TENDER SPECIFICATION NO. RVPN /SE/T&C/HND/ BN- 06 /2017-18 D. 550 Dt.

Tenders are hereby invited in e-tender system for construction work 132 KV GSS RIICO Dholpur. Tenders are to be submitted online in electronic format on website http://eproc.rajasthan.gov.in. The tender document/specification can be downloaded from above mentioned website.

GENERAL DETAIL OF WORKS:

<table>
<thead>
<tr>
<th>A</th>
<th>NIT No.</th>
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<tr>
<td>B</td>
<td>Work Description</td>
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<tr>
<td></td>
<td>Earth Mesh, Erection of Sub-Station Structure, Bus bar stringing, equipment erection and Cabling work at 132 KV GSS RIICO Dholpur</td>
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<tr>
<td>C</td>
<td>Cost of Tender Specification</td>
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<tr>
<td></td>
<td>Rs. 2500.00 (Two Thousand Five Hundred Only)</td>
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<td></td>
<td>{Including 18% GST}</td>
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<td>D</td>
<td>Processing fee of RISL</td>
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<td></td>
<td>Rs. 1000/-</td>
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<td>E</td>
<td>Bid Security</td>
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<td>Rs. 22000/- Only</td>
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<td>F</td>
<td>Estimated Cost</td>
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<td></td>
<td>Rs. 1100000/- (Approx.)</td>
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<tr>
<td>G</td>
<td>Validity</td>
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<td>120 days after the date of Tender Opening</td>
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</table>

IMPORTANT DATES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Events</th>
<th>Date &amp; Time</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Date of downloading of tender specification</td>
<td>07/07/2017 (10:00 Hours) to 28/07/2017 (18:00 Hours)</td>
<td><a href="http://eproc.rajasthan.gov.in">http://eproc.rajasthan.gov.in</a> and <a href="http://sppp.rajasthan.gov.in">http://sppp.rajasthan.gov.in</a></td>
</tr>
<tr>
<td>(ii)</td>
<td>Deposit of Cost of Tender Specification, Processing Fee &amp; Bid Security</td>
<td>27/07/2017 Up to (14:00 Hours)</td>
<td>Office of the SE(T&amp;C), RVPN, Hindaun, <a href="http://eproc.rajasthan.gov.in">http://eproc.rajasthan.gov.in</a></td>
</tr>
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<td>(iv)</td>
<td>Last date &amp; time of submission of electronic bid</td>
<td>28/07/2017 (18:00 Hours)</td>
<td><a href="http://eproc.rajasthan.gov.in">http://eproc.rajasthan.gov.in</a></td>
</tr>
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<td>(v)</td>
<td>Opening of Technical Bid</td>
<td>01/08/2017 (14:00 Hours)</td>
<td><a href="http://eproc.rajasthan.gov.in">http://eproc.rajasthan.gov.in</a></td>
</tr>
<tr>
<td>(vi)</td>
<td>Opening of Price Bid</td>
<td>To be intimated separately to the qualified bidders</td>
<td><a href="http://eproc.rajasthan.gov.in">http://eproc.rajasthan.gov.in</a></td>
</tr>
<tr>
<td>(vii)</td>
<td>Pre Bid Meeting</td>
<td>21/07/2017 (11:00 Hrs)</td>
<td>Office of the SE(T&amp;C), RVPN, Hindaun</td>
</tr>
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</table>
1. The bidders are requested to submit their bids prior to last date of submission to avoid Non-submission of their bids up to prescribed date due to non-availability of / hanging of website at last moments. The date of submission of bids will not be extended if system is hang up in last hours or congestion.

2. Furnishing of Bid Security / Exemption certificate as per clause No.1.03 of Section-I of this specification is essential otherwise the electronic bid will not be opened.

3. (i) The bidder will have to deposit prescribed cost of tender specification by DD/Banker’s cheque payable in favour of Accounts Officer (T&C), RVPN, Hindaun up to stipulated date & time in the office of the A.O (T&C) RVPN, Hindaun and obtain a receipt thereof.
(ii) The bidder will have to deposit prescribed Bid Security by DD/Banker’s Cheque payable in favour of Accounts Officer (T&C) RVPN, Hindaun payable at Hindaun or Bank guarantee in favour of Superintending Engineer (T&C), RVPN, Hindaun in prescribed format (Annexure-I) up to stipulated date & time in the office of the A.O (T&C) RVPN, Hindaun and obtain a receipt/ acknowledgement thereof and they shall upload the receipt/ acknowledgement along with their online bid.

4. Bid security is to be furnished also by the Vendors registered with the NIGAM.

5. The Central and State Govt. undertaking/Corporations and companies are exempted from furnishing of bid security. However, they have to upload copy of certificate/documentary evidence in support of their being Govt. undertaking, with their bid.

6. Offers of bids without relevant documents with respect to qualifying requirements shall not be considered, as per mention in point no. 21.

7. Technical and Commercial deviations, if any, shall only be mentioned in Schedule-V Section IV 'Departure from the Specification' attached with this specification. Mentioning of such deviations elsewhere in the offer will not be considered as deviation. The printed terms and conditions of firms, if any, attached with the tender will not be considered. RVPN shall have right to accept or reject these deviations.

8. Offers of bids without Schedule-I to VIII and without relevant documents with respect to qualifying requirements shall not be considered.

9. Any cutting / over writing in the figures of tendered documents should also be clarified / indicated in words duly signed.

10. The bidders are required to furnish the clarification/confirmation/ documents sought subsequent to opening of bid within specified time failing which, the case shall be finalized/decided on the basis of available information. The responsibility of being ignored on account of delay in furnishing of desired information/documents shall be of the bidder.

11. The tender documents can be downloaded from web site http://eproc.rajasthan.gov.in. Details of this tender notification and pre-qualification criteria can also be seen in NIT exhibited on website www.rvpn.co.in. Tenders are to be submitted online in electronic format only on website http://eproc.rajasthan.gov.in.
12. The bidders who are interested in bidding can download tender documents from http://eproc.rajasthan.gov.in up to the stipulated date & time.

13. Bidders who wish to participate in this tender will have to register on http://eproc.rajasthan.gov.in (bidders registered on eproc.rajasthan.gov.in before 30.09.2011 need to register again). To participate in online tenders, bidders will have to procure Digital Signature Certificate (Type-II or Type-III) as per Information Technology Act-2000 by using which they can sign their electronic bids. Bidders can procure the same from any CCA approved certifying agency i.e TCS, SafeCrypt, Neode etc. or they may contact e-Procurement Cell, Department of IT & C, Government of Rajasthan for future assistance. Bidders who already have a valid Digital Certificate need not to procure a new Digital Certificate.

Contact No. 0141 – 4022688 (Help desk 10.00 AM to 6.00 PM on all working days) .e-mail eproc@rajasthan.gov.in
Address : e-Procurement Cell, RISL, Yojana Bhawan, Tilak Marg, C-Scheme, Jaipur

14. Bidder shall submit their offer online in electronic formats both for technical and financial proposals. However, cost of specification and Bid Security in the office of A.O (T&C) RVPN, Hindaun should be submitted physically in the Office of The Superintending Engineer (T&C), RVPN, Hindaun up to stipulated date & time. The tenderer shall upload scanned copies of receipts / acknowledgement of above fee documents along with their online bid.

15. Before electronically submitting the tenders, it should be ensured that all the tender papers including conditions of contract are digitally signed by the tenderer.

16. Bidders are also advised to refer “Bidders Manual” available under “Downloads” section for further details about the e-tendering process.

17. The tenders are being invited by Superintending Engineer[T&C] Rajasthan Rajya Vidyut Prasarani Nigam Limited having office at 400 KV GSS Hindaun [Rajasthan] Email id is se.tnc.hindaun@rvpn.co.in and contact no. is 9414061384, Sh. D.K. Sharma,SE[T&C] RVPN Hindaun.


19. The construction work is to be done as per RVPN BSR-2017 effective from 01.04.2017 for which Bill of Quantity (BOQ) shall be provided with Bid specification.

20. The work is to be completed within 3 Months of placement of order (15 days time for mobilization of resources in addition to the above mentioned completion Time).

21. Qualifying Requirement: Only those firms who have completed construction of any 220 KV GSS, 132 KV GSS and above or part thereof of minimum of Rs. 5 Lacs within the five year up to the date of opening of tender on labour contract and have completed within the contract time of the work order will be qualified for price bid. A completion certificate issued by authority not below the rank of Superintending Engineer in case of RVPN and Project Manager in case of other than of RVPN is to be enclosed as proof of qualification.

22. The Purchaser does not bind himself to accept the lowest or any Bid or any part of the Bid and shall not assign any reason(s) for the rejection of any Bid or a part thereof.

23. The bidder will have to quote the FIRM prices inclusive of all taxes and duties and other related Cost.

24. The online tenders will have to be digitally signed and submitted in time specified on http://eproc.rajasthan.gov.in in the following manner:
ONLINE SUBMISSION:
The tenderer have to submit their bid in 3 covers comprises of

(a) Cover 1 (.pdf) : FEE (scanned copies)

(i) Proof of depositing cost of tender specification i.e the receipt issued by the ACCOUNTS OFFICER (T&C), RVPN,HINDAUN on account of depositing the cost of tender specification through DD/Banker’s Cheque payable in favour of Accounts Officer (T&C),RVPN, Hindaun.

(ii) Proof of submitting Processing Fee i.e. the acknowledgement issued by the SE (T&C), RVPN, Hindaun on account of depositing the processing fee (Rs.1000.00) through DD/Banker’s Cheque in favour of M.D, RISL payable at Jaipur.

(iii) (a) Proof of depositing bid security i.e the receipt/ acknowledgement issued by the ACCOUNTS OFFICER (T&C), RVPN, HINDAUN on account of depositing bid security through DD/Banker’s Cheque payable in favour of Accounts Officer(T&C)RVPN, Hindaun or bank guarantee in prescribed format.

(b) Bid security is to be furnished also by the Vendors registered with the NIGAM.

(c) The Central and State Govt. undertaking/Corporations and companies are also exempted from furnishing of bid security. However, they have to upload copy of certificate/documentary evidence in support of their being Govt. undertaking, with their bid.

(b) Cover 2 (.pdf) : TECHNO COMMERCIAL BID (scanned copies)

The technical information has to be prepared very carefully since it will be the basis for the pre-qualification of bidders. Only relevant and to the point information should be indicated. Tenderers should neither supply information not requested in the specification nor make any comments. Failure to provide any required information, may lead to the rejection of the offer. Tenderer must read Section-I, Section-II, Section-II(A), Section-III & Appendix of specification very carefully before signing on it. Similarly, Schedules-I to VIII of Section-IV, Documents in support of qualifying requirement & Bar-chart etc. must be signed digitally on each & every page by the authorized representative of the firm after filling requisite information/details, desired in the specification & PQR (Pre-Qualifying Requirement).

