

**REQUEST FOR PROPOSAL**

**Tender For**

**Supply Installation Testing and Commissioning of LT Under Ground Cable & 13 Nos. 100 KVA  
11/4 Kv Plinth mounted Transformers at various locations at Naya Raipur for Street Light supply**

**Tender NO.: \_\_\_\_\_/STREETLIGHT/NRDA/ELECT-INFRA/05 dated 04.08.2011**



**NAYA RAIPUR DEVELOPMENT AUTHORITY**

**In front of Mahanadi Dwar of Mantralaya,**

**Raipur 492 001, Chhattisgarh**

**TEL NO: + 91 771 4066011; Fax No.: +91 771 4066188**

**Website: [www.nayaraipur.com](http://www.nayaraipur.com),**

**email: [ceo@nayaraipur.com](mailto:ceo@nayaraipur.com), [nrda.electrical@gmail.com](mailto:nrda.electrical@gmail.com)**

# NAYA RAIPUR DEVELOPMENT AUTHORITY



## Supply Installation Testing and Commissioning of LT Under Ground Cable & 13 Nos. 100 KVA 11/.4 Kv Plinth mounted Transformers at various locations at Naya Raipur for Street Light supply

Tender NO.: \_\_\_\_\_/STREETLIGHT/NRDA/ELECT-INFRA/05 dated 04.08.2011

# TENDER DOCUMENT

**Credible Chhattisgarh**  
विश्वसनीय छत्तीसगढ़



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In front of Mahanadi Dwar of Mantralaya,

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Website: [www.nayaraipur.com](http://www.nayaraipur.com),

email: [ceo@nayaraipur.com](mailto:ceo@nayaraipur.com), [nrda.electrical@gmail.com](mailto:nrda.electrical@gmail.com)

**OFFICE OF THE CHIEF EXECUTIVE OFFICER, NAYA RAIPUR DEVELOPMENT AUTHORITY  
NEAR MANTRALAYA MAHANADI DWAR, RAIPUR**

**LEGEND**

<b>Name of the work</b>	<b>:</b>	<b>Supply Installation Testing and Commissioning of LT Under Ground Cable &amp; 13 Nos. 100 KVA 11/.4 Kv Plinth mounted Transformers at various locations at Naya Raipur for Street Light supply</b>
<b>Probable amount of contract</b>	<b>:</b>	<b>₹ 177.81 Lacs</b>
<b>Amount of earnest money</b>	<b>:</b>	<b>₹ 1.80 Lacs (EMD in the form of Pay Order or DD of Nationalised/Scheduled Bank drawn in favor of "CHIEF EXECUTIVE OFFICER, NRDA Raipur "should be enclosed in Envelope-1)</b>
<b>Time allowed for completion</b>	<b>:</b>	<b>3 (Months) Months including rainy season</b>
<b>Last date of Submission of tender document</b>	<b>:</b>	<b>23.08.2011 up to 15.00 Hrs. by Registered AD/Speed post/Courier</b>
<b>Date of opening of tender document</b>	<b>:</b>	<b>23.08.2011 after 16.00 Hrs.</b>
<b>Cost of tender document</b>	<b>:</b>	<b>₹ 5,000.00 (Rupees Five Thousand Only)(If the tender document is downloaded, cost of document should be enclosed as a DD of Nationalised/Scheduled Bank drawn in favor of "CHIEF EXECUTIVE OFFICER, NRDA Raipur "should be enclosed in Envelope-1)</b>
<b>Issued to Shri/M/s</b>	<b>:</b>	<b>.....</b>
<b>Class of Contractor</b>	<b>:</b>	<b>CG PWD/HB/CSPDCL ..... Registration No: ..... Date.....</b>
<b>Vide M.R. No. &amp; Date:</b>	<b>:</b>	<b>.....date.....</b>
<b>Client/Employer</b>	<b>:</b>	<b>Chief Executive officer, Naya Raipur Development Authority (NRDA), Raipur</b>
<b>Department/Government</b>	<b>:</b>	<b>Naya Raipur Development Authority (NRDA), Raipur</b>
<b>Chief Engineer</b>	<b>:</b>	<b>Chief Engineer, Engineering Section, NRDA</b>
<b>Superintending Engineer</b>	<b>:</b>	<b>Superintending Engineer, Engineering Section, NRDA</b>
<b>Engineer-in-charge</b>	<b>:</b>	<b>Executive Engineer, Engineering Section, NRDA OR Any Person Deputed By Chief Executive officer, Naya Raipur Development Authority (NRDA), Raipur For The Purpose</b>

Signature of Contractor.....

Signature of NRDA.....

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Signature of Contractor.....

Signature of NRDA.....

### IMPORTANT NOTES

1. Tender submitted with condition (s) other than as stipulated in this tender shall be summarily rejected.
2. The rates quoted shall be in percentage below/at par/above the base rate given in the "Summary sheet of lumpsum bid price" based on the Schedule of Rates (SOR) of CSPDCL with amendments and PWD SOR 2010, if any, up to the date of opening of this tender. Base rate for all SOR items have been indicated in bill of quantities. No separate rate shall be quoted for SOR items. If different rate(s) are quoted for items of bill of quantities(B.O.Q.) , the offer of such tenderer shall be summarily rejected.
3. Any item not included in the bill of quantities , however , available in SOR of CSPDCL & PWD in force from 01.04.2010 may be got executed, if circumstance so arise at the quoted percentage rate of contractor at the time of opening of price bid.
4. In case of extension of due date of opening of tender, the tenders already submitted will be retained by this office. However the bidders who have already submitted the bids, will be allowed to submit fresh bids in a plain paper mentioning the percentage rates (in words and figures), above/below/at par of Summary sheet of lumpsum bid price based on the SOR w.e.f. 01.04.10 of CSPDCL and PWD SOR 2010, the modification up to the date of opening of tender/base rate of Non SOR items, in a sealed envelope mentioning, the reference of tender specification no, which should be submitted in this office within stipulated time and date, both original and subsequent fresh offers will be opened on the extended due date of opening and the lowest of the two will only be considered. In case fresh offer is not received, the original offer will be considered."
5. Formation of tenderer's cartel is strictly prohibited. "Cartel" includes an association of sellers, distributors, traders or service providers who by agreement amongst themselves, limit control or attempt to control the production, distribution, sale or price of or trade in goods or provision of services. Here "agreement" includes an arrangement or understanding or action, whether or not in formal or in writing.

Quoting same rates, i.e. pool rate is not acceptable. In case the same rate is found to be quoted by more than two bidders, offers of all such bidders shall be outrightly rejected and they can be debarred from the tender process for two years or cancel their registration. However, if rates of two bidders are found to be same then the orders will be placed to them by allotting the work to the lowest tenderers by diving it work wise through Chit System. But in case of multi-work tender, if rates of even two bidders for more than one item are found to be same, it will be considered as deliberate cartel and offers of both the bidders shall be rejected. Accordingly all the bidders are advised to quote their own individual and most competitive rates.

Rates received in a tender will be minutely scrutinized to find out as to whether some or all bidders have entered in to any such 'agreement'. If NRDA is satisfied with the conclusion that some or all the bidders have formed a cartel, offers of all such bidders shall be rejected.

Above Cartel clause shall have over-riding effects in so far and other provision elsewhere is found inconsistent with it and will be applicable for all future tenders".

6. The tender Document can be purchased from the office of the CEO NRDA, Near Mantralaya Mahanadi Gate, Ghari Chowk, Raipur, at the cost of ₹ 5000/- (Rupees Five Thousand only)in the form of cash or DD of any nationalized/scheduled bank in favor of CEO, NRDA, payable at Raipur. The Tender document can also be downloaded from the web site [www.nayaraipur.com](http://www.nayaraipur.com) however while submitting the proposal it should be accompanied with a demand draft of ₹ 5000/-. The proposal without the cost of the document will not be considered for evaluation.

Signature of Contractor.....

Signature of NRDA.....

**NAYA RAIPUR DEVELOPMENT AUTHORITY**  
**DETAILED NOTICE INVITING TENDERS**

1. Sealed percentage at par/below/above the summary sheet of lump sum bid price based on Schedule of Rate (SOR) tenders are invited from experienced **electrical contractors registered with CSPDCL in Class I & Class II category or any other Govt. /Semi-Govt. departments in equivalent category**, who have successfully executed similar work, for the work as per Notice Inviting Tenders.

- |     |  |   |                      |
|-----|--|---|----------------------|
| (a) | Probable value of the contract   | - | <b>₹ 177.81 lacs</b> |
| (b) | Earnest Money  | - | <b>₹ 1,80,000.00</b> |
| (c) | Time allowed for completion from the date of handing over of work site including Rainy Season. | - | <b>3 months.</b>     |

**1.1 Pre-qualification Criteria**

- The intending tenderer should have a minimum of ₹ 3.00 Crores as an average annual turnover during last three years(A document showing balance sheet duly certified by Chartered Accountant Shall be submitted).
- The intending tenderer should have completed at least 6 nos distribution transformer s/s work and 15 Kms Underground/overhead line work of LT line or above voltage in Govt department satisfactorily during last three years.(A certificate from the officer not below the rank of Executive Engineer, duly notarised shall be submitted.)

2. Tenders must be submitted in sealed covers, addressed to CEO, NRDA, Raipur shall be superscribed with the name of the work, tender number, the due date of the opening of tender and name of the tenderer clearly visible on the main envelope as per below.

ENVELOPE – 1	EMD & Photocopy for the receipt of Purchase of tender/cost of tender document, if downloaded in form of Demand Draft.
ENVELOPE – 2	Technical bid consisting of the techno-commercial documents/certificate in proof of prequalification criteria.
ENVELOPE – 3	Form-A tender of works.

Tender shall be submitted by post in sealed envelope containing the tender and super scribed as specified above, shall be enclosed in another envelope properly addressed and shall be forwarded so as to reach not later than the date and time fixed as notified in the NIT. For any postal delay or delay for any other reason occurred any Official /Staff of NRDA shall not be responsible and such tenders reaching late shall be returned in original to the address of the tenderer given on the envelope. Photocopy of registration of contractor in the O/o CE(ST:RE), CSPDCL , Gudhiyari , Raipur / **any other Govt. /Semi-Govt. departments** attested by Notary is also required with tender document. All other documents, techno-commercial documents, drawings, specifications etc. (except FORM-A indicating price/ rate w.r.t. Summary sheet of lumpsum bid price based on S.O.R.) duly signed on all pages in another sealed envelope superscribed as "PART-II" and a third sealed envelope enclosing FORM-A superscribing "PART-III (FORM-A)" with the name of the work, tender number, the due date of the tender and name of the tenderer and all the three sealed envelopes shall be enclosed in the main envelope.

3. Tender form/tender document *can be downloaded from NRDA's website [www.nayaripur.com](http://www.nayaripur.com)* or could be collected personally by the tenderer *from the office issuing the NIT* on producing application on payment of the cost of tender form as per the NIT.
4. Tender duly completed in all respects will be received in the O/o the Chief Executive officer, Naya Raipur Development authority, Near Mahanadi Dwar of Mantralaya, Raipur up to 15:00 hours on due date AS

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Signature of NRDA.....

PER TENDER NOTICE and will be opened on the same day at 16:00 hours in the presence of such tenderers or their authorized representatives as may choose to be present at the time. In case of authorized representative(s) he shall bring the original authorization letter with his signature attested by the tenderer.

- 5.(a) Tender forms and Conditions of contract and other necessary documents can be downloaded from our website or will be issued to the contractors on all working days from 05/08/2011 to 19/08/2011.  
(b) The drawings and other documents such as Technical specifications, schedule of quantities and the conditions of contract etc. pertaining to the work can be seen on our website. Any other information if required could be obtained from the office of the Chief Engineer (Engg), NRDA, Govind Sarang Parisar New Rajendra Nagar, Raipur during office hours on any working days. No tender forms will be issued nor will any information be given after the date fixed for submission of the tenders.
6. Not more than one tender shall be submitted by one contractor or one firm. **Joint Venture firms are not allowed.**
7. Tenderers are required to deposit the earnest money along with tender form in crossed Pay orders or Demand Drafts payable to CEO, NRDA, Raipur. **(Cheque shall not be accepted)** No interest shall be allowed on the earnest money deposit. *The earnest money deposited by the successful tenderer shall be forfeited if the tenderer fails to furnish security deposit or fails to execute the agreement or start any work for which the contract is awarded within such time as may be determined by the CEO, NRDA, after intimation of the acceptance of his tender. This forfeiture shall be without any prejudice to the right of the NRDA to recover further damage, if any, from the tenderer on whom contract(s) awarded. However, the earnest money deposit of the unsuccessful bidders will be refunded within reasonable time , on receipt of written request from such tenderers to O/o CEO, NRDA, Raipur in this regard.*
8. Within 10 days from the date of issue of contract order , the successful tenderer shall execute an agreement (on stamp paper worth ₹ 100 and affixing revenue stamp worth ₹ 1/-) with the NRDA after making a deposit as **Security Deposit** equivalent to 5% value of the contract order value towards the due and proper fulfillment of the contract performance guarantee. The security deposits shall be either in the form of Pay orders / Demand Drafts payable to CEO, NRDA, Raipur (Cheque shall not be accepted). *Bank Guarantee in NRDA's prescribed format from a Nationalised/Scheduled Bank can also be accepted operatable at Raipur.* The cost of stamp paper including cost of revenue stamps shall be borne by the contractor. The security deposit towards performance guarantee shall be valid up to guarantee period from the date of execution of agreement up to the date of completion of the work as per NIT .This amount will be retained as the security for the due and proper fulfillment of the contract i.e. security deposit towards loss & damage to material/equipment and shall be refunded after commissioning/charging of the work completed and that towards performance guarantee after expiry of guarantee period of the works/equipment being commissioned/charged , as well as settlement of liabilities if any against the contract . No interest shall be payable by NRDA for security deposits.
- 9 Failure by the successful tenderer to furnish the prescribed security deposit or to execute the agreement with in the period specified in clause-8 above after his tender has been accepted or to start the work with in such time as is determined by the engineer-in charge after notification of the acceptance of the tender shall be liable for forfeiture of the earnest money and cancellation of contract without prejudice to the right of NRDA to recover further damages, if any, from the tenderer.
- 10 Tenderers must return the form of tender with the specification and the bill of Quantities and rates and any other schedule duly signed in each page at the place specified. All pages of the tender documents conditions of contract, specification etc. shall bear the full signatures of the contractor at the foot of every page on the right hand corner and seal affixed. Any tender not bearing signatures on all the documents accompanying the tender is liable to be rejected.  
Note – The transfer of tender forms purchased by one tenderer to another is not permissible.
- 11 Tenders which do not fulfill all or any of the above conditions or are incomplete in any respect are liable to be rejected.
- 12 (a) The quantities such as lengths mentioned , number of supports/structures , excavation , concreting etc. are all as per the sanctioned estimate.  
(b) The bidder shall ensure the actual quantities after site verification.

Signature of Contractor.....

Signature of NRDA.....

- (c) The erection/construction etc. shall be as per the standard practice adopted by CSPDCL .Necessary permission shall be obtained by the contractor for PTCC (for power & telephone crossings), for Railway Crossings, Forest clearances, Electrical Inspector etc. All correspondence if required in this regard from NRDA/CSPDCL to such Govt. Departments shall be made by O.I.C. of the contract of the jurisdiction on the contractor's request in writing.
- (d) Painting on material/equipment shall be as per the standards followed by CSPDCL, but the numbering of poles shall be done as per guidelines taken from the O.I.C. of the contract of the jurisdiction.
- (e) Before submitting the tender, tenderer shall be deemed to have full knowledge of all relevant documents and to have satisfied himself by actual inspection of the site and locality of work, all the conditions liable to be encountered during the execution of the works are taken into account and that the rate he enters in the tender forms are adequate and all inclusive to accord with the provisions of general/special conditions of contract for the completion of the work to the satisfaction of the Engineer-in-charge .Information about works given in bidding document is purely tentative and may change during actual execution as per site requirement . The bidder is advised to visit and examine the site(s) of work and their surroundings and obtain himself, at his own risk & cost all information that may be necessary for preparing the bid and entering into a contract for the work(s) . NRDA will not entertain any claim at any stage from the bidder on the plea of having him not acquainted sufficiently to the site condition.
- (f) The submission of a tender by the tenderer implies that he has read and accepted all the instructions, the conditions of contract etc. and local conditions and other factors bearing on the execution of the work. *This shall be kept in view while quoting the rate(s).*
- (g) The NRDA will not, after acceptance of contract rate, pay extra charges for any reason whatsoever, in case the contractor is found later to have misjudged any site conditions (s).
- The contractor must arrange for materials/equipments as per specification/drawings of CSEB/CSPDCL/CSPTCL and conforming to relevant ISS procured from approved vendors of CSEB/CSPDCL/CSPTCL after inspection at the manufacture's works by inspecting engineer of NRDA or a third party authorized by NRDA or both ( until or unless waiver of inspection conveyed in writing by NRDA in case of urgency or in case of minor materials ) and include all such costs in the rate quoted by him for finished work.
- (h) The items as executed at site shall be measured and paid by NRDA, as per the contract. All the material required in execution, shall have to be brought by the contractor. No material / equipment/T&P shall be issued by NRDA.
- (i) For material/equipment provided by the contractor, transporting to site, installation, testing, commissioning and handing over to NRDA/CSPDCL's Engineer-in-Charge in complete shape, good/working condition in all respects within scope of this tender.
- (j) The testing & commissioning of the equipments installed/erected shall be witnessed by the Engineer-in- Charge of the work.
- (k) It may please be noted that all the works in the scope of this tender shall be in accordance with the provisions of Rules/Acts/Laws of Govt. of India/CG State Govt. and other requisite formalities of the Indian Railways, Forest /BSNL (P&T) Departments, Local Self Govt. etc. of the jurisdiction.
13. The Rates shall be quoted in figure as well as in words percentage at par / below / above the base rates as per the summary sheet of bid price based on SOR of CSPDCL & PWD, in force from 01.04.10 with amendments up to the date of tenders which is provided in this tender document vide S.No.6 (Summary sheet of bid price) of the "Index". Base rate for all the items have been indicated in Bill of Quantities. No separate rate should be quoted for SOR items. Only one rate (percentage) common for all the works in the summary sheet of bid price based on Schedule of Rate(SOR) must be quoted. In case different rates are quoted for items of bill of quantities the tender shall be summarily rejected. No SEPARATE PAYMENT OF LEAD AND/LIFT OF MATERIAL SHALL BE MADE. In case of ambiguity in rates the rate quoted in works shall be treated as final. Bill of quantities is enclosed with the tender documents' vide S.No.7 the "Index" , the rate shall be quoted against all the works at the bottom of the summary sheet of bid price based on Schedule of Rate(SOR) separately in figures as well as in words. In case of ambiguity the rate quoted in words shall be treated as final. No SEPARATE PAYMENT OF LEAD AND/LIFT OF MATERIAL SHALL BE MADE.
14. The tender documents shall be written legibly and free from erasure, over writings or conversions of figures. Any corrections, where unavoidable, shall be made by crossing out/corrected, duly signed by the tenderer at every correction/re-writing/retyped as the case may be.

Signature of Contractor.....

Signature of NRDA.....

15. The contract or any part there of shall not be sublet without the written permission of the company/ or its authorized representative.
16. The contractor shall be bound to follow the rules prevailing in the state / country.
17. The contractor shall pay not less then the minimum wages to labours engaged by him on the work.
18. The Engineer-in-charge reserves the right to take up departmental work or to award any work on contract in the vicinity prejudice to the terms of this contract.
19. It shall not be obligatory for the NRDA or its Officers to accept the lowest tender. The authority for the acceptance of the tender will rest with the NRDA which neither binds itself to accept the lowest or any other tender nor does it undertake to assign any reasons for declining to consider any particular tender or tenders.
20. The Tenderers shall furnish full details of their work(s) in hand pending for completion at the time of submission of the bid with them, on the prescribed form included in the tender (vide Annexure "C").
21. Canvassing or support in any form for the acceptance of a tender is strictly prohibited. A list showing the names of the persons who are working with the contractor and are near relatives to any gazetted officer in the NRDA (vide Annexure-"D") should also be appended with the tender.
22. Tender shall remain open for acceptance subject to the provisions of clause-19 above for a period of **three** months from the date on which they are due for submission in accordance with clause-4 above or any other extended date for their receipt any other extended period consented upon by the tenderer and during this period no tenderer shall be allowed to withdraw his tender any such withdrawal during the said period will entail forfeiture of earnest money deposited with the tender. The decision of NRDA in such case shall be final and binding.
23. Further information, if any required, can be obtained from the Engineer-in-charge NRDA, concerned but it must be clearly understood that the tenders must be received in order by the due date and time and according to the instructions.
24. All royalties are to be paid by the contractors as also all tolls, duties, local and other levels including sales Tax, Insurance and Workman's compensation Act, etc.
25. THIS NOTICE OF TENDER SHALL form part of the contract and any breach of the terms of this notice . shall be breach of the contract.

Dated

Address

Signature of Contractor.....

Signature of NRDA.....

## NAYA RAIPUR DEVELOPMENT AUTHORITY

### INSTRUCTIONS TO TENDERERS

#### 1. Definitions

##### Authority

**Naya Raipur Development Authority**, a special area development authority established under the Chhattisgarh Nagar Tatha Gram Nivesh Adhiniyam, 1973 and having its principal place of business at Near Gate No. 2, Maha Nadi Dwar, Mantralaya, Raipur, – 492 001. CG India.

##### ENGINEER-IN-CHARGE

It shall mean the Engineer of NRDA who is appointed by the NRDA as Engineer-in-charge for the purpose of this contract.

##### SITE

The term shall mean the whole of the area earmarked by the NRDA for execution of the work as indicated in the NIT & provisions in sanctioned estimate (vide S.No.9 of "Index") and single line diagram (vide S.No.10 of "Index") attached to the tender.

##### WORKS

The expression works of work shall unless there be something, either in the subject or contract, repugnant to such contract, be construed to mean work undertaken to be executed by the contractor whether temporary or permanent and whether original, substituted or additional.

#### 2. Specifications and drawings.

Copies of specifications, Designs, drawings and other documents required in connection with the works, signed for purpose of indentifications by ExecutiveEngineer/AssistantEngineer shall also be kept open for inspection by the tenderer at the office of the The Chief Engineer(Engg), NRDA, Raipur, during office hours.

#### 3. Printed Forms.

No tender will be considered which is not submitted on the prescribed form downloaded from our website or obtained from the office of the Chief Executive Officer NRDA, Raipur on payment of the cost of tender form given in the NIT . This amount will not be refunded under any circumstances. Tenderer must return the form of tender with the technical specifications , drawings ,Bill of Quantities and rates and other schedules/annexures etc. of the tender documents duly signed & affixing seal. intact and duly signed Any tender not so signed will be rejected. The transfer of tender form purchased by one tenderer to another is not permissible.

#### 4. Final date for receipt of tender.

All tender must be forwarded to the Chief Executive Officer, NRDA, Raipur in a sealed envelope with the name of work due date of tender and the name of contractor superscribed on the cover, so as to reach him not later than 15.00 hours on the date specified in the tender notice.

#### 5. Rules for firm.

If the tender is submitted by any proprietary concern, it shall be signed by the proprietor only. In case of a Registered Company, the seal of the company shall be affixed over the signatures of one or more Directors *or any authorized signatory having power of attorney* as may be provided in the Articles of Association along with a true copy of the Memorandum of Association and Articles of Association/Resolution passed in the meeting of B.O.D. in this regard . In case of any partnership, true copy of Deed of Partnership shall be furnished along with the tender and the tender shall be signed by all the partners unless otherwise authorized by the deed of partnership in which case necessary power of attorney shall be furnished.

Full name and address of the signatory shall be mentioned in all cases.

**NOTE- The above shall also apply to clause-8 herein.**

Signature of Contractor.....

Signature of NRDA.....

6. Any person who submits a tender shall fill up the usual printed form stating at what rate w.r.t , *total value of all the work(s) specified in the summary sheet of lump sum bid price based on Schedule of Rate(SOR) in the tender as per Bill of Quantity(B.O.Q.) based on SOR being provided in the SUMMARY SHEET OF LUMP SUM BID PRICE* , he is willing to undertake the work. Tenders, which propose any alteration in the work specified in the said form of invitation to tender or in the time allowed for carrying out the work or which contains any other condition of any sort will be liable for rejection. Tenderer not offering a percentage at par , below or above S.O.R. **OR** and those not submitted in proper form or due time, will be rejected.

**7. Mode of Security Deposit.**

The security deposit shall be made in the form of Bank Guarantee/MICR crossed D.D. Nationalised/Scheduled Bank having a Branch at the City/Town of the office placing the contract order. Bank deposits must be made out in the name of in favour of the Chief Executive Officer, NRDA, Raipur. Interest shall not be allowed on D.Ds. On acceptance of the tender, the successful tenderer within the time specified in the letter of intent must deposit the required amount towards security deposit in one of the forms stated above. The amount of security deposit shall be 5% value of the contract towards performance guarantee .

**8. Execution of agreement.**

The tenderer, whose tender is accepted shall be required to present himself or his duly authorized signatory in person at the office of CEO, NRDA, after notice that the contract has been awarded to him to execute the agreement on the proper form duly stamped for due and proper fulfillment of the contract. The cost of the stamp paper and revenue stamp shall be borne by the contractor. Not less than two copies of the contract documents shall be signed by the contractor or his authorized signatory. In case of authorised signatory Clause No.5 above shall be applicable . One copy of the agreement will be given to the contractor. Any payment against the contract shall be released only after issue of acceptance of security deposit/finalization of agreement by the NRDA's office placing the order.

**9. Forfeiture in case of failure.**

- (a) Failure to furnish the security deposit or to execute the required agreement within the time specified shall constitute a breach of the agreement attached by the acceptance of the tender in which case the earnest money deposit shall be forfeited by the NRDA as Liquidated damages for such default without prejudice to the right of the NRDA to recover further damages if any from the tenderer/*bidder*. *The defaulter bidder shall also be liable for cancellation of registration as well as blacklisting by the NRDA from future business for a period deemed fit by the competent authority of the NRDA.*

**10. Refund of Security Deposit**

The security deposit shall be refunded soon after the completion of the guarantee period and the contractor fulfilling all the conditions of the contract to the satisfaction of the Engineer-in-charge and on making application therefore.

**11. Guarantee Period.**

Normally the performance guarantee period is one year from the date of commissioning of the Sub-Stations/Lines constructed. Distribution Transformers are also to be provided by the contractor from approved vender(s) of CSPDCL , the guarantee period of these equipments shall be *as per those stipulated in prevailing tender/order of CE(S&P),CSPDCL,Raipur and that stipulated in the prevailing tender/order of CE(S&P),CSPDCL,Raipur are reproduced* as under:-

**a) 11/0.4kV Distribution Transformer.**

The transformer shall be guaranteed for a period of 60 months from the date of receipt in the Area Store of CSPDCL/site store of contractor. Transformer failed or found to be defective within guarantee period shall have to be repaired / replaced free of cost expeditiously.

All transformers repaired by the manufacturer under guarantee clause shall carry a further guarantee for an unexpired period of 60 months guarantee mentioned as above subject to minimum of further 12 months from the date of receipt of the repaired unit. Any subsequent failure within this period shall be guaranteed in the same manner subject maximum total service period of 72 months . Service period of the transformer shall exclude the time taken in lifting and repairing of the transformer(s) .

Signature of Contractor.....

Signature of NRDA.....

The said material, if required to be replaced, shall be collected by the manufacturer/contractor from Area Store of CSPDCL/site store of contractor at their own cost and their own responsibility . These material(s) shall likewise be returned duly repaired/replaced and tested subsequently by the manufacturer to the destination indicated by CSPDCL on "freight paid basis" at their own cost within the time prescribed penalty clause of the contract

Further , all the charges towards carrying out repairs including packing/forwarding loading/unloading and transportation shall be borne by the manufacturer/contractor . The amount deposited under security deposit clause shall also cover the performance guarantee of the material repaired/replaced.

In the event of the manufacturer/contractor's inability to adhere to the aforesaid provisions/clauses , suitable penal action shall be taken against them , which may interalia , include blacklisting of the manufacturer/contractor for future business with the NRDA/CSPDCL for a certain period

**Penalty for defective supply/WGP failed Transformers.**

*i)If during the course of 60 months from the date of receipt of consignment in Area Stores/ site store of contractor , any of the transformer is found to be defective in material or workmanship or develops defect during course of service , the same will be repaired/replaced by the firm free of all charges at the earliest but in any case within 6 months from the date of intimation by the concerning field officers/from the consignee or within 60 days from the date of lifting from Area Stores/ site store of contractor , whichever is earlier.*

*ii)However, in case transformer is not lifted or lifted but repair/replacement of transformer is delayed and repaired transformer is returned to Area Stores/ site store of contractor beyond prescribed period as mentioned above , penalty @ 0.5% of cost of new transformer per week subject to maximum 10% shall be levied and this penalty shall be deducted from the pending bill/security deposit available with the Company.*

*iii)In case defective/failed transformers lifted by the firm are not repaired and not returned to Area Stores/ site store of contractor beyond above prescribed period ( including period covered under penalty as above i.e. 20 weeks) , an amount equivalent to the cost of new transformer shall be recoverable from the supplier apart from penalty stated above.*

*iv)If the transformer failed within guarantee period has not been lifted by the firm and remained lying unattended in Area Stores/ site store of contractor for want of repair for more than above period , the CSPDCL/NRDA may get the transformers repaired from any other firm/departmentally and the cost of repair of the transformer shall be recovered , apart from the penalty of 10% of the cost of new transformer.*

**12. Receipt**

The receipt of a clerk for any money paid by the tenderer will not be considered as any acknowledgement of payment to the NRDA and the tenderer shall be responsible for seeing that he procures a receipt signed by the authorized signatory or any other Person duly authorized by him.

**13. Offer to be open for 3 months for acceptance.**

The act of the submission of bid to NRDA shall be deemed to constitute an agreement between the tenderer and the NRDA where by such tender shall remain open for acceptance by the NRDA. Subject to its right, for a period of *three* months from the date and time on which tenders are opened/negotiation done whichever is later, during which period the tenderer shall agree not to withdraw his offer not to impair or derogate their effects. If the tenderer be notified within the aforesaid period that his tender is accepted he shall be bound by the acceptance thereof by the NRDA. Any such withdrawal during the said period will entail forfeiture of the earnest money deposited with tender, without prejudice to the right of the NRDA to recover further damages if any from the tenderer.

**14. Opening of tenders.**

The Chief Executive Officer or his duly authorized representative will open the tenders at 16:00 Hours on the date of opening of the tenders in presence of such tenderers or their authorised representatives as may wish to be present at the time.

Signature of Contractor.....

Signature of NRDA.....

**15. Prohibition of separate communication.**

No separate communication regarding the tender shall be addressed by the tenderer to the Chief Executive Officer, but explanatory or qualifying remarks which the tenderer may desire to make must be recorded on page-..... thereof (mentioning the page number). No post tender correspondence regarding any terms & conditions , discount/rebate , reduction in rate from that submitted at the time of submission (in the sealed envelope with the tender) shall be entertained or replied for until or unless any clarifications/confirmations/documents needed/required by the office issuing the NIT/opening the tender.

**16. Contract documents to be studied by the tenderer.**

The tenderer shall examine closely the specifications and carefully study the drawings and all documents, which form part of the contract to be entered into by the successful tenderer, before submitting the tender, unit rates shall be for finished work. Plans and specifications and other documents connected with contract can be seen from the website or on the specified date on any working day between working hours in the office issuing NIT, only.

A copy of the set contract documents can also be had on payment. No information will, however, be given on the date fixed for the opening of the tenders.

**17. Bill of Quantities.**

A Bill of Quantities is included in the tender document to give an idea of the nature and quantum of work to be executed, it shall, however, be understood that this is liable to alterations by omissions, deductions or additions at the discretion of the NRDA during the course of the contract. Consequently, the quantities of individual items of work may vary or certain items may very or certain items may not be required to be executed at all. The rates quoted shall remain firm so long as the overall value & quantites of the contract does not very beyond  $\pm 15\%$  of the contract value. In case of variations beyond  $\pm 15\%$  of the contract value, the rates shall be mutually negotiated for execution of balance value of work and shall be examined for approval of competent authority of CSPDCL/NRDA.

**18. Care in submission of tender.**

Before submitting a tender, the tenderer will be deemed to have satisfied himself by actual inspection of the site and locality of the work that all conditions liable to be encountered during the execution of the work are taken into account and that rates he enters in the tender from are adequate and all inclusive to accord with the provision of the general & special conditions of contract for the completion of the work to the satisfaction of the Engineer-in-charge.

**19. Omissions and Discrepancies.**

Should a tenderer find discrepancies in or omissions from the drawings or any of the tender from or should he be in doubt as to their meaning, he should at once notify the authority inviting tenders, well before the date of opening notified , who may send written clarification to all tenderers. Every endeavor has been made to avoid any error which can materially affect the basis of the tender, but if any error is subsequently discovered, the tenderer shall make no subsequent claim on account thereof.

**20. Visit to site etc.**

The submission of tender by a tenderer implies that he has read and accepted all the instructions & the conditions of the contract etc. and has made himself aware of the scope and specifications of the work to be done and of the conditions, and rates at which stores, materials/equipments etc. will be issued to him and local conditions and availability of materials of required quality and quantity and other factors bearing on the execution of the work. The NRDA will not after acceptance of contract, pay extra charge for any reason whatsoever in case the contractor is found later on to have misjudged the actual conditions at site of work or the availability of materials etc. for work.

**21. Transport of materials.**

The contractor must arrange for all transport of materials to be provided by the contractor and include all such cost in the rates quoted by him for finished work. The contractor shall make his own arrangement for the supply of wagons if required by him for the transport of his material at his own expenses.

Signature of Contractor.....

Signature of NRDA.....

**22. Royalties and other taxes.**

All taxes & royalties as on the date of opening of price bid, would be deemed to have been included in the quoted price. Any statutory increases in the rates of excise duty, royalties, taxes & other levies after the award of the contract up to the stipulated contract period only shall be reimbursable to the contractor on production of documentary proof of payment of the same to the concerning authorities.

**23. Sub-letting of contract.**

The contract in all full or any part thereof shall not be assigned or sublet the Work.

**24. Memorandum of work and list of materials.**

Deleted.

**25. Receipt for payment made to contractors.**

Receipt for payment made on account of work executed must be signed by the contractor or by the person legally authorized to give effectual receipts for the contractors.

**26. Protection of public and workmen.**

It shall be the sole responsibility of the contractor to protect the public and his employees and workman against accident from any cause and he shall indemnify the NRDA from any claims for damages or injury to a person or property resulting from such accident.

**27. Employment of qualified Engineers and Engineering Subordinates.**

The contractor will have to engage engineers and engineering supervisory staff commensurate/conversant with the technical nature and quantum of work in the event the Engineer-in-charge finds that engineering and supervisory staff employed at any stage is not adequate and that the contractor has not taken due action to employ the requited staff in spite of notice given to him in writing by the Engineer-in-charge, the later shall have power to recover from any payments due to the contractor by any way of penalty a sum equal to the estimated salary of the staff so less employed.

In case of any dispute regarding the scale of engineering staff to be so employed, the decision of the Chief Executive Officer, NRDA shall be final and binding on the contractor.

**28. Where tendereres are not registered with the CSPDCL/CG Govt. departments**

Tender of contractor/persons who has not registered for the Classes stipulated for the tendered work(s) in the CSPDCL,Raipur and CG Govt departments shall not be opened.

**29. Acceptance of Tender.**

The acceptance or rejection of any tender is left entirely to the discretion of the authority empowered to deal with the matter and no explanation can be demanded for the cause of rejection of his tender by any tenderer.

