&T/Neptune
36	Sealed Maintenance Free Batteries	Exide/Panasonic/Hitachi/Shinkobe
37	Battery charger	Caldyne/Chhabi Electricals/Statcon/Max Power
38	Cable Trays (Factory Fabricated/Overhead & Floor Raceways	Legrand/MEM/OBO/ Milestone/ Neptune
39	HDPE underground cable duct	Rex Polyextrusion/Tirpura/Plasomatics/Duraline
40	Insulation Mats	DL Miller & Co. Ltd. ?Premier Polyfilm Ltd./RMG Polyvinyl India Ltd/Jyoti
41	Smoke/Heat detectors	Apollo/ System Sensor/ Agni
42	Manual Call point	PRD/System-Tek/ Simplex/ System Sensor/Agni
43	Response indicators	PRD/System-Tek/ Simplex/ System Sensor/Agni
44	Fire Exit Signs	System-Tek/ Simplex/ Agni
45	Fire Control Panel	System-Tek/ Morley /Agni
46	Speaker / Hooter	System-Tek/ Philips /Agni
47	Occupancy Sensors/ Movement Sensor	Legrand/ Philips/ Wipro
48	Flush type switch /socket	Anchor/ Kinjal/ SSK/ Havells Reo
49	Fuse switches unit / switch fuse unit /HRC fuse	L&T / Siemens/ Havells/ C&S
50	Exhaust fan	Almonard/ Alstom/ Crompton/ Havells
51	XLPE insulated HT cables	Gloster /KEI/Havells
52	Cable lug	Ascon (Heavy gauge) Jainson Dowells
53	Lamp Holder (Brass)	Kay/SSK/Kinjal
54	Telephone wires/Telephone Cable / jelly filled telephone cables	Finolex /Delton/Havell's /R.R. Kabel
55	Telephone tag blocks	Krone/ Pouyet
56	Telephone outlet	MK Electric /Legrand (Mosaic)/Crabtree (Piccadilly)
57	GI raceways	Milestone Engineering /Legrand/MDS/Neptune Systems Pvt. Ltd./MK
58	PVC raceways	Legrand/ MK
59	Electronic ballast	Philips /Wipro/Bajaj/Decon/Crompton/Havells
60	DLP plastic trunking	Legrand/MK
61	Geysers	Recold /Venus /Usha Lexus /Sphere hot
62	Tower Light	Ligman/Simes/Bega
63	HT/LT transformers	ABB/Schneider /CGL (Crompton Greaves Ltd.)
64	HT SF-6 circuit breakers/VCB	Siemens /ABB/CGL/Schneider

65	<i>Programmable Logic Controller(PLC)</i>	<i>Siemens/Allen-Bradley/Schneider</i>
66	<i>Earthing (Chemical Earthing) Plate Earthing</i>	<i>JMV/As per CPWD Norms</i>
67	<i>Octagonal Pole</i>	<i>Bajaj / Crompton / Phillips</i>
68	<i>11 kV HT panel Incoming relay</i>	<i>CGL/Schneider/ABB/ Siemens</i>
69	<i>Control Relay Panel</i>	<i>CGL/Schneider/ABB</i>
70	<i>Lightning Arrestor</i>	<i>ABB/Alltec/JMV</i>
71	<i>Temp. Gauge</i>	<i>Guru</i>
72	<i>Gate Valve</i>	<i>Leader/Sant</i>
73	<i>Electrical Backup</i>	<i>Spare hot/ Racold</i>
74	<i>PVC Tank</i>	<i>Syntex/ Polycon</i>
75	<i>Thermostat</i>	<i>ISI Marked</i>
76	<i>Flat Collector Plate</i>	<i>Solocrome/ Tata BP/ Racold</i>
77	<i>S.S Sheet</i>	<i>Jindal / National</i>
78	<i>HT/LT cable joints (Straight through/outdoor/indoor)</i>	<i>3M/ Denson/ M Seal/Raychem/ Cabseal</i>
79	<i>Alternator</i>	<i>STAMFORD/Crompton Greaves</i>
80	<i>DG Set</i>	<i>Sterling &amp; Wilson /Caterpillar/Commins Power / eneration/ Kirlosker</i>
81	<i>Makes of accessories of HT / LT Panel / Transformers</i>	<i>As per standard practice of manufacturer.</i>
82	<i>Bus Trunking</i>	<i>C&amp;S / L&amp;T/ Schneider as per standard practice of OEM manufacturer / channel partner</i>
83	<i>HT Panel 11 KV</i>	<i>ABB/Schneider /CGL (Crompton Greaves Ltd.)</i>
84	<i>Bus Duct</i>	<i>Neptune/Milestone/Tricolite</i>