(c) Cover 3 (.xls) : FINANCE : PRICE BID

This cover consists of price schedules (BOQ) for Earth Mesh, Erection of Sub-Station Structure, Bus bar stringing, equipment erection and Cabling work at 132 KV GSS RIICO Dholpur. The tenderer must quote the prices for the construction of GSS in the manner as indicated in the Price schedules, failing which Bid is liable for rejection. The rates/prices shall be entered in figures in % Excess / Less. These schedule(s) must be digitally signed by the authorized representative of the firm.

25. The tenderer, if is a Micro, Small or Medium enterprise as per the Micro, Small & Medium enterprise development act, 2006 (MSMED Act 2006) and registered with the authorities under the above Act for the items/services covered under this tender, then the firm has to indicate the Entrepreneurs Memorandum No. (Twelve Digit) and scanned copy of the certificate issued by the Authorities under the MSMED Act, 2006 should be uploaded along with the online bid.

26. Payment shall be made to supplier/contractor through RTGS/NEFT for quick and safe transfer of funds across the country. The charges for transfer through RTGS/NEFT shall be on the part of supplier/contractor. The supplier/contractor shall furnish particulars to the payment making authorities of RVPN in prescribed format to be provided by the purchaser.

27. This specification includes Section-I, Section-II, Section-II(A), Section-III, Appendix and Section-IV(Schedules).

SUPERINTENDING ENGINEER (T&C)
RVPN,HINDAUN
TENDER SPECIFICATIONS FOR AWARD OF CONTRACTS FOR EARTH MESH, ERECTION OF SUB-STATION STRUCTURE, BUS BAR STRINGING, EQUIPMENT ERECTION AND CABLING WORK AT 132 KV GSS RIICO Dholpur UNDER S.E.(T&C), VPN, HINDAUN.

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<td>SECTION-II &quot;GENERAL CONDITIONS OF CONTRACT INCLUDING ERECTION&quot;</td>
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<td>SECTION-III &quot;TECHNICAL PARTICULARS&quot;</td>
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<td>124-128</td>
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SECTION-I
INSTRUCTIONS TO TENDERERS

1.01 INTRODUCTION:
The bidder, in his own interest, is requested to read very carefully these instructions and the terms and conditions as incorporated in Sections – II, II A, III and IV before filling the bid form. Submission of the bid shall be deemed to be the conclusive proof of the fact that the bidder has acquainted himself and is in agreement with all the instructions, terms and conditions governing the specification, unless otherwise specifically indicated / commented by him in his bid.

1.02 FILLING OF BIDS:

a) For procurement of Goods & Services having estimated value of Rs. Ten lakh or more, and procurement of works (labour contracts) having estimated value of Rs. Five lakh or more shall be submitted online in the electronic format attached hereto and all blanks in the bid and the schedule to the specification shall be duly filled in. The completed forms and schedule(s) shall be considered as part of the contract documents in the case of successful bidder(s).

b) No alteration should be made to the form of the bid specification and schedules. The bidder must comply entirely with specification. Alternative proposals, if any, shall be clearly stated in the covering letter and shall accompany each copy of the bid.

c) The bid and all accompanying documents shall be in Hindi / English Language and shall be signed by a responsible and authorized person. The name, designation and authority of the signatory shall be stated in the bid.

d) Bid should be filled in only with ink or typed. No bid filled in by pencil or otherwise shall be considered.

e) All additions, alterations, and over writings in the bid must be clearly initialed by the Signatory to the bid.

f) The bidder must quote the prices strictly in the manner as indicated herein, failing which bid is liable for rejection. The rates / prices shall be entered in words as well as in figures. These must not contain any additions, alterations, over writings, cuttings or corrections and any other marking which leave any room for doubt.

g) The NIGAM will not be responsible to accept any cost involved in the preparation or submission of bids.

h) All bids and accompanying documents will have to be digitally signed and submitted in time specified on http://eproc.rajasthan.gov.in

i) The bidder should digitally sign the bid form at each every page at the end.

j) Any printed conditions of sale on the bid shall not be accepted by the NIGAM. The bidder shall incorporate his conditions of sales, if any, in the text of the bid itself.

k) Telegraphic quotation or quotations sent by fax or email will not be considered.
1.03 BID SECURITY:

(a) The bidder shall have to furnish prescribed Bid Security by DD/Banker’s cheque payable in the name of Accounts Officer (T&C) RVPN, Hindaul payable at Hindaul or Bank guarantee in favour of Superintending Engineer (T&C), RVPN, Hindaul in prescribed format (Annexure-IV) up to stipulated date & time and obtain a receipt/ acknowledgement thereof. No other mode of deposit shall be accepted.

(b) Any bid not accompanied by a copy of receipt/ acknowledgement for cost of Bid Specification (exempted in case limited bid) and bid security / Exemption Certificate shall be rejected and the bid will not be opened.

(c) The bid security of unsuccessful bidders shall be refunded soon after final acceptance of successful bid and signing of contract agreement and submitting performance security either in form of bank guarantee (B.G.) or crossed Bank Draft or by furnishing an undertaking for deduction of performance security from his each running and final bill @ 10% of the amount of the bill by successful bidder(s). In case of the successful bidder, the amount of bid security may be adjusted in arriving at the amount of the Performance Security, or refunded if the successful bidder furnishes the full amount of performance security.

(d) Request for adjustments/ proposal for acceptance of bid security, if any, already lying with the NIGAM in connection with some other bids/orders shall not be entertained.

(e) No interest shall be payable on such deposits.

(f) The purchaser reserves the right to forfeit bid security or part thereof in circumstance, which according to him indicate that the bidder is not earnest in accepting/ executing any order placed Under the specification.

(g) Bid security is to be furnished also by the Vendors registered with the NIGAM.

(h) A pre-bid conference is also scheduled to clarify doubts within the period specified in the NIB of the Prospective bidders who have deposited the cost of bid specification as per the details mentioned in the clause No.1.16 of Section-I. The minutes and response shall be provided promptly to all bidders and shall be published on the respective websites.

(i) The Bank guarantee in lieu of Bid security shall be furnished from a scheduled bank in favour of Accounts Officer (T&C), RVPN Ltd., Hindaul payable at Hindaul in prescribed format (Annexure-IV) on the Rajasthan state non judicial stamp paper of appropriate value as required under the Rajasthan stamp duty act purchased in the name of the executant’s bank duly authenticated either by a first class magistrate or notary public or directly confirmed by the issuing banker along with a certificate with regard to stamp duty and shall be furnished in acceptable form in the office of the Accounts Officer (T&C), RVPN Ltd., Hindaul valid for 180 days with the grace period of 90 days.

1.04 DOCUMENTS TO BE ENCLOSED WITH THE BID:

Each tender in electronic format shall be accompanied with the following schedules, documents and the fact of their having been enclosed should be as per tender specification. All tenders and accompanying documents will have to be digitally signed and submitted in time specified on http://eproc.rajasthan.gov.in. The tender which is not accompanied by any or all of the following schedules, documents or is accompanied by incomplete annexures / schedules is liable for rejection:

(a) Cover 1 (.pdf) : FEE (scanned copies)
(i) Proof of depositing cost of tender specification
(ii) Proof of submitting processing fee
(iii) Proof of depositing bid security / Exemption certificate
(b) Cover 2 (.pdf) : TECHNO COMMERCIAL BID (scanned copies)

(i) Section – I - Instructions to Tenderers
(ii) Section – II - General Conditions of Contract Including Erection
(iii) Section – IIA – Commercial Terms and Conditions for Erection of SubStation.
(iv) Section – III – Technical Particulars
(v) Appendix – Annexure A to D
(vi) Section – IV – Safety and Schedules (I to VIII)
(vii) Documents in support of Qualifying Requirement

The above information should be prepared very carefully since it will be the basis for the prequalification of bidders. Only relevant and to the point information shall be indicated. Failure to provide any required information may lead to the rejection of the offer. All above documents are to be digitally signed on each & every page by the authorized representative of the firm after filling requisite information/details desired in the specification & PQR. Departure from specification (Technical & Commercial) shall only be given in Schedule-V. Deviations indicated elsewhere will be ignored.

(c) Cover 3 (.xls) : PRICE BID : PRICE SCHEDULES (Section – IV, Schedule III)

This cover consists of price schedules (BOQ) for EARTH MESH, ERECTION OF SUB-STATION STRUCTURE, BUS BAR STRINGING, EQUIPMENT ERECTION AND CABLING WORK AT 132 KV GSS RIICO Dholpur. The tenderer must quote the prices for construction of gss in which they wish to participate in the manner as indicated in the Price schedule(s), failing which tender is liable for rejection. The rates/prices shall be entered in figures in % Excess / Less. These schedule(s) must be digitally signed by the authorized representative of the firm. The opening date for this shall be intimated later on.

1.05 BID FORMAT, SUBMISSION AND OPENING OF BIDS

(a) Bidder shall submit their bid in electronic format by digitally signing the same. Bidder shall procure Digital Signature Certificate (DSC) as per IT Act - 2000.

(b) The documents listed in ITT (Instructions To Tenderers) clauses, along with addendum’s issued till date & time of bid submission, shall be filled by the bidder to bind the bidder to contract. All pages of the bid shall be stamped and digitally signed.

(c) All omissions in the schedule of price, must be serially numbered and digitally attested by the officer opening the bids, so as to make further dispute impossible on this score.

(d) Bidders who have to participate in this tender will have to register on http://eproc.rajasthan.gov.in. Further Bidders who have to participate in online tenders will have to procure digital signature certificate as per IT act so that they can sign their electronic bids.

(e) Before electronic submission of tender, it should be ensured that Section-I, Section-II, Section-II (A), Section-III ,Section-IV, Schedules & Appendix of the tender specification are digitally signed by the tenderer.

(f) All tenders, in which any of the prescribed conditions are not fulfilled or which have been vitiated by errors in calculations, totaling or other discrepancies or which contain over writing in figures or words or corrections not initialed and dated, may be liable to rejection.

(g) The electronically received bids will be opened in the office of the Superintending Engineer (T&CC) RVPN, Hindaun on stipulated date & time in the presence of such tenderers or their authorized representative, who choose to be present. The system does not permit electronic submission of late tenders after the due date & time.
(h) The opening of tender shall not be witnessed by a tenderer or tenderers who himself / themselves has / have not bided for the same work.

(i) In case, the date fixed for opening of the tenders be declared as a public holiday, the bid shall be opened on the next date on which office re-opens after such holiday(s).

1.06 VALIDITY OF OFFERS:

Tenders shall be valid for a minimum period of 120 days after the date of opening of tender. Tenders mentioning a shorter validity period than specified are likely to be rejected/ignored.

1.07 SIGNATURE OF TENDERER:

The tender must contain the name, designation and place of business of the person or persons making the tender and must submit online, placing them in 3 covers after filling & signing digitally with his DSC (Digital signature). Tender by a partnership firm must be furnished with full names of all the partners and should be signed digitally by one of the member of partnership firm or by a authorized representative indicating the designation of the person or persons, with authority letter signed by the Chairman/ Secretary other person authorized to bind the Corporation / Company in the matter.