**30. Right of NRDA to deal with tender.**

The NRDA reserves the right of not to invite open or limited tenders, and when tenders are invited, to accept a tender in whole or in part or reject and tender or all tenders without assigning any reasons for any such action.

**31. Specification to be followed.**

The work will be carried out strictly in accordance with Indian Standard Code of Practice. The aforesaid specification Should, however, be read in conjunction with the specification annexed to the tender, and in the event of any conflict contradiction between the provisions of such specifications, the specification annexed to the tender shall prevail. In case there is no provision in BIS/Indian Standard code of practice of CSEB/CSPDCL/CSPTCL and construction practice/standards . The work shall be carried out in accordance with such codes or practice as may be decided by the Engineer-in-charge in the absence of specification in any of the above codes, the specification as decided by the NRDA/CSPDCL shall be applicable.

**32. Instructions to form part of contract.**

These INSTRUCTION TO TENDERERS SHALL from part of the contract and any breach thereof shall be deemed to be breach of the contract.

Signature of Contractor.....

Signature of NRDA.....

**FORM A  
TENDER FOR WORKS**

I/We hereby tender for the execution for the NRDA *of the work(s) specified in the tender/NIT*

*within the time schedule specified therein at par/.....%(in figures)\_\_\_\_\_ Percent (in words) below/above* ( In figures as well As in words)

the summary sheet of lump sum bid price (₹ 177.81 lacs) based on Schedule of Rate(SOR) in accordance with clause 13 of the detailed notice inviting tenders and in accordance and in all respects with the specifications, designs drawing and instructions in writing referred to above clause hereof and in clause of the annexed conditions, and with such materials, as are provided for by and in all other respects *strictly in accordance with such specifications/terms & conditions* so far as applicable.

**PLEASE SEE THE SUMMARY SHEET OF LUMPSUM BID PRICE FOR THE TENDERED WORK(S) BELOW FOR QUOTING THE PERCENTAGE BELOW/AT PAR/ABOVE THE TOTAL VALUE OF ALL THE TENDERED WORKS**

- |   |   |
|---|---|
| (a) General description   | - AS PER TENDER NOTICE  |
| (b) Estimated cost  | - AS PER TENDER NOTICE  |
| (c) Security deposit  | - AS PER CLAUSE 8 OF THE CHAPTER-DETAILED<br>IN NOTICE INVITING TENDERS |
| (e) Time allowed for the work from the date of written order to be completed. | - AS PER DETAILED NOTICE INVITING TENDER                                |

**Give particulars and numbers**

Should this tender be accepted, I/We hereby agree to abide by and fulfill all the terms and provisions of the said conditions of contract annexed here to so far as applicable or in default thereof to forfeit and pay to the NRDA, the sums of money mentioned in the said conditions: The sum of ₹ ..... submitted by me/we towards earnest money the full value of which is to be absolutely forfeited by the NRDA without prejudice to any other right or remedies. Should I/we fail to commence the work specified in the above memorandum (a) Should I/We not deposit the full amount of security deposit specified in the Detailed Notice Inviting Tender in accordance with clause -1(General Conditions of Contract & clause-7(Instructions to Tenderers) otherwise the said sum shall be forfeited by the NRDA as on account of such security deposit as aforesaid, or (b) the full value of which shall be forfeited by the NRDA on account of the security deposit specified in Clause-1(General Conditions of Contract , clause-7(Instructions to Tenderers) & clause-11(Instructions to Tenderers) .

- (a) Number of pages.....Nos. duly numbered.  
(b) Number of Enclosure(s)..... Nos. having .....pages duly numbered

Date

.....Day of month                      year 2011

Signature of Tenderer

(Before Submission of tender)

I Witness: (to be signed after opening of bid)

1. Signature:
2. Name:
3. Address:

II Witness: (to be signed after opening of bid)

- 1                      Signature:
- 2                      Name:
- 3                      Address:

Signature of Contractor.....

Signature of NRDA.....

**NAYA RAIPUR DEVELOPMENT AUTHORITY**  
**SUMMARY SHEET OF LUMPSUM BID PRICE FOR THE TENDERED WORK(S)**

Sr. No.	Name of work	Total value of the work including cost of material provided by contractor , transportation , labour charges and centages (Rupees in lakhs)*
1	<b>Supply Installation Testing and Commissioning of LT Under Ground Cable &amp; 13 Nos. 100 KVA 11/.4 Kv Plinth mounted Transformers at various locations at Naya Raipur for Street Light supply</b>	<b>₹ 177.81 lakhs</b>
	-	<b>₹ 177.81 lakhs</b>

**(Rupees One Hundred Seventy Seven Lakhs and Eighty One Thousand only).**

\*The details given in separate schedules of B.O.Q. for individual estimate/work separately.

Signature of Contractor.....

Signature of NRDA.....

**Estimate for LT power supply to Street Light points from transformers proposed for street light in Naya Raipur with underground cable.**

**ABSTRACT**

<b>S.No.</b>	<b>Sch. Ref.</b>	<b>Particulars</b>	<b>Amount</b>
1	COST SCHEDULE - A	COST SCHEDULE - PLINTH MOUNTED 11/0.4 KV OUTDOOR SUB-STATION	2632043.78
2	COST SCHEDULE - B	COST SCHEDULE FOR FABRICATION SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF CUBICAL TYPE CONTROL PANEL BOARD	147540.03
3	COST SCHEDULE - C	COST SCHEDULE FOR FABRICATION SUPPLY, ERECTION, TESTING & COMMISSIONING OF LT CABLE OF VARIOUS SIZES	15001471.20
		TOTAL AMOUNT	<b>17781055.01</b>
		SAY ₹	<b>17781055.00</b>

**SAY ₹ 177.81 Lakhs**

Signature of Contractor.....

Signature of NRDA.....

**COST SCHEDULE -A**  
**COST SCHEDULE - PLINTH MOUNTED 11/0.4 KV OUTDOOR SUB-STATION**

S.No.	Particular	Unit	Rate	100 KVA X-mer	
				Qty	Amount
1	RS Joist (175X85) mm 11 Mtr Long i.e.19.495 kg/mtr x 11mtr=214.44kg x 2No =428.89Kgs	kg	43.40	5577	242041.80
<b>Transformer 11/0.4 KV (Convensional)</b>					
2	100 KVA of approved vendors of CSPDCL	No	108587.00	13	1411631.00
3	11 KV V CROSS ARM	No	26.00	720	18720.00
4	33 KV TOP CLAMP SEMI FINISHED	No	26.00	195	5070.00
5	11 KV TOP CLAMP	No	26.00	185	4810.00
6	ACSR conductor Rabbit	Mtr	19.57	1500	29355.00
7	DC cross arm 100x50 mm 8' centre	No	2990.00	13	38870.00
8	11 KV DO fuse & LA mounting DC cross arm (70 x 40mm)	No	2180.00	13	28340.00
9	11 KV DO fuse unit	No	1009.00	39	39351.00
10	M.S. Angle 50x50x6 mm	kg	43.40	260	11284.00
11	(i)Stay set 16 mm	No	311.00	52	16172.00
12	(ii) Stay wire 7/10 SWG (7.5 kg each)	Kg	52.83	390	20603.70
13	(iii) Stay clamp for RSJ	No	190.00	52	9880.00
14	Cement @ 208 Kg/CMT.	Kg	4.50	3786	17037.00
15	Danger Board	No	60.00	13	780.00
<b>Earthing set pipe carth</b>					
16	(i) GI pipe 40 mm	Mtr	143.00	117	16731.00
17	(ii) GI wire 8 SWG	Kg	56.96	195	11107.20
18	Anticlimbing dence	No	160.00	26	4160.00
19	Red oxide paint	Ltr	125.00	26	3250.00
20	Aliminium paint	Ltr	270.00	26	7020.00
21	11 KV lightning arrestore	No	538.00	39	20982.00
<b>M.S. Nuts &amp; bolts</b>					
22	16x40 mm	kg	48.00	13	624.00
23	16x65 mm	kg	47.00	52	2444.00
24	16x140 mm	kg	45.00	52	2340.00
25	16x200 mm	kg	45.00	65	2925.00
PVC insulated XLPE armoured 3.5 core cable of <b>Approved Make : Universal/CCI/Gloster/Ravin cables (prime-cab) /PolyCab</b>					
26	70 sqmm	Mtr	159.76	390	62306.40
27	150 sqmm	Mtr	312.95	130	40683.50
<b>LT distribution box for X-mer</b>					
26	100 KVA	No.	12118.00	13	157534.00
27	Clamp for (i) RSJ 175x85 mm	No.	190.00	182	34580.00
28	11 KV AB switch	Set	9824.00	13	127712.00
29	ACSR conductor Rabbit	Mtr	19.57	390	7632.30
<b>Total</b>					<b>2395976.90</b>
<b>Centages @ 11.50%</b>					<b>275537.34</b>
Labour Charges as per CL-9.					154511.50
Service in lieu of concreting @ 1664.00 per CMT					30284.80
Transportation Charges ₹					51270.58
<b>Grand Total</b>					<b>2632043.78</b>

Signature of Contractor.....

Signature of NRDA.....

**COST SCHEDULE - B**  
**COST SCHEDULE FOR FABRICATION SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF**  
**CUBICAL TYPE CONTROL PANEL BOARD**

S.No.	Particulars	Unit	Rate	Quantity	Amount
1	Fabrication, supply, installation, testing and commissioning of cubicle type compartmentalized wall/ floor mounted power cum control panel board of specified size and <b>upto 300 mm deep</b> made out of not less than 2 mm thick CRCA MS sheet with suitable size compartments for bus bars, switchgears and necessary cutouts for voltmeters, ameters etc as per specifications including powder coating painting but without busbars, switchgears and other accessories etc complete as required. (Only face area is to be measured) & as per enclosed Drawing Size 600(L)x450(w)x300(d)	sqm	5,577.00	15.39	85830.03
13	Excavation Concreting of supports @ 0.15 CMT per cubical	CMT	2600	7.95	20670
3	Supply, installation, testing and commissioning of 4 pole (3 phase + neutral) aluminium bus bars in existing cubicle type compartmentalized wall/ floor mounted panel board alongwith suitable size and shape insulators, necessary bolts and nuts etc complete as required.				
	200 amp (30x5mm)	Metre	700	17.1	11970
4	Providing and fixing knife (DIN) type following H.R.C. fuses, with 80 KA breaking capacity in existing SFU/ FSU including bolts and nuts etc. as required. <b>MCCB : Legrand/Standard/Andrew Yule/C&amp;S</b>				
	100 amps	Each	170	171	29070
					<b>147540</b>

Signature of Contractor.....

Signature of NRDA.....

**COST SCHEDULE - C**  
**COST SCHEDULE FOR FABRICATION SUPPLY, ERECTION, TESTING & COMMISSIONING OF LT**  
**CABLE OF VARIOUS SIZES**

Sr.No.	Particulars	Unit	Rate	Quantity	Amount
1	Supplying and laying following sizes one number PVC insulated, PVC sheathed, steel armoured, aluminium conductor power cable of 1.1 KV grade <b>direct in ground</b> including excavation, sand cushioning, protective covering and refilling the trench etc as required. <b>Approved Make : Universal/CCI/Gloster/Ravin cables(prime-cab) /PolyCab</b>				
	3½ X 50 sq. mm	Meter	325	990	321750
	3½ X 70 sq. mm	Meter	385	3100	1193500
	3½ X 95 sq. mm	Meter	445	7015	3121675
	3½ X 120 sq. mm	Meter	528	7334	3872352
	3½ X 150 sq. mm	Meter	596	10537	6280052
2	Supplying and making <b>cramping suitable size and all type aluminium ferule/lugs to following size 1.1 KV grade power cable core/ lead, pressed with high pressure cramping tool including connection to switch gear/MCCB etc as required.</b> <b>Approved Make</b> <b>Lugs : Dowells/Raychem/Densons/3M</b>				
	25 sq. mm	Each	9.6	12	115.2
	35 sq. mm	Each	10	63	630
	50 sq. mm	Each	12	18	216
	70 sq. mm	Each	15	119	1785
	95 sq. mm	Each	19	69	1311
	120 sq. mm	Each	23	69	1587
	150 sq. mm	Each	27	112	3024
3	Supplying and making <b>straight through joint with cast resin compound</b> including aluminium ferrules and other jointing materials for following size of PVC insulated and PVC sheathed / XLPE aluminum conductor cable of 1.1 KV grade as required. <b>Approved Make : Raychem/Densons/3M</b>				
	3½ X 50 sq. mm	Each	890	6	5340
	3½ X 70 sq. mm	Each	909	15	13635
	3½ X 95 sq. mm	Each	960	45	43200
	3½ X 120 sq. mm	Each	1,351.00	45	60795
	3½ X 150 sq. mm	Each	1,388.00	58	80504
	<b>Total</b>		<b>7892.6</b>	<b>29607</b>	<b>15001471.2</b>

Signature of Contractor.....

Signature of NRDA.....

**NAYA RAIPUR DEVELOPMENT AUTHORITY**  
**General Conditions of Contract**

**Clause-1. Security Deposit**

The person/persons whose tender may be accepted hereinafter called; the contractor (which expression shall, unless excluded by or repugnant to the context, includes his heirs, executors, administrators, representatives and assigns) shall deposit as stipulated in clause-8 of the detailed notice inviting tenderers & clause-7 of Instructions to Tenderers unless the payments against this contract shall not be released by the payment authority and towards any delay in payments for non-submission of security deposit by the contractor NRDA shall not be responsible .

**Clause-2(a). Penaltly towards Compensation for delay in execution of work.**

*The completion period of works proposed in the tender will depend upon the scope and quantum of work. **In this particular tender the work shall be completed within three months including rainy season , from the date of handing over of site.***

The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor and shall be reckoned from the date on which the order to commence the work is given to the contractor or **from the date of handing over the site** . The work shall throughout the stipulated period of contract be proceeded with all due diligence (time being deemed to be the essence of the contract on the part of the contractor) and the contractor shall be liable for imposing penalty for delay in completion of work within the period stipulated in the NIT/contract until or unless 'Competent Authority of the NRDA grant extension of time after examining the contractor's representation, if found genuine & justified to the NRDA.

**Penalty:** If the contractor fails to complete the erection, testing & commissioning etc. within the completion period stipulated in clause 2(a) above penalty @half percent (0.5%) of total contract value per week or part thereof subject to a maximum of 10% of total contract value shall be imposed

**(b) Interim progress of work:**

To ensure good progress during the execution of the work the contractor shall be bound in all cases in which the time allowed for any work exceeds one month to complete one fourth of the time allowed under the contract has elapsed, one half of such time has elapsed and three fourth of the work, before three fourth of such time has elapsed. In the event of the contractor failing to comply with this condition, he shall be liable for imposing penalty for delay in completion of work within the period stipulated in the NIT/contract until or unless Competent Authority of the NRDA grant extension of time after examining the contractor's representation , if found genuine & justified to the NRDA under the provision of the aforesaid clause-2 shall not exceed ten percent (10%) on the value of the contract order awarded for the work .

**Clause-3.**

In any case in which the contractor commits breach of any terms of the contract or abandons the work wholly or partly for any reasons or dies or fails to carry out any work which he is bound to carry out under the terms of this contract, the NRDA or the Engineer-in-charge on behalf of the NRDA shall have power to adopt any of the following courses without prejudice to any other right that may accrue to the NRDA under this contract.

- (a) To rescind the contract (of which rescission notice in writing to the contractor under the hand of the Engineer-in-charge shall be conclusive evidence) in which case the security deposit of the contractor, shall stand forfeited, and be absolutely at the disposal of NRDA without prejudice to the right of the Company to recover any further amount by way of damages.
  
- (b) To measure up the work of the contractor and to take such part thereof as remains unexecuted out of his, hands, and to give it to another contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (of the amount which in excess, the certificate in writing of the Engineer-in-charge shall be final and conclusive) shall be borne and payable by the original contractor and may be deducted from any money due to him by NRDA under the contract and may be deducted from any money due to be

Signature of Contractor.....

Signature of NRDA.....

paid him by NRDA under the contract or otherwise from his security deposit or the proceeds of sale sufficient part thereof.

- (c) If the Engineer-in-charge adopts any of the above courses, the contractor shall in no case whatsoever, have any claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered in to any engagement or made any advances on account of or with a view, to the execution of the work or the performance of the contract. In case the contract shall be rescinded under the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work, therefore, actually performed under this contract, unless and until the Engineer-in-charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified. If the amount recoverable is found insufficient , the NRDA shall file suit against the contractor in a Court of Law competent in the jurisdiction at Raipur.
- (d) The defaulter contractor shall also be liable for blacklisting by the NRDA for future business for a period deemed fit by the competent authority of the NRDA.

**Clause-4. Contractor remains liable to pay compensation if no action taken under clause-3.**

In any case in which any of the powers conferred upon the Engineer-in-charge by clause-3 thereof, shall have become exercisable and the same are not exercised, the non exercise thereof shall not constitute a waiver of any of conditions thereof and such power shall not with standing be exercisable in the event of any future case of in the event of the Engineer-in-charge putting in force either of the power (a) or (c) vested in him under the preceding clause he may, if he so desires take possession of all or any tools, plant, materials, and stores in or upon the work or in site thereof or belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof paying or allowing for the same in account at the contract rates or in case of these not being applicable, at current market rates to be certified by the Engineer-in-charge whose certificate thereof shall be final otherwise the Engineer-in-charge may be notice writing to the contractor or his Clerk or work foreman or the authorized agent require him to remove such tools, plants, materials or stores from the premises (within a time to be specified in such notice) and in the event of the contractor failing to comply with any such requisition, the Engineer-in-charge may remove them at the contractor expenses or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificate of the Engineer-in-charge may remove them at the contractors expense or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificate of the Engineer-in-charge as to the expense of any such act shall be final and conclusive against the contractor.

**Clause-5. Extension of time.**

If the contractor shall desire an extension of time for completion of the work on the grounds of his having been unavoidably hindered in its execution or on any other genuine ground, he shall apply in writing to the Engineer-in-charge within 15 days of hindrance on account of which he desires such extension as aforesaid and the Engineer-in-charge may in his discretion (which in final) grants such extension after approval of competent Authority of NRDA as per prevailing rules. Strike by the contractor's labours, and lock out by the contractor shall not be unavoidably hindrance for the work.

**Clause-6. Final Certificate.**

**On completion** of the work, the contractor shall be furnished with a certificate by the Engineer-in-charge of such completion but no such certificate shall be given, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed scaffolding/ladders, surplus materials/excavated soil and metal/rubbish and cleaned off the dirt from all work area/site or others parts of any building, Sub-station, line in upon, or about which the work is to be executed or of which he may have had possession for the purpose of the execution thereof and until the work shall have been measured by the Engineer-in-charge whose measurement shall as to removal of scaffolding/ladders, surplus materials/excavated soil and metal/rubbish and cleaned off the dirt from all work area/site on or before the date fixed for the completion of the work, the Engineer-in-charge may at the expense of the contractor, remove such scaffolding/ladders, surplus materials/excavated soil and metal/rubbish and cleaned off the dirt from all work area/site and dispose of the same as he thinks fit and clean off such dirt as aforesaid and the contractor shall forthwith pay the amount of all expenses so

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incurred together with departmental charge as may be fixed by the NRDA from time to time and shall have no claim in respect of any scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

**Clause-7. Payment on intermediate/running bills Certificate to be regarded as advances.**

No any payment against supply of material shall be allowed separately . As per the verification of work under progress and measurement done by the Engineer-in Charge 95% of value of work completed during a month shall be considered to be passed for payment against running bills . Balance 5% shall be payable on satisfactory completion of the work .i.e. after proper handing over of the works to the Engineer-in Charge.

**Clause-8. Submission of bills.**

For the work executed during the previous month, a running bill submitted by the contractor each month on or before the date fixed by the Engineer-in-charge and the Engineer-in-charge shall take necessary action to have the same verified. If the contractors does not submit the bill within the time fixed as aforesaid, the Engineer-in-charge *may* prepare a bill from the measurements so taken which shall be binding on the contractor in all respects.

**Clause-9. Material/Equipment provided by the NRDA.**

Deleted

**Clause-10. Materials and workmanship.**

The contractor shall execute the whole and every part of the work in the most substantial and workmanship like manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also confirm exactly, fully and faithfully to the design, drawing and instruction in writing relating to the work signed by the Engineer-in-charge and lodged in his office and to which the contractor shall be entitled to have access at such office or on the site of the work for the purpose of inspection during office hours and the contractor shall, if he so requires, be entitled at his own expense to make or cause to be made couple of the specification and of all such design, drawings and instructions as aforesaid.

**Clause-11. Alteration in specification and designs.**

The NRDA shall have power to make any alteration in, omissions from additions to or substitutions for the original specifications, drawing, designs and instructions, that may appear to be necessary or advisable during the progress of the work, and the contractor shall be bound to carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-in-charge and such alterations, omissions, additions or substitution shall not invalidate the contract and any altered, additional or substituted work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work and at the same rates as are specified in the tender for the main work. The time for the completion of the work shall be extended in proportion that the altered, additional or substituted works bears to the original contract work, and the certificate of the Engineer-in-charge shall be conclusive as to such proportion. And if the altered, additional or substituted work includes any class of work for which no rate is specified in this contract such class of work shall under no circumstances be commenced by the contractor or without an order in writing by the Engineer-in-charge and the rate for such work shall be derived before commencing the work in the following manner in that order of preference.

- a) Wherever possible the rates shall be derived from one or more of the existing items in the Unified/Current Schedule of Rates applicable at the percentage at which the successful tenderer quoted in the tender form.
- b) Otherwise, the rate will be derived on the basis of a joint record of material and labour employed on a representatives sample piece of work signed by the Engineer-in-charge on behalf of the NRDA and the contractor or his authorized representative. In the event of any dispute regarding the fixation of such rate, the decision of the NRDA shall be final.

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**Clause-12. No claim for any payment or compensation for alteration in or restriction of work.**

If at any time after the execution of the contractor agreement, the Engineer-in-charge shall, for any reasons whatsoever, requires the whole or any part of the work as specified in the tender to be stopped for any period or shall not require the whole or part of the work to be carried out at all he shall give notice in writing of the fact to the contractor shall have no claim for any payment or compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not so derive in consequence of the full amount of the work not having been carried out or on account of any loss that he may be put to on account of materials purchased or agreed to be purchased or for unemployment of labour recruited by him. He shall not also have any claim for compensation by reasons of any alterations having been made in the originally contemplated, where however; materials have already been purchased by the contractor before receipt by him of the said notice, the contractor may be paid for such materials at the market rates or at the actual purchase price of the said material whichever is less, provided they are not in excess of requirements and are of approved quality.

**Clause-13. Time limit for claim of the contractors.**

Under no circumstances whatsoever the contractor be entitled to make any claim from the NRDA on any account whatsoever unless the contractor shall have submitted a claim in writing to the Engineer-in-charge within one month of the cause of such claim occurring . In the event of the contractor not lodging any claim as aforesaid, he will be deemed to have abandoned such a claim.

**Clause-14. Action and compensation payable in case of bad work.**

If at any time, before the security deposit is refunded to the contractor, it shall appear to the Engineer-in-charge his subordinate in charge of the works that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of inferior quality or that any materials or articles provided by him for the execution of the work are unsound or of a quality inferior to that contracted for, or are otherwise not in accordance with the contract, it shall be lawful for, the Engineer-in-charge to intimate this fact in writing to the contractor and when notwithstanding the fact the work materials or articles, complained of may have been passed, certified and paid for, the contractor shall be found forthwith to rectify or remove and reconstruct the work so specified and provide other proper and suitable materials or articles at his own proper charge and cost and in the case of any such failure, the Engineer-in-charge may rectify or remove and re-execute the work or remove and replace the materials or articles complained of as the case may be at the risk and 'expense in all respects of the contractor. In the event of his failing to do so within a period to be specified by the Engineer-in-charge in the written intimation aforesaid, the contractor shall be liable to pay to the NRDA the cost of such rectification, replacement and modification estimated by the Engineer-in-charge together with such departmental charges as may be fixed by the NRDA from time to time, provided, however, should the Engineer-in-charge any such inferior work or materials as described above may be accepted or made use of, it shall be within his discretion to accept the same at such reduced rates as he may fix therefore.

Nothing in this clause shall be deemed to deprive the NRDA or affect any right under the contract which may otherwise have and failure to take any action under this clause shall not be considered as acceptance of such plants, materials or work.

The Engineer-in-charge may by any certificate make any correction or modification in any previous certificate which has been issued by him and payment shall be regulated and adjusted accordingly.

**Clause-15. Contractor liable for damages done and for imperfection till the expiry of the guarantee period.**

The guarantee period for the work shall be as detailed in clause no-11 of Instructions to Tenderers . The contractor shall maintain the works in such a manner that, at expiry of the period of guarantee , they shall be in a good and perfect order, repair and condition (Fair wear and tear excepted) as that in which they were at the commencement of the maintenance period to the satisfaction of the Engineer-in-charge all defects, imperfection, shrinkages or other faults arising from faulty design of the contractor or due to the use of materials or workmanship not in accordance with the contractor or from neglect or failure on the part of the contractor to comply with the provisions of the contract.

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If the contractor or his labour or servants shall break, deface, injure or destroy any part of the Sub-Station, Line, any equipments, Building in which or near by they may be working or any building, road, curbs, culverts/bridges, water pipes, cable drains, electric or telephone post or wires, trees, grass land or cultivated ground continuous to the premises on which the work of any part of it is being executed, or if any damage shall happen to the work while in progress from any cause whatever or any imperfections become apparent in it within the maintenance period specified above, the contractor shall make the same good at his own expense or, in default the Engineer-in-charge may cause the same to be made good by other workman and deduct the expense together with such departmental charges as may be fixed by the NRDA from time to time (of which the certificate of the Engineer-in-charge shall be final) from any sums that may be then or at any time thereafter may become due to the contractor or from his security deposits, or the proceeds of sale thereof of a sufficient portion thereof.

The security deposit of the contractor shall not be refunded before the expiry of the guarantee period or the settlement and payment of the final bill or any liabilities due, whichever is later. The contractor hereby also covenants that it shall be his responsibility to see that the Sub-station, Line, Structure/Supports constructed under this contract does not be damaged during the period of one full rainy season or one full year respectively after the completion and if any defects are pointed out to him by the Engineer-in-charge may get them rectified and deduct the expenses there of together with such departmental charges as may be fixed by the NRDA from the security deposit of the contract. If any amount become due on their account after the refund of security deposit and there are no other dues to the contractor from which it can be recovered, the same may be recovered from the contractor as arrears of land revenue.

**Clause-16. Notice to be given before work is covered up.**

The contractor shall give not less than five days notice in writing to the Engineer-in-charge or his subordinate-in-charge of the work before covering up, otherwise placing beyond the reach of measurement, any work in order that the same may be measured and correct dimensions thereof be taken before the same is so covered up or placed beyond the reach of measurements. The contractor shall not cover up or place beyond the reach of measurements, any work without the consent in writing of the Engineer-in-charge or his subordinate-in-charge of the work, and if any work shall be covered up or placed beyond the reach of measurement without such notice having been given and consent obtained, the same shall be uncovered at the contractors expense or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

**Clause-17. Contractor to supply construction equipments/requisite machines/tools & plant, ladders, scaffoldings etc.**

The contractor shall supply at his own cost materials (except such special materials, if any, as may be in accordance with the contractor be supplied from the Engineer-in-charges stores). Plants, tools, tackles appliances, implements, derricks and guys, ladders, cordage, tackle scaffoldings, pumps, mechanically operated concrete mixers and temporary work requisite for the proper execution of the work whether original, altered, substituted in the specification or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-charge as to any matter as to which under these conditions he is entitled to be satisfied or which he is entitled or require together with carriage thereof to and from the work.

The department will not assist in procuring of the tools, plants, equipments etc. from any source whatsoever. Such items of plant and machinery as are available with the NRDA may be made available at the discretion of the NRDA but the contractor will have to execute a separate agreement for the hire of plant and machinery. The contractor shall also supply, if so required by the Engineer-in-charge in writing, without charge, requisite numbers of persons with the means and materials necessary for the purpose of setting out works and counting, weighting and assisting in the measurement or examination at any time and from time to time of work or materials, failing which, the same may be provided by the Engineer-in-charge at the expenses of the contractor and the expenses may be deducted from any money due to the contractor under the contract, or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof. The contractor shall also provide at his own cost all necessary fencing and lights required to protect the public from accident and shall be bound to bear expenses of defence of every suit, action or proceedings at law that may be brought by any person against the NRDA or its officers for injury

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sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any suit, action or proceedings to any person, or which may with the consent of the contractor be paid to compromise/compensate any claim by any such person.

**Clause-18. Works to be open to inspection.**

All works under or in course of execution or executed in pursuance of the contract, shall be at all time be open to inspection and supervision of the Engineer-in-charge and his subordinates; and the contractor shall at all times during the usual working hours and all other times at which notice of the intention of the Engineer-in-charge or his subordinate to visit the works shall have been given to the contractor, either, himself be present to receive orders and instructions, or make a responsible agent duly authorised in writing be present for the purpose. Order given to the contractor's agent shall be considered to have the same force as if they given to the contractor himself.

**Clause-19. Compensation under Section-12, Sub-section (1) of the Workmen's compensation Act 1923.**

In every case in which by virtue of the provision of section 12, subsection (1) of the Workmen's Compensation Act-1923, the NRDA is obliged to pay compensation to workmen employed by the contractor in execution of the works, the NRDA will recover from the contractor, the amount of the compensation so paid without prejudice to the right of the company under section 12, sub-section (2) of the said Act. The NRDA shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit of from any sum due by the NRDA to the contractor whether under this contract or otherwise. NRDA shall not be bound to contest any claim made against it under section 12, sub-section (1) of the said Act, except on the written request of the contractor and upon his having to the NRDA full security for all costs for which the NRDA might become liable in consequence of contesting such claim. The NRDA shall in no case be responsible for any fatal , non fatal , electrical , non-electrical accident caused to any workman or outsider in course of treatment or compensation whatsoever on this account and shall be borne by the Contractor only.

**Clause-20. Minimum Wages.**

The contractor shall pay not less than minimum wages to the labours engaged by him on the work.

Explanation –

- (a) Minimum wages means wage whether for time or piece of work notified at the time of inviting tenders for the work and where such wage have not been so notified, the wages prescribed by the public works Departments, state or labour department
- (b) The contractor shall not with standing the provision of contract to the contrary cause to be paid minimum wages to labourers indirectly engaged on the work including any labour engaged by his sub-contractors in connecting with the said works as if labourers had been employed by him.
- (c) In respect of all labour directly or indirectly employed in the work for the performance or his part of this contract by the contractor shall either comply or cause to be complied with the Central provinces and Bearer PWD Contractors Labour Registration contained in Appendix-150 of M.P.P.W.D. Manual (Vol.II) Contractor should register his establishment under contract labour (Regulation and Abolition) Act.1970. with Labour department of M.P Government and C.G. Govt. and produce copy of same to Engineer-in-charge.
- (d) The Engineer-in-charge shall have the right to deduct from money due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker/workers by reason of non-fulfillment of the conditions of the contract for the benefit of the workers, non-payments of wages on deduction made from his or their wages which are not justified by their terms of the contract or nonobservance of the regulation.
- (e) The contractor shall be primarily liable for all payment to be made under and for the observance of the regulation aforesaid without prejudice to his right to claim indemnity from his sub-contractors.
- (f) The regulation aforesaid shall be deemed to be a part of the contract and any breach thereof shall be deemed to be breach of the contract. The contractor shall disburse the wages to his workers within the time limit prescribed under the provisions of payment of Wages Act-1936, or any other similar law in force as amended up to date.

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**Clause-21.**

(a) Whenever demanded by the Engineer-in-charge the contractor shall submit a true statement showing (1) number of labours employed by him on the work (2) their working hours (3) the wages paid to them and (4) the accidents that occurred during the period of which information is required stating the circumstances under which they occurred and the extent of damage of damage and injury caused by them. Failure to supply such information or supplying materially incorrect statement may amount to breach of contract. The decision of Engineer-in-charge shall be final in determining whether a breach has taken place.

(b) In respect of all labourers directly or indirectly employed in the works for the performance of the contractors part of this agreement, the contractor shall comply with or cause to be complied with all the rules framed by the Government from time to time for the protection of health and sanitary arrangement for workers employed by the public works Department and its contractors.

**Clause-22.**

The contract shall be not be assigned/sublet the work. And if contractor shall assign or sublet his contract or attempt to do so or become insolvent or commence any insolvency proceeding or make any composition with his creditors or attempts to do so or if any bribe, gratuity. Gift, loan, perquisite, reward or advantage, pecuniary or otherwise, shall either directly or indirectly, be given, promised, or offered by the contractor or any of his servants or agents to any public officer or person in the employment of the NRDA in any way relating to his office or employment of if any such officer or person shall become in any way directly or indirectly interested in the contract, the NRDA may there upon by notice in writing rescind the contract and the security deposit of contractor shall there upon stand forfeited and be absolutely at the disposal of NRDA and the same consequence shall ensure as if the contract has been rescinded under clause 3 hereof and in addition the contractor shall not be entitled to recover or paid for any work therefore actually performed under the contract.

**Clause-23. Changes in the constitution of the firm.**

In the case of a tender by partners, any change in the constitution of the firm shall be forth with notified by the contractor to the Engineer-in-charge for his information.

**Clause-24 Works to be executed under the direction of Engineer-in-charge.**

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respect of the Engineer-in-charge of the NRDA who shall be entitled to direct at what point and in what manner they are to be commenced and from time to time carried on.

**Clause-25 Settlement of disputes and arbitration.**

Except as otherwise provided in this contract all question and dispute relating to the meaning of specification, designs, drawings and instruction here in before mentioned as to thing whatsoever in any way arising out of or relating to contract designs, drawings, specification, estimate, concerning the works, or execution or failure to execute the same, whether arising during the progress of work or a after the abandonment there of shall be referred to the Chief Engineer, NRDA for his decision, within a period of 30 (thirty) days of such an occurrence(s). There upon the Chief Engineer, NRDA shall give his written instructions and/or decisions ,after hearing the contractor and Executive Engineer, NRDA within a period of thirty days of such request. This period can be extended by mutual consent of parties.

Upon receipts of written instruction or decisions, of Chief Engineer, NRDA the parties shall promptly proceed without delay to comply such instructions or decisions. If the Chief Engineer fails to give his instruction or decision in writing within a period of 30 days or mutually agreed time after being requested and/ or, if the parties is/ are aggrieved against the decision of the Chief Engineer, the aggrieved party may within 30 days prefer an appeal to Chief Executive Officer, NRDA which consist of following members, who shall afford an opportunity to the parties being heard and to offer evidence in support of his appeal. The CEO, NRDA will give his decision within 30 (Thirty) days or such mutually agreed period.

If any party is not satisfied with the decision of the CEO, NRDA , he can file the petition for resolving the dispute through arbitration in the arbitration tribunal, GoCG at Raipur within 30 days from the date of issue of the decision by CEO, NRDA.

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A reference to Arbitration Tribunal shall be no ground for not continuing the work on the part of contractor. Payment as per original terms and condition of the agreement shall be continued by the Executive Engineer, NRDA in accordance with the relevant clause. Arbitration shall be held in accordance with ARBITRATION & CONCILIATION Act 1996.

**Clause-26. Claims for items not entered in the bill of Quantities.**

Items are shown in the bill of Quantities purely for the purpose of indicating the type of work to be carried out and no claim shall be entertained for any item or the work executed being not mentioned in the aforesaid B.O.Q.

**Clause-27. Claim of compensation for delay in starting the work.**

No compensation shall be allowed for any delay caused in the starting of the work on account of handing over the site, or in the case of clearance to works, on account of any delay in according sanction to estimate.