1.08 QUALIFYING REQUIREMENT:

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<th>S.No.</th>
<th>Qualifying Requirement Details</th>
<th>Supporting Documents required</th>
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| 1.    | **Bidder Status:**
|       | 1.1 This invitation for Bids, issued by the Nigam is open to all firms who are single entity and not Joint Venture including company(ies), Government owned Enterprises registered and incorporated in India as per Companies Act. 2013/Other relevant Act, barring Government Department and those bidders with whom business is banned by the Nigam. |
|       | 1.2 The bidder must be ‘A’ class contractor for electrical works. |
|       | 1.3 The bidder must have Service Tax registration. |
|       | 1.4 The bidder must be registered with Provident Fund Commissioner. |
|       | 1.5 Bidder shall registered in GST as per GST Act applicable w.e.f. 01.07.2017 |
|       | Memorandum of Association/Partnership deed/other relevant document, Registration certificate as per Companies Act / Relevant Act |
|       | Certificate issued by the Electrical Inspector. |
|       | Copy of Service Tax Registration |
|       | Certificate issued by Provident Fund Commissioner. |
|       | Certificate of registration issued by Competent authority. |
### TECHNICAL EXPERIENCE:

Bidder who have completed construction of any 220 KV GSS, 132 KV GSS and above or part thereof of minimum of Rs. 5 Lacs within the five year up to the date of opening of tender on labour contract and have completed within the contract time of the work order will be qualified for price bid.

### FINANCIAL POSITION:

The Net Worth of bidder for last 3 years should be positive.

### PRICES:

1. **The bidders are advised to quote firm prices. No variation in the quoted prices will be allowed. The bidder quoting 'VARIABLE' prices shall be ignored.**
2. The bidder shall quote the prices inclusive of Income Tax, Service Tax, Sales Tax and Works Contract Taxes as may be levied as per applicable laws.
3. The price shall remain valid till completion of the work as per work order awarded against this specification.
4. Any bid containing prices not quoted in the manner prescribed under the above sub clauses is liable to be ignored.
5. No representation for enhancement of rates once accepted will be considered.
6. The rates/prices shall be quoted in the manner as desired in the schedule of prices.

### RAJASTHAN VALUE ADDED TAX:

In accordance with the scope of works, this is a labour contract of erection from the 'Free issue' material, hence no VAT shall be leviable. However VAT if levied shall be to the contractor's account.

### QUANTITIES:

1. **The quantum of work indicated in the accompanied schedule (s) are only provisional and the purchaser reserves the right of revising the same at the time of placing the order. The NIGAM also reserves the right to entrust only part work of a particular Work.**

2. The NIGAM also reserves the right to split the quantities and to entrust the order for the erection work to one or more contractors. The tenderer shall agree to accept part works at the rates/prices mentioned in his tender and/or accepted by the NIGAM.
1.12 COMPLETION TIME:
   a) The proposed work of construction of GSS mentioned in Schedule-I is required to be erected/executed and commissioned within the period mentioned in Schedule-VI. This targeted completion period is inclusive of monsoon period. The commencement of completion period shall be reckoned after fifteen days from the date of issue of commencement order/date of layout issued by the work Incharge after ascertaining the availability of material and site clearance.
   
b) In case, completion of the work is not possible within the specified completion period, the Engineer Incharge will review the situation, record the reasons of delay either on part of Nigam or the contractor as the case may be and initiate a case for grant of further extension in completion period indicating expected target date of completion. Such case for time extension in completion period indicating expected target date of completion. Such case for time extension will be processed by the Engineer Incharge and submitted to XEN (T&C) before expiry of the stipulated completion period. The XEN (T&C) will examine the matter and submit his comments for obtaining time extension or cancellation of contract on the basis of facts/recorded reasons.
   
c) The Accounts Officers (T&C) will ensure that, final bill is entertained only after grant of suitable time extension in completion period is received from the competent authority.

1.13 AMENDMENT IN SPECIFICATIONS:
The Superintending Engineer (T&C) RVPN, Hindaun may revise or amend the specification and timings prior to the date notified for opening of the Bids. Such revision or amendment, if any will be communicated to all the bidders through corrigendum(s) on http://eproc.rajasthan.gov.in as amendment or addenda to this invitation of the Bid.

The amendment (if any) will be notified on web for all prospective bidders who have received the Bid documents and it shall be binding on them. Bidders are required to immediately download any such amendment. It will be assumed that the information contained therein has been taken into account by the bidder in its Bid.

In order to provide prospective bidders reasonable time to take the amendment into account, in preparing their Bid, the Nigam may, at its discretion, extend the deadline for the submission of Bids, in which case, the Nigam will notify all bidders on web of the extended deadline, for submission of Bids.

1.14 GENERAL:
   (a) Specification/Bid document may be downloaded by any of the interested bidder from http://eproc.rajasthan.gov.in for the consideration of his Bid up to stipulated date & time. The cost of specification once deposited will not be refunded under any circumstances.
   
   (b) The contractor shall treat the details of the specification and other Bid documents as private and confidential and they shall not be reproduced without the written authorization of the NIGAM.
   
   (c) The NIGAM does not bind himself to accept the lowest or any Bid or any part of the Bid and shall not assign any reason(s) for the rejection of any Bid or a part thereof.
   
   (d) The fact of submission of Bid to the NIGAM shall be deemed to constitute an agreement between the bidder and NIGAM whereby such Bid shall remain open for acceptance by
the NIGAM and bidder shall not have option to withdraw his offer, impair or derogate the same. If the bidder be notified during the period of validity of Bid that his Bid is accepted by the NIGAM, he shall be bound by the terms of agreement constituted by his Bid and such acceptance thereof by the NIGAM, until formal contract of the same Bid has been executed between him and the NIGAM, in replacement of such agreement.

(e) The successful bidder shall have to execute the contract documents/agreement for the proper fulfillment of the contract. This shall be done by him and the NIGAM shall furnish such an executed stamped agreement free of charge.

1.15 Any action on the part of the bidder to revise the rates/price at his own interest after the opening of the Bid may result in rejection of the Bid and also debar him from submission of Bids to the NIGAM at least for one year.

1.16 PRE-BID MEETING/ CLARIFICATIONS:

i. A pre-bid conference is also scheduled by the procuring entity as per the details mentioned in the NIB and to clarify doubts of potential bidders in respect of the procurement and the records of such conference shall be published on the respective websites.

ii. Prospective bidders/firms, who have deposited the prescribed cost of bid specification as specified in NIB, are allowed to attend the pre-bid conference/meeting and submit their pre-bid queries only in the specified format (Annexure-1) and schedule.

iii. The period within which the bidders may seek clarifications under (b) above and the period within which the procuring entity shall respond to such requests for clarifications shall be as under:-

(a) Last date of submitting clarifications requests by the bidder: As per bid specification.
(b) Response to clarifications by procuring entity: As specified in bid specifications.

iv. The minutes and response, if any, shall be provided promptly to all bidders to which the procuring entity provided the bidding documents, so as to enable those bidders to take minutes into account in preparing their bids, and shall be published on the respective websites.

v. Publishing of any clarification on the respective website shall be deemed to have been conveyed to all bidders in cases of non-availability of contact details of those bidders who have purchased downloaded to the bid document, postal delay, and loss of clarification in the transit.

1.17 NEGOTIATIONS:

(1) Except in case of procurement by method of single source procurement or procurement by competitive negotiations, to the extent possible, no negotiations shall be conducted after the pre-bid stage. All clarifications needed to be sought shall be sought in the pre-bid stage itself.

(2) Negotiations shall, however, be undertaken only with the lowest or most advantageous bidder under the following circumstances-

(a) When ring prices have been quoted by the bidders for the subject matter of procurement; or
(b) When the rates quoted vary considerably and considered much higher than the prevailing market rates.

(3) The bid evaluation committee shall have full powers to undertake negotiations.

(4) The lowest or most advantageous bidder shall be informed in writing either through messenger or by registered letter and email (if available). A minimum time of seven days shall be given for calling negotiations. In case of urgency the bid evaluation
committee may reduce the time, provided the lowest or most advantageous bidder has received the intimation and consented to regarding holding of negotiations.

(5) Negotiations shall not make the original offer made by the bidder inoperative. The bid evaluation committee shall have option to consider the original offer in case the bidder decides to increase rates originally quoted or imposes any new terms or conditions.

(6) In case of non-satisfactory achievement of rates from lowest or most advantageous bidder, the bid evaluation committee may choose to make a written counter offer to the lowest or most advantageous bidder and if this is not accepted by him, the committee may decide to reject and re-invite bids or to make the same counter-offer first to the second lowest or most advantageous bidder, then to the third lowest or most advantageous bidder and so on in the order of their initial standing and work / supply order be awarded to the bidder who accepts the counter-offer. This procedure should be used in exceptional cases only.

(7) In case the rates even after the negotiations are considered very high, fresh bids shall be invited.

1.18 TRANSPARENCY IN PUBLIC PROCUREMENT:

The Government of Rajasthan has enacted the Rajasthan Transparency in Public Procurement Act, 2012 and Rajasthan Transparency in Public Procurement Rules, 2013 w.e.f. 26.01.2013. This procurement process is abided by the processes and procedures of the aforesaid Act & Rule. In case the any clause (s), term (s) & condition (s) in this bidder document differ in its interpretation and context from it the later (i.e. GOR Act and Rule as mentioned above) shall prevail.
SECTION-II

RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LTD
GENERAL CONDITIONS OF CONTRACT INCLUDING ERECTION

Notwithstanding anything contained to the contrary in the specification or tender or any subsequent exchange of correspondences, these General Conditions of Contract shall prevail and shall be binding on the Contractor and any change or variation expressed or impressed howsoever made shall be inoperative, unless expressly sanctioned by the NIGAM. The Contractor shall be deemed to have fully informed himself and to have specific knowledge of the provisions of the General Conditions of Contract mentioned hereunder.

1. DEFINITION OF TERMS
   a) In constructing these general conditions and the annexed specification, the following words shall have the meaning herein assigned to them unless there is anything in the subject or context inconsistent with such construction.
   b) The "NIGAM" shall mean the RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LTD represented by Chairman & Managing Director and shall include their legal personal, representative, successors and assignees. The "NIGAM" owner or customer shall mean the NIGAM.
   c) The "Bidder/Bidder" shall mean and include one or more persons or any firm or any Company or Body incorporate who has submitted the Bid in response to "Invitation of Bid".
   d) The "Contractor" shall mean the Bidder/bidder whose Bid has been accepted by the NIGAM and shall include the Bidder's heirs, legal representative, successors and assignees approved by the NIGAM.
   e) The "Sub-contractor" shall mean the firm or the persons named in the contract for any part of the work or any person to whom any part of the contract has been sublet with the consent in writing of the NIGAM and shall include his heirs, legal representative, successors and assignees approved by the NIGAM.
   f) The "CMD" shall mean the Chairman & Managing Director, RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LTD, JAIPUR.
   g) The "Engineer" shall mean the Chief Engineer, RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LTD or other Engineer or officer for the time being or from time to time duly authorized and appointed in writing by the NIGAM to act as Engineer or Inspector for the purpose of the contract. In case where such Engineer has been so appointed, the word "Engineer" shall mean the NIGAM or his duly authorized representative.
   h) "Plant", "Equipment", "Materials", "Stores", "Works", mean to include the plant and materials to be provided and work or works to be done by the Contractor under the Contract.
   i) THE CONTRACT SHALL MEAN AND INCLUDE THE FOLLOWING:
      1. Invitation of Bid.
      2. Instructions to Bids.
      3. Bid Form including schedule of prices.
      5. Letter of Intent and its acknowledgement.
      7. Formal work order.
      10. Special instructions.
      11. Site conditions.
13. Addenda which may hereafter be issued by the NIGAM on web to the contractor as agreed between the Contractor and the NIGAM.
14. The Agreement to be entered into under Clause 2 of these General Conditions.
   j) The „Specification“ shall mean the specification, specific conditions annexed to the General Conditions of the Contract and the schedule thereto, if any.
   k) The month shall mean, English calendar month i.e. period of 30 days and week shall mean a period of 7 days.
   l) The "Site" shall mean the place or places named in the Contract and include, where applicable, the lands and buildings upon or in which the works are to be executed.
   m) The "Place of delivery" shall mean the place of delivery at which the contractor is responsible to deliver the materials at the contract price.
   n) The "Test of completion" shall mean such tests as are prescribed in the contract to be made by the Contractor before the Plant is taken over by the NIGAM as per the General Conditions.
   o) "Letter of Intent" shall mean the NIGAM's letter conveying his acceptance of the Bid subject to such reservations as may have been stated therein.
   p) The "Contract price" shall mean the sum named in or calculated in accordance with the provisions of the Contract/purchase or any amendments thereto.
   q) CONSIGNEE / ENGINEER INCHARGE", The consignee shall mean and include the Assistant Engineer, Junior Engineer, Asstt. Controller of Stores, Store Superintendents and or any other officer/official of the RAJASTHAN RAJYA VIDHYUT PRASARAN NIGAM LTD, all over Rajasthan, performing the duties of the consignee / Engineer Incharge as assigned to him under the contract.
   r) "Writing " Shall include any manuscript, type written or printed statement under or over signature or seal as the case may be.
   s) The Word "Codes" shall mean and include the Indian Electricity Rules IS Code of practice and Factory Rules and Regulations applicable in the State of Rajasthan on the date of issue of the letter of intent of such modifications thereof as may be specially stipulated by competent State authorities i.e. Electrical Inspector and Chief Inspector of Factories, Rajasthan.
   t) Words importing the singular only shall also include the plural and vice versa where the context requires.

2. CONTRACT AGREEMENT:
The contractor and NIGAM shall as soon as possible, unless otherwise agreed upon enter into a sealed agreement for the proper fulfillment of the contract. The expenses of completing and stamping the agreement shall be paid by the contractor and the NIGAM shall be furnished free of charge with an executed stamped counter part of the agreement after the tender has been accepted by the NIGAM. All orders/instructions to the contractor shall, except as herein otherwise provided, be given by the Engineer on behalf of the NIGAM

3. SUBLETING AND ASSIGNMENT:
The contractor shall not save with the previous consent in writing of the NIGAM, sublet, transfer or assign the contract, or any part thereof, interest therein or benefit or advantage whatsoever provided nevertheless that any such permission granted to the contractor shall not relieve him from any obligation, duty or responsibility under the contract.

4. PERFORMANCE SECURITY DEPOSIT:
   a) In order to secure/assure the fulfillment of the contract, the successful tenderer(s) upon receipt of preliminary acceptance letter/detailed purchase order as the case may be shall furnish within a period of 15 days a Performance Security deposit amount equivalent to 10% (Ten percent) of the contract value either by furnishing an undertaking for deduction of performance security from his each running and final bill @ 10% of the amount of the bill or by crossed Bank Draft or by way of Bank Guarantee from the scheduled Bank in the prescribed proforma to be obtained from the NIGAM on a Rajasthan state Non judicial stamp paper of appropriate value as required under the Rajasthan stamp duty Act duly authenticated by a 1st Class Magistrate or notary public or directly confirmed by the issuing Banker along with a certificate with regard to stamp duty. Such Bank Guarantee shall be valid upto a period of 14 months from the date of commissioning of Substation (e.g. upto the last day of the calendar month) and if
required by the NIGAM, the validity of the Bank guarantee shall be further extended for such period as desired. The B.G. is to be furnished in whole Rupees.

If the substation is not commissioned at specified parameters but commissioned at reduced parameters due to reasons beyond the control of the contractor e.g non readiness of Gantry / GSS at the line emanating / terminating points etc. in those cases Such Bank Guarantee shall also be valid up to a period of 14 months from the date of commissioning of Substation (e.g. up to the last day of the calendar month).

b) Unless otherwise specifically required to be retained/forfeited by the NIGAM, the Performance Security deposit shall be refunded on request of the contractor after **twelve months** on completion of the entire work to the satisfaction of the NIGAM.

c) If the contractor fails or neglect to observe or perform any of his obligation under the contract, it will be lawful for the NIGAM to forfeit either in whole or in part at his absolute discretion, the Performance Security deposit furnished by the contractor.

d) No interest shall be payable on such deposits. Bank charges or any other charges, if any, shall be to the Contractor's account. If the contractor fails to provide the Security within the period specified, such failure shall constitute a breach of the Contract and the NIGAM shall be entitled to make other arrangements at the risk and expenses of the contractor and the Bid Security deposited by the Contractor shall stand forfeited to the NIGAM.

5. RAJASTHAN VALUE ADDED TAX, ROYALTY, LEVIES & DUTIES:

a) In accordance with the scope of works, this is a labour contract of erection from the "FREE ISSUE" material, hence no VAT will be leviable. However tax on such labour contracts if levied, shall be to the Contractor's account.

b) **Service Tax:**

The bidder shall quote the prices inclusive of applicable service tax. Any liability towards service tax, if arises/applicable, inclusive of cost of material to be supplied by RVPN free of cost, shall be to the bidder's account. The bidder shall give service tax registration number. Any statutory variations in service tax will be to the contractor's account.

c) **Work Contract Tax:**

The work contract tax will be deducted at the applicable laws on the value of erection, testing & commissioning activities. Any liability arising on A/c of work contract tax will be to the contractor's account. Any statutory variation in the work contract tax will be to the contractor's accounts.

d) **Income Tax:**

If any income tax, surcharge on income tax or any other corporate tax is attracted under the law then the same shall be paid by him as per Government rules / deducted from his bills / invoices at the prevailing rate and if such tax is not applicable, then the contractor can claim reimbursement of the same from the relevant competent authority. However necessary TDS certificate(s) shall be issued by Nigam's paying Authority.

e) **Royalty Tax:**

In pursuance of the notification issued by Department of Mines, Government of Rajasthan vide circulars dtd.15.11.11, 18.10.12 & 09.01.13 regarding royalty tax determination and deposition of
the same in the department of Mines & Geology, the Contractor shall be responsible for legitimacy of the civil material used in construction of Substation. The Contractor shall also be responsible for compliance of the instructions contained in the said circulars and further amendments if any. The payment of RA bills shall be made after ensuring compliance of the guidelines contained in the above circulars by the contractor.

In case any liability/dues against royalty is finalized by the Department of Mines, GOR, the firm shall be fully responsible for payment of such dues to the Mining Department or the same may be deducted/recovered by the Nigam from the financial hold available under this contract or any other contacts of Nigam or its successor companies of erstwhile RSEB.

f) GST:- Bidder should quote the price inclusive of applicable GST.

6. ERECTION INSURANCE:

The contractor shall take suitable storage cum erection insurance policy for entire project at his own cost, the estimated cost per store issue rate of the material shall be intimated by the officer in charge, who will supervise the work/project as nominated by the order placing authority.

The contractor shall also ensure the following:
I) Contractor shall take storage cum erection insurance policies for entire project. However the insurance premium could be paid on installment basis, but it will be the responsibility of the contractor that the installments are paid well within the time. In case the insurance is on installment basis, the receipt of payment of each installment shall be submitted to SE(T&C) HINDAUN, Engineer incharge and A.O. (T&C) HINDAUN by the contractor.

II) Deductible franchise should be minimum as per insurance rules. In case of any loss to the extent of deductible franchise, the same shall be borne by the contractor.

III) Deleted.

IV) A policy indicating discount on account of "EXCESS" is not to be accepted.

V) Insurance policy shall be drawn in favour of the project indicating the full name of Substation.

VI) Insurance policy shall be taken from Jaipur based office of nationalized insurance companies, however for the contractor whose office is situated outside the Rajasthan, the insurance policy may be taken from place where such office is situated.

VII) Insurance policy shall be in combined name of RRVPN and contractor.

VIII) Computerized and stamped insurance policy shall be furnished by the contractor to the SE(T&C) HINDAUN for its acceptance.

IX) A copy of Computerized and stamped insurance policy shall also be furnished by the contractor to the work incharge who on receipt of its acceptance issued by SE(T&C) HINDAUN, shall issue the Substation material.

If Substation is not completed within the schedule completion time, the extension of insurance policy shall be arranged by the contractor. A part of the premium paid to the insurance company for this extension, corresponding to the delay on the part of RVPN, shall be reimbursed to the contractor on finalization of time extension case. However part of the premium corresponding to the delay on the part of the contractor shall be borne by the contractor.

Deviation to this clause will not be acceptable. It is in the interest of contractor to take insurance policy for a longer period.

X) In case of up-gradation/modification of existing substation, the contractor may take section wise (instead for complete substation/work) storage cum erection insurance policy. However, this section wise policy shall also remain valid up to 30 days from the date of handing over the section of substation to the Engineer-incharge.

[Signatures]
7. COMPLETION TIME:

a) The completion time shall be governed by clause No.1.12 of Section-I.

b) The NIGAM reserves the right to defer the completion period as indicated in the work order. The period during which the works have been so deferred, shall not be reckoned as delay in completion in terms of clause "Delay in completion".

8. DELAY IN COMPLETION:

a) The time for and the date of completion specified in the work order shall be deemed to be essence of the contract and the work shall have to be completed not later than the period specified therein. If the contractor fails to complete the work or any part thereof within the specified completion period, the NIGAM shall be entitled at his option.

(i) To recover from the Contractor, 0.5% (half percent) per week or part thereof for the delay (for unexecuted works) subject to maximum of 10% (ten percent).