**Clause-28. Recovery of any dues from contractor.**

It shall be lawful for the NRDA to deduct from the money payable to the contractor under this contract, the amount due from the contractor in respect of any other contract which has been entered in to or may be entered in to by the contractor with the NRDA.

**Clause-29. Royalties and other Taxes.**

The contractor shall be responsible for the payment directly to the authorities concerned of all import duties/Excise Duty, sales tax/VAT, Service Tax , Cess towards Building and Other Constructions, octroi duties, quarry fees, ground rent at quarry, royalties, Income Tax , local and any other taxes, etc. on all materials and articles he may use. In case the contractor fails to pay such charges and/or the authorities concerned desire that NRDA shall recover and pay the same, the NRDA shall recover the same from any dues payable to the contractor along with such departmental charges as may be fixed by the NRDA from time of time. The contractor will not be entitled to any refund or claim on this account.

The royalty charges for minor mineral either supplied to NRDA or used on NRDA's work by contractor will be paid by the contractor to the collector as per Government rules and he will have to produce royalty clearance certificate before the payment of final bill failing which royalty payable per existing rules and rate shall be recovered from the final bill for the works.

**Clause-30. Penalty for breach of contract.**

On the breach of any terms or condition of this contract by the contractor the NRDA shall be entitled to forfeit the security deposit or the balance thereof that may at the time be remaining and to realize and retain the same as damager and compensation for the said breach but without prejudice to the right of the NRDA to recover any further sum as damages from any sum due or which may become due to the contractor by NRDA or otherwise howsoever.

**Clause-31. Inventory of the contractor's materials.**

At the time of the commencement of the works or any time thereafter, whenever the contractor brings any material or equipment to the site for use, he shall submit a list of all such materials requirement to the Engineer-in-Charge. After the completion of works or at any time during the tenure of the contract, such material belonging to the contractor can be removed form the site only with the written permission of the Engineer-in-Charge or his authorized representative.

**Clause-32– Force Majeure Conditions.**

The following clauses which substantially affect the performance of the contract shall only be considered as force majeure conditions:-

“The acts of God , strikes , lock-outs , or other industrial disturbances , acts of the public enemy wars , blockades , insurrection , riots , epidemics , landslides , earthquakes , storms , lightning , floods , wash outs , civil disturbances , , explosions , any other similar events , not within the control of either party and which by the exercise of due diligence neither party is able to overcome.” Provided the party affected by the ‘Force Majeure’ shall within fifteen(15) days from the occurrence of such a cause , notify the other party in writing of such cause with sufficient documentary proof .The contractor or the NRDA shall not be liable for delays in performing their respective obligations resulting from any force majeure causes as

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defined above. In case of any damage or destruction of any property or equipment belonging to the contractor due to 'Force Majeure' clauses , the NRDA shall not be liable for the same.

**Clause-33. Marking.**

The contractor's name and date of work completion shall to be provided on support(s)/equipments marked by black letter on white background in a strip of size 200x100mm as per guide lines of Engineer-In Charge.

**Clause-34.**

The breach of any terms of any of these General conditions of contract shall be deemed as breach of this contract.

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## Special Conditions of Contract

### **1 General.**

These special conditions of contractor supplement the instructions to Tenders and the General Conditions of Contract and shall be considered as part of the contract, these conditions shall prevail. The work will be carried out strictly in accordance with the Indian Standard codes of practice. The aforesaid specifications should however, be read in conjunction with the specifications annexed to the tender and in the event of any contradiction between the provision of such specification , the specifications annexed to the tender shall prevail. In case there is no provision in Indian Standard Codes of practice, the work shall be carried out in accordance with such codes of practice as may be decided by the Engineer-in-charge. In the absence of any specifications in any of the above codes, the specifications as decided by the Engineer-in-charge shall be applicable. The specifications are not intended to cover the minutes details and the work shall be executed according to the spirit of specifications and the best prevailing engineering practice.

### **2 Drawings and specifications.**

The drawings show the work to be done, as definitely and in such detail as is possible at the present stage of development of the design. The attached drawings will be supplemented or superseded by such additional and detailed drawings, as may be necessary or desired as the work proceeds. Such additional general and detailed drawings will show dimensions and details necessary or desired as the work proceeds. Such additional general and detailed drawings will show dimensions and details necessary for constructions purpose more completely than are shown on the attached drawings for all features of the work. The contractor shall be required to perform the work on these features and in accordance with the additional general and detailed drawings mentioned above at the applicable unit prices tendered in the Schedule for such work of similar nature, as determined by the Engineer-in-charge.

The contractor shall check all drawings carefully and advise the Engineer-in-charge, of any error or omissions discovered. The contractor shall not take advantage of errors or in these drawings.

The drawings and specification are to be considered as complimentary to each other and should anything appear in one that the other does not have, no advantage shall be taken of such omission. Should any discrepancies, however appear or should any misunderstanding arise as to the meaning and interpretation of said specifications or drawings or as to the dimension or the quality or materials or the proper execution of the work as to the measurement or quality and valuation of the work executed under this contract as extra thereupon the same shall be brought to the notice of the Engineer-in-charge before the work is carried out and clarifications in writing is obtained from the Engineer-in-charge.

Figure dimensions and drawing shall supersede measurements by scale and drawing to a large scale shall take precedence over those on a small scale. Special directions incorporated on the drawings shall be complied with strictly.

One copy of drawings and contract document shall be kept at all time at the site of the work by the contractor.

### **3. Data to be furnished by the contractor.**

The contractor shall submit the following to the Engineer-in-charge.

- a) Proposed construction programmes and time schedule showing sequence of operations within two weeks of receipt of notice to proceed with the work in pursuance of the conditions of contract.
- b) Deleted.
- (c) Layout plan of diversion and care of river, road crossing , railway crossing , Power line /Power & Telephone line crossing , forest clearances etc. , materials storage, plant and machinery required for the construction of the work within *1 week* of the date of notice to proceed with the work.

### **4. Construction Programme.**

In order to fulfill the condition for which the development has been designed, the contractor and Engineer-in-charge shall, prior to the commencement of work and within *7 days* after date of receipt of notice to proceed with the work by the contractor, arrange a definite construction programme of schedule covering the order in which the work is to be carried out so as to ensure the under-lying conditions on which the design is based and shall be maintained in their entirety and without any interference with the expeditious and economical carrying out of the contractors projected scheme of procedure. The several

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sections of the work shall be carried out in such order as to permit the completion of the whole work within the stipulated time and as closely as possible in conformity with the agreed upon construction schedule. The construction programmes shall be in such form and in such detail as to properly shows the sequences of operations and the period of time required for completion of the work under each operation. However the Engineer-in-charge shall have the power to alter the construction programme due to exigencies of work. In case of any disagreement between contractor and the Engineer-in-charge regarding such construction programmes, the programmes as decided by the Engineer-in-charge shall be final and binding on the contractor. Wherever the progress in not according to construction programme approved by the Engineer-in-charge a penalty for short progress will be imposed at the same rate as provided in clause-2 of General Conditions of contract.

**5. Time is the essence of contract.**

Time is the essence of contract and the various items of the work shall be completed within the stipulated time as per construction programme. The time shall be reckoned as per the date as specified in clause 2 (a) of the General conditions and shall include the final cleaning up of site of work.

The contractor shall at all times, during the continuance of the work, execute it with such forces and equipment as in the judgment of the Engineer-in-charge are necessary to complete it within specified period of time. The capacity of the contractors construction plant, sequence and methods of operation and the force employed shall at all times during the continuance of the contract be subject to the approval of the Engineer-in-charge and shall be such as to ensure completion of the work within the specified period of time.

**6. Power to vary or omit works.**

No alterations, amendments omissions, suspensions or variations of the work (hereinafter referred to as variations) under the contract other than as show in the approved contract drawings and the specifications, shall be made by the contractor except as directed in writing by the Engineer-in-charge but the Engineer-in-charge shall have full powers and subject to special conditions herein from time to time during the executions of contract by notice in writing to instruct to make such variation without prejudice to the contract, and the contractor shall carry out such variation and be bound by the same conditions as far as applicable as though the said variations occurred in the specifications. If any suggested variations would in the opinion of the contractor, if carried out, prevent him from fulfilling any of this obligation or guarantee under the contract, he shall notify the Engineer-in-charge in writing and the Engineer-in-charge shall decide forthwith whether or not the same shall be carried out. If the Engineer-in-charge confirms his instructions, the contractor's obligations and guarantee shall be modified to such an extent as may be justified. The difference of cost, if any occasioned by any such variations, shall be added to or deducted from the contract price as the case may require. The amount of such difference if any, shall be ascertained and determined in accordance with the rates specified in the schedule of prices so far as the same may be applicable and where the rates are not contained in the said schedule or are not applicable, they shall be settled by the Engineer-in-charge as stipulated in clause-12 of General conditions of contract.

In any case in which the contractor has received instructions from the Engineer-in-charge as to carrying out the work which either then or later will in the opinion of the contractor involve a claim for additional payments the contractor shall within 15 days of the receipt of the aforesaid instructions advice the Engineer-in-charge to that effect in writing.

**7. Housing accommodation and water supply.**

The contractor shall make his own arrangement for the housing of his staff and labour and also for the supply of water for construction and domestic use.

The contractor shall also have to provide for sufficient latrines for the use of his works people, male and female, to keep the same clean and disinfected at all time during the period of work and to remove the same and disinfect the ground and make good all damage on the completion of the work. In regard to hutted accommodations for his workmen latrines etc. the contractor should comply with the local regulations and the M.P Model Rules relating to lay-out, water supply and sanitation in labour camps. (Annexure A) to enable the contractor to erect a colony for housing labour and his staff and for storing materials, the contractor will be allowed the use of such portion of land at site as considered sufficient for that purpose by the Engineer-in-charge free of rent. The contractor shall keep the said premises clean

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and in good condition and shall vacate the same immediately after the expiry of the maintenance period. If due to exigencies of work, the contractor is directed by the Engineer-in-charge to vacate the said portion of land and occupy another piece of land the contractor shall immediately vacate the land in his possession as aforesaid and shall not be entitled to claim any amount the NRDA on that account. It shall also be ensured by the contractor that when the site is vacated, the land shall be returned to the NRDA in the same conditions as it was handed over to him.

**8. Electrical Energy.**

The contractor shall make his own arrangement for the Electrical Energy for construction and domestic use.

**9. Working hours.**

The hours of work for the labour employed by the contractor shall conform to the hours fixed by the administration. The daily and weekly hours of work and over-time will be regulated in accordance with the provision of the Minimum Wages Act, 1948 or any other similar law in force as amended up to date.

**10. Execution of works.**

The works shall be carried out to the entire satisfaction of Engineer-in-charge. The contractor shall be responsible for the correctness of the position, alignment of the works and dimensions of the works according to the drawing notwithstanding that he may have been assisted by the representatives of Engineer-in-charge in setting out the same.

**11. Setting out work.**

The contractor shall at his own expense provide all page nails strings and such other materials necessary for setting out and shall at all time provide for skilled work in accordance with the drawings and specifications to correct lines and levels. The contractor shall be responsible for setting out the work and get it approved before the work is actually commenced. The contractor shall not be entitled for any separate payment on this account.

**12. Change in Design.**

The NRDA reserves the right to make any changes in the designs and plans the work and the contractor shall be bound to carry them out. No claim or compensation would be allowed on this account.

**13. Special conditions of supply materials.**

**Deleted**

**14. Material brought on the site.**

All materials, tools and tackles brought to and delivered upon the site the purpose of the work by the contractor shall, from time to the time of their being so brought, be deemed to be in the possession of the NRDA as if attached to the land on which they are brought and may be used for the purpose of the works but for that purpose only and shall not on any account be removed or taken away by the contractor or any other person without express permission in writing of the Engineer-in-charge but the contractor shall nevertheless be solely responsible for any loss or destruction thereof or damage thereto. To NRDA shall have a lien on such materials tools and tackles for any sum or sums which may at any time prior to the completion of the works be due or owing the NRDA by the contractor any of such materials, tools and tackles remaining after the completion of the works in such manner as he shall think fit, and to apply proceeds in or towards the satisfaction of such or sum so due or owing as aforesaid but subject to such lien and power of sale and disposal.

**15. Rejected materials.**

It shall be absolutely essential on the part of the contractor to have on the site of work only such of the materials as have been duly passed by Engineer-in-charge. Such of the materials which have been rejected shall on no account be allowed to remain on site and if they are not removed even in spite of a written order to remove the rejected materials out of site within a specified period as directed by the Engineer-in-charge, the contractor shall have the full right either to remove the rejected materials or to destroy

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them and recover the cost thereof together with such departmental charges as may be fixed by the Company from time to time.

**16. Contractor’s Representative and workmen.**

The contractor shall at his expense employ at least one competent representative, whose name or names shall have previously been communicated in writing to the Engineer-in-charge by the contractor and approved by the Engineer-in-charge to supervise the construction of the work. The said representative or if more than one of such representatives shall be present on the site during working hours, and written order or instruction which the Engineer-in-charge or his duly authorized representative may give to the said representative of the contractor, shall be deemed to have been given to the contractor.

The Engineer-in-charge shall be at liberty to objection to any representative or person employed by the contractor in the execution of or otherwise about the works who shall misconduct himself or be incompetent or negligent and the contractor shall remove the person so objected to upon receipt form the Engineer-in-charge of notice in writing requiring him to do so and shall provide in his place a competent substitute.

The contractor shall not contravene any of the provision of Factories Act. 1948 as amended from time to time. Engineer-in-charge or his duly authorized representative may given to the said representative of the contractor shall be deemed to have been given to the contractor.

The Engineer-in-charge shall be at liberty to object to any representative or person employed by the contractor in the execution of or otherwise about the works who shall misconduct himself or be incompetent or negligent and the contractor shall remove the person so objected to, upon receipt from the Engineer-in-charge of notice in writing requiring him to do so and shall provide in his place a competent substitute.

The contractor shall not contravene any of the provision of Factories Act. 1948 as amended from time to time no responsibility shall be accepted by the NRDA for any delay caused in the completion of the work by such removal. The NRDA shall also not be liable for any contravention of the laws in force by the contractor who shall solely be responsible for the same.

**17. Contractor’s liability or loss, damage, accident, etc.**

The contractor shall indemnify and save the NRDA against all actions, suits, demands, costs or expenses arising in connection with injury suffered prior to the date when the work shall a been taken over by person employed by the contractor, his sub contractor on the works whether under the General law or under the workmen’s Compensation Act. 1923 & Amendment Act 2000 or any other status or law in force dealing with the question of the liability of the employers and shall so take steps property to ensure against any claims thereunder.

On the occurrence of an accident which results in the death of any of the workmen employed by the contractor or which is so serious as to be likely to result in death of any such workman, the contractor shall within 24 hours of happening of such accident intimate in writing to the concerned Engineer-n-charge of the NRDA the fact of such accident. The contractor shall indemnify the NRDA against all loss or damage sustained by the NRDA resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines, if any payable by the NRDA as a consequence of the NRDA’s failure to given notice under the workmen’s Compensation Act or otherwise to confirm to the provision of the said Act, in regard to such accident.

In the event of any claim being made, or action brought against the NRDA and arising out of the matter referred to and in respect of which to contract is liable under this clause the contractor shall be immediately notified therefore, and he shall, with the assistance, if he so requires, of the NRDA but at the sole expense of the contractor conduct all negotiations for the settlement of the same or any litigation that may arise, therefrom, in such case, the NRDA shall at the expense of the contractor, afford all available assistance for any such purpose.

In the event of an accident in respect of which compensation may become payable under Workmen’s Compensation Act. VII of 1923 whether by the contractor or by the Company as principal employer, it shall be lawful for the Engineer-n-charge be sufficient to meet such liability. The opinion of the Engineer-n-charge shall be final in regard to all maters arising under this clause.

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The amount of all costs, damages or expense or other sums which under this or any other contract shall be payable by the contractor to the NRDA may be deducted by the NRDA from any money due or becoming due by it to the contractor under the same or any other contract, without prejudice to the NRDA to recover the same by ordinary process of law.

**18. Damage of works.**

The works whether fully completed or incomplete, all the materials, machinery, tools, plant, temporary buildings and other things connected there with shall remain at the risk and in the sole charge of the contractor until the completed work has been delivered to the Engineer-in-charge and till completion certificate has been obtained from the Engineer-in-charge. Until such delivery of the completed work, the contractor shall at his own cost take all precaution necessary to keep all the aforesaid works, materials, machinery, plants, temporary buildings and other things connected therewith free from any loss or damage and in the event of the same or any part thereof being lost or damaged, he shall forthwith reinstate and make good such loss or damage at his own cost.

**19. Use of excavated materials.**

The contractor shall not sell, consume or otherwise dispose of or remove from site of work, sand, stone clay, ballast, earth, rock, boulders or any other materials which may be obtained from excavations made for the purpose of this contract. All such materials shall be the property of the NRDA and shall be disposed off in the manner and place shown in drawings or as directed by the Engineer-in-charge. The contractor may with the permission in writing of and shall when directed by the Engineer-in-charge use any of the same for the purpose of the work, at such rates as may be fixed therefore by the NRDA, Royalty or other charges or duties as may be levied on such materials by the authorities shall be paid by the contractor and in the event of the same being paid by the NRDA, it will be recovered from the contractor at such as may be fixed therefore by the NRDA.

**20. Use of Work pending completion.**

The NRDA shall be at liberty at any time to put to beneficial use the whole or any part of the work, it may desire to use pending completion and taking over the same the decision of the Engineer-in-charge certifies that the items to be completed are important notwithstanding anything contained in this contract the taking over certificate shall not be issued. Such possession or use shall not be deemed as an acceptance of any contract.

**21. Removal of temporary work, plant and surplus material.**

Prior to final acceptance of the completed work, but accepting as otherwise expressly directed or permitted in writing, the contractor shall, at his own expense, remove from site and dispose of all the temporary structure, including, building, pole work, crib work, all plant and surplus material, and all rubbish and debris for which he is responsible to the satisfaction of the Engineer-in-charge.

**22. Inspection of tests:**

- i) Offered material shall be inspected by the NRDA's inspecting officer before despatch. The Contractor shall extend all reasonable and necessary testing help to the inspecting officer of the NRDA to carry out testing of material at his works along with traveling, Boarding and Lodging charges for two person equivalent to that eligibility of Class I officer of the Govt. of Chhattisgarh.
- ii) An intimation about the date, by which material shall be ready for inspection, indicating quantity, be given to NRDA by the contractor, so as to reach him sufficiently in advance, failing which, the contractor shall be responsible for delay in delivery on account of inspection. On receipt of such intimation, the material shall be inspected normally within 15 days.
- iii) The contractor shall not despatch the material unless specific despatch instructions are issued by the NRDA or any other authorized officer of the NRDA.
- iv) In case the inspector deputed for inspection does not find the offered lot ready, the NRDA reserves the right to recover from the supplier, such charges as may have been incurred towards arranging such inspection.

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- v) No Plant may be despatched and delivered to site without Employer’s written permission in the form of “Test Certificate approval and Despatch Clearance”.
- vi) The contractor shall furnish promptly without additional charge all facilities labour and materials necessary for the safe and convenient inspection and test that may be required by the Engineer-in-charge. All inspection and test by the department shall be performed in such manner as not to unnecessary delay the work. The contractor shall be charged with any additional cost or inspection when material and workmanship are not ready at the time of inspection.

**23. Examination and tests on completion:**

On the completion of the work and not later than the expiry of the guarantee period thereafter, the Engineer-in-charge shall make such examination and test of the work as may seem to him to be possible, necessary or desirable and the contractor shall furnish free of cost any materials and labour which may be necessary therefore, and shall facilitate in every way all operation required by the Engineer-in-charge in making examination and tests.

**24. Laws and Regulations:**

All work shall be executed in accordance with the laws in India relating to the work and rule and regulation there under and any statutory modifications thereof wherever they are applicable unless otherwise agreed to in writing by the Engineer-in-charge.

The contractor shall be bound by the provisions of all legislation whether Central or State as the NRDA and, if on the default on the part of the contractor or his agent of any other the provision of any such law, the NRDA is required to incur any expenditure and liabilities arising there from, the NRDA may deduct and recover the same out of the sums due to the contractor in respect of this contract. The decision of the NRDA that any sums has become payable there under and the amount which has become payable shall be final and binding on the contractor.

**25. Fencing and lighting:**

The contractor shall be responsible for the proper fencing, guarding, lighting and watching of all works comprised in the contract and for the proper provision of temporary roadways, guards, and fences as far as same may be rendered necessary by reason by the work the accommodation and protection of the workers, passengers or other traffic and the owners and occupiers of adjacent property and of the public.

**26. Patents, Rights etc.**

The contractor shall fully indemnify the NRDA against all actions, suits, claims, demand, cost, charges and expenses arising from or incurred by reason of any infringement or alleged infringement of any letters patents designs trade marks or name/copy right or other protected right in respect of any machine, plant, work, materials, things or system or method of using, fixing, working of arrangement used or fixed or supplied by the contractor but his indemnity shall not extend or apply to any action suit, claim, demand cost charges or expenses arising from or incurred by a reasons of the use of the work or any part there of otherwise then in the manner for the purpose contemplated by the contract. All royalties and other similar payments which may have to be paid for the use of any such machine, plant, work, materials, things, system or method as aforesaid (whether payable in one sum or by method of installments or otherwise) shall be deemed to have been covered by the contract price and payable by the contractor.

In the event of any demand claim being made or action or suit brought against the NRDA in respect of any such matter or matters aforesaid the contractor shall be duly notified thereof and he shall conduct all negotiations for the settlement of such claim or demand such action or suit shall also be conducted by him subject, if any so for as the NRDA shall think proper to the supervision and control of the NRDA through the officer duly authorized in this behalf.

**27. Scaffolding, working platforms and stairways:**

The contractor shall provide suitable scaffolds, working platforms stairways and gangways and shall comply with the following regulations in connection therewith. Suitable scaffolds shall be provided for all work that cannot be safely done from a ladder or by other means.

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- (a) A scaffold shall not be constructed, taken down or substantially altered Except.
  - (i) Under the supervision of a competent and responsible person and.
  - (ii) As far as possible by competent workers possessing adequate experience in this kind of work.
- (b) All scaffolds and appliances connected therewith and all Ladders shall
  - (i) be of sound materials
  - (ii) be of adequate strength having regard to the load and strain to which they will be subject and
  - (iii) be maintained in proper condition
- (c) Scaffolds shall be so constructed that no part thereof can get displaced in consequence of normal use.
- (d) Scaffolds shall not be overloaded as far as practicable the load shall be evenly distributed.
- (e) Before installing lifting gear on scaffolding special precaution shall be taken to ensure the strength and stability of the scaffolds and the same shall be periodically inspected by a competent person.
- (f) Before allowing a scaffold to be used by his workmen, the contractor shall, whether the scaffolds have been erected by his workman or not, take steps to ensure that it complies fully with the regulation herein specified.
- (g) Working platform, gangways and stairways shall:
  - (i) be so constructed that no part thereof can sag unduly unequally
  - (ii) be so constructed and maintained, having regard to the prevailing conditions as to reduce as far as practicable risk of persons falling tipping or slipping and
  - (iii) be kept free from any unnecessary obstructions.
- (h) In the case of working platforms, gangways working places and stairways at a height exceeding 16 ft.(4.8m)
  - (i) Every working platform and every gangway shall be closely Company unless other adequate measures are taken to ensure safety.
  - (ii) Every working platform and gangways shall have adequate width and.
  - (iii) Every working platform, gangways working place and stairway shall be suitably fenced.
- (i) Every opening in the floor of a building or in a working place and stairway shall be suitably fenced.
- (j) When persons are employed on roof where there is danger of falling from height exceeding 4.8 m suitable precautions shall be taken to prevent the falling of persons or materials.
- (k) Suitable precautions shall be taken to prevent persons being stuck by articles, which might fall from the scaffold or other working places.  
The contractor shall comply with the following regulations as regards the hoisting appliances to be used by him
- (m) Hoisting machine and tackle including their attachments, anchorage's and supports shall.
  - (i) be of good mechanical construction, sound materials and adequate strength and free from latent defects and.
  - (ii) be kept in good hoisting working order.
- (n) Every rope used in hoisting or lowering materials as a means of suspension shall be of suitable quality and adequate strength and free from latent defects.
- (o) Hoisting machine and tackle hall be examined and adequately tested after erection on the site and before use and be re-examined in positions at intervals to be prescribed by the Engineer-in-charge.
- (p) Every chain, ring, hook shackle, swivel and pully block used in hoisting or lowering materials or as a means of suspension shall be periodically examined.
- (q) Every crane driver or hoisting appliance operator shall be properly qualified.
- (r) No person who is below the age of 25 years shall be in control of any hosting machine, including any scaffolding or give signals to the operators.

**28. Death, Bankruptcy, Breach of contract.**

If the contractor dies or becomes insolvent or bankrupt or has a receiving order made against him or compound with or make any proposal for carrying on his business under inspection or for the benefit of his creditors or commit an act of insolvency or bankruptcy or being a corporation pass a resolution or be ordered to be wound up or have a receiver or its business appointed, or commit any breach of contract, the NRDA shall be entitled forth with by in writing to the contractor or his assigns or legal representatives to determine the contractor and the NRDA may in that event complete the contract in such time and manner and by such persons think fit at the risk cost and liability of contractor.

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**29. Rights of other contractor and persons.**

If during the progress of the work covered by this contract, it is necessary for other contractors or person to do work in or about the site of work, the contractor shall afford such facilities as the Engineer-in-charge may require.

**30. Insurance.**

- a. The contractor shall, at all times during the tenure of this contract at his own expense insure and keep insured in the name of the NRDA with any of the nationalized General Insurance Companies all the work in progress: plants, equipments, stores, instruments, implements, tools and all other materials whatsoever against loss, destruction or damage by fire, flood or any other cause whatsoever including war, revolution, Civil communal riot and all liabilities under the workmen’s compensation Act in respect of death or body, injury payable to any worker and damage to property of the third persons.
- b. During the continuance of this contract, the contractor shall pay all premium and sums of money necessary for keepings this Insurance policy on foot and deliver to the NRDA the receipt of such payment within seven days after the same shall have become due. In the event of the contractor refusing or neglecting to effect insurance as aforesaid or to deliver receipt the NRDA, it shall be lawful for the NRDA to effect the insurance as aforesaid and to pay the premium thereon and deduct the cost of such insurance or the amount of premium so paid from time to time from any sums payable to the contractor under this contract.
- c. Provided further that if the contractor or the NRDA has not effected such insurance, the liability for any loss occurring due to the cause mentioned in clause I above shall be that of the contractor and it shall be lawful for the NRDA to deduct by way of penalty the whole cost if insurance including the amount of premium that would have been paid from time to time from any sums payable to the contractor under this contract, has such an insurance been effected.

**31. Implementation of Employees Provident Fund and Miscellaneous provision Act. 1952**

The provisions on Employees Provident Fund and Miscellaneous provision. Act. 1952 are applicable in respect of work charged and NMR employees. The following instructions are to be followed for statutory compliance and proper implementation of the *E.P.F.* Act.

- a. The definition of the work Employee includes any person employed directly by the establishment on work charged/NMR or by or through the contractors including the daily rated or piece rated employees.
- b. Every employee shall have to be enrolled for the membership of Employees Provident Fund from the date of his joining i.e. deductions towards E.P.F. are to be effected from the 1<sup>st</sup> day of employment.
- c. The contractors shall be responsible for deduction towards E.P.F. contribution from workers.
- d. The contractor shall be responsible for payment of wages to each worker employed by him as a contract labour in accordance with the provisions of the law.
- e. A representative duly authorized by the Principal employer shall be present at the time of disbursement of wages by the contractors and certify the amount paid as wages.
- f. The contractors shall ensure the disbursement of wages in the presence of authorized representative of the Principal employer.
- g. In respect of employees by or through a Contractors shall recover the contribution payable by such employees and shall pay to the Principal Employer the amount of Members Contribution to so deduct together with an equal amount of contribution and also administrative charges as specified in the E.P.F , Act.
- h. In case the contractor fails to make payment of wages or remittance of E.P.F. Contribution in accordance with the provisions of the law, Principal employer shall be liable to make payment of full wages or the unpaid balance due, as the case may be, to the contract labour employed by the contractor or to the E.P.F. Commissioner authorities and recover the amount so paid from the

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contractor either by deduction from any amount payable to contractor under any contract or as debt payable by the contractor.

**32.** In case of tenders where the completion time is exclusive of rainy season, the rainy season shall be counted from 16th June to 15th October.

**33.** The breach of any terms or any of special condition shall be deemed as breach of the contract.

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## ANNEXURE-A

### **MODEL RULES RELATING TO WATER SUPPLY AND SANITATION IN LABOUR CAMPS**

**Note:-** The model rules are intended primarily for labour camps which should be adhered to Standards in permanent or semi-permanent labour camps should not obviously be lower than those for temporary camps. Any other conditions as may be imposed by the State Government or the local authorities in this respect shall be complied with the contractor.

1. Location :- The camps should be located in elevated and well drained ground in the locality.
2. Layout :- Labour huts to be constructed for one family of 5 persons each. The layout to be shown in the prescribed sketch shall be approved by the Engineer-in-charge.
3. Hutting :- The huts to be build of local materials and each hut should provide at least 20 sq. m of living space.
4. Sanitary facilities :- There shall be provided latrines and urinals at least. 15 m. away from the nearest quarter, separately for men and women and specifically so two families per seat. No separate urinals are required as prives can also be used for this purpose.
5. Drinking water :- Adequate arrangements shall be made for the supply of drinking water, if practicable filtered and chlorinated supply shall be arrange.  
When supply is form an intermittent Source, a covered storage tank shall be provided with a capacity of one gallon per person per day. Where the supply is form a well, it shall confirm to the sanitary standards laid down in the report of the Rural Sanitation Committee. The well should be at least 30 m. away from any latrine or other source of pollution, if possible a hand pump should be installed for drawing the water from the well. The well should be effective disinfected once every month and quality of water should be tested at the public Health Institution between every two disinfecting.
6. The rules aforesaid shall be deemed to be a part of the contract and any breach there of shall be deemed to be breach of contract.

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**PARTICULARS OF THE CONTRACTORS**

**ANNEXURE-C**

- 1. Name and address of the contractor
- 2. Particulars of registration and class in which registered
- 3. Reference may be made to :-

- (1)
- (2)
- (3)

(4) Details of works IN HAND/ UNDER PROGRESS by the tenderer FOR ORDER PLACED IN THE CSPDCL at the time of submitting this tender.

S N o	Name of work	Contract/ Work Order no& date	Value of Order (₹)	Order issued by	Quantum of work		Probable date of complet-ion	Reasons for delay
					Compl eted	Pending		

- (i)
- (ii)
- (iii)
- (iv)
- (v)
- (vi)
- (vii)

7. Details of machinery , Tools and Plants and experienced of those who handled the job on the site of contractor.

8. Any other information the contractor may desire to give.

Note:- The photo copies of testimonials attested by Notary may be attached but will not be returned.

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**LIST OF PERSONS WORKING WITH THE CONTRACTOR -ANNEXURE-D**

<b>S.No.</b>	<b>Name</b>	<b>Designation In contractor's firm</b>	<b>Age</b>	<b>Qualification</b>

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## PREAMBLE TO PROBABLE ITEMS OF WORK

1. The various items listed at Bill of quantities must be read with the specifications and the tender will be deemed to have examined the general condition, drawing. Specification and from of tender and contract for himself and to have visited the site and to have acquainted himself with the detailed descript of the work to be done and the way in which it is to be carried out as also nature of roads and cart, tracks available for access to site etc.
2. All the works described in the enclosed Bill of quantities shall be executed in accordance with the drawing and specification for the work and as ordered by the Engineer-in-charge.
3. The items included in the probable items of works are only for the purpose of giving a detailed idea of the type of work to be executed under the contract and are given for the convenience of forming a common basis for the tenders. These items of the works shall therefore not be considered as the only items of work to be mentioned therein shall carried out by the contractor, for completion of work, the Engineer-in-charge or his authorised representative shall measure and pay for the various items at the accepted rates. The payment shall be according to the net measurement only as measured on the site (not withstanding any trade custom to the contrary) as more fully set forth in the relevant clause of General conditions and the specifications. Any special methods of measurement used are stated hereafter. All other items are measured net in accordance with the drawings, and the allowance has been made for wastage or overlaps or rejected materials.
4. The rates quoted by the contractor shall include supplying all material and labour necessary for completing the work in the best and most workman like manner and for maintain the same in accordance with the provision of specification and conditions of contract, for erection and removal, on completion of all the necessary scaffolding, for providing all water required for the work including payment of all charges for the same, for all fencing required to be enclosed the site of work to prevent trespassing and all other purpose required by the Engineer-in-charge for all mats, cloths etc. to exclude dirt and dust and for all other purposes required by the Engineer-in-charge for carting away all debris and rubbish, for removing paints, stains for cleaning floor, door windows etc for leaving the premises in clean, satisfactory state of completion and for working in conjunction with and attending on all other contractor employed on the building.
5. All materials, articles and workmanship shall be best of their respective kinds for the class of work described in the contract specification and the materials should be obtained form source approved by the Engineer-in-charge.
6. The rates to be quoted by the tenderers are to be the full inclusive of value of the work described under the several items including all costs and expenses and which may be required for the construction of the work described, together with all general risks, liabilities and obligations set forth or implied in the document on which the tender is to be based.
7. Deleted.
8. General directions and descriptions of work and materials given in the Specification are not necessarily repeated in the probable items of works. Reference is to be made to the specification for this information.
9. The contractor shall work amicably and co-operate with the building, electrical and such other contractors working in the area and shall carry out his work with the least disturbance to then.
10. The contractor shall also provide for necessary qualified technical staff, operator, labour, materials, scaffolding, safety tools and plant of every kind, quality and description whatsoever necessary for the speedy and efficient execution of the work.

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# GENERAL CONSTRUCTION PRACTICES

## SPECIFICATION FOR 11/0.4KV 100 KVA TRANSFORMER ON PLINTH

1. **SCOPE:** Design, planning, supply, installation, testing for commissioning of double pole structure (D.P. structure) for pole mounting transformer Sub-station with all allied equipments etc. complete. The Sub-station plan shall be got approved by the concerned competent office of Chief Engineer (Electrical Safety) cum Chief Electrical Advisor to Government of C.G. and concerned competent office of C.G. Electricity Board prior to erection work.

2. **SUPPORTS:** The D.P. structure shall have two numbers 140 Kg. 8 meter long PCC Pole for 63 & 100 KVA Sub-station as specified in the schedule of items. Normally one sixth of the pole shall be buried in the ground. The support shall be placed at a distance of 2400 mm. For erection of pole, a pit digging of size 600x900x1500 mm should be done and base padding of 200 mm thick should be provided and concreting with 0.3 Cmt per pole with 1:3:6 cement concrete mixture for size 450x600x1500 mm. Suitable time for atleast seven days shall be allowed for setting the base concrete with proper curing etc. the pole shall than be laid in the center of the pit and tied with ropes of adequate strength of four side of the pole by means of suitable clamps fixed at right angles to each other. Loose ends of two sides of ropes forming a straight line shall be tied firmly with deep driven iron pigs located equidistant from the center of the pole pit. One of the remaining two ends of remaining ropes shall be connected to turfer and the end of opposite rope shall be kept loose and ready to be tied with deep driven iron pigs shall be manned by skilled worker to control the unwanted deflection of pole while pulling it by turfer. The pole shall then be pulled by turfer and correctly aligned to its truly vertical position and then set in 1:3:6 cement concrete poured upto ground level. Suitable time shall be allowed for setting the cement concrete before removing the ropes. Proper curing of cement concrete for atleast seven days shall be done. All precautions shall be taken to avoid any chance of injury or damage to labour and technicians working at site.

### 3. FITTINGS:

11KV V cross arms shall be made up of MS Channel 65x65x6 mm size having phase to phase clearance of 1070 mm.

11KV top clamps shall be made up of MS angle 65x65x6 mm size 405 mm long.

DC cross arms, single pole cut point DC, transformer mounting DC, AB Switch mounting DC, DO and LA mounting channel shall be made up of MS Channel 100x50x6 mm size of required length. Back clamps and stay clamps shall be made up of 65x8 mm size.

MS Nut and Bolts conforming to IS: 1363-1902 shall be used of 5/8" (16mm) for fitting works and for earthing arrangements GI nut-bolts must be used.

### 4. AB Switch :

AB switches and DO Fuses should be supplied with base steel structure, terminal bi-metallic connectors / PG clamps / earth connector. They should be checked for proper alignment and free & smooth operation. The insulators should be cleaned before commissioning. The linkage of contacts should be checked for free and adequate grip. The AB switch should be checked for fully OPEN/CLOSED positions. Contact between two movable points should be checked and recorded. The contacts should be adequately lubricated before commissioning. Connection of terminal connectors shall be checked for proper tightness. Operating handle should be separately grounded. Equipments should be supplied with detail technical specifications enclosed. The associated mounting / connection accessories items shall not be considered for measurement under any head of Price Schedule even if they happen to be appearing in Price Schedule.

5. **LIGHTENING ARRESTOR:** The 11KV lightening arrestor shall be valve type arrestor consisting of an outer ceramic body containing 9 Set of resistance (Valves) and spark gaps in series. The resistance shall be made of special silicon carbide ceramic, which offer high resistance to power frequency voltages and low resistance to surge voltages. Arrestor should be installed as close as possible, to the HT line. The arrestor should be solidly earthed. The lightening arrestor shall be mounted on 100x50x6 mm MS Channel fixed approximately 1500mm below the 11KV tapping point.

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6. **D.O. FUSE UNIT:** The 11KV drop out fuse unit shall have current carrying capacity of 200 Amps having 2 Nos 11KV post insulators fitted on bakelite base with fuse barrel as per BSS-1314. The DO fuse should be got checked and test certificate from CPRI Bangalore/Bhopal as per IS: 5792-1970 should be obtained and Produced.

7. **TRANSFORMERS:** The 11/0.4KVstep-down distribution transformer shall be supplied and installed as per the specifications mentioned in the Transformer Section.

8. **DISTRIBUTION BOX:** The distribution box suitable for 63/100 KVA transformer with isolator on incoming side and SPMCCB on out going side will be used.

All sheet steel work shall undergo a process of digressing, pickling in acid, cold rinsing, phosphating, possivating and then sprayed with a high corrosive resistant primer and then backed in oven. The finishing treatment shall be by application of two coats of synthetic enamel gray paint in an approved manner.

9. **DANGER CAUTION BOARDS:** The danger of caution boards shall have to be displayed on pole, Transformer and LT distribution panel. The danger signboards should conform to IS: 2551-1963.

10. **ANTI-CLIMBING DEVICE:** Anti-climbing device consisting of barbed wire extending to a minimum length of 900mm shall be provided on poles. Both ends of the barbed wire shall be secured to poles by means of suitable iron clamps as per the direction of Engineer-In-Charge.

11. **PAINTING OF DP STRUCTURES:** All metallic parts except transformer and LT distribution box of D.P. structure and PCC Pole shall be painted in an approved manner.

12. **EARTHING OF SUB-STATION:** Three numbers pipe earthing with 2.5 meter long GI Pipe 40mm dia used connecting pipe earthing with 4mm GI wire with LA transformer neutral, transformer body, DO earthing, Channel earthing. Pole pit is filled with soil.

#### **EQUIPMENT ERECTION NOTES**

All support insulators; circuit breaker and other fragile equipment shall preferably be handled with cranes with suitable booms and handling capacity.

The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc. For cleaning the inside and outside of Hollow insulators only muslin or leather cloth shall be used. Handling equipment, sling ropes etc. Should be tested before erection and periodically for strength. Bending of compressed air piping should be done by a bending machine and through cold bending only. Bending shall be such that inner diameter of pipe is not reduced. Cutting of the pipes wherever required shall be such as-to avoid flaring of the ends, and only a proper pipe-cutting tool shall be used. Hacksaw shall be used. Hacksaw shall not be used.

The Contractor shall arrange at site all the equipments, instruments and auxiliaries required for testing and commissioning of equipment.

#### **STORAGE OF EQUIPMENTS**

The Contractor shall provide and construct adequate storage shed for proper storage of equipments. Weather sensitive equipment shall be stored indoor. All equipments during storage shall be protected against damage due to acts of nature or accidents. The storage instruction of the equipment manufacturer/Owner shall be strictly adhered to.

#### **Erection and commissioning of following :-**

(a) 11/0.4 KV plinth mounted Sub-station alongwith steel structure with Transformer/without Transformer including supplying, installation & commissioning of 11 KV line/LT line and pole mounted Sub-station in the rural area anywhere in Chhattisgarh State on turnkey basis.

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- b) Survey & approach clearance.
  - c) Pits digging for supports and stays & supply and erection of PCC poles /Rail Pole/ H Beam and grouting of stays.
  - d)
    - i. Supply and fixing of top clamp, 'V' Cross Arms, D.C. channels, Disc & Hardware, Pin & Pin Insulator.
    - ii. Supply & fixing of LT 3 Pin cross arm, LT hardware nut bolt shackle insulator & earth knob.
    - iii. Supply & fixing of LT 4 Pin cross arm, LT hardware nut bolt shackle insulator & earth knob.
    - iv. Supply & fixing of DC cross arm, transformer mounting channel, DO and LA mounting channel, DO set, lightening arrestor, distribution box, cable & transformer.
  - e) Supply and stringing of 11 KV lines with Rabbit/Weasel ACSR conductor.
  - g) Testing & energisation of plinth mounted Sub-station.
- Detailed drawing of fabricated materials may be seen at the office, if required.

## **MV CABLE LAYING**

### **MATERIALS:**

All **cables** shall be of approved make and ISI marked only as per specification. The bricks shall be modular well burnt clay bricks of compressive strength not less than 25kg/ sq.cm. Only fine sand shall be used.

### **(B) STORAGE AND HANDLING OF CABLES**

- (i) The cable drums shall be stored on, hard and well drained surface, to avoid sinking of drums in the ground, causing damage to the cable drums. For long term storage of all types of cables, paved surface is preferred and protection from rain and sun is to be provided.
- (ii) The drums shall always be stored on their flanges, and not on their flat sides.
- (iii) Both ends of the cables should be properly sealed to prevent ingress/ absorption of moisture.
- (iv) ventilation should be there between cable drums.
- (v) Damaged battens of drums etc. should be replaced at the earliest.

#### **Handling**

- (vi) When the cable drums have to be moved over short distances, they should be rolled in the direction of the arrow marked on the drum.
- (vii) For transportation of cable drums over long distances suitable mechanical transport should be used. If manual transportation is compulsion, the drum should be mounted on cable drum wheels, strong enough to carry the weight of the drum, and pulled by means of ropes.
- (viii) For loading and unloading from vehicles, suitable capacity crane or a lifting tackle should be used. Small sized cable drums can also be rolled down carefully on a suitable ramp for unloading, provided no damage is likely to be caused to the cable or to the drums.

### **(C) ROUTE OF CABLE**

Before cable laying, the route of the cable shall be decided by the Engineer-in-Charge considering the following.

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- (i) The shortest practicable route should be preferred, the cable route shall generally follow fixed developments such as roads, foot paths etc. with proper offsets so that future maintenance, identification etc. are rendered easy. Cross-country run merely to shorten the route length shall not be adopted.
- (ii) Cable route shall be planned away from drains and near the property, especially in the case of LV/MV cables. Cable route should be avoided from corrosive soils, ground surrounding sewage effluent etc
- (iii) Present and likely future requirements of other services should be taken into consideration, while deciding the alignment of the cable.
- (iv) Whenever cables are laid along roads, the LV/MV cables shall be laid farther from the kerb line than HV cables.
- (v) Where available space is restricted LV/MV cables shall be laid above HV cables in vertical formation.
- (vi) Cables of different voltages, and also power and control cables shall be kept in different trenches with adequate separation Where cables cross one another, the cable of higher voltage shall be laid at a lower level than the cable of lower voltage.
- (vii) Power and communication cables shall as far as possible cross each other at right angles. The horizontal and vertical clearances between them shall not be less than 60 cm.
  
- (viii) Cables under railway tracks, shall be laid in spun reinforced concrete, or cast iron or steel pipes at such depths as may be specified by the railway authorities, but not less than 1m, measured from the bottom of the sleepers to the top of the pipe. Inside railway station limits, pipes shall be laid upto the point of the railway boundary or to a point to be decided by the railway authorities. Outside the railway station limits, pipes shall be laid upto a minimum distance of 3m from the center of the nearest track on either side.
- (ix) Necessary way leave for the cable route shall be obtained from appropriate authorities, such as, Municipal authorities, Department of telecommunication, Gas works, Railways, Civil Aviation authorities, Owners of properties (in case of private property) etc. and section 12/51 of the Indian Electricity Act shall be complied with.

**(D) LAYING OF CABLE**

**GENERAL**

- (i) Cables with kinks, straightened kinks or any other apparent defects like defective armouring etc. shall not be laid.
- (ii) Cable shall not be bent sharp to a small radius, while handling or laying. The minimum safe bending radius for PVC/XLPE (MV) cables shall be 12 times the overall diameter of the cable.
- (iii) If cable is cut, the ends of cable shall be sealed with suitable sealing compound/ tape/ heat shrinkable caps immediately.
- (iv) The cables shall be tested for continuity and insulation resistance.
- (v) The cables shall be laid direct in ground, pipe, closed or open ducts, cable trays or on surface of wall etc. as specified.

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## UNCOILING OF CABLE BEFORE LAYING

- (i) The cable drum shall be properly mounted on jacks, or on a cable wheel of suitable capacity. The spindle should be horizontal in the bearings to prevent creeping of drum to one side while rotating.
- (ii) PVC/XLPE cables less than 120 sqmm size may be removed by "Flaking" i.e. by making one long loop in the reverse direction.
- (iii) The cable shall be pulled over on rollers in the trench steadily and uniformly without jerks and strain. The entire cable length shall as far as possible be laid off in one stretch.
- (iv) For short runs and sizes upto 50 sqmm of MV cables, any other suitable method of direct handling and laying can be adapted without strain or excess bending of the cables.

## LAYING DIRECT IN GROUND

- (i) for laying a single cable the minimum width of the trench shall be 35 cm and the depth shall not be less than 75cm. The bottom of the trench shall be level and smooth
- (ii) Where more than one cable is to be laid in the same trench in horizontal formation, the width of the trench shall be increased such that the inter-axial spacing between the cables shall be at least 20 cm.
- (iii) In case of vertical formation of cable laying, the depth of the trench shall be increase by 30 cm for each additional vertical tier.
- (iv) There shall be a clearance of at least 15 cm between axis of the end cables and the sides of the trench.
- (v) The trenches shall be excavated in reasonably straight lines. While changing direction of trench, suitable curvature shall be adopted.
- (vi) The changes in gradients or in depth shall be gradual.
- (vii) While excavating trench, the excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench.
- (viii) Adequate precautions should be taken not to damage any existing cable(s), pipes or any other such installations in the route during excavation.
- (ix) Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer-in-Charge.
- (x) Existing property, if any, exposed during trenching shall be temporarily supported adequately as directed by the Engineer-in-Charge. The trenching in such cases shall be done in short lengths and necessary pipes shall be laid for passing cables therein and then the trench shall be refilled.
- (xi) Excavation through lawns shall be done in consultation with the Department concerned.

## SAND CUSHIONING

- (i) The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 cm in depth, before laying the cables therein.
- (ii) Cables laid in trenches in a single their formation shall have a covering of dry sand of not less than 17 cm above the base cushion of sand before the protective cover is laid.

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(iii) In the case of vertical multi-tier formation, after the first cable has been laid, a sand cushion of 30 cm shall be provided over the base cushion before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30 cm as stated above. Cables in the top most tiers shall have final sand covering not less than 17 cm before the protective cover is laid.

#### **LOOPS**

(i) At the time of original installation, approximately 3m of surplus cable shall be left on each terminal end of the cable and on each side of the underground joints. The surplus cable shall be left in the form of a loop. Where there are long runs of cables such loose cable may be left at suitable intervals as specified by the Engineer-in-charge.

(ii) Where it may not be practically possible to provide separation between cables when forming loops of a number of cables, measurement shall be made only to the extent of actual volume of excavation, sand filling etc. and paid for accordingly.

#### **PROTECTIVE COVERING**

(i) Unless otherwise specified, the cables shall be protected by brick of specified size or 20cmx10cmx10cm or locally available size, placed on top of the sand. The bricks shall be placed breadth-wise for the full length of the cable. Where more than one cable is to be laid in the same trench, one row of bricks shall used for each cable.

(ii) Where bricks are not easily available, or are comparatively costly, there is no objection to use locally available material such as stone tiles or slates or stone/ cement concrete slabs, where such an alternative is acceptable, the same shall be clearly specified in the tender specifications.

#### **BACK FILLING**

(i) The cable cores shall be tested for continuity, absence of cross phasing, insulation resistance from conductors to earth /armour and between conductors

(ii) Insulation resistance shall be tested with a 500V megger for cables of 1.1 KV grade, or with a 2500/ 5000V megger of cables of higher voltage. Unless the insulation resistance values are satisfactory, the trench shall not be covered or filled.

(iii) The trenches shall be then back-filled with excavated earth, free from stones or other sharp edged debris and shall be rammed and watered, if necessary in successive layers not exceeding 30 cm depth.

(iv) A crown of earth not less than 50 mm and not exceeding 100mm in the center and tapering towards the sides of the trench shall be left to allow for subsidence unless otherwise specified. The crown of the earth however, should not exceed 10 cms so as not to be a hazard to vehicular traffic.

(v) The temporary re-statement of roadways should be inspected at regular intervals, particularly during wet weather and settlement should be made good by further filling as may be required.

(vi) Where it is necessary to cut road berms or displace kerb stones, the same shall be repaired and made good, except for turning/ asphaltting, to the satisfaction of the Engineer-in-Charge, and all the surplus earth or rock shall be removed to places as specified.

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## LAYING OF CABLE IN PIPE

- (i) In locations such as road crossing, entry in to building, paved areas etc., cables shall be laid in pipes or closed ducts. Metallic pipe shall be used as protection pipe for cables fixed on poles of overhead lines.
- (ii) GI, CI or spun reinforced concrete pipes shall be used for cables in ground, however only GI pipe shall be used as protection pipe on poles.
- (iii) The size of the pipe shall not be less than 50mm dia for a single cable and not less than 150mm for more than one cable.
- (iv) Where steel pipes are used for protection of single core cables feeding AC load, both cables in the case of single phase system and all cables in the case of poly phase system should be drawn in single pipe of sufficient dia.
- (v) Pipes for MV and HV cables shall be independent.
- (vi) In the case of new construction, pipes for present and anticipated future requirements shall be laid alongwith the civil works.
- (vii) Pipes shall be continuous and clear of debris or concrete. Sharp edges if any, at ends shall be smoothened to prevent damage to cable sheathing.
- (viii) The top surface of pipes shall be at a minimum depth of 1m from the pavement level when laid under roads, pavement etc.
- (ix) The pipes shall be laid preferable skew to reduce the angle of bend as the cable enters and leaves the crossing.
- (x) When pipes are laid by cutting and existing road, after laying the pipes the soil filled up is rammed well in layers with watering to ensure proper compaction. A crown of earth not exceeding 10 cm should be left at the top.
- (xi) The temporary re-instatements of roadways should be inspected at regular intervals upto 10 days and any settlement should be made good by further filling as may be required.
- (xii) After the subsidence has ceased, the top of the filled up trenches in roadways or other paved areas shall be restored. To the same density and material as the surrounding area in accordance with the relevant CPWD Building specifications and to the satisfaction of the Engineer-in-charge.
  
- (xiii) Suitable size manholes may be provided to facilitate feeding/ drawing in of cables with sufficient working space. Manhole shall be covered by suitable sizes and specified type of manhole.
- (xiv) Pipes for cable entries to the building shall slope downwards from the building. The pipes at the building end shall be suitably sealed to avoid entry of water, after the cables are laid.
- (xv) Cable-grip / draw-wires, winches etc. may be employed for drawing cables through pipes/ closed ducts.

## CABLE IDENTIFICATION TAG

Whenever more than one cable is laid/ run side by side, marker tags as approved, inscribed with cable identification details shall be permanently attached to all the cables in the manholes/ pull pits/ joint pits/ entry points in building/ open ducts etc. These shall also be attached to cables laid direct in ground at specified intervals, before the trenches are backfilled.

## (A) JOINTING OF CABLES

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### **SAFETY PRECAUTION BEFORE JOINTING**

- (i) A caution board displaying message "CAUTION CABLE JOINTING WORK IN PROGRESS" shall be displayed to warn the public and traffic where necessary.
- (iii) Before jointing is commenced, all safety precautions like isolation, discharging, earthing, display of caution board on the controlling switchgear etc. shall be taken to ensure that the cable would not be inadvertently charged from live supply.
- (iv) Metallic armour and external metallic bonding shall be connected to earth.
- (v) Where "permit to work" system is in vogue, safety procedures prescribed shall be complied with

### **LOCATION**

- (i) Before laying a cable, most suitable locations for proposed cable joints, if any shall be decided. The water logged locations, carriage ways, pavement, proximity to telephone cables, gas or water mains, inaccessible places, ducts, pipes, racks etc. shall be avoided for locating the cable joints.
- (ii) Joints shall be staggered by 2m to 3m when joints are to be done for two or more cables laid together in the same trench.
- (iii) Joints pits shall be of sufficient dimension as to allow easy and comfortable working. The sides of the pit shall be well protected from loose earth falling into it. It shall also be covered by a tarpaulin/ PVC sheet to prevent dust and other foreign matter being blown on the exposed joint and jointing materials.
- (iv) Sufficient ventilation shall be provided during jointing operation.

### **JOINTING MATERIALS AND PROCEDURE**

**Jointing as well as storing shall be done strictly as per the instructions of the manufacturer of jointing kit.**

- (i) Only approved make and specified type of cable jointing kit shall be used.
- (ii) The clamps for the armour shall be clean and tight.
- (iii) About 3m long surplus cable shall be left on each side of joints.
- (iv) Jointing work shall be carried out by a licensed/ experienced cable jointer. The sequence of cores should be so arranged as to avoid crossing of cores.
- (v) Before jointing cable cores shall be tested for continuity, absence of cross phasing, insulation resistance from conductors to earth /armour and between conductors.
- (vi) Insulation resistance shall be tested with a 500V megger for cables of 1.1 KV grade, or with a 2500/ 5000V megger of cables of higher voltage. Unless the insulation resistance values are satisfactory, jointing shall not be done
- (vii) If oxide film is formed on aluminium conductor, it should be removed by using appropriate type of flux.

### **TESTING AFTER LAYING**

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- (i) After laying and jointing, the cable shall be subjected to a 15 minutes pressure test with 2 KV AC or 3 KV DC pressure. DC pressure testing may normally be preferred to AC pressure testing.
- (ii) Alternatively pressure test for one minute with 1,000V megger for cables of 1.1 KV grade and with 2,500/5,500V megger for cables of higher voltages shall be sufficient

**(B) ROUTE MARKERS**

- (i) Route markers shall be provided along the runs of cables at locations approved by the Engineer-in-Charge and generally at intervals not exceeding 100m.
- (ii) Markers shall also be provided to identify change in the direction of the cable route and at locations of underground joints.
- (iii) Route markers shall be made out of 100mm x 5mm GI plate welded/ bolted on 35mmx 35mm x 6mm angle iron, 60cm long. Such plate markers shall be mounted parallel to and at about 0.5 m away from the edge of the trench.
- (iv) C.C. route marker made of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate of 20mm in size) shall be laid flat and centered over the cable. The concrete markers, unless otherwise instructed by the Engineer-in-Charge, shall project over the surrounding surface so as to make the cable route easily identifiable.
- (v) The works' PWD-MV/HV CABLE' as the case may, shall be inscribed on the marker.

**(C) MEASUREMENT:**

Cable laid direct in ground, duct and surface/ cable tray shall be measured in running metre straight along trench (excluding ramble length) in running metre correct to 1 cm.

Cable laid pipes/ closed duct shall be measured in running metre correct to 1 cm taking actual length of the pipe/ duct for each run of the cable (excluding ramble length), irrespective of the length of cable drawn through it.

Cable length used in connections shall be measured as item of cable layed in open duct.

**Jointing and route marker shall be counted in number.**

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**IMPORTANT INSTRUCTIONS BEFORE FILLING UP THE PRICE BID**

Rates entered against each items shall deemed to have included the following works:

1. All nuts, bolts and screw etc. of required size. Measurement and payment of nut bolts screw etc. shall not be made with the items of iron/steel hardware. Nuts and bolts should be machine made only of renowned makes.
2. All mechanical works e.g. fabrication, cutting, drilling, welding, grinding, painting and blacksmith works etc.
3. Cable and overhead conductors terminations, crimping of lugs with crimping tools and cost of appropriate size of lugs, cable glands etc.
4. Providing and applying sealing compounds, insulating toughness compound wherever required and directed.
5. Touching up all damaged paint with one coat of red oxide primer and two finishing coats of approved synthetic enamel paint.
6. All fixing accessories such as saddles, brass screws, lug plugs etc.
7. Cutting chases, holes and making good the same wherever required.
8. All lead and lift, transportation of materials at site, loading unloading and all labour required completing the job.
9. The items are complete in itself and any allied work or equipments not mentioned in the nomenclature of item but forming part of the system shall in all respect deemed to be included within the meaning of the execution of the said item and shall not be paid extra than the tendered rates until and unless specified. The tenderer are therefore advised to have clear under-standing of the 11 KV & LT KV line work before filling in the rates.
10. Each and every item shall be reading continuation with its respective specification for work and specific requirements of relevant Indian Standard Specification and local Electricity Authority before filling up the rates.
11. Drilling and cutting holes in brick/RCC walls for clamping cables, earth leads, earth strips, GI pipes or whatever it may be including cost of clamping device.

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# **Technical Specification of Items**

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## TECHNICAL SPECIFICATION OF 11 KV PIN INSULATOR

### 1.SCOPE:-

This specification covers the design, manufacture, testing, supply and delivery of 11 KV and 33 KV Porcelain Pin Insulators for use on 11 KV and 33 KV overhead Power Lines.

### 2.STANDARD:-

Except where they conflict with specific requirement in the specification, the Pin Insulators shall comply with the Indian Standard Specification IS:731-1971 and its amendments from time to time.

The insulator conforming to any other internationally accepted standard which ensures equal or better quality than the standard mentioned above would also be acceptable.

Where the material is offered according to the international standards, an English version of the specifications shall be attached with the tender.

### 3. ATMOSPHERIC CONDITIONS:-

3.1 The material offered shall be suitable for operation under the climatic conditions indicated in Clause 31 of Annexure II General Terms and Conditions of purchase appended with this Tender Specification.

3.2 Reference atmospheric conditions at which insulators characteristics shall be expressed for the purpose of comparison shall:-

Ambient Temperature	-	20 Degree Centigrade
Barometric Pressure	-	1013 Milli bars
Absolute Humidity	-	11 gms of water per cubic meter corresponding to 63 percent relative humidity at 20 Degree Centigrade

Note:- A pressure of 1013 millibars is equivalent to a pressure of 750 mm of Mercury at 0 degree centigrade.

3.3 Tests for the purpose of this standard shall preferably be carried out under conditions of temperature and humidity specified in IS:196-1966(i.e. at a temperature of 27+ 2 degree centigrade and relative humidity of 66+2 percent) and at the prevailing atmospheric pressure. When this is not possible, test may be carried out under conditions naturally obtained at the time of the test. The barometric pressure, air temperature and humidity shall be recorded for the purpose of correction.

Corrections of test voltage for atmospheric conditions is given in Appendix A of IS:731-1971.

4. The Thimble for 11 KV Pin Insulator should be suitable for use with Galvanised Steel Pins conforming to reference S-165 of IS:2486 (Part-II) of 1974 with shank length 150 mm which is provided with a small steel head. Similarly, the thimble of 33 KV Pin Insulator should be suitable for use with 33 KV Galvanised steel Pins conforming to reference I-300-N of fig. 6 with shank length of 150 mm and with large head of ISS-2486 (Part-II) of 1974.

### 5. INSULATOR CHARACTERISTICS:-

The insulator shall have the electrical and mechanical characteristics which are given below:- The test voltage of insulator shall be as under:-

Sr.No.	Particulars	11KV PIN INSULATOR
1.	Highest system voltage	12KV (rms)
2.	Wet Power frequency withstand voltage test for one minute	35 KV (rms)
3.	Visible discharge voltage	9 KV (rms)
4.	Power frequency puncture withstand voltage	105 KV (rms)
5.	Impulse withstand voltage	75 KV(peak)

In the above standards, power frequency voltage is expressed as peak values divided by 2 and impulse voltage is expressed as peak value)

6. The withstand and flash over voltage are referred to the reference atmospheric conditions.

7.	Mechanical Loads	Minimum Failing Loads
i.	11 KV Pin Insulator	5 KN

### 8. DIMENSIONS AND CREEPAGE DISTANCE:-

The insulators shall have the following dimensions and minimum creepage distance for a moderately polluted atmosphere:-

Particulars	11 KV Pin Insulator
(A) Dimensions	
i. Height	130 MM
ii. Diameter	125 MM

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(B) Creepage Distance 230 MM

9. TESTS:- The insulator shall comply with the following tests as per IS-731-1971.

9.1 TYPE TESTS:-

The following constitute the type tests :-

- a. Visual examination
- b. Verification of dimensions
- c. Visible discharge test
- d. Impulse withstand voltage test
- e. Wet power frequency withstand voltage test
- f. Temperature cycle test
- g. Mechanical failing load test
- h. Puncture test
- i. Porosity test
- j. Galvanising test.

Type test certificate from recognized Govt. lab for the tests carried out on prototype of same specifications shall be enclosed with the tender. The type test certificates shall not be more than 5 years old from the date of opening of tender.

9.2 ROUTINE TESTS:-

The following shall be carried out as the routine tests:- a. Visual examination b. Electrical Routine tests c. Mechanical Routine tests

9.3 ACCEPTANCE TESTS:-

The test samples after having withstood the routine tests shall be subjected to the following acceptance tests in the order indicated below:-

- a. Verification of dimensions
- b. Temperature cycle test
- c. Mechanical failing load test
- d. Puncture test
- e. Porosity test
- f. Galvanising test

9.4 Tolerance in insulator dimensions shall be as per the relevant Indian Standard i.e.  $\pm(0.04d+1.5)$  mm when  $d \leq 300$  mm and where  $d$  is the dimension in mm.

10. MARKING:-

Each insulator shall be legibly and indelibly marked to show the followings:-

- a. Name and trade mark of manufacturer
- b. Month and year of manufacture
- c. Minimum failing load in newtons
- d. Country of manufacture

Marking on porcelain shall be printed/engraved and shall be applied before firing.

11. PACKING:-

All insulators shall be packed in wooden crates suitable for easy but rough handling and acceptable for rail and road transport.

12. STANDARDISATION OF DIMENSIONS OF TOP AND NECK OF 11 KV PIN INSULATOR Please note that now-a-days Board is using preformed ties for binding conductor with the Pin Insulator instead of conventional method of binding by aluminium binding wire and tape. The design of the preformed ties depends upon the dimensions of top and neck of 11 KV Pin Insulator. For proper gripping of the conductor with the help of preformed fittings it has become necessary to standardise the dimensions of the insulator top and neck. Accordingly, a drawing 051-32/CSEB/1 dt.1.9.2001, which indicates the standardised dimensions of top and neck of 11 KV Pin Insulator is enclosed with Tender Specification. This drawing has been approved by REC, New Delhi, therefore, the tenderers are advised to offer material based on this drawing.

## TECHNICAL PARTICULARS FOR 11KV PIN INSULATORS

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Sno.	Particulars	11KV Pin Insulator
1.	Maker's name & Country	
2.	Electrical Characteristics	
	a. Nominal system voltage	11 KV (rms)
	b. Highest system voltage	12 KV (rms)
	c. Visible discharge voltage	9 KV (rms)
	d. Dry one minute power frequency withstand voltage	55 KV (rms)
	e. Wet one minute power frequency withstand voltage	35 KV (rms)
	f. Power frequency puncture	105 KV (rms)
	g. Impulse (1/50 micro second wave) Voltage	75 KVP
	h. Impulse flashover (1/50 micro second wave) voltage negative	108 KVP
	i. Impulse flashover (1/50 micro second wave) voltage negative	124 KVP
	j. Dry flashover voltage	60 KV
	k. Wet flashover voltage	40 KV
3.	Mechanical characteristics:	
	a. Minimum falling load	5 KN
	b. Minimum creepage distance	230 mm
4.	Colour of glaze	Brown
5.	Size of insulators:	
	a. Height	130 mm
	b. Diameter	125 mm
6.	Standard according to which porcelain insulator shall be 731/1971 manufactured and tested	As per IS:
7.	Tolerance in dimensions if any	As per ISS
8.	Weight per unit of	
	a. Porcelain Part	To be indicated
	b. Thimble	To be indicated

#### TECHNICAL PARTICULARS FOR GS PINS

Sno.	Particulars	Requirement of 11 KV GS Pins
1.	Dimensions	Shall conform strictly to reference S-165-P of Figure-5 of IS: 2486 (Part-II) of 1974.
2.	Pins & Studs	The forged pins and studs shall be of steel complying with clause: 2 of IS: 2004/1962.
3.	Nuts	The nuts shall be made of material conforming to property clause 4.8 of IS: 1367/1983 (Part-xiii) with regard to its mechanical properties.
4.	Steel Head	This shall be as per Figure 1-A (small steel head) of IS: 2486 (Part-II) 1974 suitable for use with indigenous 11KV pin insulator.

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5.	Nuts, Flat & Spring Washers	a) Nuts shall be not dip galvanised. b) One flat washer & spring washer shall be provided with each pin. Both these washers shall be electro galvanised as per clause-5.2.3 of IS: 2486(Part-I)	
6	Mounting arrangements	Shall be suitable for mounting on 75x100mm M.S.Channel	
7.	Falling load	Minimum 540 Kg. (5 KN)	
8.	Dimensional Requirements	11 KV GS Pins	
I.	Length of stalk	165 mm	
II.	Bottom diameter of stalk	25 mm	
III.	Top diameter of stalk	24 mm	
IV.	Length of shank	150 mm	
V.	Diameter of shank	20 mm	
VI.	Length of threaded portion in the shank	100 mm	
VII.	Length of threaded portion of stalk	44 mm	
VIII.	Thickness of collar	5.00 mm	
IX.	Diameter of collar	40 mm	67 mm
X.	Tolerance	i) No negative tolerance is permissible for Dip test & Mass of Zinc coating. ii) $\pm 5\%$ (Plus minus five percent) shall be allowed in all the dimensions except in thickness of collar and threaded portion of stalk.	
9.	Method of Galvanising	As per IS: 2633/1972 (Hot dip for both 11KV Galvanising GS Pins)	
	TESTS	FOR GS PINS	FOR GI NUTS
I.	Dip Test	4 dips of 1 minute each	4 dips of 1 minute each
II.	Mass of zinc coating	300 gms/m <sup>2</sup> (Minimum)	300 gms/m <sup>2</sup> (Minimum)
		The mass of zinc coating on Pins shall be as per Clause-4 of IS:4759-1979 and in case of Nuts shall be as per Clause No. "4" of IS: 1367 (Part-XIII)-1983. The above tests shall invariably be	
10.	Applicable specifications: (with latest amendments, if any).	IS: 2486 (Part-II) of 1974, IS: 2486 (Part-I) of 1971, IS: 4759 – 1979 and IS: 1367 (Part-XIII) – 1983. IS: 2633 – 1972 IS: 2004 - 1962	

## TECHICAL SPECIFICATION OF 11KV DISC INSULATOR

### 1. SCOPE:-

This specification covers the design, manufacture, testing, supply and delivery of porcelain Disc Insulator for use on 11 KV and 33 KV overhead power lines.

### 2. STANDARD:-

Except where they conflict with specific requirement in the specification, the Disc Insulator shall comply with the Indian Standard Specification IS:731/1971 and its amendment from time to time.

The insulator conforming to any other internationally accepted standard which ensures equal or better quality than the above standard would also be acceptable.

Where the material is offered according to the international standards, an English version of the specification shall be attached with the tender.

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3. ATMOSPHERIC CONDITIONS:-

3.1 The material offered shall be suitable for operation under the climatic conditions indicated in Clause 31 of Annexure-II General Terms and Conditions of purchase appended with this tender specification.

3.2 Reference atmospheric conditions at which insulator characteristics shall be expressed for the purpose of comparison shall be:-

Ambient Temperature - 20 Degree Centigrade  
Barometric Pressure - 1013 millibars  
Absolute Humidity - 11 gms of water per cubic  
Meter corresponding to 63% Relative humidity at 20 Degree Centigrade

Note:- A pressure of 1013 millibars is equivalent to a pressure of 750 mm of Mercury at 0 degree centigrade.

3.3 Tests for the purpose of this standard shall preferably be carried out under conditions of temperature and humidity specified in IS:196-1966 (i.e. at a temperature of 27+2 degree centigrade and relative humidity of 66+2 percent) and at the prevailing atmospheric pressure. When this is not possible, test may be carried out under conditions naturally obtained at the time of the test. The barometric pressure, air temperature and humidity shall be recorded for the purpose of correction. Corrections of test voltage for atmospheric conditions is given in Appendix A of IS:731-1971.

4. GENERAL REQUIREMENTS:-

The porcelain shall be sound free from defects, thoroughly vitrified and smoothly glazed.

4.1 Unless otherwise specified, the glaze shall be brown in colour. The glaze shall cover all the porcelain parts of the insulator except those areas which serve as supports during firing or are left unglazed for the purpose of assembly.

4.2 The design of insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. The porcelain shall not engage directly with hard metal.

4.3 Cement used in the construction of the insulator shall not cause fracture by expansion or lossening by contraction and proper care shall be taken to locate the individual parts correctly during cementing. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as uniform as possible.

5. TYPE OF INSULATOR:-

The insulator shall be of type "B" according to its construction which is defined hereunder:- Type "B":-An insulator or an insulator unit in which the length of the shortest puncture path through solid insulating material is less than half the length of the shortest flash over path through air outside the insulator.

6. INSULATOR CHARACTERISTICS:-

6.1 The insulator shall have the electrical and mechanical characteristics which are given below:-

The test voltage of insulator shall be as under:-	Disc Insulator
1. Highest system voltage	12 KV (rms)
2. Wet power frequency withstand voltage for one minute	35 KV (rms)
3. Visible discharge voltage	9 KV(rms)
4. Power frequency puncture withstand voltage	105 KV (rms)
5. Impulse withstand voltage	75 KV(peak)

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6.2 In this standard, power frequency voltage are expressed as peak values divided by 2 and impulse voltage are expressed as peak value.

6.3 The withstand and flash over voltage are referred to the reference atmospheric conditions.

6.4 Minimum Failing Load 45 KN

7. DIMENSIONS:-

7.1 The insulator shall have the following dimensions:-

Diameter - 254 mm

Height -146 mm (Hole to Hole)

7.2 CREEPAGE DISTANCE:-

The insulator shall have minimum 320 mm creepage distance for a heavily polluted atmosphere.