(ii) To cancel the contract and if so desired to complete the erection works by other agencies at the risk & cost of the contractor.

(iii) In case, completion of the work is not possible within the specified completion period, time extension in completion period shall be sought in advance for which the Engineer In-charge will review the situation, record the reasons of delay activity wise either on part of Nigam or the contractor as the case may be and initiate a case for grant of further extension in completion period (original or revised) without waiting for completion of the work, indicating expected revised target date of completion. Such case for time extension will be processed by the Engineer In-charge and submitted to XEN (T&C) before expiry of the stipulated completion period. The XEN (T&C) will examine the matter and submit his comments for obtaining time extension or cancellation of contract on the basis of facts/recorded reasons.

(iv) The Accounts officer (T&C) HINDAUN will ensure that, final bill is entertained only after grant of suitable time extension in completion period is received from the competent authority.

9. TERMS OF PAYMENT:

(i) Payment equal to 100% (In case contractor furnishes Performance Security deposit by crossed Bank Draft or by way of Bank Guarantee) or 90% (In case contractor furnishes an undertaking for deduction of performance security amount from his each running and final bill @ 10% of the amount of the bill) of the total value of the works will be paid against monthly running account bills to be submitted to the AEN (T&C) in-charge of the work.

(ii) Balance 10% payment will be made after the 12 months performance period is over and instructions for release of the RMD has been issued by the SE(T&C) HINDAUN as per clause No.12. GUARANTEE or on furnishing of 10% performance bank guarantee. The payment will be made only after a Material Account Statement of items received and used or returned to stores is settled. Any discrepancy in the quantity, will have to be made good by the contractor or deduction of its cost at double the issue rate applicable at the time of issue of material will be made while settling the balance payment.

(iii) If a firm supplying material to the RVPN or executing any work obtain finance from bank by way of discounting of the bills. In such cases RVPN shall not at all be responsible for arranging payments to banks nor shall bear any liability towards the bank in such cases. This is to safeguard interest of the NIGAM against the firms/suppliers taking advantage of bank finance.

(iv) The payment of the running bills, up to the work order value will be released without limiting to the individual item quantity.

(v) Deduction, in respect of deficiencies etc. will be made by the AEN-Incharge while passing/verifying the bills and simultaneously be conveyed to the contractor.
The following time schedule is specified within which verification / countersignature of all bills shall be done.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Activity</th>
<th>Time schedule</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>All Running Account Bills</td>
<td>Other Bills (Balance payment, etc.)</td>
</tr>
<tr>
<td>1.</td>
<td>Verification by AEN – In – Charge &amp; submission to XEN</td>
<td>7 days</td>
</tr>
<tr>
<td>2.</td>
<td>Countersignature by XEN &amp; forwarding to Accounts Officer</td>
<td>3 days</td>
</tr>
</tbody>
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10. MODE OF PAYMENT:

A) GENERAL:

(a) The Running Account and Final bills in accordance with above clause (s) shall be furnished along with following information:
   (i) Item wise work done during the billing period.
   (ii) Cumulative work done item wise.
   (iii) Accounts for material, bolts, nuts, accessories, etc. consumed and balance stock.
   (iv) Consumption account of RVPN supplied material, wastage and balance stock.

(b) The payment shall be made after receipt of the bill with complete documents by the concerning Accounts Officer and subject to completion of all contractual formalities as per requirement of the work order. The time for making payment shall be as per prevailing payment policy of RVPN.

(c) The payment of works up to the value of the work order shall be made irrespective of individual item quantities (including excess or extra) appearing in the relevant price schedules. However, approval of competent authority for excess / extra quantities shall be necessary before releasing final bill.

(d) The Contractor shall submit the complete materials account immediately after the work is completed and in any case not later than one month of completion of the work. The Work-In-Charge shall settle the MAS A/c within one month from the date of receipt of MAS A/c from the Contractor.

(e) Recovery of all material including structure material (on per MT basis) shall be affected at double the issue rate. The recovery of shortages of structure material shall be made only for short members / materials as per their weight.

(f) Payment shall be made to the Contractor through RTGS/NEFT for quick and safe transfer of funds across the country. The charges for transfer through RTGS/NEFT shall be on the part of the Contractor. The Contractor shall furnish particulars to the concerning Accounts Officer in prescribed format.

i) Bills for 100% or 90% (as the case may be) value of the erection work during each calendar month as per clause 9 shall be submitted to the AEN (T&C) in-charge of the works at the end of that particular month, who will in turn process the same and forward it to XEN(T&C) in-charge of the works for countersignatures and finally to the Accounts Officer(T&C) for payment. These bills shall be serially numbered with suffix E-1.

ii) Bills for 10% value of the erection work done as per clause 9 shall be submitted to the AEN (T&C) in-charge of the works, who will in turn process the same and forward it to XEN(T&C) in-charge of the works for countersignatures and finally to the Accounts Officer(T&C) HINDAUN for payment. These bills shall be serially numbered with suffix E-2.
iii) All the bills (in accordance with above clauses) shall be furnished along with following information:

a) Item wise work done during billing period, i.e., respective month
b) Cumulative work done item wise.
c) Accounts for tower material, bolts-nuts and accessories consumed and balance stock.
d) Account of cement consumed, wastage and balance stock e) Account of material consumed, wastages and balance stock.

iv) The payment shall be made as per payment policy / within thirty days from the date of submission of complete document and completion of all contractual formalities as per requirement of the work order but in case of delay in payment the purchaser shall not be liable to pay any interest on the outstanding amount to the contractor.

v) The payment for survey, excavation, Stab setting, Concreting & earthing shall be made without insisting for Insurance Policy.

vi) The payment shall be made up to order value irrespective of individual item quantities appearing in price schedules of respective works.

11.0 QUANTITY OF WORK:

a) The quantities of various items of erection work indicated in the work orders shall be tentative/ estimated. Final quantities shall be determined after completion of work. The Contractor has to carry out the work according to the quantities as determined so as to complete the work as required.

b) After completion of all works, the bill of quantity of the work shall be finalized as prescribed hereunder:

(i) Initiation by Engineer – In-Charge & approval if in his competence. Within 10 days
(ii) Initiation by Engineer – In-Charge & submission to XEN if not in his competence. Within 5 days
(iii) Approval by XEN if in his competence. Within 10 days of receipt from Engineer – In-Charge.
(iv) Verification by XEN & submission to SE if not in his competence. Within 3 days of receipt from Engineer – In-Charge
(v) Approval by SE if in his competence. Within 10 days of receipt from XEN.
(vi) Verification by SE & submission to CE / ZCE if not in his competence. Within 5 days of receipt from XEN.
(vii) Approval by CE / ZCE in concurrence with Sr. Accounts Officer. Within 10 days of receipt from SE
SE/ XEN/ AEN shall approve the quantity with the concurrence of Circle AO.

12. INSPECTION BY NIGAM’S REPRESENTATIVE:

i) Surprise check of the Vendor/Supplier premises can be done by the Quality Control, Inspection & Monitoring section of the RVPN’s corporate office on a short notice for which all necessary arrangement towards inspection of the RVPN’s supply/work orders are to be arranged by the Vendor/Supplier for ensuring quality as per RVPN requirement. The Vendor/Supplier provides all requisite co-operation/assistance and facility for such quality check/inspection.

ii) The XEN (T&C) in-charge of the works or his representative will be free to visit the contractor’s works, their site stores and erection site and also verify the NIGAM’s materials in the custody of the contractor, as and when required.
iii) The contractor shall check the verticality of the structures in the presence of NIGAM's Engineer before tightening and punching of bolts and nuts. The structures erected should be truly vertical after erection and no straining will be permitted to bring them so. The maximum tolerance permissible is 2.5 cm per 9 meters of height. However, due allowance in verticality due to any possible difference in the levels of stub-tops of the location would be permissible.

iv) Wherever asked upon to do so, the contractor shall check the sag of the conductor and earth wire in the presence of NIGAM's Engineer before final sagging. The contractor shall intimate the date and time of final sag to the NIGAM's Engineer well in advance and the same will be done in the presence of NIGAM's Engineer.

v) Chief Engineer (T&C) or Engineer appointed by him at his discretion may uncover any casted foundation to find out the workmanship of foundation. Contractor shall render necessary assistance during such fact finding operation and shall comply with the report of the investigating officer.

13.0 TESTING AND COMMISSIONING:
The provisions of this Clause shall be applicable only for Sub Station Erection Works:

(a) After completion of the work as mentioned in Clause 1.0 “Scope” of Section – III, the Contractor will ensure that all works connected with the Sub Station have been completed correctly as per Indian Electricity Rules and procedures. Any extra cost involved due to incompleteness of work or bad workmanship found out subsequently shall be set right forthwith by the Contractor at his cost. The Contractor shall arrange to handover the complete Work.

(b) TAKING OVER:
When the whole of the work has been completed and has passed all the tests on completion prescribed in the contract to the satisfaction of the Engineer-In-Charge, the Engineer-In-Charge shall issue to the Contractor a taking over certificate as proof of the final acceptance of the work executed. Such certificate shall not unreasonably be withheld nor will the Engineer-In-Charge delay the issuance thereof on account of minor omissions or defects which do not affect the commercial operation and / or cause any serious risk to the work or where failure of any equipment to pass prescribed tests can not be attributed to the Contractor. Such certificate shall not relieve the Contractor of any of his obligation which otherwise become due by the terms and conditions of the contract. Contractor shall give an undertaking to finish any outstanding work expeditiously.

(c) The Sub Station / bay / equipment can be energized and taken over if the deficiencies do not materially affect the safety of the Sub Station / bay / equipment and can be attended while the same is in charged condition. However, the deficiencies shall be jointly listed and intimated to the order placing authority.

14. GUARANTEE:
The erection work will be covered under guarantee period against any defect arising from erection workmanship up to a period of 12 months from the date on which the work is completed in all respects, handing over of operation & material account is settled to the satisfaction of the NIGAM. The necessary instructions to release the P.B.G or RMD (10% amount) retained against Guarantee (as the case may be) will be issued by the SE(T&C)Hindaun.

15.MODE OF GUARANTEE:
In order to ensure compliance of the provisions contained in specifications, the successful contractor who have furnished an undertaking for deduction of performance security from his each running and final bill @ 10% of the amount of the bill irrespective of his being a registered vendor with NIGAM or not, shall be required to furnish a performance bank guarantee after completion of work and before claiming balance 10% payment, from any scheduled bank for an amount equivalent
to 10% of the contract value on Rajasthan state Non judicial stamp paper of appropriate value as required under the Rajasthan stamp duty Act duly authenticated by a Ist Class Magistrate or notary public or directly confirmed by the issuing Banker alongwith a certificate with regard to stamp duty.

Such guarantee shall be valid initially for a period of 14 months and to be extended for the period as specified in Clause No. 12. The contractor shall have to extend the validity period of the Bank guarantee, if required on intimation from the purchaser. Such Bank guarantee should remain valid up to the last day of the calendar month and be furnished in whole rupees.