8. TESTS:-

The insulators shall comply with the following tests as per IS:731-1971 with its latest amendments.

8.1 TYPE TESTS:- The following constitute the type tests :

- a. Visual examination
- b. Verification of dimensions
- c. Visible discharge test
- d. Impulse voltage withstand test
- e. Wet power frequency withstand voltage test
- f. Temperature cycle test
- g. Electro-Mechanical failing load test
- h. Puncture test
- i. Porosity test
- j. Galvanizing test.

Type test certificate from recognized Govt. lab for the tests carried out on prototype of same specifications shall be enclosed with the tender for each type test failing which the tenders are liable for rejection. The type test certificates shall not be more than 5 years old from the date of opening of tender.

8.2 ROUTINE TESTS:- The following shall be carried out as the routine tests:-

- a. Visual examination
- b. Electrical Routine tests
- c. Mechanical Routine tests

8.3 ACCEPTANCE TESTS:-

Acceptance of samples after having withstood the routine tests shall be subjected to the following acceptance tests in the order indicated below:-

- a. Verification of dimensions
- b. Temperature cycle test
- c. Electro Mechanical failing load test
- d. Puncture test
- e. Porosity test
- f. Galvanizing test

8.4 Tolerance in insulator dimensions shall be as per the relevant Indian Standard, i.e.  $\pm (0.04d+1.5)$ mm when  $d \leq 300$  mm and where d is the dimension in mm.

9. MARKING:-

Each insulator shall be legibly and indelibly marked to show the followings:-

- a. Name and trade mark of manufacturer
- b. Month and year of manufacture

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- c. Minimum failing load in new tons
- d. Country of manufacture

Marking of porcelain shall be printed/engraved and shall be applied before firing.

10. PACKING:-

All insulator shall be packed in wooden crates suitable for easy but rough handling and acceptable for rail and road transport.

**TECHNICAL PARTICULARS OF 11 KV DISC INSULATORS**

1. Makers name & country :
2. Type of Insulator :
3. Electrical Characteristics:
  - a. Nominal system voltage : 11 KV (RMS)
  - b. Highest system voltage : 12 KV (RMS)
  - c. Visible discharge voltage : 9 KV (RMS)
  - d. Dry one minute power frequency withstand voltage : 70 KV (RMS)
  - e. Wet one minute power frequency withstand voltage : 40 KV (RMS)
  - f. Power frequency juncture withstand voltage : 110 KV (RMS)
  - g. Impulse withstand (1.2/50 microsecond wave) voltage positive : 100 KVP
  - h. Impulse withstand (1.2/50 microsecond wave)voltage negative : 100 KVP
  - i. Impulse flash over (1.2/50 microsecond wave)voltage positive : 105 KVP
  - j. Impulse flash over (1.2/50 microsecond wave)voltage negative : 110 KVP
  - k. Dry flash over voltage : 75 KV (RMS)
  - l. Wet flash over voltage : 45 KV (RMS)
4.
  - a. Minimum creepage distance : 320 mm
  - b. Minimum failing load : 45 KN
5. Colour of glaze : Brown
6. Size of Insulator
  - a. Outer diameter : 255 mm
  - b. Spacing : 145 mm
7. Net weight : 4.5 Kg. (Approx)
8. Standard according to which : IS 731/1971 porcelain insulator shall be manufactured and tested
9. Tolerance in dimensions, if any : As per ISS

**TECHNICAL SPECIFICATION FOR STRAIN HARDWARE FITTINGS FOR 11 KV LINES SUITABLE FOR USE WITH TONGUE AND CLEVIS DISC INSULATORS (CONVENTIONAL TYPE FITTINGS)**

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1. SCOPE : This specification provides for manufacturers, testing before dispatch and delivery of materials listed in Schedule-I at the specified destination.

2. TEST CERTIFICATE: The following shall constitute the type tests for clamps:

- (a) Visual examination,
- (b) Verification of dimensions,
- (c) Slip strength tests,
- (d) Ultimate strength tests,
- (e) Galvanizing / Electroplating tests.

The type tests are intended to prove the general qualities and design of a given type of 33 KV & 11 KV Hardware fittings. These tests should not have been conducted earlier, than 5 years from the date of opening of tender. One copy of same should be submitted alongwith the offer otherwise the offer is liable to be rejected.

ii) ACCEPTANCE TESTS:

The following shall constitute the acceptance tests :

- a) Visual examination tests,
- b) Verification of dimensions,
- c) Galvanizing / electroplating test,
- d) Mechanical tests,
- e) Ultimate strength test,

The acceptance tests shall be carried out on all the samples taken from a lot for the purpose of acceptance of lot.

iii) ROUTINE TESTS:

The following shall constitute the routine test,

- a) Visual examination tests,
- b) Mechanical routine tests on Conductor Tension clamp only.

The routine tests will be carried out on each of insulator fittings to check requirement, which are likely to vary during production. All the above three tests have been described in IS:2486 (Part-I) 1993. Galvanizing tests for Hot Dip Ferrous material shall be carried-out in accordance with IS-2633/1986 and satisfy the requirements in IS:4759/1984. Electro-galvanized ferrous fittings shall be checked in accordance with IS:1573/1986. However, one sample from each lot will be tested as per IS:4759/1984.

11 KV STRAIN HARDWARE FITTINGS (T&C) TYPE :

Each Hardware fittings of the Strain Insulators shall comprise of :-

- i) Hot dip galvanized cross arms and straps properly profiled suitable for use on 75/100 mm channel cross arms with 16 mm dia, hot dip galvanized Bolts, Nuts spring washers, Plain washer and 4 mm dia split pin as per figures 26 of IS:2486 (Part-II) 1989 and its latest amendments:
- ii) Snail type clamp with clevis eye suitable for 11 KV System for following sizes of Conductors :-

(A) ACSR:-

S.N.	Item	Stranding & Wire dia meter (Aluminum + Steel)	Nominal Aluminum Area
i.	ACSR Conductor (Squirrel)	(6+1/2. 11 mm)	20 mm <sup>2</sup>
ii.	ACSR Conductor (Weasel)	(6+1/2.509 mm)	30 mm <sup>2</sup>
iii.	ACSR Conductor(Rabbit)	(6+1/3.35 mm)	50 mm <sup>2</sup>

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(B) AAAC:-

S.N.	Item	Stranding & Wire dia meter (AA aLLOY)	Nominal Aluminum Area
i.	AAA Conductor (Squirrel)	(7/2.00 mm)	22 mm <sup>2</sup>
ii.	AAA Conductor (Weasel)	(7/2.50 mm)	34 mm <sup>2</sup>
iii.	AAA Conductor (Rabbi)	(7/3.15 mm)	55 mm <sup>2</sup>

The ultimate strength of the clamp should not be less than 3000 kg. The clamp shall be made by process of Die casting. The clamp with process of sand casting shall not be accepted.

All dimensions of clevis and tongue connections shall be as per figure-25 of the IS:2486 (Part-II) 1989 and its latest amendments.

5. GENERAL REQUIREMENTS:

- (A) All fittings of same type and design manufactured under similar conditions of productions.
- (B) All forging and castings shall be of good finish and free from flaws and other defects. The edges on the outside of fittings, such as the eye, clevis and holes ,

shall be rounded.. The clamp shall be manufactured by the process of die casting or pressure die casting and shall be free from blow holes and other defects.

- (C) All ferrous fittings and the part other than those of stainless steel shall be galvanized by the Hot Dip process. Only small fittings like, plain & spring washers, nuts may be electroplated galvanized.

- (D) The nuts shall conform to property 4.8 of IS:1367 (Part-6) 1980.

- (E) The cotter pins shall be provided with Galvanized Mild Steel Flat Washers in addition to split pins.

- (F) The split pin to be used on the cotter Pin shall be of phosphor bronze conforming to IS:7814/1975 or Stainless Steel conforming to IS:5577/1992 or brass conforming to IS:410/1977 with a minimum hardness of 160 HV.

6. MARKING ON CLAMPS :

The clamps shall have the following markings for their identification as per IS:

- i) Trade Mark of manufacturer.

Please note that the marking should be legible and permanent (preferable die casted).

7. PACKING :

Strain clamps and related hardware shall be packed in double gunny bags or wooden cases if deemed necessary. The gross weight of the packing shall not exceed 50 kg. Different fittings shall be packed in different bags or cases and shall be complete with minor accessories fitted in place. All the nuts shall be hand tightened over the bolt and screwed up to the farthest point with split pin in position. The packing shall be fit to withstand rough handling during transit and storage at destination.

**TECHNICAL SPECIFICATION FOR MS STAY SETS 16 MM DIA BLACK STAY SETS FOR LT LINES (NON GALVANIZED, NOT-PAINTED):**

- 1. The stay sets (Line Guy set) will consist of the following components:-

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i) Anchor rod with one washer and nuts: Overall length of rod should be 1800mm to be made out of 16mm MS rod, one end threaded upto 40mm length with pitch of 5 threads per cm and provided with one square MS washer of size 40x40x1.6mm and one MS Hexagonal nut conforming to IS:1367/1967 and IS:1363/1967. Both washer and nut to suit the threaded rod of 16mm dia. The other end of rod to be made into a round are having an inner dia of 40mm with best quality welding. Dimensional and other details are indicated in the enclosed drawing No.1 and details of welding are indicated below and also shown in the enclosed drawing No.4.

ii) Anchor Plate Size 200x200x6mm: To be made out of MS plate of 6mm thickness. The Anchor plate should have at its center 18mm dia hole.

iii) Turn Buckle : (a) Eye bolt with 2 nuts: To be made of 16mm dia MS Rod having an overall length of 450mm. One end of rod to be threaded upto 300mm length of pitch of 5 threads per cm and provided with two MS Hexagonal nuts of suitable size conforming to IS:1637/1967 & IS:1363/1967. The other end of rod shall be rounded into a circular eye of 40 mm inner dia with proper and good quality welding as described below and also shown in enclosed drawing No.4.

(b) Bow with welded angle: To be made out of 16mm dia MS Rod. The finished bow shall have an overall length of 995mm and height of 450mm as shown in the enclosed drawing No.1. The apex or top of the bow shall be bent at an angle of 10 R. The other end shall be welded with proper and good quality welding to a MS angle

130mm long having a dimension of 50x50x6mm. The angle shall have 3 holes of 18mm dia each as per drawing

No.1 enclosed herewith. Details of welding are indicated below and also shown in the enclosed drawing No.4.

iv) Thimble: To be made on 1.5mm thick MS sheet into a size of 75x22x40mm and shape as per details given in attached drawing No.1.

2. WELDING: The minimum strength of welding provided on various components of 16mm dia stay sets shall be 3100Kgs. Minimum 6mm fillet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS:823/1964 or its latest amendment. Minimum length of weld to be provided at various places in the stay sets shall be as shown in the enclosed drawing No.4. Welding if found short in lengths or not done properly as required shall be rejected.

3. THREADING: The threads on the Anchor Rod, Eye Bolt and Nuts shall be as per specifications IS:4218/1967 (ISO Metric Screw Threads). The nuts shall be conforming to the requirement of IS:1367/1967 & have dimensions as per IS:1363/1967. The mechanical property requirement of fasteners shall conform to property clause 4.6 each for Anchor Rod & Eye Bolt and property clause 4 for nuts as per IS:1367/1967.

AVERAGE WEIGHT OF FINISHED STAY SETS: 7.702 Kg. (Minimum) (EXCLUDING NUTS, THIMBLES & WASHERS): 8.445 Kg. (Maximum)

i) Anchor rod with one washer and nuts: Overall length of rod should be 1800mm to be made out of 16mm MS rod one end threaded upto 40mm length with pitch of 5 threads per cm and provided with one square MS washer of size 40x40x1.6mm and one MS Hexagonal nut conforming to IS:1367/1967 and IS:1363/1967. Both washer and nut to suit the threaded rod of 16mm dia. The other end of rod to be made into a round are having an inner dia of 40mm with best quality welding. Dimensional and other details are indicated in the enclosed drawing No.2 and details of welding are indicated below and also shown in the enclosed drawing No.4.

ii) Anchor Plate Size 200x200x6mm: To be made out of MS plate of 6mm thickness. The Anchor plate should have at its center 18mm dia hole.

iii) Turn Buckle : (a) Eye bolt with 2 nuts: To be made of 16mm dia MS Rod having an overall length of 450mm. One end of rod to be threaded upto 300mm length of pitch of 5 threads per cm and provided with two MS Hexagonal nuts of suitable size conforming to IS:1637/1967 & IS:1363/1967. The other end of rod shall be rounded into a circular eye of 40 mm inner dia with proper and good quality welding. Welding details are specified below and also shown in enclosed drawing No.4.

(b) Bow with welded angle: To be made out of 16mm dia MS Rod. The finished bow shall have an overall length of 995mm and height of 450mm as shown in the enclosed drawing No.2. The apex or top of the bow shall be bent at an angle of 10 R. The other end shall be welded with proper and good quality welding to a MS angle

180mm long having a dimension of 65x65x6mm. The angle shall have 3 holes of 18mm dia each as per drawing

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No.2 enclosed herewith. Details of welding are indicated below and also shown in the enclosed drawing No.4.

iv) Thimble: To be made on 1.5mm thick MS sheet into a size of 75x22x40mm and shape as per details given in attached drawing No.2.

II. TOLERANCES: The tolerances for various components of the stay sets are indicated below subject to the condition that the average weight of finished stay sets of 16 mm and 20mm dia excluding nuts & thimbles and washers shall not be less than the weight specified above:-

SNo. Item	Section Tolerances	Fabrication Tolerances	Material
1. Anchor Plate 6mm thick +12.5%	200x200 mm - 5%	MS plate 6mm + 1%	Thick
	8mm thick +12.5% - 5%	300x300 mm + 1% Thick	MS plate 8mm
2. Anchor Rod	16mm dia + 5% - 3%	Length 1800mm + 0.5% Round Eye 40mm inside dia + 3% Threading 40 mm + 11% - 5%	MS Round 16mm dia MS Round 16mm dia
	20mm dia + 3% - 2%	Length 1800mm + 0.5% dia Round Eye 40mm inside dia + 3% Threading 40mm + 11% - 5%	MS Round 20mm
3. Turn Buckle Bow	16mm dia + 5% - 3%	Length 995mm +1% 16mm dia	MS Round 16mm dia
	Length 180mm +1% 50x50x6mm		MS angle
	Length 180mm +1% 65x65x6mm		MS Angle
	Channel length 200 mm + 1%		MS Channel 100x50x4.7mm
4. Eye Bolt Rod	16mm dia + 5% - 3%	Length 450mm +1% Threading 300mm +1% Round Eye 40mm inside dia +3%.	MS Round 16mm dia
	20mm dia + 3% - 2%	Length 450mm +1% Threading 300mm +1% Round Eye 40mm inside dia +3%.	MS Round 20mm dia

#### TECHNICAL SPECIFICATION FOR HOT DIP GALVANISED MS STRANDED WIRE

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The hot dip galvanised MS stranded wire of sizes 7/4 mm & 7/3.15 mm should conform to the below specifications :

1. MATERIAL:
  - a) MS WIRE: Used for each strands shall have the chemical composition maximum sulpher & Phosphorus-0.055% each, Carbon-0.25%.
  - b) Zinc shall conform to grade Zn 98 specified IS:209-1966 & IS:4926-1979 with upto date amendments.
2. ZINC COATING: Shall be in accordance with IS:4826-1979 (heavily coated hard quality grade 4 as per table) with up-to-date amendments.
3. GALVANISING: Shall be as per IS:2629-1966, IS:4826-1979 with up-to-date amendments.
4. UNIFORMITY OF ZINC COATING: Shall be as per IS:2633-1972 (Col.4.2.1 to 4.2.3) with up-to-date amendments.
5. TENSILE PROFERTIES: Of each strand ensuring MS wire Mechanical properties as per IS-280-1972 Cl.8.1 to 8.3 and after galvanising each wire shall be of tensile strength minimum 700 N/mm2 (71 kgs/mm2).  
Tensile strength, breaking load, lay & elongation of each wire and full stand shall conform to IS:2141-1968, IS:2141-1979 in the tensile grade given above.
6. CONSTRUCTION: Shall be as per IS:2141-1968.
7. FREEDOM FROM FEFECTS: Be ensured as per IS:2141-1968, 1975 Clause 4.1 & 6 respectively.
8. TEST ON WIRE BEFORE MANUFACTURE: As per IS:2141-1979 (Cl.7.1 to 7.2.2) shall be done.
9. TEST ON COMPLETED STRAND: In accordance to IS:2141-1979 and tests as per schedule-II (B) enclosed herewith shall be performed in presence of Board's representative deputed for this at your works & cost.
10. PACKING: Each coil shall be between 50-100 kgs. packed as per IS:2141-1968 (Col. 9.10 6594-1979) & 2141-1979 (Col.11).
11. MARKING: as per IS:2141-1968 (Col.8.1 & 8.1.1), IS:2141-1979 (Col.10 & 10.1) is required.

Particulars	7/4 mm	7/3.15 mm	S.No.
1. Number of wire in strand	7 mm	7 mm	
2. Nominal diameter of each wire	4 mm	3.15 mm	
3. Tolerance in diameter	+/- 2.5%	+/- 2.5%	
4. Sectional Area of each wire	12.56	7.789	
5. Min. tensile strength of each wire before stranding corresponding to grade-4	700N/mm2 (71.4 kgf/mm2)	700N/mm2 (71.4 kgf/mm2)	
6. Minimum breaking load of each wire	897	556	
7. Elongation test: The elongation shall be subject to a reduction of not more than	10%	10%	
8. Weight of zinc coating gms./mm2 of each wire tested.			
i) Before stranding	260	240	
ii) After stranding	247	208	
9. Type of coating of each wire	Heavy	Heavy	
10. Variety of each wire	Hard	Hard	

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11. Ductibility test (wrap test of each wire before manufacture)		
a) Complete turns of wrap	8	8
b) Dia menorel on which to be wrapped	4 mm	3.15 mm
12. Min. braking load after stranding		
	5962 kgf	3698 Kgf
13. Elongation test (Min. % elongation corresponding to Grade-4)		
	10%	10%
14. Length of lay of strand --		
Minimum	144 mm	113.4 mm
Maximum	216 mm	170.1 mm
15. Number of dips the opating each strand at		
	18 +/- 2oC	
a) Before stranding	-----3 dips of 1 minute-----	
b) After stranding	-----2 dips of 1 minute-----	
each dip & 1 dip of 1/2 minute		
16. Freedom from defects	As per IS:2141-1968, 1979 Clause 4.1 & 6 respectively	
17. Chemical composition.	The MS wire used shall not exceed	
a) Sulpher	-	0.055%
b) Phosphorus	-	0.055%
c) Carbon	-	0.25%

**TECHNICAL SPECIFICATION FOR HOT DIP GALVANISED MS SOLID WIRE**

The hot dip galvanised MS solid wire of sizes 5 mm, 4 mm and 3.15 mm diameters shall conform to the relevant ISS specification briefed here below:

1. MATERIAL:
  - a) This Mild Steel wire shall have the chemical composition maximum Sulpher - 0.055%, Phosphorus - 0.055%, Carbon - 0.25%.
  - b) Zinc shall conform to grade Zn 98 specified IS: 209-1966 & IS: 4926-1979 with upto date amendments.
2. ZINC COATING: Shall be in accordance with IS: 4826-1979 (col.4.2.1) for heavily coated hard quality.
3. GALVANISING: Shall be as per IS: 2629-1966, IS: 4826-1979 with up-to-date amendments.
4. UNIFORMITY OF ZINC COATING: Shall be as per IS: 2633-1972 (Col.4.2.1 to 4.2.30 with up-to-date amendments).
5. TENSILE PROFERTIES: The tensile strength of the wire after galvanizing shall be between 55-95 kg/mm (heavily coated Hard as per IS: 4826-1979 Table-1) ensuring MS wire Mechanical properties as per IS-280-1972 8.1 to 8.3.
6. FREEDOM FROM FEFECTS: As per IS: 2629-1966 (Cl.6.1) & 4826-1979 (Col.4.3) & with up-to-date amendments, be ensured.
7. TESTS: During the process of manufacture/fabrication and finish all tests for chemical, mechanical, galvanizing tests as per IS: 280-1978, IS: 1521-1972, IS: 755-1961, IS: 6745-1972 & 4826-1979 be ensured. Test Certificate towards chemical composition (as per sno. 1 above) shall be submitted for each lot offered for inspection. The below said tests shall be conducted in presence of Board's representative deputed at your works & cost.
  - a) Visual physical inspection and measurement of specified dimensions.
  - b) Coating test as per IS:1755-1961, IS:2629-1966, IS:2633-1972, IS:4826-1968 & 1979, IS:6745-1972.
  - c) Adhesion test as per IS:1755-1961, IS:2629-1966, IS:2633-1972, IS:4826-1968 & 1979, IS:6745-1972.
  - d) Tensile strength and breaking load and elongation determined as per IS:1521-1972 with up-to-date amendments.
8. PACKING: Shall be as per IS:280-1972 (Col.13.1) and each coil between 50-100 Kgs.
9. MARKING: As per IS:280-1972 (Col. 14.1) is required.

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## SPECIFICATION OF GALVANISED SOLID WIRE

S.No. Particulars	5 mm	4 mm	3.15 mm
1. Nominal diameter of wire	5 mm	4 mm	3.15 mm
2. Tolerance in diameter	+/- 2.5%	+/- 2.5%	+/- 2.5%
3. Sectional Area in Sq.mm	19.625	12.56	7.789
4. Tensile strength			
(a) Minimum (Kg/mm <sup>2</sup> )	55	55	55
(b) Maximum (Kgs./mm <sup>2</sup> )	95	95	95
5. Minimum breaking load (kgf.)	1079.5	690.0	428.4
6. Type of coating Heavy/Medium	Heavy	Heavy	Heavy light
7. Variety Hard/Soft	Hard	Hard	Hard
8. Weight of zinc coating (gms/sq.mtr)	275	260	240
9. No.of dips the coating is able to withstand at 18 +/- 2o C & 1 dip each each of 1/2 min.	3 dips of 1 min.	3 dips of 1 min.	3 dips of 1 min.
10. Adhesion test (warp test at 1 turn per second coiling tensile strength not exceeding 2% nominal tensile strength: 2% nominal tensile strength:			
a) Min. complete turn of wrap	10	10	10
b) Dia of mandrels on which wrapped	(6 time of d) 30.0 mm	(4 time of d) 24 mm	12.6 mm
11. Send test:			
a) Angle bend	90	N.A.	N.A.
b) Dia round & former to be bend	10 mm	N.A.	N.A.
12. Freedom from defect	As per schedule –II (A) page 10.1, S.No.6		
13. Chemical composition			
The MS wire used shall not exceed			
Sulpher	- 0.055%		
Phosphorus	- 0.055%		
Carbon	- 0.25%		

## TECHINCAL SPECIFICATION FOR DISTRIBUTION TRANSFORMERS

### 01. Scope

The specification covers the design, manufacture, testing and inspection before dispatch and delivery of distribution transformers at places anywhere in Chhattisgarh listed in Annexure-C.

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The specification covers oil immersed, naturally air cooled (type ONAN), outdoor type, three star rating, three phase, 50 Hz, 11/0.433 KV step down distribution transformers of capacity 25, 63 & 100 KVA.

**02. System Particulars:-**

The transformers shall be suitable for outdoor installation with following system particulars and they should be suitable for service under fluctuations in supply voltage as permissible under Indian Electricity Rules

- 2.1 Nominal System Voltage : 11 kV
- 2.2 Corresponding Highest System Voltage : 12 kV
- 2.3 Neutral earthing : Solidly earthed
- 2.4 Frequency : 50 Hz with ±3 % tolerance
- 2.5 Number of Phase : 3

**03. Applicable Standards**

3.1 The design, manufacture and performance of the equipment shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this specification shall be construed to relieve the bidder off his responsibilities.

3.2 The Distribution Transformers shall conform to IS: 2026 as amended up to date or other International Standards for equal or better performance. Unless otherwise modified in this specification the Distribution Transformers shall comply with the Indian Standard Specification IS 2026 latest.

3.3 Unless otherwise specified, the equipment offered shall conform to amended up to date Indian, IEC, British or U.S.A. Standards and in particular, to the following:-

a.	IS 2026(Part I,II,IV)/1997,(Part-III)/1981, (Part-V)/1994	Power Transformer
b.	IS: 1180/1989 (Part-1& Part-2)	Outdoor type, Three phase distribution transformers up to and including 100 kVA, 11KV
c.	IS:335/1993(fourth revision)	New insulating oil- Specification
d.	IS:2099/1986, IS: 7421-1988, IS:3347 (Part-I /Sec-2)-1979, IS:3347 (Part-I /Sec-1)-1982 amended up to date	Bushing
e.	IS 5	Colours for ready mixed paints and enamels.
f.	IS 13730 (Part-27)1996	Specification for particular types of winding wires.
g.	CBIP Publication No.295:2006	Manual on transformers

3.4 In case of conflict arising out due to variations between the applicable standard and the standards specified herein the provisions of this specification should prevail.

**04. Climatic Conditions**

- (i) Peak Outdoor temperature : 50 ° C Minimum (50 ° C+40 ° C)
- (ii) Maximum oil temperature : (50 ° C+35 ° C)  
: 85°C under max. temperature & max load condition attainable.
- (iii) Maximum relative humidity : 95% (sometime approaches saturation point).
- (iv) Minimum relative humidity : 10%
- (v) Average No. of thunderstorm days per annum : 40 days
- (vi) Average number of rainy days : 90 days
- (vii) Number of months of tropical monsoon conditions. : 3 months
- (viii) Average annual rainfall : 125 cm.
- (ix) Wing pressure : 100 Kg/m<sup>2</sup>

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(x) Altitudes not exceeding : 1000 meters.

**05. Specific Technical requirement:**

**5.1 Standard kVA Ratings:-**The standard ratings for transformer shall be 25, 63 & 100kVA.

**5.2 Nominal voltage ratings:** Primary voltage: 11 kV

Secondary voltage: 0.433 kV

**5.3 Winding connections:-**

i. H.V. Winding : Delta (A)

ii. L.V. Winding : Star (Y)

The neutral of the L.V. winding shall be brought out to a separate insulated terminal. The voltage group shall be Dyn-11.

**5.4 Temperature Rise:**

a. The temperature rise for top oil over an ambient temperature of 50° C should be 35 °C maximum measured by thermometer in accordance with IS 2026.

b. Temperature rise for winding over an ambient temperature of 50° C should be 40° C maximum (measured by resistance method in accordance with IS 2026.

**Bids not meeting the above limits of temperature rise will be treated as non responsive.**

The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise.

**5.5 No load voltage ratio:-**

The no load voltage ratio shall be 11000/433 Volts.

**06. Taps**

No tapings shall be provided for transformers upto 100kVA rating.

**Design & construction:**

**Core**

i. The core shall be stacked type. The core shall be of high grade cold rolled grain oriented (C.R.G.O) annealed steel lamination having low loss and good grain properties, coated with hot oil proof insulation, and bolted together to the frames firmly to prevent vibration or noise. All core clamping bolts shall be effectively insulated. The complete design of core must ensure permanency of the core losses with continuous working of the transformers.

ii. **The grade of core laminations shall be M4 or better.** The value of the flux density allowed in the design and grade of lamination used shall be clearly stated.

The successful bidder shall be required to submit the manufacturer's test report showing the Watt loss per Kg and the thickness of the core lamination, to ascertain the quality of core materials. The purchaser reserves the right to get sample of the core material tested at any Govt. recognized laboratory.

(iii) The transformer core shall not be saturated for any value of v/f ratio to the extent of 112.5% of the rated value of V/f ratio (i.e. 11 KV/50 due to combined effect of voltage and frequency) up to 12.5% without injurious heating at full load condition and should not get saturated. The supplier shall furnish necessary design data in support of this situation.

(iv) Flux density should not be more than 1.55 Tesla for CRGO transformers at the rated voltage and frequency. The value of the flux density allowed in the design shall be clearly stated in the offer along with graph.

No load current at rated voltage and at 112.5% of rated voltage for 25 KVA rating shall not exceed the % (percentage) values given below for different types of core:

KVA Rating	No load current as a percentage of rated full load current	
	At 100 percent Rated Voltage	At 112.5 percent Rated voltage
25	3	6
63	3	6
100	2.5	5

Test for magnetic balance by connecting the LV phase by phase to rated phase voltage and measurement of an, bn, cn voltages will be carried out.

**(v) Details of Core:**

SN	Particulars	Rating in KVA		
		25	63	100
i)	No. of steps (Min) for stack core	5 standard steps	5 standard steps	5 standard steps

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**7.2 Winding:-**

- i. Materials: Double paper covered / Super enamel covered Aluminium conductor shall be used for HV and LV winding.
- ii. Current Density: Current density for HV and LV should not be more than 1.6 A / sq.mm for aluminium conductor.
- iii. L.V. winding shall be in even layers so that neutral formation will be at top.

**7.3 Losses:**

The total losses at 50% & 100% loading for three phase, three star rating 25, 63 & 100 KVA, 11/0.433 kV transformers at rated voltage, frequency and at 75 deg. Centigrade shall not exceed the values indicated as below:

Note: Please refer to the Technical Specification for 3 Star Distribution Transformer given by Bureau of Energy Efficiency (the same is enclosed below as a schedule V).

**TABLE – 1**

KVA Rating	Voltage Ratio in kilovolts	Losses at 50% loading (Watts) at 75°C	Losses at 100% loading (Watts) at 75°C
25	11/0.433	210	695
63	11/0.433	380	1250
100	11/0.433	520	1800

Apart from above, Distribution Transformers should conform to minimum requirements of IS 1180 (Part-I):1989 for no load losses etc.

**No positive tolerance shall be allowed in the maximum losses given in the table for both 50% & 100% loading values. Bids with higher losses than the above specified values would be treated as non-responsive. In case the actual loss values exceed the above guaranteed values, the transformers shall be rejected at the risk, cost and responsibility of the supplier.**

The values guaranteed in G.T.P. for flux density, no load current at rated voltage, no load current at 112.5% of rated voltage and no load loss at rated voltage shall be individually met.

**7.4 Insulation material & clearances:**

(a) **Materials** – Makes of Electrical grade insulating epoxy dotted craft paper, Pressboard of standard make shall be declared in GTP by the bidder. All spacers, axial wedges/runners used in windings shall be made of pre-compressed pressboard-solid conforming to type B 3.1 of IEC 641-3-2. The test reports for all properties as per relevant I.S. amended up to date shall be submitted during inspection.

(b) The minimum electrical clearance between the winding and body of the tank (between inside surface of the tank and outside edge of the windings) should be 30 mm.

**(c) Minimum external clearances of bushing terminals**

HV	Ph to Ph	255 mm
	Ph to E	140 mm
LV	Ph-to-Ph	75 mm
	Ph to E	40 mm

**7.5 Impedence value:-**

The percentage impedance at 75°C shall be 4.5% for transformers (IS tolerance of ± 10%).

**7.6 Tank**

**7.6.1**

The transformer tank shall be made up of prime quality MS Sheets of rectangular shape. The transformer tank shall be of robust construction. All joints of tank and fittings should be oil tight and no bulging shall occur during service. The tank design shall be such that the core and windings can be lifted freely. The tank plates shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of the lifting lugs provided. Tank inside shall be painted by varnish. Top cover plate shall be slightly sloping; approximately 5 to 10 deg. Towards HV bushing and edges of cover plate should be bent downwards so as to avoid entry of water through the cover plate gasket. The width of bend plate shall be 25 mm

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min. The top cover shall have no cut at point of lifting lug. The rectangular tank shall be fabricated by welding corners.

7.6.2 In rectangular shape tanks, horizontal or vertical joints in tank side walls and its bottom or top cover will not be allowed. In addition the cover of the main tank shall be provided with an air release plug.

Side wall thickness : 3.15 mm. (min.)

Top and bottom plate thickness : 5 mm. (min.)

7.6.3 Reinforced by welded angle 50x50x5 MM on all the outside walls on the edge of tank to form two equal compartments. The permanent deflection is not more than 5mm up to 750 mm length and 6mm up to 1250 mm length when transformer tank without oil is subject to air pressure of 35 KPa above atmospheric pressure for 30 min. Pressure test shall be performed carefully at the time of 1<sup>st</sup> stage inspection only to confirm the adequacy of reinforcement angle and gauge of the tank.

7.6.4 All welding operations to be carried out by MIG process.

7.6.5 **Lifting lugs:** 2 nos. welded heavy duty lifting of MS plate of **8mm** thickness suitably reinforced by vertical supporting flat of same thickness as of lug welded edgewise below the lug on the side wall, up to reinforcing angle. They shall be so extended that cutting of bend plate is not required.

7.6.6 **Pulling lugs:** 4 nos. of welded heavy duty pulling lugs of MS plate of **8mm** thickness/ pulling holes in the base channel shall be provided to pull the transformer horizontally on width side up-to 100kVA.

7.6.7 **Top cover fixing bolts:** GI nuts bolts of 3/8" dia. with one plain washer shall be used for top cover fixing spaced at 4" apart. 6mm neoprene bonded cork/ nitrile rubber bonded oil resistance gaskets conforming to type B/C IS 4253 Part – II amended up to date will be placed between tank and cover plate.

7.6.8 **Vertical clearance:** The height of the tank shall be such that minimum vertical clearance up to the top cover plate of 120 mm is achieved from top yoke.

#### 7.7 Heat Dissipation:

1. Heat dissipation by tank walls excluding top and bottom should be 500 W/m<sup>2</sup>.
2. Heat Dissipation by fin type radiators of 1.25 mm thickness will be worked out on the basis of manufacturer's data-sheet. Supplier should submit the calculation sheet.
3. For 25 KVA transformers, 1 Nos. and for 63 & 100 KVA transformers, 2 Nos. Radiators shall be provided only on LV Side and shall be of fin type. They should be fixed at right angle to the sides and not diagonally.
4. Arrangement for studs provided for fixing of HV bushings shall be in diamond shape, so that the arcing horns are positioned vertically.

#### 7.8 Conservator:

1) The total volume of conservator shall be such as to contain 10% quantity of the oil. Normally 3% quantity of the total oil will be contained in the conservator. Dimension of the conservator shall be indicated in General arrangement drawing.

2) Die cast Oil level indicator shall be provided on the side of conservator which will be with fully covered detachable flange with single gasket and tightened with MS Nut/Bolt and will be fixed on the side of rating plate and drain valve.

3) The pipe from the conservator tank connecting to main tank shall be of 30 mm. internal dia. and shall have a slopping plate so that the oil falling from the pipe shall not fall directly on the active job and shall fall on the side walls only. The pipe should project in the conservator so that its end is approximately 20 mm. above the bottom of the conservator. Thus slopping plate should be fitted such that clearance from the yoke/live part of the tap changer is maintained as prescribed i.e. 120 mm. The conservator shall be provided with a filling hole, with cover. In addition the cover of the main tank shall be provided with an air release plug.

**Note: Transformer shall be supplied complete with first filling of oil.**

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**8.0 Breather:** Breather joints will be screwed type. It shall have die-cast Aluminium body. Make of breathers shall be subject to purchaser's approval. Volume of breather shall be suitable for **500 gm.** (minimum) **of silica gel (crystal size 6 mm).**

**9. Terminals:**

1) Brass rods of 12 mm dia for H.T. and L.T. with necessary nuts, check nuts and plain thick tinned washers for 25 KVA ratings.

Brass rods of 12 mm dia for H.T. and L.T. with necessary nuts, check nuts and plain thick tinned washers for 63 & 100 KVA ratings.

2) HT/LT bimetallic connectors shall be provided with transformer.