16.1. LABOUR LAWS

16.1.1 Contractor shall maintain a valid labour license under the Contract Labour (Regulation & Abolition Act) for employing necessary manpower required by him. In the absence of such license, the contract shall be liable to be terminated without assigning any reasons thereof.

NOTE: “All contracts / Contractors with the Government shall require registration of workers under the Building & other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and extension of benefit to such workers under the Act. Deductions of cess at source will be made as per provisions of the said Act, in force from time to time.”

16.2. EMPLOYEES PROVIDENT FUNDS:

The contractors registered with PF Commissioner will only be qualified to participate in the bid. The contractor shall have to submit a certificate every month that he is an establishment covered under the employees provident fund and miscellaneous provisions act.1952 and is having a separate code number with the Provident Fund Commissioner and also that the Provident Fund contribution in respect of all the employees employed by him along with employer’s share of contribution etc. is being deposited with the Provident Fund authorities and shall also submit certified photo copies of the challans of deposits. In absence of above, the contractor shall be liable to deposit employee contribution, as well as, Employer’s contribution and other charges in respect of all the employees engaged by him for the said work with RVPN alongwith details of the employees, their wages and the amount of contribution as per RVPN CPF Rules every month. In case of failure, RVPN shall be entitled to deduct as per law of EPF Act & Rules

16.3 CONTRACTOR TO INDEMNIFY THE NIGAM:

The contractor shall indemnify the NIGAM and every member, officer and employee of the NIGAM, also Engineer-in-charge and his staff against all actions proceedings, claims, demands, costs and expenses whatsoever, arising out of or in connection with the matters referred herein above elsewhere and against all actions, proceedings, claims, demands, costs and expenses which may be made against the NIGAM or Govt. for or in respect of performance of his obligation under the contract documents. The NIGAM shall not be liable for or in respect of or in consequence of any accident or injury to any workman or other person in the employment of the contractor or his sub-contractor, and the contractor shall indemnify and keep indemnified the NIGAM against all claims, demands, proceedings, cost, charge and expenses whatsoever in respect thereof or in relation thereto.

17. CLIMATIC AND ISOCERINIC CONDITIONS:

The Contractor shall be required to execute the work in the tropical conditions such as high temperature, excessive humidity, dust and salt-laden atmosphere as detailed below.
(a) Maximum ambient air temperature in shade 50 deg.C
(b) Minimum temperature of air in shade 0 deg.C
(c) Maximum relative humidity 90%
(d) Minimum relative humidity 10%
(e) Height above Mean sea level, Upto 530 meters
(f) Dust storms are liable to occur during the period from March to July
(g) Average no. of thunder storm days per annum 25
(h) Average no. of tropical monsoon(condition) per annum 4 months
(i) Average Rainfall 10 cms to 100 cms.

18. MATERIAL AND WORKMANSHIP:

All the work executed shall be of best quality and capable of satisfactory operation under the climatic humid tropical conditions mentioned under clause no.17 above. The workmanship shall be of the highest grade and the entire work shall be in accordance with the best modern Engineering practices.

19. THE ELECTRICITY ACT, 2003:

All the works covered by the Contract shall be in accordance with the Indian Electricity Act, 1910 with the latest amendments and the Electricity rules made there under.

20. SITE TESTS:

The NIGAM reserves the right to carry out any site tests. He may decide upon at his own expenses. In case the quality of work is not found as per work order, all expenses incurred during the site testing will be to the contractor's account.

21. CHANGE OF NAME OF THE TENDERER/CONTRACTOR:

(a) At any stage after tendering the NIGAM shall deal with the Contractor only in the name and at the address under which he has submitted tender. All the liabilities/responsibilities for due execution of the Contract shall be that of the Contractor and in no circumstances, he shall be relieved of any obligations under the Contract. The NIGAM may, however, at his discretion deal with the Agents/Representatives/Distributors/Manufacturers/Associates/Principals/Sister concerns and such dealings shall not absolve the Contractor(s) from his responsibilities/obligations/liabilities to the NIGAM, under the contract.

(b) Any change/Alteration of name/Constitution/Organisation of the Contractor shall be duly notified to the NIGAM and the NIGAM reserves the right to determine the Contract, in case of any such notification. In the event of such determination, the Nigam may get the work executed from elsewhere at the risk and cost of the contractor.

22. DEDUCTION FROM CONTRACT PRICES:

All costs, damages or expenses which the Owner may have paid under the contract, for which the Contractor is liable, may be deducted by the Owner from any money due or becoming due by him to the Contractor under this or any other contract or may be recovered by suit or otherwise from the Contractor. Any sum of money due and payable to the Contractor (including performance security deposit returnable to him) under this contract may be appropriated by the Owner and set off against any claim of the Owner for the payment of a sum of money arising out of or under any other contract made by the Contractor with the Owner.
23. BANKRUPTCY:

If the Contractor shall commit any act of bankruptcy or being a Corporation commence to be wound up except for reconstruction purpose of carry on its business under a receiver, the executors, successors or other representative in law of the Contractor or any such receiver, liquidator or any person in whom the Contract may become vested, shall forthwith give notice thereof in writing to the NIGAM and shall for one month during which he shall take all reasonable steps responsible to prevent stoppage of the works, have the option of carry out the Contract subject to his or their providing such guarantee, as may be required by the NIGAM but not exceeding the value of the work for the time being remaining executed. In the event of stoppage of the works, the period of the option under this clause shall be fourteen days only. Provided that should the above option not be exercised, the Contract may be determined by the NIGAM by notice in writing to the Contractor and it shall be lawful for the NIGAM to take the work full or in part out of the Contractor’s hands and recontract at reasonable prices with any other persons and the NIGAM shall be entitled to retain and apply any balance which may be otherwise due on the Contract by him to the Contractor, or such part there of as may be necessary to the payment of the cost of executing such work as aforesaid.

24. CONTRACT DOCUMENTS:

The contractor shall have to execute the contract agreement within 15 days from the date of receipt of detailed work order in triplicate in the prescribed (Form- on non judicial stamp paper as per stamp duty applicable in Govt. of Rajasthan along with copy of work order, copy of Section-I (Instructions To Bidders), Section-II (General conditions of Contract including Erection), Section-II(A) (Commercial Terms & Conditions for Erection of Substation) and Section-III (Technical Particulars) Section-IV, Schedules and annexures. It is advised that each and every page of relevant documents are signed by authorized person with stamp. It may however be ensured that the one copy of the work order and other Documents as above, are signed by an authorized person holding valid power of attorney. The power of attorney on non judicial stamp paper (as per Rajasthan stamp duty act) which should be attested by the notary public. For this a copy of power of attorney in favour of person signing these documents, duly notarized in original be also submitted alongwith the above documents.

The receipt of above documents in order shall be notified by the Accounts Officer (T&C), RVPN, HINDAUN in due course of time under intimation to SE (T&C), HINDAUN No any payment shall be released without acceptance of the contract agreement.

25. FURTHER CORRESPONDANCE:

All correspondence pertaining to the work order in respect of any clarification required on the terms and conditions etc. should be addressed to the Superintending Engineer (T&C), RVPN, HINDAUN.

26. FORCE MAJEURE CONDITIONS:

If at any time during the currency of the contract the performance in whole or in part be prevented or delayed by reason of any war, hostility, acts of public enemy, civil commotion, sabotage, fire, floods, explosion, epidemics, quarantine restrictions, strikes, lockouts or acts of God (herein after referred to as ‘Events’) then, provided notice and adequate proof of the work having suffered on account of these events is given within 21 days from the date of occurrence thereof, the provisions of Clause 7.0 shall not be invoked by the Owner, provided further that the works under the contract shall be resumed as soon as practicable after such event(s) has ceased to exist. The decision of the Owner as to whether the works have been so resumed or not shall be final and conclusive provided further that in case the strike / lockout prolongs beyond a period of thirty days, the Contractor shall immediately inform about it to the Owner in which case the Owner reserves the right to get the work on order or part thereof executed from any other source or as deemed appropriate.
27. DISPUTES:

i) All disputes, differences, questions, whatsoever arising between the NIGAM and Contractor upon or in relation to or in connection with the contract shall be deemed to have arisen at Hindaun (RAJASTHAN) only and no courts other than courts in Hindaun shall have jurisdiction to entertain the same.

ii) The RVPN has constituted the centralized standing committee for settlement of disputed claims under conditions of contract relating to RVPN.

The committee shall consider all cases for settlement of disputed claims relating to purchases, works, turnkey contracts and labour contracts, civil works etc. The committee shall also take decision whether a particular matter is required to be referred to the Board for approval before settlement. The matter for settlement shall only be referred to the centralized standing committee of RVPN by following the guidelines detailed below:

(1) Disputes will be referred contract wise.

(2) Disputes involving amount above Rs.1.00 lacs only will be referred/entertained.

(3) Non-refundable fee shall be deposited by the contractor/firm @ 2% of disputed amount as claimed by the contractor/firm subject to maximum fee of Rs.1.00 lac.

(4) In case of disputes, Application for settlement (only in prescribed format) may be collected from the purchaser office.

The centralized standing committee fees shall be deposited in cash/demand draft/pay order with the Account Officer (T&C), RVPN, Hindaun and shall furnish receipt thereof with a request for referring their disputes to the centralized standing committee for decision.

For settlement, the firm shall furnish their application (only in prescribed format) indicating the details of dispute/grievances along with requisite settlement fee within a period of six months after receiving communication from Contracts Wing giving rise to cause of dispute/grievances.

28. ACCEPTANCE OF THE ORDER:

The acceptance of the order shall be conveyed to the Superintending Engineer (T&C), RVPN, Hindaun, within ten days of the receipt of order in the prescribed proforma failing which it will be presumed that the terms and conditions incorporated in the order are acceptable to the contractor.
SECTION - II(A)

COMMERCIAL TERMS & CONDITIONS FOR ERECTION WORK OF SUB STATION:

1.0 SCOPE:
1.1 Please refer to clause No. 1.1 of section-III of this specification.

1.2 This specification covers the works of erection of 220 KV and 132 kV Sub Stations and 220KV/132KV/33KV/11KV bays at such Sub Stations. The works shall be carried out as detailed in the schedule.

1.3 The Contractor shall carry out all additions / alterations required to complete the Sub Station works for commissioning at the same rates as indicated in the schedules.

1.4 The Contractor shall carry out / take up the work of erection activities awarded to him on as is where is basis.

2. WAY LEAVE, TREE CUTTING AND OTHER OBSTRUCTIONS:

2.2.1 The NIGAM will arrange for right of way and clearance for other obstructions, however tree/crop cutting and corridor clearance as per IS 5613 Pt-II will be done by contractor at his own cost. Compensation for tree/crop if any shall be borne by the NIGAM. Proposals for "Right of way" and clearance for other obstructions will have to be prepared and submitted by the contractor well in time. It will also be necessary on the part of contractor to instruct his labourers and staff to use minimum area while doing the work where there are standing crops. No person of the Contractor should pick any items from standing crops. The Contractor should take all possible steps to avoid or minimize damage to standing crops, etc.