**10. Bushing & Connections:**

For 11 KV side - 12 KV bushing and for 433 volts side 1.1 KV terminal bushing will be used. Bushings of the same voltage class shall be interchangeable. Bushings with plain sheds as per IS: 3347 shall be mounted on side of the tank and not on the top cover. Only continuous sheet metal pocket shall be provided for mounting of all H.V/L.V. bushings and the same shall not be fixed on pipes. Sheet metal pocket shall be designed in such a way that all HT bushings shall remain parallel and equidistance all through. The inside connections of windings to bushings shall remain within the pocket. Bushings having type tested as per IS:3347 shall only be acceptable.

**11. Internal connections:**

In case of HV winding, all jumpers from windings to bushing shall have cross section larger than the winding conductor (normally 1.5 times). For Aluminium winding L&T, Alkapee Aluminium brazing rods with suitable flux will be used or alternatively joints will be made by using tubular connectors properly crimped at three spots. Aluminium brazing rods to be used for ring forming on other end and nut bolting on HV bushing stud.

LT Star connection will be made by using Aluminium/Copper Flat as per winding material and properly brazed or bolted with the crimped lugs on windings by means of plain or spring washers and lock nuts to the flat. Other end of the conductor is brazed on "L" shape Aluminium/copper flat and flat nut bolted with neutral bushing stud. ALTERNATIVELY, for 63 & 100kVA ratings all the three terminals of LV windings together with terminals for neutral bushing shall be properly brazed and then covered with Aluminium tubular sleeve of suitable length and cross sectional area duly crimped in order to provide sufficient strength to the joint. The star connection should be wrapped with cotton/paper tape.

Firm connection for LV windings to bushings shall be made by brazing with adequate size of "L" shape flat nut bolted with LV Bushing stud. For delta formation on HV side, copper wire having cross sectional area 1.5 times the winding area should be used. SRBP tube /insulation paper should be used for delta connection and on the portion of HV winding joining to HV bushing.

**12. Tank base channel:**

Tank base channels to be fitted across the length of the transformer as follows:

(a) For 25, 63 & 100 KVA Transformer - Two channels of 75x40 mm of length 460 mm.

**13.0 Terminal Marking Plates and Rating Plates:**

The transformers shall be provided with a plate showing the relative physical position of the terminal and their markings engraved on it. The transformers shall be provided with non-detachable rating plate of Aluminium anodized material fitted in a visible position, furnishing the information as specified in IS:2026. The rating plate shall be embossed/ engraved type but not printed type. The relative position of tapping switch and corresponding voltages may also be shown on the rating plate.

Further, MS plate of size 125x125 mm be got welded on width side of the transformer on stiffener angle. On this plate Name of firm, order No. & Date, Rating, serial number and Date of dispatch should be engraved.

Labeling shall be done as per BEE guidelines.

**14. Fittings:**

The fittings on the transformers shall be as under:

1	Rating and diagram plate	1 no.
2	Earthing terminals with crimping lugs.	2 nos.
3	Lifting lugs	2 nos. (for tank)
4	Thermometer pocket	1 no.
5	Oil Indicator on tank	1 no.
6	Platform mounting channel with suitable holes	2 nos
7	HT & LT bushing	3 nos. of 12 kV HT bushing for 11 kV and

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		4 nos. of LT bushing (1.1 kV) shall be provided. Each bushing (HV & LV) should be provided with 3 nos. of brass nuts and 2 plain brass washer.
8	Pulling lugs	4 nos
9	Aluminium die cast silica gel 1 No. breather 500 gms. Capacity	1 no.
10	Top cover lifting lugs	2 nos.
11	Bimetallic connectors to be fitted on the stud	HV: 3 nos. LV: 4 nos.
12	Radiators	1 no. for 25KVA/2 nos. for 63& 100KVA
13	Oil level gauge indicating three position of oil marked as below:- Minimum(-)5°C, 30°C Maximum 98°C	1 no
14	Conservator	1 no.

**15. Transformer Oil:**

The transformer shall be supplied complete with first filling of oil and the same shall comply with IS: 335-1983 with latest version thereof with ageing characteristics specified. These characteristics are shown in **Schedule-II(C)**. Type tests certificate of oil being used shall be produced at the time of inspection.

**16. Tests & Test Certificates**

The following routine tests and type tests are required to be carried out on the transformers.

**16.1 Routine Tests:**

Before dispatch, each of completely assembled transformer shall be subjected at the manufacturers works to the following routine tests in accordance with the details specified in IS: 2026:

- (a) Measurement of winding resistances.
- (b) Ratio, polarity and phase relationships.
- (c) Impedance voltage.
- (d) No load losses and no load current.
- (e) Load losses.
- (f) Insulation resistance.
- (g) Separate source voltages withstand.
- (h) Induced over voltage withstand.
- (i) Vacuum test.

**16.2 Type Test:**

In addition to the routine tests as above the following type tests shall be carried out on the transformers in accordance with IS: 2026/1977 as amended from time to time:

- (a) Lightning impulse tests.
- (b) Temperature rise test.
- (c) Short circuit test.

The suppliers may carefully note following specific requirements of short circuit, impulse voltage and temperature rise tests:

The Company intends to procure transformers designed and successfully tested for short circuit and impulse test. It may also be noted that the Company reserves the right to conduct any of the above type tests in accordance with the IS, afresh on each ordered rating at Company's cost, even if the transformers of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by the Company either at their works - when they are offered in a lot for supplies or random sample unit from the supplies already made to Company's Area Stores. After conducting short circuit test, healthiness of active parts shall be checked by un-tanking the transformer. The findings and conclusion of these tests shall be binding on the supplier.

In case the transformer does not pass in either of the tests and if the active part details are not found to be in line with the design tested and approved, the following punitive measures shall be taken:

- (i) 5% payment of the bill for the supplies already made will be recovered by the Company.

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(ii) For transformers already supplied, the guarantee period shall stand twice the normal guarantee period. The period of performance Security Deposit shall be suitably extended to cover the extended guarantee period.

(iii) Further, supply of balance quantity of transformers will not be accepted by the Company, till another transformer from the manufactured batch is satisfactorily tested (OR transformers are modified according to the tested design) for both tests at your cost and consequent to this, if there is any delay in executing the order, the same shall be to your account. Company reserves the right to take action as per terms and conditions of the order.

(iv) The test charges shall be borne by the firm. Please note that if the terms and conditions detailed above regarding short circuit withstand test & impulse voltage test on transformers and procedure for these tests are not accepted by you in full, action will be taken as deemed fit as per the terms of the order.

**16.3 Acceptance test:**

The following tests shall be witnessed by the Purchaser through his representative at the firm's works:

(i) All the routine tests as mentioned above shall be performed on minimum 10% quantity of offered lot.

(ii) Heat run test (Temperature rise test): Heat run test shall have to be conducted at suppliers cost on one transformer of each rating in any offered lot during the course of supplies. ***In case of transformers with tap changer, test shall be conducted on the lowest tap feeding corresponding losses at 75°C.***

To facilitate conduction of heat run test on any unit in any lot at any point of time during the supplies, the manufacturers will provide a thermometer pocket, which gets immersed in oil on the side of the transformer in all the transformers. This pocket shall also be used for connecting thermal sensing device to monitor the variations in temperature and whenever required to operate the protective devices. The Sensor pocket shall be of 12 mm diameter with blanking screwed cap, removable at site. The depth of the projecting stem of this pocket inside the transformer will be below oil level. It shall not infringe with electrical clearances nor obstruct the un-tanking of the active part.

(iii) Verification of active parts on one unit of each rating of ordered quantity along-with weighing of unit.

(iv) **Unbalanced current test:** The value of zero sequence current in the star winding shall not be more than 2% of the full load current.

(v) Transformer shall be subjected to test for over fluxing of core, wherever required by the Company's inspecting officer.

Further, the purchaser's Inspector reserves the right to get the Spill Current Measurement Test and also the Pressure Test performed on any tank during their inspection.

(a) **Air pressure test:** The tank shall be fixed with a dummy cover with all fittings including bushings in position and be subjected to 0.8 Kg per cm sq. above atmosphere pressure for 30 minutes and the vacuum corresponding to (-) 0.7Kg per cm. Sq. for 30 minutes, permanent deflection for flat plate, after pressure has been released shall not exceed the values given below:

<u>Length of plate</u>	<u>Deflection</u>
Upto 750 mm	5mm
751 to 1250 mm	6 mm
1251 to 1750 mm	8mm

(b) **Test for Spill Current in neutral:** The test will comprise of measuring current between shorted secondary phases and neutral on applying impedance voltage at primary winding. The value should not exceed 2% of full load current.

**17. Testing facilities**

The bidder should have adequate testing facility for all routine and acceptance tests and also arrangement for measurement of losses, resistance, etc. details of which will be enumerated in the order.

**18. Inspection**

(A) To ensure about the quality of transformers, the inspection shall be carried out by the Company's representative or by third party at following two stages:

(i) **Stage Inspection** will be done when the raw material is received, and the assembly is in progress in the shop floor. After the main raw-materials i.e. core and coil materials and tanks are arranged and transformers are taken for production on shop floor and a few assembly have been completed, the firm shall intimate the O/o the CE(S&P), in this regard, so that an inspecting officer for carrying out such inspection could be deputed, as far as possible within fifteen days from the date of

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intimation. **During the stage inspection, a few assembled cores shall be dismantled to ensure that the CRGO laminations of M4 Grade used are of good quality.**

(ii) **Final Inspection** will be carried out at finished stage i.e. transformers are fully assembled and are ready for dispatch. As and when the transformers are ready for dispatch, an offer intimating about the readiness of transformers, for final inspection for carrying out tests as per relevant IS and as in **Clause 16** above, shall be sent by the firm along with Routine Test Certificates. The Company shall normally arrange the inspection at the earliest after receipt of offer for pre-delivery inspection.

(C) In case of any defect/defective workmanship observed at any stage by the Inspecting Officer, the same shall be pointed out to the firm in writing for taking remedial measures. Further processing should only be done after clearance from the Inspecting Officer/ this office.

(D) All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacture shall offer the Inspector representing the Purchaser all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Part Inspection during Acceptance Tests.

(E) Random sample checking and testing of the transformer selected at random from the supplies made to the Area Stores shall be done for verification of technical details, design and losses as per approved G.T.P. drawings and technical specification of the order. In case of variations, the lot shall be rejected.

(F) The purchaser has all the rights to conduct the test including type tests, at his own cost by an independent agency whenever there is dispute regarding the quality of supply or interpretation of test results. **In the event of failure of transformers in such tests, the expenses incurred in testing shall be to the supplier's account as already mentioned above in case of random testing.**

(G) **Test reports on the analysis of raw materials:** The supplier shall furnish details of source(s) of raw-materials, test certificates and report on the analysis of electrolytic copper//Aluminium used for the winding and the steel used for core, insulation material and also other bought out items from Sub-suppliers.

#### **19. Inspection & Testing of Transformer Oil**

To ascertain the quality of the transformer oil, the original manufacturer's tests report should be submitted at the time of inspection. Also arrangements should be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of purchaser's representative.

#### **20. Loading of Transformers**

Transformer loading should be complied with IS:6600.

#### **21 Drawing:-**

21.1 A set of following drawings with all dimensions shall be submitted by the Bidder along with the offer:

- i. General Dimensional drawing.
- ii. Core Assembly drawing.
- iii. Internal Construction Drawing.
- iv. Rating & Diagram Plate Drawing.
- v. HV/LV Bushings indicating measurement of creepage distances.

21.2 The drawings shall be of A-4 size only. The bidder should also supply along with his offer the pamphlets/literatures etc. for fittings/ accessories.

#### **22.0 Finishings:**

The exterior of the transformer and other ferrous fittings shall be thoroughly cleaned, scrubbed and given primary coat and two finishing coats of durable oil and weather resistant paint of enamel. **The color of finishing coats shall be DARK GREEN confirming to IS: 5 of 1961 (colors for ready mixed paints) with conservator painted with white color. 3 stars(\*\*\*) should be painted on white conservator with green paint clearly visible from ground to indicate that the transformer is a 3 star rating, besides the BEE labelling.**

#### **23.0 Guaranteed Technical Particulars:**

The bidder should fill up all the details in GTP parameter list, the statement such as "as per drawings enclosed", "as per C.S.P.D.C.L.'s requirement" "as per IS" etc. shall be considered as details are not furnished and such offers shall liable for rejection.

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**TECHNICAL SPECIFICATION OF EARTHING COILS  
(MADE OF HOT DIP GALVANISED SOFT QUALITY – MILD STEEL WIRE 4 MM DIA)**

1. Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting materials. The coil shall be made as per REC constructions standard J-1 (drawing enclosed). The Hot Dip Galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1979 with latest amendments, galvanizing should be heavily coated and should stand for the following tests :-

**I. GALVANISING TESTS :**

(i) Minimum Mass of Zinc :-

(a) ON GI Wire used 280 gm/m<sup>2</sup>

(b) After Coiling – 266 gm/m<sup>2</sup>. The certificate from recognized laboratory should be submitted towards mass of zinc.

(ii) Dip test :- Shall stand 3 dips of 1 minute and one dip of ½ minute before coiling and 3 dips of 1 minute after coiling as per IS:4826/ 1979.

**2. THE DIMENSIONAL REQUIREMENT SHALL BE AS FOLLOWS: -**

(a) Nominal dia of GI Wire 4 mm (Tolerance + (-) 2.5%)

(b) Minimum number of turns – 115 nos.

(c) External dia of Coil ( Min.) – 50 mm,

(d) Length of Coil (Min) – 460 mm

(e) Free length of GI Wire at one end coil (Min)- 2500 mm.

**3. THE TURNS SHOULD BE CLOSELY BOUND.**

**4. WEIGHT OF ONE FINISHED EARTHING COILS (MIN.) – 1.850 kg.**

**5. ADHESION TEST: As per ISS 4826-1979**

**TECHNICAL SPECIFICATION OF 11 KV DO FUSE UNITS**

1. **SCOPE:** - This specification provides for manufacture testing at works before dispatch. This covers out door open drop-out expulsion type fuses suitable for installation in 50 Hz 11KV distribution system.

2. **APPLICATION:-** The D.O. fuses are intended for use on Distribution transformers for protection/ isolation of the same during overload or fault conditions.

3. **APPLICABLE STANDARD:** - Unless otherwise modified in this specification, the drop out fuse shall conform to IS: 9385 (Part-I to III) as amended from time to time.

4. **CLIMATIC CONDITIONS:** - The climatic conditions at site under which the equipment shall operate satisfactorily, are as follows:-

- (i) Peak Ambient temperature in shade : 48 deg.c
  - (ii) Maximum average ambient temperature : 45 deg.c in 24 hours period in shade.
  - (iii) Minimum ambient temperature : 4 deg.c
  - (iv) Maximum relative humidity : 95 % (Some time approaches saturation point)
  - (v) Average number of thunder storm days per annum : 40 days
  - (vi) Average number of rainy days per annum : 90 days
  - (vii) Average annual rainfall : 124 cm
  - (viii) Number of months of tropical monsoon : 3
- conditions.

For the purpose of specifications, the reference ambient temperature shall be 40 deg. C.

5. **DROP OUT FUSES:-** The drop-out fuses shall be expulsion type. This shall be 'D' type and out-door lift off type suitable for manual operation by an operating rod from the ground level. The drop out operation will be angular in vertical plan.

5.1 The equipment offered by the tenderer shall be suitable for 11KV three phase 50 C/S solidly grounded earthed neutral systems. It shall be designed for a normal current rating of 200 Amps.

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5.2 The drops out fuses are required with Post Insulators. These shall be suitable for mounting on the structure. The bracket/Channel hardware for DO Fuses shall be provided with adequate sizes of nuts, bolts and washer for mounting on the structures of the purchaser.

6. POST INSULATORS: - Each 11KV DO Fuse shall have two nos 11KV Post Insulators. The insulators shall conform to IS: 2544 of 1973 with latest amendment. The porcelain used for manufacture of DO fuse shall be homogeneous, free from flaws or imperfections that might affect the mechanical or dielectric strength. They shall be thoroughly vitrified tough and impervious to moisture. The glazing of the porcelain shall be of uniform brown colour free from blisters, burns and other similar defects. Insulators of the same rating and type shall be interchangeable.

The porcelain and metal parts shall be assembled in such a manner that any thermal expansion differential between the metal and porcelain parts through range of temperature variation shall not loosen parts or create undue internal stresses which may effect the electrical or mechanical strength and rigidity. Each cap and base pin shall be high-grade cast steel or malleable steel casting and they shall be machine faced and smoothly galvanized. The cap and base shall be properly cemented with insulators to give perfect grip. Excess use of cement shall be avoided.

The tenderers shall invariably enclose with the offer, the type test certificate of CSEB design DO Fuses alongwith certified copy of the drawing and other relevant technical guaranteed particulars. Please note that offers without type test certificates will not be entertained and without the type test reports, offers may be rejected.

6.2 Each 11KV Post Insulators should have technical particulars as detailed below: - (i)

Nominal system voltage KV (rms)	11
(ii) Highest system voltage KV (rms)	12
(iii) Dry Power Frequency one KV (rms)	35 minute withstand voltage.
(iv) Power Frequency puncture KV (rms)	1.3 times the actual dry flashover voltage.
(v) Impulse withstand voltage KV (rms)	75
(vi) Visible discharge voltage KV (rms)	9
(vii) Creepage distance in mm (minimum)	320
(viii) Cantilever strength (KN)	6.60

7. As stated above unless otherwise modified in this specification the drop out shall conform to ISI: 9385 (Part-I to III) and as amended from time to time.

7.1 RATED VOLTAGE:- The rated voltage shall be 11KV.

7.2 RATED CURRENT:- The rated current shall be 200 Amp.

7.3 RATED LIGHTNING IMPULSE WITHSTAND VOLTAGE VALUES FOR THE FUSE BASE:- The rated lightning impulse withstand voltage both for positive and negative polarities shall be as given below:-

a. To earth and between poles	75KV peak
b. Across the isolating distance of fuse base	85KV Peak

7.4 RATED ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (DRY AND WET) VALUES FOR THE FUSE BASE:

A. To earth and between poles.	28KV Peak
B. Across the isolating distance of fuse base	32KV Peak

7.5 TEMPERATURE RISE LIMIT IN AIR ABOVE AMBIENT TEMPERATURE:

A. Brass contacts silver faced :	65 deg.c
B. Terminals. :	50 deg.c
C. Metal parts acting as spring :	The temperature shall not reach such a value that elasticity of the metal is changed

7.6 RATED BREAKING CAPACITY:- The rated breaking capacity shall be 8 KA (Asymmetrical).

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Submission of Type Test Certificate of rated breaking capacity is very essential (otherwise offers may be rejected)

8. MAIN CONTACTS: - The main contacts of the DO Fuse shall be suitable for heavy duty, properly aligned, made from Brass material. These shall have good finish and smooth surface and shall be silver-plated. All the sharp edges shall be rounded off. These contacts shall be so designed to withstand highest short circuit breaking current that may be encountered during service in nut-shell the contact assembly shall ensure:-

- (i) Electrodynamic withstand ability during short circuit without any risk of repulsion of contact.
- (ii) Thermal withstand ability during short circuits.
- (iii) Constant contact pressure even when the lower parts of the insulator stacks are subjects to tensile stresses due to linear expansion of connected bus bar or flexible conductors either because of temperature variation of strong winds.
- (iv) Proper alignment to ensure smooth operation of D.O. Fuse without adjustment.

9. CONNECTORS:- The connectors shall be made from Brass suitable for ACSR Squirrel/Weasel & Rabbit and Raccoon. The connectors should be bolted type having 4 bolts & groove to hold the conductor. All brass parts should be silver plated for corrosion resistance and efficient current flow. All ferrous parts should be Hot dip galvanized as per the latest version of IS: 2633. Nuts and bolts shall conform to IS:1364 and should be hot dip galvanized. Spring washer should be electro galvanized.

10. FLY NUTS:- These shall be provided at both the ends of SRBP tube for tightening the fuse elements. The nut shall be provided with one flat washer of 25 mm Dia. The arrangement shall be made to ensure that the fuse wire runs centrally inside the SRBP tube after tightening.

11. SPRING STRIPS:-The spring strips shall be of phosphors bronze multilane brush type having a high pressure contacts and should retain its tension under minimum continuous service current of 200 Amps.

12. OPERATING HOOKS:- The brass operating hook shall be fixed over the SRBP tube in such a way that the barrel can be removed for replacing the fuse element by operating rod from the ground level.

The drop put fuse units shall operate efficiently, speed of operation shall not depend on the inclination of the fuse. However, the inclination of the fuse barrel shall be adjusted in such a way that the barrel does not drop by gravitational force.

13. D.O.BARRELS:- The D.O. Fuse Barrels shall be made from SRBP and shall confirm to BSS:1314. The supplier shall furnish the test certificate for the fuse barrels offered for use in the drop out fuses alongwith each lot offered for inspection. The test certificates of SRBP barrel should indicate the following test minutes:-

- (i) Dimension:-
  - (a) External dia :
  - (b) Wall thickness :
  - (c) Internal dia :
- (ii) Max. wrapping in 12" length of the tube :
- (iii) Axial electric strength (Proof test in oil rms 50 C/s. : The barrel should withstand this test at 900C at 25KV satisfactorily for one minute.
- (iv) Radial electric strength (Proof test in oil at 900C at 19 KV rms 50 C/s. : The barrel should withstand this test satisfactorily for one minute.
- (v) Surface electric strength (Proof test in air at : The barrel should withstand this test room temp. (320C) at 14KV rms at 50 C/s. satisfactory for one minute.
- (vi) Water absorption in 14 hours. :
- (vii) Resistance to Hot oil. :
- (viii) Cohesion between layers (proof test) :

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(ix) Machineability :

13.1 The tenderers should indicate the name of manufacturers of SRBP tubes from where they will purchase the Barrels to make available the above test certificate. The barrels should have the properly to resist fire whenever the fuse is blown off. It should not catch fire easily during blowing off of fuse element inside the barrel, which causes short time high temperature.

14. DESIGN, MATERIALS AND WORKMANSHIP:- The successful tenderers shall assume full responsibility for co-ordination and adequate design. All materials used in the construction of the equipment shall be of the appropriate claims, well finished and of approved design and material. All similar parts should be accurately finished and interchangeable. The connecting of cap and pin with insulator should be perfect to avoid any kind of loosening. After cementing the insulator should be cured adequately in water to attain good gripping.

15. GUARANTEED DATA AND OTHER TECHNICAL PARTICULARS:- Guaranteed data and other technical particulars of the D.O. Fuse should be given in Schedule enclosed herewith. Any other particulars considered necessary by the supplier may also be given in addition to those listed in the schedule.

16. TESTS:- Each D.O. Fuse shall strictly comply with the requirement of all the type tests and shall be subjected to all routine tests stipulated in the relevant standard. All tests shall be made prior to despatch in the presence of the representative of the purchaser. No material should be despatched without prior approval of the tests certificate by the purchaser.

The tenderer should note that alongwith the tender, the following type test certificate as per ISS:9385 Part- II - 1980 (with latest amendment) must be furnished on CSEB design D.O. fuses. The type test should not be older than 5 (five) years from the date of opening of tender and should be performed in the Govt. recognized Lab.

- (i) Impulse voltage withstand test,
- (ii) H.V. Power Frequency dry/wet withstand test.
- (iii) Temperature rise test.
- (iv) Breaking Current test.

Alongwith the inspection report of D.O. Fuse Units, the supplier should invariably furnished, Routine test certificates of DO Fuse barrels & Post Insulator of their manufacturers.

17. IMPORTANT REQUIREMENTS TO BE NOTED BY THE TENDERER:- The tenderer should carefully note the following requirements otherwise their offer shall be rejected.

- (i) All the accessories of D.O. Fuse Unit should be listed out clearly.
- (ii) Technical particulars of D.O. Fuse Units should be given as desired in the enclosed schedule.

18. Each D.O. Fuse shall be provided with name plate of size 2"x1" on steel strip and shall be either reverted bolted or pasted.

The following shall be indicated on the plate:- Name of manufacturer

Order No & date

Sl. No of the equipment

Rating..... Amps.....volts

Name of purchaser viz made for NRDA/CSPDCL

Please note paper should not be used for name plate. The material should be packed in wooden cartoons.

19. DIMENSION:-

Particulars	DIMENSION OF D.O.FUSE UNIT IN MM	Sno.
1. Drawing No.	EB/P6/CSEB/5/(revised) dt. 14.1.88	
2. M.S. Flat	245 x 25 x 6	
3. M.S. Channel	----	
4. Fuse Barrels	330 x 25 x 14	
5. Lower Contact Hinge of Barrel:		
(i) Connectors	60 x 60 x 6	
(ii) Hinge Contact Length	95	
(iii) -do- Width	85	

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(iv) Thickness of Hinge		
Outer		5
Inner		4
6. Barrel take out hook:		
(i) Width		25
(ii) Thickness	4	
(iii) Length		30
(iv) Inner dia meter		25
(v) Thickness between inner Outer dia.		3 mm
7. Operating Hook		
(i) Width		18
(ii) Thickness	3	
(iii) Inner Radius		19
(iv) Outer Radius		22.5
8. Female Contact		
(i) Main contact width		65
(ii) Strip thickness		1.5
(iii) Strip length		100
(iv) Width		20
(v) Female contact height		75
9. Female Contact Holder:-		
(i) Length		74
(ii) Upper Width		34
(iii) Lower Width		40
10. Creepage of insulator		320

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**TECHNICAL PARTICULARS OFFERED FOR 9KV GAP TYPE LIGHTNING ARRESTERS EFFECTIVELY GROUNDED NEUTRAL SYSTEM**

1. Name of manufacturer	:	
2. Type	:	SDV-5
3. Model	:	
4. No.of Units	:	Single
5. Rated Voltage (KV)	:	9KV (RMS)
6. Normal discharge current (Amp)	:	5KVA (5000 A)
7. Power frequency spark over voltage (Min)	:	24 KV (RMS)
8. Switching surge spark over voltage (Max)	:	--
9. Impulse spark over voltage 1/50	:	58 KV (Peak) Micro second wave (KV peak)
10 Maximum limit of wave impulse	:	65 KV (Peak)

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spark over voltage(KV peak)

11. Virtual steepness for front of : 75 KV/Microsecond wave for above (KV Microsecond)
12. Protective ratio crest arrester : 6.60 voltage during discharge total of maximum line to ground voltage.
13. Maximum residual voltage for discharge current of B/20 micro-second wave (KV Peak):
- i. 1500 Amps. : --
  - ii. 2500 Amps. : 42 KV (Peak)
  - iii. 5000 Amps. : 46 KV (Peak)
  - iv. 10000 Amps. : 52 KV (Peak)
14. High current 4/10 Micro second test value (KA) : 65 KA (65000 A)
15. Long duration current:
- i. Current peak (KA) : 75 Amp.
  - ii. Virtual duration (Micro second) : 1000 Microsecond
  - iii. Weight of complete unit (kg) : 4 Kgs.
16. Height of complete unit : 390 mm from base to the line side
17. Minimum recommended spacing : Not Applicable between arresters center to center (mm)
18. Clearance required from ground unit (mm) : Not Applicable equipment at various heights of arrester
19. Earthing arrangement provided for : As per Drawing earthing sides of arrestors (mm)
20. Mounting flange/bracket dimensional manufacturer. : To be furnished by the details

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## TECHNICAL PARTICULARS OF EHV GRADE-I NEW INSULATING TRANSFORMER OIL

Insulating oil for transformers and switchgears shall be as per ISS:335(1993) incorporating latest amendments and additional characteristic as incorporate below. It will be pure hydrocarbon mineral oil, clean and sufficiently free from moisture and other foreign materials likely to impair its properties. The test results for the characteristic of the oil when tested in accordance with ISS:335-1993 (4th revision) incorporating upto date and additional characteristic required by us shall be as hereunder.

SN	CHARACTERSTICS	TECHNICAL REQUIREMENT
1	Appearance	Oil should be clear, transparent and free from suspended matter or sediments.
2	Density at 29.5° C	0.89 G/Cm3 (Max.)
3.	Kinematic viscosity at 27° C	27 CST.
4.	Interfacial tension at 27° C	0.04 N/m (Min)
5.	Flash Point	140 ° C (Min)
6.	Pour Point	- 10° C (Max)
7.	Neutralisation value acidity	0.01 mg KOH/q (Max)
8.	Corrosive sulphur	Non Corrosive
9.	Electric Strength (Breakdown Voltage)	
	a. New unfiltered oil (as received in condition).	40 KV (rms) (min)
	b. After filtration	60 KV (rms) (min)
10.	Dielectric disppipation factor (Tan Delta) at 90° C.	0.002 (max)
11.	SK Value	6% (Max.)
12.	Water Content	30 PPM (as received) (Max)
13	Specific resistances a. At 90° C b. At 27° C	100x10 <sup>12</sup> Ohm. (Ohm.Cm.) (Min) 1500x10 <sup>12</sup> (Ohm.Cm) (Min)
14.	Oxidation stability: a. Neutralisation value after Oxidation b. Total sludge after oxidation	0.2 mg/KOH/gm (Max) 0.05% by weight (Max)
15.	Ageing charaacterstics after Accelerated Ageing Test.	
	a. Resistivity at 27° C	2.5x10 <sup>12</sup> Ohm.Cm.(Min)
	b. Resistivity at 90° C	0.20x10 <sup>12</sup> Ohm. Cm. (Min)
	c. Dielectric loss factor (tan Delta) at 90°C	0.15 (Max)
	d. Total acidity	0.05 mg/KOH/gm
	e. Sludge content after ageing	0.05% (Max) by weight
16.	Presence of Oxidation inhibitor shall not be present.	Yes

### CHARACTERISTICS OF OIL IN THE TRANSFORMERS

SN	CHARACTERSTICS	TECHNICAL REQUIREMENT
1	Electric Strength (Breakdown voltage KV)	60 KV Min.(Prior to energisation) 40 KV Min.(After energisation)
2	Water contents (PPM)	25 PPM (Max)
3	Specific Resistance (Resistivity) Ohm-cu at 90 Dec. C	20 x 10 <sup>12</sup> Ohm-Cm (Min)
4	Dielectric dissipation factor (Tan delta) at	

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	90 Deg.C	0.01 (Max)
5	Netralisation value (Total acidity)	0.2 mg KOH/gm (Max)
6	Sediment and/or precipitable sludge	Absent
7	Flash Point	140 Deg. C (Min)
8	Interfacial tension at 27 Deg. C	0.030 N/m (Min)

S.No.	Characteristics of oil	Requirement
1	Flash point Pensky Martein (closed)	140°
2	Neutralization value	
A	Total acidity, max	0.03 mg KOH/gm
B	Inorganic acidity / alkalinity	Nil
3	Corrosive Sulphur	Non corrosive
4	Electric strength (breakdown voltage) min.	
A	New unfiltered oil	30 KV rms
B	New oil after filtration	60 KV rms
5	Dielectric dissipation factor (tan delta) at 90°c	0.002
6	Specific resistance (resistivity)	
A	At 90°c min.	35 x 10 <sup>12</sup> ohm-cm
B	At 27°c min.	1500 x 10 <sup>12</sup> ohm-cm
7	Oxidation stability	
A	Neutralization value after oxidation (max)	0.40 mg KOH/gm
B	Total sludge after oxidation (max)	0.1% by weight
C	SK value	4% to 8%
8	Ageing characteristic Ageing characteristics after accelerated ageing (open beaker method with copper catalyst)	
A	i) At 27°c min.	2.5 x 10 <sup>12</sup> ohm-cm (min)
	ii) At 90°c min.	0.2 x 10 <sup>12</sup> ohm-cm (min)
B	Dielectric dissipation factor (tan delta)	0.20 max.
C	Total acidity in mg KHO/gm	0.05 max.
D	Total sludge value	0.05% by weight
9	Characteristic of the oil in the transformer the Important characteristic of the transformer oil after it is filled in the transformer (within 3 months of filling) shall be as below :-	
A	Electric strength (breakdown voltage) min.	40 KV (min)
B	Dielectric dissipation factor (tan delta) at 90°c.	0.01 max.
C	Specific resistance (resistivity) at 27°c	10 x 10 <sup>12</sup> ohm-cm
D	Flash point PM (closed)	140°c min.
E	Interfacial tension at 27°c	0.03 N/m min.
F	Neutralization value (total acidity).	0.05 mg KOH per gm
G	Water content	35ppm (max.)

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**TECHNICAL SPECIFICATION OF LT DISTRIBUTION BOXES**

**(A) DISTRIBUTION BOXES (SHEET METAL)**

S. N.	Particulars	RATINGS
		100 kVA
1.	SCOPE	Manufacture & testing of L.T. distribution Boxes
2.	SYSTEM	AC 3 Phase 4 Wire 50 C/S.
3.	MATERIAL SHOULD BE SUITABLE IN THE WEATHER CONDITIONS AS BELOW (a) Temperature Range (b) Relative Humidity (c) Altitude	0o to 50oC 20% to Max.100% 0 to 1000 Meters
4.	SYSTEM DETAILS (a)kVA. (b)Voltage (c)Frequency (d)Approximate full load current. (e) No. of Outgoing Circuit per phase	Suitable for use with 100 kVA Distribution X'mer 415 VAC 50 C/S 140 A 3 Nos.
5.	APPLICABLE STANDARDS (WITH LATEST AMENDMENTS) (a) MCCBs (b) Enclosure Box (c) General Requirement (d) Porcelain Fuse Unit (e)LT Switchgear used in Box	IS:13947(P- II)/1993 IS:2147/1962 IS:4237/1982 IS: 2086-1973/1993 IS:8623(P- I)/1993 IS:13947(P- I)/1993
6.	MANUFACTURING/ CONSTRUCTIONAL DETAILS	One Triple Pole Moulded Case Circuit Breaker (MCCB) (Frame size 200A, O/L Current setting at 200A) on Incoming side and total 9 nos. Porcelain Fuse Units of rating of 200A on outgoing side for three circuits alongwith necessary interconnection with busbar & links with other components as per drawings enclosed.
7.	DETAILS OF INCOMING CURCUIT WITH TRIPLE POLE MOULDED CASE CIRCUIT BREAKER WITH SWITCH (MCCB)	MCCB shall conform IS:13947:1993. MCCB of reputed makes like Siemens, L&T, ABB, GE Power, Schnider-France, Spaceage-Hyundai, Havells etc. shall be acceptable. The offered make of the MCCB shall require approval of the CSEB. Type tests reports of the MCCB required to be submitted with the offer. The MCCB shall not cause any nuisance tripping due to dead load charging current or switching current of motor and capacitor load. The tripping of MCCB should be independent of the position of knob and it shall have quick make, quick break mechanism. The Switch of the MCCB should be capable of onload operation specially for making, carrying and breaking currents under normal circuit conditions which may include specified operating overload conditions and also carrying for a specified time current characteristics under specified abnormal circuit conditions such as those of short circuit.

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	(a) Rated Insulation VAC Voltage	should be more than 660 V
	(b) Rated Operating Voltage	415 V
	(c) Rated Impulse withstand voltage(kV)	6
	(d) Operating Current (Frame size)	200 Amps
	(e) Overload Currents setting (Fixed over load)	200 Amps
	(f) No. of pole	Three Pole
	(g) Rated Short circuit breaking capacity in kA (Icu) as per IS:13947 (Part-III)/1993	10 kA at 0.4 PF (LAG)
	(h) Rated Service Short circuit breaking capacity in kA (Ics) as per IS:13947 (Part- III)/1993	50% of Icu
	(i) The sequence of operation for MCCB	As per clause 8.3.4 of IS: 13947 (PII)
	(j) Utilization category	(A)
	(k) Power factor for short CKT Test	0.4 (LAG)
	(l) Arrangement of terminal strip of MCCB	(As per drawing)
	(m) Projections of terminal strips of MCCB on:-	Tinned Electrolytic Copper 60mm
	[i] Incoming side	60 mm
	[ii] Busbar side	30 x 5 Sqmm
	[iii] Size of terminal strips	
	(n) Material of the busbar strips	Continuous tinned copper strip from the point of contact.
	(o) Details of Type tests for MCCB	MCCB to be used in the distbn. Box must be type tested for Seq-I, Seq-II & Seq-III as per IS:13947 (Pt-II)/1993
	(p) Type of MCCBs to be used	Hydro-magnetic / Thermo-magnetic
	(q) Other	----
	(r) GUARANTEE	Being main equipment of Distribution Box, MCCB shall be guaranteed for 18 months. Bidders should furnish a Backup Guarantee of Manufacturer in prescribed proforma as per Annexure-II
	(s) THE TRIPLE POLE MCCB SHALL HAVE THE TIME CURRENT CHARACTERISTICS AS INDICATED BELOW:-	Multiple of Tripping Time normal current setting (O/L) of MCCB
		1.05 More than 2.5 Hrs. 1.2 More than 10 Minutes & less than 2 Hrs. 1.3 Less than 30 Minutes 1.4 Less than 10 Minutes 2.5 Less than 1 Minute 4 Not less than 2 seconds 6 Less than 5 seconds 12 Instantaneous (less than 40 Milliseconds)
	For the above time - current characteristics the reference calibration temperature of the breaker should be 50o C. Deration, if any, upto 60o C ambient temperature, shall not exceed 10% of the current setting indicated above.	
8.	OUTGOING CURCUIT DETAILS PORCELAIN FUSE UNIT SHALL BE PROVIDED AS PER DETAILS	

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	GIVEN BELOW :-	
	(a) No. of CKTs on Out-going side per phase.	2 Nos/phase
	(b) Current Rating	200 Amps
	(c) Base Size of PF Unit	200 x 80 mm
	(d) Details of Type tests for PF Unit	PF Units to be used in the Dist. Box must be type tested for Mechanical test sequence (i to v), Electrical test sequence (i to iv) and of material properties (i to iii) as per IS:2086-1993. The bidder should furnish attested copies of type test certificates.
	(e) Others	The rewirable PF-Units shall be as per drawing enclosed and conforming to IS:2086:1993. However, there shall be minor modification in the drawing of 300 Amp. fuse units so that fuse wire can be used in place of HRC link. For it, carrier should have a middle projection and fuse wire tightening arrangement as given in the drawing of 200 Amp. units. HRC fuse links are not to be supplied with the
9	DETAILS OF BUS- BAR & LINKS:-  A. Material  B. Size of main Bus- bar C. Size inter-link D. Insulations over the Bus-bar & links  E. Minimum Clearance between Busbar, Box and terminals of MCCB & PF Unit	Electrolytic tinned copper (All bus bar should be made of single strip without joint burrs and properly drilled) 30 x 5 Sqmm 30 x 3 Sqmm (As per drawing) PVC insulation of standard colour code i.e. Red, Yellow, Blue for R, Y & B Phase As per drawing & other clearance as per IS:4237 amended upto date
10	ENCLOSURES (i) Size  (ii) Material (iii) Thickness (iv) Arrangement for Pad lock  (v) Slopping of Roof  (vi) Magnetic Catcher	(900 x 950 x 325)mm (outer) As per drawing (inner) CR/MS Sheet 2 mm L-drop should be welded on the door for closing the door as well as for pad- locking. Slopping with 5 degree on back side A Magnetic Catcher should provided in such a way that when doors are pushed to closed condition, both the doors can be kept in closed condition due to magnet.
11	Size of Bottom plate perforated.  (i) Thickness of Bottom Plate (ii) Material of the	As per drawing  2mm Perforated MS

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	<p>Bottom Plate</p> <p>(iii) Fixing Arrangement of the Bottom Plate</p> <p>(iv) Knock out Holes in the Bottom plate</p> <p>(v) Additional Supports of the Bottom Plate</p>	<p>sheet.</p> <p>Should be detachable.</p> <p>3 Nos with PVC glands suitable for the required size of cable and additional 2mm thick sheet of suitable width to be provided to hold the cable glands.</p> <p>2mm thick perforated sheet</p>
	<p>(vi) Bottom Supports of Box</p> <p>(vii) Air Circulation &amp; clearance in the Box</p> <p>(viii) Clearance between the terminals of bus bar, MCCB and PF Unit</p> <p>(ix) Instructions to Lineman</p> <p>(x) Danger Board Identification Plate</p> <p>(xi) Hinges</p> <p>(xii) Other parts such as Nuts and Bolts Washers etc.</p>	<p>M.S. Channels of 75x40x3 mm size are to be provided below the box on both side as shown in the drawings, so that box does not come in direct contact with ground when stored.</p> <p>Both side louvers with wire mesh should be provided for vermin proof ventilation.</p> <p>Creepage should be as per IS:4237</p> <p>Instructions printed in Hindi to be provided as per drawing in side each box</p> <p>To be provided as per drawing and each box must have identification plate on the front cover.</p> <p>a) Name of the firm b) Rating Box c) Serial No. d) Order No. &amp; date As per drawing.</p> <p>All Nuts, Bolts &amp; Washers used in current carrying parts should be of good quality stainless steel. Petroleum Jelly should be provided in a small pack of polythene with each box which can be used by on nuts &amp; bolts by the linemen.</p>
12	<p>EARGHING STUDS</p> <p>(a) Required No.</p> <p>(b) Fixing</p> <p>(c) Size</p> <p>(d) Others</p>	<p>Two studs(one on each side) of galvanized MS 50x12 mm for external earth &amp; internal neutral connections.</p> <p>Earthing Studs should be welded at middle with the Box &amp; tightened with neutral bus-bar inside the box.</p> <p>As per drawing</p> <p>One set of one spring washer, two plain washers &amp; one nut should be provided on earthing stud inside the box and another set outside the box.</p>
13	<p>PAINTING &amp; FIXING ARRANGEMENT FOR BOX</p> <p>(a) Process</p>	

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	(b) Painting (c) Colour (d) Fixing Arrangement for Box	Electrostatically charged technique alongwith oven curing process  Powder Coating paint of good quality.  Green Suitable arrangement on a double pole structure as per drawing.
14	NEUTRAL BUSBAR  (a) Size  (b) Fixing	Neutral bus-bar should be continuous throughout the width of the box and connected to earthing studs on both sides as shown in the drawing.  30 x 5 Sqmm or equivalent As per drawing
15	LUGS ON INCOMING AND OUTGOING TERMINALS  (a) Size of Incoming side cable & lugs.  (b) Size of Outgoing cable & lugs.	Bimetallic lugs on incoming terminals of Cables to MCCB and outgoing side from PF Unit should be provided as per drawing suitable for the required size of 3-1/2 core Cable. The bimetallic lugs should conform to IS:8337 (e.g. clause 4.1.1, Clause 4.1.3 and Clause 4.2).  150 Sqmm 3-1/2 with suitable double holes lug. 70 Sqmm 3-1/2 Core size Cable suitable double hole lugs.
16	CABLE HOLDING CLAMP	Cable holding clamp be made of 2mm thick strip with 4 mm base to be provided on incoming side and outgoing side as per drawing.
17	OTHER REQUIREMENTS	There should be free circulation of Air between MCCB, bus-bar & PF Units at back and front so that the inside temp. does not exceed beyond permissible limits.
18	APPLICABLE STANDARDS FOR	IP-34 as per
	DEGREE OF PROTECTION	IS:13947(P-I) 1993
19	TEST & TEST CERTIFICATE (I) TYPE TESTS i) Temperature rise test  ii) High Voltage Test  iii) Short time withstand current test  iv) Degree of protection	Temperature rise test as per IS:8623/Pt-I/93  High Voltage Test should be done at 3.00 kV for one minute.  Short time withstand current test on Distribution Box. For short time current test the box should be subjected to a current of 10 kA for 1 Sec. for all the Ckt. Independently, after by-passing the

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	<p>v) Time/Current Characteristics</p> <p>vi) PORCELAIN FUSE UNIT</p>	<p>MCCBs.</p> <p>Degree of protection for IP-34 on complete unit as per IS:13947 or latest version thereof</p> <p>Time/Current Characteristics test should be done at 1.05 &amp; 1.2 times of O/L current setting and should pass the requirement given in clause-7(s) All type test as per IS 2086-1993 as amended upto date</p>
	(II) ROUTINE TEST	
	<p>CERTIFICATE</p> <p>Each Distbn. Box should be tested for the routine test as indicated. The routine test report indicating Sc. No. must be submitted with the offer at the time of inspection of the material.</p> <p>(III) ACCEPTANCE TESTS ON COMPLETE BOX</p> <p>These tests should be carried out as acceptance test in addition to routine test on one random sample in each rating out of the lot offered for inspection.</p>	<p>A. Over all dimension</p> <p>B. Insulation Resistance Test.</p> <p>C. H.V. with-stand test for 3.0 kV for one minute.</p> <p>D. Operation test on MCCB</p> <p>Temperature rise test:</p> <p>For this test, the box should be kept in an enclosure such that the temp. outside the box/MCCB shall be maintained at 50°C and the full load current of MCCB setting i.e. 200A is passed in all circuit and maintained till the temp. is stabilized and max. temp. rise is recorded. (These test should be carried on box and MCCB separately.</p>
		<p>Time/current characteristic test: With the stabilized temperature rise as above the MCCB should be tested for time current tested for time current characteristic at 1.05 and 1.2 times of over load release current setting and it should pass the requirement given as per Clause-7(s)</p>

(B) SMC DISTRIBUTION BOX :

S. N.	Particulars	63 kVA / 100 kVA RATINGS
1	<p>ENCLOSURE</p> <p>(i) Size</p> <p>(ii) Material</p> <p>(iii) Thickness</p>	<p>Size should be nearer to size specified for Sheet Metal but should not be more than Sheet Metal Boxes. Size will subject to approval as per sample. Drawing is also to be submitted for approval with the offer.</p> <p>Thermosetting plastic (glass fibre reinforced polyester Sheet Moulding Compound (SMC) conforming to IS 13410-1992. The SMC Meter Box shall have light grey colour.</p> <p>3 mm (back, load-bearing side)</p> <p>2 mm (other sides)</p>

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	(iv) Construction	The enclosure shall comply with the requirement IP-34 as per IS:13947 along with latest amendments thereof. Access to the equipments like MCCB and PF-Units housed inside, shall be available only after the enclosure door is opened. Enclosure made out of thermosetting plastic i.e. glass reinforced polyester sheet molding compound (SMC) conforming ISI 13410 -1992 as per requirement of this specification. The enclosure shall have two doors. The base and door of enclosure shall be individual in one piece except for fixing of the accessories like hinges clamps, mounting Clamps, Bolts etc. The box and door shall have thickness as mentioned above. The collars of base and door shall overlap by 10 mm. Four hinges of each side shall be fitted from inside of the box to fix the doors. Hinges shall be 50 mm in length and made from 2mm thick MS sheet. Hinge pin diameter shall be 4 mm. Doors shall be fixed with minimum 3 screws in each hinge. The hinges shall be visible from outside. On closing of doors right door shall rest on the left door. All other details of the construction and installation of accessories and equipments like MCCB, PF-Units, Bus-bar arrangements, pad-locking arrangement, magnetic catcher etc. shall be same as given for Sheet Metal Boxes. The entire construction shall be subject to approval as per sample and drawing submitted with the offer.																					
2	Properties of material of Sheet Moulding Compound (SMC)	<table border="1"> <thead> <tr> <th data-bbox="597 751 690 787">S.N</th> <th data-bbox="690 751 1096 787">Test details</th> <th data-bbox="1096 751 1458 787">Reference Standard</th> </tr> </thead> <tbody> <tr> <td data-bbox="597 787 690 823">1</td> <td data-bbox="690 787 1096 823">Flammability (Vo)</td> <td data-bbox="1096 787 1458 823">UL 94 or IS: 11731(Pt.II)</td> </tr> <tr> <td data-bbox="597 823 690 888">2</td> <td data-bbox="690 823 1096 888">Heat deflection temperature (min.150o C)</td> <td data-bbox="1096 823 1458 888">IS:13411</td> </tr> <tr> <td data-bbox="597 888 690 953">3</td> <td data-bbox="690 888 1096 953">Glow wire test</td> <td data-bbox="1096 888 1458 953">IEC 695 2-1 or IS:11000(Pt.2/sec.1)</td> </tr> <tr> <td data-bbox="597 953 690 989">4</td> <td data-bbox="690 953 1096 989">Ball pressure test</td> <td data-bbox="1096 953 1458 989">IEC:335</td> </tr> <tr> <td data-bbox="597 989 690 1024">5</td> <td data-bbox="690 989 1096 1024">Water absorption</td> <td data-bbox="1096 989 1458 1024">IS:14772</td> </tr> <tr> <td data-bbox="597 1024 690 1056">6</td> <td data-bbox="690 1024 1096 1056">Mechanical Strength</td> <td data-bbox="1096 1024 1458 1056">IS:14772</td> </tr> </tbody> </table>	S.N	Test details	Reference Standard	1	Flammability (Vo)	UL 94 or IS: 11731(Pt.II)	2	Heat deflection temperature (min.150o C)	IS:13411	3	Glow wire test	IEC 695 2-1 or IS:11000(Pt.2/sec.1)	4	Ball pressure test	IEC:335	5	Water absorption	IS:14772	6	Mechanical Strength	IS:14772
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3	Additional Type test for SMC material.	<p data-bbox="597 1283 1458 1377">Type tests are to be performed on material of distribution box in a Govt. approved Laboratory. Notarised photocopies of these type test should be submitted with the tender otherwise offer will be liable for rejection.</p> <p data-bbox="597 1377 1458 1413">(i) Test for water absorption (As per IS:13411:1992)</p> <p data-bbox="597 1413 1458 1478">(ii) Glass content percent test by mass(As per IS:13410,13411:1992)</p> <p data-bbox="597 1478 1458 1514">(iii) IZOD Impact Strength Test (As per IS:13410,13411:1992)</p> <p data-bbox="597 1514 1458 1579">(iv) Heat Distortion Temperature Test (As per IS:13410,13411:1992) (for 1500 C minimum)</p> <p data-bbox="597 1579 1458 1633">(v) Surface Resistivity Test (As per IS:13410:13396) (vi) Volume Resistivity Test (As per IS:13410:13396)</p>																					
4	Acceptance tests	<table border="1"> <tbody> <tr> <td data-bbox="597 1633 690 1669">(i)</td> <td data-bbox="690 1633 1209 1669">Marking</td> <td data-bbox="1209 1633 1458 1669">IS:14772</td> </tr> <tr> <td data-bbox="597 1669 690 1705">(ii)</td> <td data-bbox="690 1669 1209 1705">Protection against electric shock</td> <td data-bbox="1209 1669 1458 1705">IS:14772</td> </tr> <tr> <td data-bbox="597 1705 690 1740">(iii)</td> <td data-bbox="690 1705 1209 1740">Provision for earthing</td> <td data-bbox="1209 1705 1458 1740">IS:14772</td> </tr> <tr> <td data-bbox="597 1740 690 1776">(iv)</td> <td data-bbox="690 1740 1209 1776">Tests for dimensions</td> <td data-bbox="1209 1740 1458 1776">IS:14772</td> </tr> <tr> <td data-bbox="597 1776 690 1812">(v)</td> <td data-bbox="690 1776 1209 1812">Construction</td> <td data-bbox="1209 1776 1458 1812">IS:14772</td> </tr> <tr> <td data-bbox="597 1812 690 1848">(vi)</td> <td data-bbox="690 1812 1209 1848">Mechanical Strength</td> <td data-bbox="1209 1812 1458 1848">IS:14772</td> </tr> <tr> <td data-bbox="597 1848 690 1883">(vii)</td> <td data-bbox="690 1848 1209 1883">Spirit Burner Test</td> <td data-bbox="1209 1848 1458 1883">IS:4249:1967</td> </tr> </tbody> </table> <p data-bbox="597 1883 1458 1898">(Self extinguishing material)</p>	(i)	Marking	IS:14772	(ii)	Protection against electric shock	IS:14772	(iii)	Provision for earthing	IS:14772	(iv)	Tests for dimensions	IS:14772	(v)	Construction	IS:14772	(vi)	Mechanical Strength	IS:14772	(vii)	Spirit Burner Test	IS:4249:1967
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## TECHNICAL SPECIFICATION OF 11 KV AIR BREAK SWITCHES

1. SCOPE:- This specification provides for manufacture testing at works and delivery FOR destination of 11KV switches. The 11KV AB Switches shall conform to IS:9920(Part- I to IV).

2. A.B. SWITCHES: The 11KV Air Break Switches are required with three poles in each phase. The AB Switches shall be supplied complete with phase coupling shaft, operation rod and operating handle. It shall be manually gang operated and verifiably break and horizontal mounting type.

3. The AB Switch shall be designed for a normal current rating of 400 Amps and for continuous service at the system voltage specified here as under:-

i) 11KV AB Switch: 11KV + 10% continuous 50 C/s solidly grounded earthed neutral system.

The length of break in the air shall not be less than 400mm for 11KV AB Switches and 500 mm for 33KV AB switches.

4. The 11KV AB Switches are required with post insulators. The AB switches should be suitable for mounting on the structure. The mounting structure will be arranged by the purchaser separately. However, the AB Switches shall be supplied with base channel for mounting on the structure, which will be provided by the purchaser. The phase-to-phase spacing shall be 750 mm in cash of 11KV AB Switches.

### 5. POST INSULATORS:

The complete set of three phase AB Switches shall have stacks of post insulators.

11KV AB Switches : 1 No. 11KV Post Insulator per stack.

The post insulators should conform to the latest applicable Indian Standards IS:2544 specification for Porcelain post Insulators. Creepage distance should be adequate for highly polluted outdoor atmosphere in open atmosphere. The porcelain used for manufacture of AB Switches should be homogeneous free from flaws or imperfections that might affect the mechanical dielectric quality. They shall be thoroughly vitrified, tough and impervious to moisture. The glazing of the porcelain shall be of uniform brown in colour, free from blisters, burns and other similar defects. Insulators of the same rating and type shall be interchangeable.

The porcelain and metal parts shall be assembled in such a manner that any thermal expansion differential between the metal and porcelain parts through the range of temperature variation shall not loose the parts or create undue internal stresses which may affect the electrical or mechanical strength. Each cap and base of the insulators shall be interchangeable with each other. The cap and base shall be properly cemented with insulators to give perfect grip. Excess cement must be avoided.

6. Each 11KV post Insulators should have technical particulars as detailed below:

	11KV
i) Nominal system voltage KV (rms)	11
ii) Highest system voltage KV (rms)	12
iii) Dry power Frequency one KV	35
iv) Wet power frequency one minute withstand voltage (rms)	
v) Power Frequency puncture voltage KV (rms)	1.3 times the actual dry flashover voltage
vi) Impulse withstand voltage KV (Peak)	75
vii) Visible discharge voltage KV(rms)	9
viii) Creepage distance in mm (minimum)	320

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7. The rated insulation level of the AB Switches shall not be lower than the values specified below:

Sno	Standard Declared Voltage KV/RMS.	Ratio voltage of the A.B. Switch	Standard impulse withstand voltage positive & negative polarity KV (Peak)		One Minute power frequency withstand voltage KV (rms)	
			Across the isolating	To earth & between distance poles	Across the isolating	To earth & between distance poles
i.	11KV	12KV	85 KV	75 KV	32 KV	28 KV

8. TEMPERATURE RISE: - The maximum temperature attained by any part of the equipment when in service at site under continuous full load conditions and exposed to the direct rays of sun shall not exceed 450 C above ambient.

9. MAIN CONTACTS: - AB Switches shall have heavy duty self aligned type contacts made of hard drawn electrolytic copper/brass. The various parts should be accordingly finished to ensure interchangeability of similar components. The moving contacts of the switch shall be made from Haro drawn electrolytic copper/brass. These contact shall have dimensions so as to withstand safely the highest short-circuit currents and over voltage that may be encountered during service. The surface of the contact shall be rounded smooth and silver-plated. In nut shall the male and female contacts assemblies shall ensure that:-

- i) Electrodynamics withstand ability during short circuits without any risk of repulsion of contacts.
- ii) Thermal withstand ability during short circuits.
- iii) Constant contact pressure even when the lower parts of the insulators stacks are subjected to tensile stresses due to leaner expansion of connection bus bar of feasible conductors either because of temperature variations or strong winds.
- iv) Whipping action during closing and opening.
- v) Contact alignment assuring closing of the switch without minute adjustments.

10. CONNECTORS: The connectors shall be made of hard drawn electrolytic copper or brass suitable for raccoon/Dog ACSR conductor for both 11KV & 33 KV AB Switches. The connector should be 4 bolt type.

11. OPERATING MECHANISM: All A.B. Switches shall have separate independent manual operation. They should be provided with ON/OFF indicators and padlocking arrangements for locking in both the end positions to avoid unintentional operation. The isolating distances should also be visible for the A.B. Switches.

The AB Switch will be supplied with following accessories:

Sno	Item	Size of 11KV AB Switch
i.	Operating Rod (GI)	Length 5.50 mtrs Dia: 25 mm
ii.	Phase coupling square	Length 1800 mm size 25x25 mm
iii.	Operating handle (GI)	1 No.

The A.B. Switches shall be capable to resist any chance of opening out when in closed position. The operating Mechanism should be of robust constructions, easy to operative by single person and to be located conveniently for local operation in the switchyard. The G.I. pipe shall conform to ISS:1239-68. The vertical down rod should be provided with adequate joint in the mid section to avoid bending or buckling. Additional leverage should be provided to maintain mechanical force with minimum efforts.

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All iron parts should be not dip galvanized. All brass parts should be silver-plated and all nuts and bolts should be hot dip galvanized.

12. **ARCING HORNS:** It shall be simple and replaceable type. They should be capable of interrupting line charging current. They shall be of first made and after break type.

13. **BUSH:** The design and construction of bush shall embody all the features required to withstand climatic conditions specified so as to ensure dependable and effective operations specified even after long periods of inaction of these Air Break Switches. They shall be made from highly polished Bronze metal with adequate provision for periodic lubrication through nipples and vent.

14. **DESIGN, MATERIALS AND WORKMANSHIP:** The supplier shall assume full responsibility for co-ordination and adequate design. All materials used in the construction of equipment shall be of the appropriate class, well finished and of approved design and material. All similar parts should be accurately finished and interchangeable.

Special attention shall be paid to tropical treatment all the equipment, as it will be subjected during service to extremely severe exposure to atmospheric moisture and to long period of high ambient temperature. All current carrying parts shall be of non-ferrous metal or alloys and shall be designed to limit sharp points/edges and similar sharp faces.

15. Dimension of 11KV A.B. Switches in (Max.) tolerance 5%

Sno.	Particulars	11KV AB Switch
i.	Drawing No.	EB/P6/MPEB/7 (Revised) dt. 1.5.88
ii.	MS Channel	450x75x40
iii.	Creepage distance of Post Insulator.	320 mm (Min.)
iv.	Height it post shell	254 mm
v.	Fixed contact assembly	
	(a) Base	165x36x8
	(b) Contact	70x30x6
	(c) GI cover	110x44
(d)	Spring	Bronze Metal 6 Nos

16. Moving contact assembly

- |     |                     |              |
|-----|---------------------|--------------|
| (a) | Base Assembly       | 135x25x8     |
| (b) | Moving              | 18x25x9      |
| (c) | Bush                | Bronze Metal |
| (d) | Thickness of Groves | 7            |

17. Connectors:  
(Dimension of each pad) (Moving & fix both)

18. **ROUTINE TEST CERTIFICATE:** The Routine Test Certificate should invariably be submitted in duplicate of each lot offered for inspection as per ISS:9920 (Part-I to IV). The offers received without Routine Test Certificate shall not be entertained. This may please be noted.

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19. ACCEPTANCE TEST: At the time of inspection following tests shall be carried out:- i) Physical verification and measurement of dimension.  
 ii) Power frequency high voltage test. iii) Temperature rise test.  
 iv) Mechanical endurance test/operation test. v) Milli volt drop test.  
 vi) Galvanising test as per ISS:2633

20. Name plate: The name plate in the schedule-II following design shall be fixed on each A.B. Switch:-

- i) Name of Supplier : ii) Name of Purchaser : iii) Order No. and date  
 : iv) Rating v) Serial number of Units :

The size of name plate shall be 2"x1" for 11 KV and 2"x2" for 33 KV A.B. Switch.

#### TECHNICAL PARTICULARS FOR 11 KV A.B. SWITCHES

Sno	Particulars	11KV AB Switch
01	Type, make & country of origin	
02	Maximum permission continuous service voltage (KV)	12 KV
03	Length of the break/phase	Not less than 400mm
04	Phase to phase spacing	750 mm
05	Power frequency withstand test voltage for completely assembled switches:	
	(A) Against ground:-	
	(i) Dry KV	35
	(ii) Wet KV	35
	(B) Across open contact:-	
	(i) Dry KV	45
	(ii) Wet KV	45
	(C) Between phases:-	
	(i) Dry KV	35
	(ii) Wet KV	35
06	Impulse withstand test voltage of completely assembled switch without arcing horns with 1.25/ 50 micro second impulse wave (KV Peak)	75
07	100 % impulse flashover voltage of completely assembled switch with arcing horns with 1.2/50 micro-second impulse wave against ground (KV peak)	65
08	Particulars of the main contacts i.e. fixed contacts and moving contacts:	
	(a) Type	Heavy duty self aligned Jaw type fixed contact & Gun type moving contact.
	(b) Material	Brass
	(c) Surface treatment & thickness of silver coating	Silver plated 10/12 micron.
	(d) Contact pressure	Approx. 25 kg.
09	Continuous current rating (Amps)	400 Amp
10	Short time current rating KA (rms)	16
11	Rated peak short circuit current (KA peak)	40 KA.
12	No. of operations which the switch can withstand without deterioration of contacts.	1000 Nos
13	Type of mounting.	Horizontal
14	Type of Material used in Connector	Brass, four bolt type
15	Location and type of Bushing	At Rocking base, Bronze metal ring type

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Sno	Particulars	11KV AB Switch
16	Particulars of post insulators	
	i) Make	AC/IP/JSI/BHEL
	ii) Type	Post
	iii) Strength	Cantilever upright 550 Kg compression 3500kg
	iv) Weight	5 kg
	v) No. of units per stack	One
	vi) Height of stack mm	254
	vii) Creepage distance mm (Min. 320)	330
	viii) One minute dry withstand voltage KV (rms) Power frequency	70
	ix) Power frequency flashover voltage KV (rms)	110
	x) Impulse flashover voltage KV (Peak)	110
	xi) Impulse withstand voltage KV(Peak)	75
	xii) Puncture voltage (KV)	180

Note: Post Insulators of all standard makes will be used for manufacture of AB Switches.

PROPERTIES OF I.U. RAIL POLES:CHEMICAL COMPOSITION PERCENT

C	SI	S	P	MN
0.60	0.10	0.55	0.055	0.80
0.85	0.50	0.055	01.055	1.40

MECHANICAL PROPERTIES

Tensile strength MPa      Percentage Elongation

-----  
840 Min                      10.00 Min.  
840 Min.                      10.00 Min  
-----

**45 KN DISC INSULATOR**

3.1 SCOPE

This specification covers Porcelain Disc Insulator for use on 11 KV overhead power lines.

3.2 STANDARD

Except where they conflict with specific requirement in the specifications the Disc Insulator shall comply with the Indian Standard Specification IS 731/1971 and its amendment from time to time.

3.3 GENERAL REQUIREMENTS

The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed.

(i) Unless otherwise specified, the glaze shall be~ brown in colour. The glaze shall cover all the porcelain parts of the insulator except those areas, which serve as supports during firing or are left unglazed for the purpose of assembly.

(ii) The design Of insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. The porcelain shall not engage directly with

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hard metal.

(iii) Cement used in the construction of the insulator shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts correctly during cementing. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as uniform as possible.

### 3.4 TYPE OF INSULATOR

The insulator shall be of type "B" according to its construction

### 3.5 INSULATOR CHARACTERISTICS

The insulator shall have the electrical and mechanical characteristics which are given below:-

No.	Particulars	Disc Insulator
1.	Highest system voltage	12 KV (rms)
2.	Wet power frequency/withstand voltage for one	35 KV (rms)
3.	Visible discharge voltage	9 KV (rms)
4.	Power frequency puncture withstand voltage	105 KV (rms)
5.	Impulse withstand voltage	75 KV (peak)

3.6 The test voltage of insulator shall be as under :-

In this standard, power frequency voltages are expressed as peak values divide by  $\frac{1}{2}$  and impulse voltages are expressed as peak values.

The with-stand and flashover voltage are referred to the reference atmospheric conditions.

Minimum Failing Load : 45 KN

The insulator shall have minimum 230 mm creepage distance for a moderately polluted atmosphere.

### 3.7 TESTS

The insulators shall comply with the following tests as per IS 731-1971.

#### A. Type tests:

The following constitute the type tests

1. Visual examination
2. Verification of dimensions
3. Visible discharge test
4. Impulse voltage withstand test
5. Wet power frequency withstand test
6. Temperature cycle test
7. Electro-Mechanical failing load test
8. Puncture test
9. Porosity test
10. Galvanizing test

The test certificates from recognized Govt. lab for the tests carried out on prototype of same specifications shall be enclosed with the tender.

#### B. Routine tests:

1. Visual examination
2. Electrical Routine tests
3. Mechanical Routine tests

#### C. Acceptance tests:

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Acceptance of samples after having withstood the routine tests shall be subjected to the following acceptance tests in the order indicated below:-

1. Verification of dimensions
2. Temperature cycle test
3. Electro Mechanical failing load test
4. Puncture test
5. Porosity test
6. Galvanizing test

Tolerance in insulator dimensions shall be as per the relevant Indian Standard.

### 3.8 MARKING

Each insulator shall be legibly and indelibly marked to show the followings: -

- Name and trade mark of manufacturer
- Month and year of manufacture
- Minimum failing load in Newton
- Country of manufacture

Marking of porcelain shall be printed or engraved and shall be applied before firing. Disk insulator without above marking shall not be accepted~

### 3.9 PACKING

All insulators shall be packed in wooden crates suitable for easy but rough handling and acceptable for rail and road transport.

## POST INSULATOR

### 4.1 SCOPE

The specification covers Porcelain Post Insulator shells with metallic cap and base. These shells will be used for manufacturing of 11 KV Single Phasing AB switches / 3 phase AB Switches or n other equipment in the system.

### 4.2 STANDARDS

Post Insulator should conform latest applicable Indian IEC standards and in particular to the IS 2544 specification for Porcelain Post Insulators. Polygon or compact solids core or long rod insulator is also acceptable. Creepage distance should be adequate for highly polluted outdoor atmosphere in open execution. The porcelain used for manufacture of post insulator shall be homogeneous free from flaws or imperfections that might affect the mechanical or dielectric quality. They shall be thoroughly vitrified through and impervious to moisture. The glazing of the porcelain shall be of uniform brown colour, free from blisters, burns and other similar defects. Insulators of the same rating and type shall be interchangeable. The porcelain and metal parts shall be assembled in such a manner that any technical expansion differential between the metal and porcelain parts through the range of temperature variation shall not loosen the parts or create undue internal stresses which may affect the electrical or mechanical strength and rigidity. Each cap and base shall be of high-grade cast steel or malleable steel casting and they shall be machine faced and smoothly galvanized. The cap and base of the insulator shall be interchangeable with each other. The cap and base shall be properly cemented with insulators to give perfect grip. Excess cementing shall be avoided.

### 4.3 TEMPERATURE RISE

The maximum temperature attained by any part of the insulator when in service at site under continuous full load conditions and exposed to the direct rays of sun shall not exceed 45 degree centigrade above ambient temperature.

The corrections proposed shall be stated in the tender and shall be subjected to approval of the Owner

### 4.4 INSULATOR CHARACTERISTICS

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The insulator shall have the electrical and mechanical characteristics, which are given below -

Highest system voltage	12 KV (rms)
Dry one minute power frequency withstand	35 KV (rms)
Wet one minute Power frequency with stand voltage	35 KV (rms)
Power frequency puncture with stand voltage	1.3 times the actual dry flash over voltage of the unit
Impulse voltage withstand voltage	75 KV (peak)
Visible discharge voltage	9 KV (rms)

In this standard power frequency voltages are expressed as peak values divided by 1/2 and impulse voltage is expressed as peak values.

The with-stand and flashover voltage are referred to the reference climatic conditions.

#### 4.5 MECHANICAL CHARACTERISTICS

The insulators shall be suitable for the minimum failing load of 10 KN. Nature of load will be transverse.

#### 4.6 CREEP PAGE DISTANCE

The minimum creep page distance of 11 KV Post Insulators shall be 320 mm for highest system voltage of 12 KV.

#### 4.7 PACKING

All insulator shall be packed in wooden creates suitable for easy but rough handling and acceptable for rail and road transport.

#### 4.8 TEST

The insulator shall comply with following tests as per IS 2544 (1973).

#### 4.9 Type tests

Type tests are normally carried-out once and unless otherwise agreed to, test certificates giving the results of type tests, made on not less than 2 post insulators and post insulators unit identical in all essential details with those to be supplied are regarded as evidence of compliance. The tests should be carried out on two samples in the order mentioned below:

##### (i) Test on both Insulators:

1. Visual examination
2. Verification of dimensions
3. Visible discharge test
4. Impulse voltage withstand test
5. Wet power frequency voltage withstand test
6. Dry power frequency voltage withstand test
7. Temperature cyclic test

##### (ii) Test on first Insulators:

1. Mechanical strength test
2. Porosity test
3. Puncture test
4. Galvanizing test

The contactor shall invariably enclose with offer; the type test certificates and guaranteed technical particulars.

#### B. Routine tests:

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The following shall be carried out as routine tests:

1. Visual examination.
2. Electrical routine test

C. Acceptance test:

The test samples after having withstand the routine test shall be subject to the following acceptance tests in the order indicated below:

1. Verification of dimensions
2. Temperature cyclic test
3. Mechanical strength test
4. Puncture test
5. Porosity test
6. Galvanizing test

Tolerance in insulator dimensions shall be as per the relevant Indian Standards.

#### 4.9 MARKING

Each insulator shall be legibly and indelibly marked to show the following:

1. Name and trade mark of the manufacturer
2. Month and year of manufacturing
3. Minimum failing load in KN
4. Country of manufacturing

The above marking on porcelain shall be engraved and shall be applied before firing. Post insulator, without above markings shall not be accepted under any circumstances.

#### 4.10 DESIGN, MATERIALS AND WORKMANSHIP

The successful tenderer shall assume full responsibility for co-ordination and adequate design. All materials used in the manufacturing of insulator shall be of the appropriate class well finished and of approved design and make. All similar parts should be accurately finished and interchangeable.

All ferrous parts including bolts & nuts etc. used on the post insulators shall be heavily hot dip galvanized. Specific attention shall be paid to tropical treatment to the entire insulator, as it will be subject during service, to extremely severe exposure, to atmospheric moisture and to long period of high ambient temperature.

### **BOLTS AND NUT**

5.1 ISI Marked bolts and nuts made of black mild steel shall conform to IS: 6639 and galvanized as per IS:

1367 — Part 13) IS-2629. All bolts and nuts shall have hexagonal heads, the heads being forged out of solid truly concentric, and square with the shank, which must be perfectly straight..

(i) Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolt for 5.6 grade should be

310 MPA minimum as per IS —12427. Bolts should be provided with washer face in accordance with IS: 1363 Part — I to ensure proper bearing.