2.2.2 The Contractor should immediately notify any obstructions or hindrance from local villagers or the local authorities in the execution of the work, to the concerned Engineer-in-charge but should not deal directly with the matter. The Engineer-in-charge will arrange to remove the obstacles as soon as possible.

3 ACCESS TO LOCATIONS:

3.2.1 It will be the contractor’s sole responsibility to take the materials up to the location. Any path way, temporary road, temporary bridge required will have to be provided by the Contractor at his cost. If, for any reason the above is not feasible, the Contractor at his own cost shall have to arrange transportation by head loads. This is in connection with the transportation of material only.

4. DISTRIBUTION OF MATERIALS:

4.1 The Contractor has to take delivery of the equipments and other materials directly from the NIGAM’s store at Sub Station site and handle them carefully and transport them to the location where these will be erected. He will be responsible for any damage to or loss of the equipments/materials at any stage during transportation or erection. The materials that will be issued by the NIGAM will be on “as is where is” conditions at the Sub Station site stores of the purchaser. The materials shall normally be issued during working hours.

4.2 The equipments/materials for the work shall be issued from the site stores located within the Sub Station. The stubs/anchor bolts/parts of the structure required for grouting will be issued at one time for carrying out the grouting work without insisting for insurance. The remaining material (other than the stubs/anchor bolts/ parts of the structures required for grouting) shall be issued to the Contractor only after furnishing of valid insurance policy to the order placing authority and Indemnity Bond to the Work - In - Charge. The insurance policy shall be accepted by order placing authority as per Clause 6.0 of Section - II whereas Indemnity Bond shall be accepted by the
Work – In – Charge. The provision of clause 1.09 “PRICES” of Section – I shall be applicable for transportation of material.

4.3 The material shall be issued to the Contractor based on the progress of the work and subject to acceptance of insurance policy and indemnity bond as per provisions of Clause 6.0 of Section – II.

4.4 All the material shall be thoroughly checked by the Contractor before lifting from NIGAM stores. Once the material is lifted, no complaint for quantity or / and quality will be entertained.

4.5 The empty drums of conductor, earth wire and control cables shall be returned by the Contractor on as is where basis is.

4.6 On completion of the work, all surplus materials including the excess bolts and nuts, spring washers, plain washers, D – shackles, step-bolts, etc. and stub/anchor bolt setting templates shall be returned by the Contractor at the site stores of the NIGAM.

4.7 All the surplus structure/structure material shall be returned to the site stores as per instructions of Engineer – in – Charge of the work within one month of completion of erection. This includes unloading of structure material and stacking it as per instructions of the Engineer – in – Charge.

5.0 METHOD OF MEASUREMENT:
(Refer Section III for Scope of Work)

a) EARTHING

i) Earth Mat: The distance between the two points of the earth mat between which the M.S. Rod has been connected shall be measured for the purpose of payment. The length of M.S. Rod actually laid shall not be considered for measurement of this work. No payment will be made for the length of the rod which may extend outside the points connected. Also, no payment shall be made for the overlapping lengths of M.S. Rod in case of joints in the earth mat.

ii) Earth Risers: The length of the M.S. Flat laid between the earthed point of the equipment/structure and the earth mat where it is connected shall be measured for the purpose of payment. No payment shall be made for the overlapping lengths of M.S. Flat in case of joints in the risers between the structure/equipment and the earth mat.

(iii) Earth Electrodes: The measurement shall be in terms of numbers of electrodes irrespective of the length of the electrodes.

(iv) The actual length of M.S. Rod/M.S. Flat used shall not be measured for the purpose of payment, i.e., the overlapping length of M.S. Rod/Flat in case of joints shall not be considered while measuring the length in case of earth mat and earth risers.

v) However, the actual length of M.S. Rod/M.S. Flat laid, including the overlapping lengths and the lengths extending beyond the connecting points, shall be considered in the material at site Account submitted by the Contractor.

vi) Small extra lengths of M.S. Rod/M.S. Flat up to 100 mm extending beyond the connecting points need not be cut.

vii) Wastage up to 1.0% of the M.S. Rod/M.S. Flat shall be permitted. However, the pieces of M.S. Rod/M.S. Flat left after the work is completed shall be deposited as far as possible.

b) SUB STATION AND EQUIPMENT STRUCTURE ERECTION AND ASSEMBLY:

No measurements are to be taken, but payments shall be made in respect of fully assembled structures (in terms of the unit in the Schedule – III (B), i.e., weight in M.T. as applicable) at the rates indicated in the work order and in accordance with the Technical Specifications in Section – III A. (Note: The unit weight of the Sub Station and equipment structure in sections III A are indicative only. The actual weight shall be taken as per approved BOM of the supplied structure. This may vary to any extent depending on the types of structures at the sub-station).
c) STRINGING OF BUS BAR:
The measurement of each bus section shall be on the basis of the section length measured between the center lines of the structures at both ends. The work of each section shall mean stringing of all three phases.

d) STRINGING OF EARTH WIRE:
The measurement shall be in terms of each earth wire strung between any two structures irrespective of the distance between the structures.

e) JUMPERING:
The measurement shall be in terms of each set of three jumpers of single/double conductors per phase connected between bus to equipment or equipment to equipment or between bus to bus irrespective of the length of the conductor used.

f) EQUIPMENT ERECTION:
The measurement of the works at clause 1.1A(h) to (t) and 1.1B(h) to (r) of Section III(A) shall be made only in terms of numbers of the items erected as per requirements of Section III A and relevant Schedule.

g) CABLING

i) Cable Laying: The measurement of the length of the Power/Control cables laid shall be made.

ii) Fixing in Cable Glands: The measurement shall be in terms of each end of the cable laid. For clarity, the payment for two nos. shall be made for each cable laid and fixed at both ends.

iii) Cable Termination:

a) Control Cable: The measurement shall be in terms of number of cables of each size which have been terminated, which includes termination of all the wires in the control cable at both ends. If all the wires are not got terminated, then deduction shall be made at the rate specified in the relevant item of the schedule for each wire not terminated.

b) Power Cables: The measurement shall be in terms of the ends of the cables terminated which includes termination of all 4 wires at each end. To clarify, the payment for termination of each cable shall be for 2 sets of 4 wires each.

6.0 INSPECTION BY NIGAM's REPRESENTATIVE:

a) The Contractor shall check the verticality of the towers/structures in the presence of NIGAM's Engineer before tightening and punching of bolts and nuts. The structures erected should be truly vertical after erection and no straining will be permitted to bring them so. The maximum tolerance permissible is one mm per 360 mm of tower height.

b) Surprise check of the Vendor/Supplier premises can be done by the Quality Control, Inspection & Monitoring section of the RVPN’s corporate office on a short notice for which all necessary arrangement towards inspection of the RVPN’s supply/work orders are to be arranged by the Vendor/Supplier for ensuring quality as per RVPN requirement. The Vendor/Supplier provides all requisite cooperation/assistance and facility for such quality check/inspection.

7.0 ELECTRICITY RULES:
7.1 All works shall be carried out in accordance with the revised and latest provisions under The Electricity Act, 2003 and Rules made there under.
8.0 ERECTION TOOLS:

8.1 a) All the erection tools required during construction of Sub Stations/bays shall be arranged by the Contractor at his own cost.

b) The crane required for any activity during erection shall be arranged by Contractor at his own cost. The price quoted shall also include charges for crane.

c) Templates for structures will however be supplied by the NIGAM which shall be returned by the Contractor in good condition on completion of the works.

d) Compression machine, if required for stringing/jumpering works, shall be provided by RVPN on rent free basis.

8.2 The Contractor only shall be completely responsible for any damage and or loss of erection tools.

9.0 WASTAGES:

9.1 a) The Contractor shall make every effort to minimize the breakages, losses and wastages of materials/equipments, etc. supplied “Free of Cost” by the NIGAM for construction.

b) No damage/breakage/wastage shall be permitted except for the items mentioned at clause 9.2 below.

9.2 The maximum ceiling for wastages permitted is as under:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>Percentage wastage permitted (Max.)</th>
<th>Compensation payable for excess wastage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conductor and earth wire</td>
<td>1.0%</td>
<td>Double the issue rate</td>
</tr>
<tr>
<td>2</td>
<td>Insulators</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bolts &amp; nuts (no extra bolts &amp; nuts shall be supplied)</td>
<td>2.0%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hardware &amp; accessories</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>M.S. Flat/M.S Rod</td>
<td>1.0%</td>
<td></td>
</tr>
</tbody>
</table>

9.3 The erection Contractor shall return to the NIGAM all the unused items. Conductor / earth wire length(s) less than 20 metres will be treated as wastage, but will be required to be returned as far as possible. Small extra lengths of M.S. Rod/M.S. Flat shall also be deposited as far as possible. However, the erection Contractor shall compensate the NIGAM at double the issue rate for the quantities exceeding permitted wastage and for the material not returned by the Contractor. However, In case of theft of material, recovery shall be made at single issue rate provided FIR has been lodged timely by the Contractor and a copy of the same is submitted to the Work – in – Charge.

9.4 All the wastages are accountable except for item no. 1 of clause 9.2. The account of permissible wastages shall be maintained at site in the registers as prescribed by the Engineer – in – Charge of the work, which will be subjected to periodical checking by NIGAM’s authorized representatives.

9.5 The account of wastages shall also be submitted with running accounts bills to the Engineer – in – Charge of the work. The copy of running account bill shall also be submitted to the concerned order placing authority.
10.0 PROGRESS REPORT:

10.1 Progress review meeting with the Contractor will be taken by the order placing authority as and when required. Minutes of such meeting shall be drawn and will include progress of works, site constraints, material constraints, delay on part of VPN / Contractor, other bottlenecks, instructions given, decisions taken, agreed targets and views of both parties. Copy of these minutes shall be sent to the Contractor.

10.2 Deficiencies in the work shall be communicated in writing to the Contractor continuously and timely by all Inspecting Officers, and also taken up during progress review meetings.

10.3 Deficiencies which materially affect the safety and commercial use of the Sub Station/bay work will have to be attended by the Contractor before the Sub Station/bay is declared fit for charging or taking over.

11.0 QUANTITY OF WORK:
11.1 The quantities of various items of erection works indicated in the work orders placed against Central Labour Rate Contract shall be tentative / estimated. Final quantities shall be determined after completion of work. The Contractor has to carry out the work according to the final quantities as determined so as to complete the work for commissioning for which the rates of the Rate List shall be valid.