(ii) Nuts should be double chamfered as per the requirement of IS: 1363 Part-III 1984. The manufacturer should ensure that nuts should not be over tapped beyond 0.4 mm oversize on effective diameter for size up to M16.

(iii) Fully threaded bolts shall not be used The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.

(iv) All bolts shall be threaded to take the full depth of the nuts and threaded to permit the firm gripping of the component parts but no further. It shall be ensured that the threaded portion of the bolt protruded not less than 3 mm and not than 8 mm when fully tightened. All nuts shall fit and tight to the point where of the bolt connects to the head.

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- (v) Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanised. The of washers shall conform to IS: 2016.
- (vi) The Bidder shall furnish bolt schedules giving thickness of components connected the nut and the washer and the length of shank and the threaded portion of bolt and size of holes and any other special details of this nature.
- (vii) To obviate bending stress in bolt, it shall not connect aggregate thickness more than three time its diameter. Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.
- (viii) To ensure effective in-process quality control it is essential that the manufacturer should have all the testing facilities for tests like weight of zinc coating, shear strength, other testing facilities etc, in-house. The agency should also have proper Quality Assurance system which should be in line with the requirement of this Jon and IS —14000 services Quality System standard.

Fasteners of grade higher than 8.8 is not to be used.

## 5.2 RAW MATERIALS

MS round 16mm /12mm used shall be tested for quality as per IS: 2062 Gr. "A".

## 5.3 SPECIFICATION OF FINISHED PRODUCTS

The bolts & Nuts shall be ISI Marked Mild Steel of Black Grade "B" and shall be round with hexagonal head.

- (i) The Bolts and Nuts shall be manufactured by Hot/Cold forging process neatly and cleanly finished and shall have metric threads as per IS : 4218/1967 with its latest amendments.
- (ii) The dimensions of the bolts & nuts and tolerances should conform to IS: 1363 with their latest amendments in all respect. The eccentricity and angular errors of various elements shall be within specified limits as per IS: 1367/1967 with its latest amendments the bolts & nuts shall be free from forging and threading defects such as cuts, spats. burns, bulging taper eccentricity, loose fill etc. which may affect their serviceability.
- (iii) The colt heads and nuts shall be chamfered on one face only and other face shall be machined made.
- (iv) Mechanical property requirement of tester shall conform to IS: 1367 (Part-III) 1979 property class 4.6 for bolts & property class-5 for nuts as per IS: 1367 (Part VI) — 1980.
- (v) The bolts & nuts shall be supplied in well-cleaned conditions and suitably protected against corrosion in individual bags of 50 kgs.

## 5.4 ACCEPTANCE TESTS

The bidder should furnish test certificate from his awn/recognized Govt. Laboratory giving the results of tests as per IS: 1367 (Part-III) —1979 & IS: 1367 (Part-VI) 1980 witnessed by inspecting officer for each lot under inspection. The test certificate shall be in respect of the following for all sizes of both bolts & nuts as applicable given below:-

1. Dimensional particulars (Sampling lfl accordance with IS: 2614 for both bolts & nuts (tolerance as per drawing).
2. Tensile strength test on full size (for bolts minimum 400 NI Sq.mm and for Nuts Proof Stress test Mm 610 N/Sq. mm).
3. Power load test on full size bolts and M-12-51400 N for 15 Sec.
4. Head soundness tests for bolts (no fracture).
5. Brinell hardness tests or Rockwell Hardness or Vickers's Hardness tests for bolts min-114 & max. 209 or mm. 67 & max. 95 or mm. 120 & max. 220 respectively. For nuts Vickers's Hardness mm. 130 & max. 302.

## 5.5 PRE-DESPATCH INSPECTION AND TEST

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The bidder shall arrange to carryout acceptance tests in presence of owners inspecting officer in his own laboratory. In case testing facilities are not available at works he will make necessary arrangements for carrying out these tests at a Govt. recognized lab at his own expense(s) and will provide all testing arrangement for Board's representative to witness the tests.

**5.6 MARKINGS**

On the bolt head, there shall be identification marking of the manufacturer as well as property class '4.6". If possible property class "5" shall be marked on Nuts also. Further 'ISI' mark shall be marked on Sunny Bags for proper identification.

**TECHNICAL PARTICULARS FOR ACSR/AAA CONDUCTORS**

1. SCOPE: This specification provides for the Manufacture , Testing before despatch , supply and delivery of ISI Marked Aluminium Conductors Galvanised Steel Reinforced (ACSR) and All Aluminium Alloy (AAA) conductors.

2. STANDARD: The conductor shall strictly comply with the Indian Standard Specification IS:398 (Part-1 & 2)/1996 & (Part-4)/1994 with the latest amendments unless otherwise stipulated in this specification , or any other International Standards which ensure equal or higher quality material and workmanship.

**3. MATERIAL:**

3.1. The conductors offered shall be of best quality and workmanship. The steel reinforced aluminium conductors shall be manufactured of hard drawn EC Grade aluminium wires and high tensile galvanised steel wires of the sizes as specified in Table-I and with mechanical and electrical properties as specified in Table-II . The coating on the galvanized steel wires may be applied by hot process or electrolytic process in accordance with IS:4826-1979(specifications for hot dipped galvanized coatings on round steel wires). AAA conductor shall however be constructed of heat – treated aluminium magnesium silicon alloy wire .

3.2 The wires shall be smooth and free from all imperfections such as spills and splits and rolling and wire drawing defects etc., resulting in reduction in cross – sectional area over the entire length .

4. TOLERANCE: The following tolerance shall be permitted:-

- (i) Tolerance on Nominal diameter of Aluminium wires plus/minus 1%.
- (ii) Tolerance on Nominal diameter of High Tensile Galvanised Steel Wires plus / minus 2%.

**5. MODULUS OF ELASTICITY AND CO-EFFICIENT OF LINEAR EXPANSION:**

The values of the final modulus of elasticity and co-efficient of linear expansion of ACSR/AAA conductor shall be as given hereunder:-

Item	No. of wires	Final modulus of elasticity GN/mm2(practical)	Coefficient of linear expansion per 0 C Density at temp. of 20 0 C
ACSR	6/1(Al./Steel)	79 19.1X10-6 for ACSR conductor	7.8gm/cm3 (Steel ) 2.703gm/cm3(Al.)
ACSR	6/7(Al./Steel)	75 19.8X10-6 for ACSR conductor	7.8gm/cm3 (Steel)2.703gm/cm3 (Al.)

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AAAC	7	0.6324X106 kg/cm <sup>2</sup> 23.0X10 <sup>-6</sup> for Alu. Alloy	2.7 kg/dm <sup>3</sup> (Al. Alloy)
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The wires of Aluminium Alloy conductor shall be of heat treated aluminium , magnesium , silicon alloy having composition appropriate to the technical and electrical properties as specified in Table\_i of IS:398(Pt-4)/1994.

**6. JOINTS IN WIRES:**

- (a) No two joints shall be permitted in the aluminium strands closer than 15 metres. (b) No joints shall be permitted in galvanized steel wires.
- (c) In AAA conductors there shall be no joint in any wire/stranded conductor containing wires except those made in the base rod or wire before final drawing .

**7. STRANDING:**

7.1 The wires used in the manufacturing of a stranded conductor before stranding satisfy all requirement of IS:398(Part-2 & 4)/1996 & 1994 with its latest amendments. The lay ratio of the layer shall be within the limit given under clause-8 below.

7.2 In all construction , the successive layers shall have opposite directions of lay . The outermost layer being right handed . The wires in each layer shall be evenly and closely stranded.

8. LAY RATIO: The lay ratio ( ratio of the axial length of a complete turn of the helix formed by an individual wire in a stranded conductor to the external diameter of the helix ) shall be within the limit given below :-

Item No. of wires Ratio of Aluminium Wire dia to Steel wire dia Lay ratio for Aluminium wire

Alum-inum	Steel	Total	Lay ratio for Aluminium wire			
			Max.	Min.		
ACSR Conductor 6	1	7	1	14	10	
ACSR Conductor 6	7	13	3	14	10	
AAA Conductor 7(Al.Alloy)	NA		7(Al.Alloy)	NA	14	10

**9. PACKING AND MARKING:**

(A) The conductor shall be wound in non-returnable reels or drums conforming to IS:1778-1981 ( Specifications for reels and drums for bare wire ) or the latest version thereof . The drums shall be marked with the following details :-

- (a) Manufacturer's name
- (b) Trade Mark , if any
- (c) Drum No. & identification Number
- (d) Size of conductor
- (e) Number and lengths of pieces of conductor on each drum
- (f) Gross mass of the packing
- (g) Net mass of conductor
- (h) ISI or relevant international standard specification mark , if any
- (i) Name and address of the consignees.

**10. PACKING CONDITION:**

10.1 The reels/drums shall be of such constructions as to assure delivery of conductors free from displacement and damage and should be able to withstand all stresses due to handling and the stringing operation so that the conductor surface is not dented , scratched or damaged in any way during manufacture , transport and erection . The conductor shall be properly lugged on the drums.

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10.2 The conductor drums should be suitable for wheel mounting . Before reeling , the cardboard or other suitable material shall be secured to the drum and inside flanges of the drums . After reeling the conductor , the exposed surface should be wrapped with suitable soft material e.g. polythene sheet etc. across the flanges to protect the conductor from dirt , grit and damage during transportation and handling and also prevent ingress of rain water during storage / transport.

10.3 All wooden components shall be manufactured out of seasoned wood of good quality free from defect that may materially weaken the component parts of the drums . Preservative treatment for anti-termite / anti- fungus shall be applied to the entire drum with preservatives of a quality which is not harmful to the conductor .

11. STANDARD LENGTH AND GROSS WEIGHT OF CONDUCTOR: The gross weight of each packing shall not exceed to the following limits subject to a tolerance of  $\pm 10\%$  .

(i) For Steel Reinforced Aluminium Conductor of 20 mm<sup>2</sup> and 30 mm<sup>2</sup> - 1000 Kg  
Size ( & equivalent sizes of 22 mm<sup>2</sup> & 34 mm<sup>2</sup> of AAA Conductor) (Code word Squirrel & Weasel respectively .)

(ii) For Steel Reinforced Aluminium Conductor of 50 mm<sup>2</sup> and 80 mm<sup>2</sup> - 1500 Kg  
Size ( & equivalent sizes of 55 mm<sup>2</sup> & 80 mm<sup>2</sup> of AAA Conductor) (Code word Rabbit & Raccoon respectively .)

“The standard wire length for ACSR/AAA shall be 2 kms except for 80 mm<sup>2</sup> of ACSR & equivalent size of AAA conductor (code word “Raccoon”) and 50mm<sup>2</sup> of ACSR & equivalent size of AAA conductor (code word “Rabbit”) , for which it shall be 1.2 kms and 1.5 kms respectively . Longer lengths shall be acceptable . Short lengths of not less than 50% of the standard lengths , as indicated above , shall be acceptable to the maximum extent of 10% of the quantity ordered for each size”.

## 12. TESTS:

12.1 Samples of individual aluminium , aluminium alloy and steel wires for tests shall be taken before stranding from not less than 10% of the spools/coils . If samples are taken after stranding, they shall be obtained by cutting 1.2 metres from the outer end of the finished conductor from not more than 10% of the reels .

12.2 The mechanical tests shall be carried out on single wires only and not on complete conductor .

12.3 The following tests shall be carried out on Aluminium wires as per detailed procedure given in IS:398(Part-II)/1996 and on Aluminium Alloy wires as per detailed procedure given in IS:398(Part-4)/1994 :-

- (a) Breaking load test.(in both i.e. ACSR/AAA conductors)
- (b) Elongation test. (in case of AAA conductors only)
- (c) Wrapping test.(in case of ACSR conductors only)
- (d) Resistance test.( in both i.e. ACSR/AAA conductors)

12.4 The following tests shall be carried out on galvanized steel wire as per detailed procedure given in IS:398(Part-2)/1996 :-

- (a) Breaking load test.
- (b) Ductility test (by either of the procedures viz. Torsion test or Elongation test)
- (c) Wrapping test.

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(d) Galvanising test.(the uniformity of Galvanising and the weight of coating shall be in accordance with IS:4826-1968)

12.5 The Rejection and Re-test procedure shall be followed as stipulated in IS:398(Part-2)/1996 and IS:398(Part-4)/1994.

**13. CHECKING AND VERIFICATION OF LENGTH OF CONDUCTORS:**

The supplier/manufacturer of conductor should arrange for the inspection by the representative of the purchaser specially authorised for this purpose . At least 5% of the total number of drums of conductors taken at random should be checked to ascertain the lengths of conductor adopting either of the following two methods :-

(a)The drum alongwith the conductor should be weighed and six empty drums alongwith protective laggings & studs etc. normally used for winding the conductor should also be weighed . Net weight of the conductor should be calculated by subtracting the average weight of the six empty drums from the gross weight of the conductor and drums . Having known the weight of the conductor , the length of the conductor can be computed.

In case of empty conductor drums , a check weighment of every one in ten empty drums shall also be done before the conductors are wound on the drums .

(b)Arrangements should be made available in the works of the manufacturer for transferring the conductor from one reel to another at the same time measuring the length of the conductor so transferred by means of a meter . Percentage shortage , if any , in the length thus obtained and as declared by the supplier in the packing list shall be applied to all the drums .

**14. CHECK MEASUREMENT:**

Where length of conductor is verified by weighment basis , the determining factor will be length/weight ratio of the sample drums verified at the firm's premises of the lot of which the drum under measurement at the consignee's end forms a part .

(i) Wherever at the end of the consignee , length measurement machines are available , conductors shall be accepted by verification of lengths only and where the length measurement machines are not available , conductor shall be accepted on weighment basis .

(ii) In case , where the recorded weight on the drum tallies with the measured weight at consignee's end , then the conductor length shall be accepted as recorded on the drum . In other cases , the determining factor will be wight/lenth ratio of the sample(s) inspected at the firm's premises of the lot of which the drum under measurement at the consignee's end , forms a part . The factors of weight/length ratio shall however be made available to the consignees in the despatch instructions itself . If such factors are not available due to some reasons , actual measurement of diameter shall be made and weight/length ratio shall be obtained for the purpose of computing length .

**TECHNICAL SPECIFICATION FOR, R.S.JOIST.**

**a. MICRO ALLOYING ELEMENTS:-**

Elements, such as niobium, vanadium and titanium, added singly or in combination to obtain higher strength levels combined with better formability, weld ability and toughness as compared with non alloyed steel produced to equivalent strength levels.

**b. WELDABILITY:-**

A metallic substance is considered to be weldable by a given process and for the given purpose, when metallic continuity to a stated degree can be obtained by welding using a suitable procedure, so that the joints comply with the requirements specified in regard to both their local properties and their influence on the construction of which they form a part.

**3) SUPPLY OF MATERIALS:-**

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General requirements relating to supply of weldable structural steel shall confirm to IS 8910.

4) **GRADE OF MATERIAL:-**

The material shall be of Grade – A. Other details shall be as mentioned in IS 2062:1999 and its latest amendments.

7) **FREEDOM FROM DEFECTS:-**

ii) All finished steel shall be well and cleanly rolled to the dimensions, sections and masses specified. The finished material shall be reasonably free from surface flaws, laminations, rough/jagged and imperfect edges and all other harmful defects.

iii) Minor surface defects may be removed by the manufacturer by grinding provided the thickness is not reduced locally by more than 4 percent below the minimum specified thickness. Reduction in thickness by grinding greater than 4 percent, but not exceeding 7 percent may be allowed.

8) **CHEMICAL COMPOSITION:-**

The ladle analysis of the steel, when carried out by the method specified in the relevant parts of IS 228 for the required materials shall be strictly as below:-

Grade	Designation	Ladle analysis, percent, and max.					Carbon Equivalent (CE) Max	Deoxidation mode	Supply condition
		C	Mn	S	P	Si			
A	Fe 410 WA						0.42	Semi killed or killed	As rolled
		0.23	1.50	0.05	0.05	0.40			

9) **SELECTION & PREPARATION OF TEST SAMPLES:-**

The selection and preparation of samples for testing of the material should be done strictly as per the clause no. 9.1 to 9.9 of IS 2062 Part – I/1999.

10) **TESTS:-**

The following tests are to be conducted and required to confirm as per relevant test as specified in the IS 2062:1999 as below:-

S.No.	Name of test	Clause no. of IS 2062:1999
1.	Tensile test	10 (10.1 to 10.3.2)
2.	Bend test	11 (11.1 to 11.3.1)
3.	Impact test	12 (12.1 to 12.4)
4.	Y – groove crack ability test	13

11) **MECHANICAL PROPERTIES:-**

Grade: -	A
Designation	Fe 410 WA
Minimum Tensile strength in MPa: -	410 MPa

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Minimum Yield Stress in MPa: -	
<20 mm	250 Mpa
20 – 40 mm	240 Mpa
>40 mm	230 Mpa
Percent elongation at Gauge Length	
5.65 √So min.	23
Internal diameter of Bend (Min.)	3t
Charpy Y-Notch Impact Energy J, Min	--

12) DIMENSIONS:-

The nominal dimensions of R.S. Joist required in the table shown in the "SCOPE" of this schedule and shall be in accordance with the relevant IS as mentioned in table 4 of the IS 2062: 1999 at Page No. 6.

13) TOLERANCES:

The rolling and cutting tolerances for steel products conforming to IS 2062 : 1999 shall be those specified in IS 1852. The aforesaid tolerances shall be strictly followed.

14) RETEST: -

Should any one of test pieces first selected fail to pass any of the tests specified in this standard, two further samples shall be selected for testing in respect of each failure. Should the test pieces from both these additional samples pass, the material represented by the test samples shall be deemed to comply with the requirements of that particular test. Should the test pieces from either or these additional samples fail, the material represented by the test samples shall be considered as not having complied with this standard.

15) MARKING:-

a. Each products with the exception of round, square and hexagonal bars and flats, shall carry a tag or be marked with the manufacturer's name or trade – mark. Bars and flats shall carry a tag bearing the manufacturer's name or trade mark. Designation of steel should also be similarly marked on the product or tag

b. The ends of the rolled product shall be painted with Green colour.

16) BIS CERTIFICATION MARKING:-

The material may also be marked with Standard Mark according to Bureau of Indian Standards Act 1986 and the rules and regulations made there under.

CHEMICAL COMPOSITION AND PHYSICAL PROPERTIES OF STEEL SECTIONS CONFORMING TO IS-2062/84 AND ITS SUBSEQUENT AMENDED

CHEMICAL COMPOSITION FOR FE 10 WP GRADE

1. C	0.23%	MAX.
2. Mn.	1.5%	MAX.
3. S	0.050%	MAX.
4. P	0.50%	MAX.
5. SI	0.40%	MAX.
6. CE	0.42%	MAX.

Carbon Equivalent

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## MECHANICAL PROPERTIES

1. Tensile strength kgf/mm<sup>2</sup> Min - 42, N/Min. - 410
2. Yield stress Min. for thickness/diameter

< 20mm - 26 Kgf/mm<sup>2</sup> OR 250N/mm<sup>2</sup>

20-40mm - 24 Kgf/mm<sup>2</sup> OR 240N/mm<sup>2</sup>

> 40mm - 23 Kgf/mm<sup>2</sup> OR 230N/mm<sup>2</sup>

3. Elongation % - 23 Min.

4. End test (Internal Dia) Min 3-t

(t is the thickness of the material)

## TECHNICAL SPECIFICATION OF DIFFERENT STEEL SECTION

- 1) Scope: This tender is floated for the purchase of 948 MT M.S. "H" Beam 37.1 kg/metre 152 x 152 mm length 11 mtr. The specifications with quantity conforming to relevant IS nos. are as below:-

S. No.	Relevant IS to which it shall conform	Material Particulars
1	IS 2062: 1999 and latest amendment	Gr. A

2) The above material is required IS mark and of standard quality conforming to the following important technical point along with relevant IS.

3) The steel products conforming to the requirement of this specification can be rolled from the cast billet ingots, billets, blooms, slabs and continuously cast billets, blooms or slabs conforming to IS 2830:1992 "Carbon steel cast billet ingots, billets, blooms and slabs for re-rolling in to steel for general structural purposes (second revision)".

## TECHNICAL SPECIFICATION FOR, H-BEAM

a. MICRO ALLOYING ELEMENTS:-

Elements, such as niobium, vanadium and titanium, added singly or in combination to obtain higher strength levels combined with better formability, weld ability and toughness as compared with non alloyed steel produced to equivalent strength levels.

b. WELDABILITY:-

A metallic substance is considered to be weldable by a given process and for the given purpose, when metallic continuity to a stated degree can be obtained by welding using a suitable procedure, so that the joints comply with the requirements specified in regard to both their local properties and their influence on the construction of which they form a part.

4) SUPPLY OF MATERIALS:-

General requirements relating to supply of weldable structural steel shall conform to IS 8910.

5) GRADE OF MATERIAL:-

The material shall be of Grade – A. Other details shall be as mentioned in IS 2062:1999 and its latest amendments.

7) FREEDOM FROM DEFECTS:-

iv) All finished steel shall be well and cleanly rolled to the dimensions, sections and masses specified. The finished material shall be reasonably free from surface flaws, laminations, rough/jagged and imperfect edges and all other harmful defects.

v) Minor surface defects may be removed by the manufacturer by grinding provided the thickness is not reduced locally by more than 4 percent below the minimum specified thickness. Reduction in thickness by grinding greater than 4 percent, but not exceeding 7 percent may be allowed.

17) CHEMICAL COMPOSITION:-

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The ladle analysis of the steel, when carried out by the method specified in the relevant parts of IS 228 for the required materials at S. No. 1 to 40 shall be strictly as below:-

Grade	Designation	Ladle analysis, percent, and max.					Carbon Equivalent (CE) Max	Deoxidation mode	Supply condition
		C	Mn	S	P	Si			
A	Fe 410 WA	0.23	1.50	0.05	0.05	0.40	0.42	Semi killed or killed	As rolled

18) SELECTION & PREPARATION OF TEST SAMPLES:-

The selection and preparation of samples for testing of the material should be done strictly as per the clause no. 9.1 to 9.9 of IS 2062 Part – I/1999.

19) TESTS:-

The following tests are to be conducted and required to confirm as per relevant test as specified in the IS 2062:1999 as below:-

S.No.	Name of test	Clause no. of IS 2062:1999
1.	Tensile test	10 (10.1 to 10.3.2)
2.	Bend test	11 (11.1 to 11.3.1)
3.	Impact test	12 (12.1 to 12.4)
4.	Y – groove crack ability test	13

20) MECHANICAL PROPERTIES:-

Grade: -	A
Designation	Fe 410 WA
Minimum Tensile strength in MPa: -	410 MPa
Minimum Yield Stress in MPa: -	
<20 mm	250 Mpa
20 – 40 mm	240 Mpa
>40 mm	230 Mpa
Percent elongation at Gauge Length	
5.65 √So min.	23
Internal diameter of Bend (Min.)	3t
Charpy Y-Notch Impact Energy J, Min	--

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21) DIMENSIONS:-

The nominal dimensions of Angle, Joists, Channel, Plates, rounds, Flats, Tor-steel, I.U.M.S. Rail, H-beams etc. are required as per S.No. 1 to 43 of the table shown in the "SCOPE" of this schedule and shall be in accordance with the relevant IS as mentioned in table 4 of the IS 2062: 1999 at Page No. 6.

22) TOLERANCES:

The rolling and cutting tolerances for steel products conforming to IS 2062 : 1999 shall be those specified in IS 1852. The aforesaid tolerances shall be strictly followed.

23) RETEST: -

Should any one of test pieces first selected fail to pass any of the tests specified in this standard, two further samples shall be selected for testing in respect of each failure. Should the test pieces from both these additional samples pass, the material represented by the test samples shall be deemed to comply with the requirements of that particular test. Should the test pieces from either or these additional samples fail, the material represented by the test samples shall be considered as not having complied with this standard.

24) MARKING:-

a. Each products with the exception of round, square and hexagonal bars and flats, shall carry a tag or be marked with the manufacturer's name or trade – mark. Bars and flats shall carry a tag bearing the manufacturer's name or trade mark. Designation of steel should also be similarly marked on the product or tag

b. The ends of the rolled product shall be painted with Green color.

25) BIS CERTIFICATION MARKING:-

The material may also be marked with Standard Mark according to Bureau of Indian Standards Act 1986 and the rules and regulations made there under.

**TECHNICAL SPECIFICATION FOR LT XLPE POWER CABLES**

1. SCOPE:

The specification covers design, manufacture, shop testing, packing and delivery of 1100 Volts grade , Aluminium conductor , XLPE insulated multi core power cables.

2. SERVICE CONDITIONS:

Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.1	Maximum ambient temperature (deg C)	50
2.2	Maximum temperature in shade (deg C)	45
2.3	Minimum temperature in air (deg C) in shade	3.5
2.4	Relative Humidity (%)	10 to 100
2.5	Maximum annual Rainfall (mm)	1450
2.6	Maximum Wind Pressure (kg/mm2)	150
2.7	Maximum altitude above mean sea level (Meters)	1000
2.8	Isoceraunic level (days/year)	50
2.9	Seismic level (Horizontal acceleration)	0.3 g.
2.10	Ground temperature (deg. C )	30
2.11	Thermal Resistivity of soil ( deg. C cm / watt )	150
2.12	Depth of laying for 1.1 kV (cm)	75
2.13	Cables installed singly for twin / multi core cables and 3 Nos. of single core cables in Trefoil Touching	
2.14	Moderately hot and humid tropical climate, conducive to rust and fungus growth.	

3. STANDARDS:

3.1 Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the LT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited as per below:

Signature of Contractor.....

Signature of NRDA.....

**LIST OF STANDARDS  
(All amended upto date)**

SR.No.	STANDARD NO.	TITLE
1	IS: 7098( Part 1 )- 1988	Specification for XLPE insulated , PVC sheathed cables for working voltages upto and including 1100 Volts.
2	IS : 5831-1984	Specification for PVC insulation and sheath of electric cables.
3	IS: 8130-1984	Specification for conductors for insulated electric cables and flexible cords.
4	IS: 3975-1988	Specification for Mild Steel wires, formed wires and tapes for armouring of cables.
5	IS: 10462 ( Part I ) – 1983	Fictitious calculation method for determination of dimensionS of protective covering of cables.

4. GENERAL TECHNICAL REQUIREMENTS:

4.1 ARMOURED CABLES

1100 Volts Grade L.T. cable with stranded H2/H4 grade aluminium conductor , XLPE insulated , colour coded , laid up , with fillers and/or binder tape where necessary provided with extruded PVC inner sheath , single galvanized round steel wire / strip armoured and provided with PVC outer sheath . Both inner and outer sheath shall be of Type ST-2 as per IS: 5831-1984 and cable shall be conforming to IS: 7098 ( Part 1 ) - 1988 ( amended upto date ) and bearing ISI mark . In case of single core cable armouring shall be of almunium.

4.2 INSULATION , INNER SHEATH AND OUTER SHEATH :

Insulation , inner sheath and outer sheath shall be applied by separate extrusion . Inner sheath shall be applied by extrusion only. Bedding of PVC tape for inner sheath is not acceptable. Colour of outer sheath shall be black . The quality of insulation should be good and insulation should not be deteriorated when exposed to the climatic conditions.

4.3 SEQUENTIAL MARKING OF LENGTH ON CABLE

Non erasable Sequential Marking of length shall be provided by embossing on outer sheath of the cable for each meter length.

4.4 CONTINUOUS A.C. CURRENT CAPACITY:

Continuous a.c. current capacity shall be as per Table given below.

Conductor sizes in	Continuous A.C. current capacity in Amps	
	When laid direct in the ground 30 deg.C	When laid in air 40 deg.C
70 sq.mm	165	175
95 sq mm	200	224
120 sq mm	225	240
150 sq mm	255	305

4.5 SHORT CIRCUIT CURRENT

Short circuit current of LT XLPE cable shall be as per Table given below.

Duration of Short Circuit in sec	Area of Al. conductor	Short circuit current in kA
T	A	$I=0.094 \times A/\text{sq.rt} (t)$
1	70 sq.mm	6.58
1	95 sq.mm	8.93
1	120 sq.mm	11.28
1	150 sq.mm	14.10

Signature of Contractor.....

Signature of NRDA.....

## 5. TESTS :

### 5.1 TYPE TESTS:

All the type tests in accordance with IS: 7098 (Part 1) - 1988 (amended upto date) shall be submitted by the bidder at the time of submission of bid document. The details of facility available in the manufacturer's works in this connection should be given in the bid.

### 5.2 ROUTINE TESTS:

All the Routine tests as per IS: 7098 (Part 1) - 1988 amended upto date shall be carried out on each and every delivery length of cable. The result should be given in test report. The details of facility available in the manufacturer's works in this connection should be given in the bid.

### 5.3 ACCEPTANCE TESTS:

All Acceptance tests as per IS-7098 (Part-I) 1988 as amended upto date including the optional test as per clause no 15.4 and Flammability Test as per clause No. 16.3 shall be carried out on sample taken from the delivery lot.

5.4 The following additional acceptance test should be carried out on PVC compounds used for outer sheath , as per IS: 5831 - 1984 ( amended upto date )

#### 1.Hot Deformation Test.

### 5.4.1 TESTING FACILITIES AND DETAILS OF EQUIPMENTS :

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in IS: 7098 ( Part 1 ) - 1988 (amended upto date ) on the cable including test as per clause No.5.4 of specification. The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works. If any test cannot be carried out at manufacturer's works reason should be clearly stated in the tender.

## 6 PACKING AND MARKING :

### 6.1 a) Upto 120 sq. mm. Size :

Cables shall be supplied in continuous standard length of 500 meters with plus minus 5% ( five percent ) tolerance wound on non returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

### b) Above 120 sq.mm. size :

Cables shall be supplied in continuous standard length of 250 meters with plus minus 5% ( five percent ) tolerance wound on non returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

6.2 The following particulars shall be properly legible embossed on the cable sheath at the intervals of not exceeding one meter through out the length of the cable. The cables with poor and illegible embossing shall be liable for rejection.

- a) Manufactures name .
- b) Voltage grade.
- c) Year of manufacture.
- d) CSPDCL/NRDA.
- e) Successive Length.
- f) Size of cable
- g) ISI mark

Signature of Contractor.....

Signature of NRDA.....

6.3 Packing and marking shall be as per clause No. 18 of IS 7098 ( part I)/1988 mended up to date.

6.4 Supplier should provide statistical data regarding cables of all sizes viz.-

- 1) Weight of one meter of finished product of cable of various sizes and ratings.
- 2) Weight of one meter of bare conductor used for cables of various sizes and ratings.

**7. QUALITY ASSURANCE PLAN:**

A detailed list of bought out items which got into the manufacture of cables should be furnished indicating the name of the firms from whom these items are procured.. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking. The Company may at its option order the verification of these plans at manufacturer's works as a pre qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

**8. SCHEDULES:**

8.1 The tenderer shall submit the list of orders for similar type of equipments, executed or under execution during the last three years.

Signature of Contractor.....

Signature of NRDA.....



## NAYA RAIPUR DEVELOPMENT AUTHORITY

Near Mahanadi Dwar, Mantralaya, Raipur-492001, Chhattisgarh  
Ph:0771-4066011 Fax:0771-4066188, Website: [www.nayaraipur.com](http://www.nayaraipur.com)

### Tender Notice

NIT no. /STREETLIGHT//NRDA/ELECT-INFRA/05/2011-12, Raipur, dated: 03/08/2011

Sealed tenders are invited from the registered electrical contractors with CSPDCL in Class I & Class II category or any other Govt. /Semi-Govt. departments in equivalent category, who fulfill the Pre-Qualification criteria, for the work of **“Supply, Installation, Testing and Commissioning of LT Under Ground Cable and 13 Nos. 100 KVA 11/4 kV Plinth mounted Transformers at various locations at Naya Raipur for Street Light supply”** as detailed below:

Time allowed including monsoon season	Estimated Cost (₹ in Lacs)	EMD (₹ in Lacs)	Cost of Tender Document (₹)	Pre -Qualification Criteria		
				Average Annual turnover in last three financial years (₹ in Lacs)	Work completed satisfactorily during last three years	
					Distribution Transformer	Underground/overhead line work of LT line or higher voltage
3 months	177.81	1.80	5,000	300	6 Nos	15 kms

Bids are invited in three envelope system. Detailed NIT can be seen on website [www.nayaraipur.com](http://www.nayaraipur.com)  
Tenders can be downloaded from the website [www.nayaraipur.com](http://www.nayaraipur.com) and also can be purchased on any working day from **04.08.2011 to 19.08.2011, upto 16.00 hrs** from the Accountant NRDA, Raipur. The last date for submission of the tenders by speed post/registered post/ courier is **23.08.2011, upto 15.00 hrs**. Documents shall be opened thereafter on same day after 16.00hrs. Amendment in tender, if any, will only be posted on the website and shall not be published in any newspaper.

**Credible Chhattisgarh**  
विश्वसनीय छत्तीसगढ़

Chief Executive Officer

Signature of Contractor.....

Signature of NRDA.....

(Revised from Bank Guarantee Bond)

**(GUARANTEE BOND)**

**(In lieu of performance Security Deposit)**

**(To be used by approved Scheduled bank)**

1. In consideration of the CEO, NRDA (here in after called the NRDA) having agreed to exempt ..... (Herein after called the contractor (s) from the demand under the terms and conditions of an agreement dated ..... made between ,, for the work (Name of work) ..... (hereinafter called the said Agreement) of security deposit for the due fulfillment by the said contractor (s) of the terms and conditions contained in the said agreements on production of a bank Guarantee for Rs. .... Rupees ..... Only, we. (.) ..... (hereinafter referred to as " the bank (at the request of the said contractor (s) do here by undertake to pay the NRDA an amount not exceeding Rs. .... against any loss or damage caused to or would be caused to or suffered by the NRDA, by reasons of any breach by the said contractor (s) of the terms or conditions contained in the said agreement.

2. We (.) ..... do here by undertake to pay the amount due and payable under this guarantee without any demur merely on demand from the NRDA stating the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the NRDA by reason of breach by the said contractor (s) of any of the terms or conditions contained in the said agreements or by reasons of the contractor (s) failure to perform the said agreement, Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee, However our liability under this Guarantee, shall be restricted to an amount not exceeding .....

3. We undertake to pay to the NRDA any money so demanded not with standing any dispute or disputes raised by the contractor (s) in any suit or proceedings pending before any court or tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor (s) shall have no claim against us for making such payments.

Signature of Contractor.....

Signature of NRDA.....

4. We (.) ..... further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of said agreement and that it shall continue to be enforce able till all the dues o the NRDA under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the Executive Engineer, NRDA certified that the terms and conditions of the said agreement have been fully and property carried out by the said contractor (s) and terms and conditions of the said agreement have been fully and property carried out by the said contractor (s) and accordingly discharged this guarantee, unless a demand to claim under this Guarantee is made on us in writing on or before the (here indicate a date which falls 9 months beyond the due date of completion of the work) ..... we shall be discharged from all liability under the guarantee.

5. We (.) ..... further agree with that the NRDA, shall have the fullest liberty without our consent and with out affecting in any manner our obligation here under to vary any of the terms and conditions of the said agreement or to extend time of performance by the said contractor (s) from time to time or to postpone for any time or for time to time any of the powers exercise able by the NRDA. Against the said contractor (s) and to for bear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reasons of any such variations or extension being granted to the said contractor (s) or for barnacle, act or commission on the part of the NRDA or any indulgence by the NRDA to the said contractor (s) or by any such matter or thing what so ever which under the lay relating to suites would but for this provision have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor (s).

7. We (.) ..... lastly under take not to revoke this guarantee during its currency except with the previous consent of the NRDA in writing:-

Dated the ..... day of ..... for ( ) .....(>)  
indicate the Name of the Bank .....

Signature of Contractor.....

Signature of NRDA.....