12.0 QUALITY OF MATERIAL TO BE USED BY CONTRACTOR
The material used shall meet the following requirements:

a) Paint: Asian / Nerolac / Berger / Jenson & Nicholson make
b) Cable Gland: Heavy duty single compression brass gland SIBG type of Gripwel, Comet, Metalcraft, Cabend, Trinity Touch or HMI make
c) Thimbles: Copper Terminal lugs of Dowell, Jainson, Elcon, Metalcraft, Cabend, Trinity Touch or Data make
d) Bitumen Impregnated tape: Bengal Bitumen, SPT Ltd. or Arcus Ltd. make
e) Bitumen Compound: Bengal Bitumen, SPT Ltd. or Arcus Ltd. make
f) Welding Electrodes: ISI marked

13.0 PENALTY FOR DELAY:
The Tenderer should note that the completion time allowed in the work order for carrying out the work shall be strictly observed. In case of failure to complete the contracted works within the stipulated completion period, the Contractor shall be liable to pay penalty as per Clause 8.0 “Delay in Completion” of Section - II.

14.0 IMPORTANT INSTRUCTIONS:
In case of any doubt in the interpretation of the terms and conditions, the decision of the concerning Chief Engineer (T&C) will be final and binding on the bidder and no dispute in this regard will be entertained.

15.0 SPECIAL INSTRUCTIONS:
a) The Bidders shall specifically note that the NIGAM will not pay any extra amount towards any type of claim except for the description indicated in erection schedule.

b) Quantities of works indicated in the work orders placed against Central Labour Rate Contract will be tentative / estimated and may vary according to requirement. For the items where quantity is one (1), the Contractor has to execute the work as per requirement.

16.0 PERFORMANCE SECURITY DEPOSIT:
a) In order to secure/assure the fulfillment of the contract, the successful tenderer (s) upon receipt of preliminary acceptance letter/detailed purchase order as the case may be shall furnish within a period of 15 days a Performance Security deposit amount equivalent to 10% (Ten percent) of the contract value by
furnishing an undertaking for deduction of performance security from his each running and final bill @ 10% of the amount of the bill.

b) Unless otherwise specifically required to be retained/forfeited by the NIGAM, the Performance Security deposit shall be refunded on request of the contractor after twelve months on completion of the entire work to the satisfaction of the NIGAM.

c) If the contractor fails or neglect to observe or perform any of his obligation under the contract, it will be lawful for the NIGAM to forfeit either in whole or in part at his absolute discretion, the Performance Security deposit furnished by the contractor.

d) No interest shall be payable on such deposits. Bank charges or any other charges, if any, shall be to the Contractor's account. If the contractor fails to provide the Security within the period specified, such failure shall constitute a breach of the Contract and the NIGAM shall be entitled to make other arrangements at the risk and expenses of the contractor and the Bid Security deposited by the Contractor shall stand forfeited to the Nigam.
SECTION – III

TECHNICAL SPECIFICATIONS
FOR ERECTION WORKS OF SUB STATIONS

1.0 SCOPE:
1.1 The erection work of Sub Stations covered under this section consists of the following:

TYPES AND AREAS OF WORK:

A) Erection of 220kV and 132kV Sub Stations
The works/activities which may be required to be got done for the work of Erection of Sub Station are as given below:

a) Laying of earth mesh.
b) Laying of Earth risers.
c) Placing/Driving of earth electrodes.
d) Erection of Sub Station Steel Structures.
e) Stringing of Bus bar of ACSR conductor.
f) Stringing of Earth wire.
g) Jumpering.
h) Erection of EHV transformer (tank already placed on foundation with wheels).
i) Erection of Circuit Breakers
j) Erection of Station Transformer.
k) Erection of current transformer/ potential transformer/ capacitive voltage transformer / Series Reactor / Residual Voltage Transformer / Neutral Current Transformer
l) Erection of Lightening Arrestor.
m) Erection of Isolator & Earthing Switches.
n) Erection of Wave Trap.
o) Erection of Post insulator.
p) Erection of control relay panel / L.T Panel / D.C. Board / RTCC Panel / PLCC Panels, etc.
q) Erection of marshalling kiosk / line matching unit / Line matching and distribution unit.
r) Erection of Battery Charger.
s) Erection of Battery Sets.
t) Laying of control & Power cables & wiring etc.

1.2 The Contractor shall be fully responsible for completing all the above works and till they are taken over by the NIGAM.

1.3 The methods of erection activities not dealt in details are left to the Contractor who shall exercise his own judgment with regard to actual handling of materials and in deciding upon the best methods to be adopted.

2.0 GENERAL INSTRUCTIONS

(i) Transportation and unloading of the Sub Station material and equipment at the location shall be done in a safe manner so that they are not damaged or misplaced.
(ii) All the material and equipment shall be checked as per Bill of Material (BOM).
(iii) All support insulators and other fragile equipment shall be handled carefully preferably with cranes having suitable boom length and handling capacity.
(iv) Sling ropes etc. should be of sufficient strength to take the load of the equipment to be erected. They should be checked for breakages of strands before being used for the erection of equipments.
(v) The slings should be of sufficient length to avoid any damage to insulator or other fragile equipments due to excessive swing or scratching by sling ropes, etc.
(vi) Mulmul cloth shall be used for cleaning the inside and outside of hollow insulators.
(vii) Erection of equipment shall be carried out as per and in the manner prescribed in the erection, testing and commissioning manual / instructions procedures of the manufacturer, to be provided by the Engineer-In-Charge.
(viii) The services of the manufacturer’s Engineer, wherever necessary may be utilized by RVPN on its own account for erection, testing and commissioning of Sub Station equipment.

(ix) Whenever the work is required to be got done at the existing GSS where the adjacent portions may be charged, effective earthing must be ensured for safety against induced voltages so that work can be carried out without any danger / hazard to the workmen.
(x) Wherever EHT/HT/LT lines or installations are located in the land of the Sub Station, the Contactor shall ensure that adequate safety clearance is maintained during erection activities. In case shutdown of such lines or installations is required, the Contractor shall submit the request well in advance to the Work-In-Charge.
(xi) Wherever it is necessary to avail shutdowns of energized circuits for carrying out any work, the contractor shall request the work – In-charge for arranging the same. The Work – In- Charge shall submit a requisition to the Engineer In - charge of the GSS stating the date, time and duration of the shutdown and the section / portion which is to be kept out of circuit during the shutdown.
(xii) The Work-In-Charge shall ensure that the portion of the switchyard under shutdown has been isolated and that effective earthing of the equipment / bus bar, on which work is to be carried out, has been done and obtain the PTW. He will then issue PTW to the contractor.
(xiii) The contractor shall ensure that the work is completed within the requisitioned time.
(xiv) After completion of the erection work, all surplus material including bolts and nuts, templates, etc. shall be returned to the store. All unusable cut lengths of material such as conductor, earth wire, M.S. Rod and M.S. Flat, etc. shall not be treated as wastage and shall also be deposited in the store.

3.0 EARTHING:
PLACING / DRIVING OF EARTH ELECTRODE, LAYING OF EARTHEMAT AND LAYING AND FIXING OF EARTHING RISERS.

Note 1: The text and the drawings in this clause refer to some particular sizes of M.S. Rod or M.S. Flat. The reference is indicative only. The procedure/ method, etc. are typically applicable to all sizes of M.S. Rod/ M.S.Flat. The following basic principles shall be followed.
  a) The minimum overlapping length for joints of M.S. Flat shall be equal to twice the width of the M.S. Flat.
  b) The Minimum overlapping length for joints of M.S. Rod shall be 100 mm for 25/28 mm dia and 200mm for 40mm dia. rod.

Note 2: The scope of work includes consumable items such as welding electrodes, bitumen compound, bitumen impregnated tape, red oxide paint, green paint and bentonite slurry except where specifically mentioned otherwise.

3.1 GENERAL INSTRUCTIONS:
(i) Earthing of the Sub Station shall be done as per the earth mat design provided by the Work-In-Charge.
The details of the earthing material generally used in a Sub Station are given below:
<table>
<thead>
<tr>
<th>S. No</th>
<th>Purpose</th>
<th>Description &amp; Size of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main Earthing Conductor for Earth Mat</td>
<td>132 kV Sub Stations 25/28 mm dia. M.S. Rod</td>
</tr>
<tr>
<td></td>
<td></td>
<td>220 kV Sub Stations 28/40 mm dia. M.S. Rod</td>
</tr>
<tr>
<td>2</td>
<td>Earthing Conductor for Risers (for equipments &amp; structures)</td>
<td>50 x 10 mm M.S. Flat 50 x 12 mm M.S. Flat or 75x12 mm GI/MS Flat</td>
</tr>
<tr>
<td>3</td>
<td>Earthing of LT panels, DC panel, C &amp; R Panels, marshalling boxes,</td>
<td>50 x 6 mm M.S Flat</td>
</tr>
<tr>
<td></td>
<td>Compressors, MOM boxes, junction boxes, lighting panels, etc.</td>
<td>50 x 6 mm M.S Flat</td>
</tr>
<tr>
<td>4</td>
<td>Earth Electrodes</td>
<td>25/28 mm dia. M.S. Rod, 3250 mm long</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28/40 mm dia. M.S. Rod, 3250 mm long</td>
</tr>
</tbody>
</table>

(ii) All equipment’s and structures are required to be earthed by two separate and distinct connections with earth mat.

(iii) The neutrals of all voltage levels of transformers shall be earthed through independent earthing. All these earthing points should be interconnected with the Sub Station earth mat. Each earthing lead from the neutral of the power transformer shall be directly connected to two earth electrodes separately which, in turn, shall be connected to the earth mesh. The transformer tanks as well as associated accessories like separate cooler banks shall also be connected to the earth mat at two points.

(iv) Capacitor Voltage Transformers & Lightning Arresters shall be earthed through two independent risers directly connected to earth electrodes which should in turn be connected to the Sub Station earth mat. The distance between the electrodes should not be less than 4.0 metres.

(v) All other equipments such as Circuit Breakers, CTs, Isolators, Post Insulators, etc. shall also be earthed at two points.

(vi) Bus Bar structures and equipment structures shall be earthed at two points.

(vii) Marshalling boxes, cubicles, C&R Panels and all other metallic enclosures, which are normally not carrying any current, shall also be earthed.

(viii) All the earthing connections to the earth mat shall be by 2 nos. direct earthing risers free from kinks and of the shortest length. The two earthing connections / risers should be connected to the different sides of the earth mat enclosing the structure / equipment to be earthed.

(ix) For equipment earthing (including isolators), the earthing risers should be connected to the earthing terminal / pad of equipment and brought down along the leg / main member of structure and connected to the earth mat. The structure shall not be used as a part of the earthing.

3.2 BURIAL OF EARTHING CONDUCTOR:

(i) The alignment of the earth mat conductor can be changed by forming U – loops in case it fouls with equipment / structure foundations. The average spacing for East - West rows and for North -
South rows of the earth mat shall, however, be kept as near as possible to the spacing indicated in the earth mat design.

(ii) Earthing conductors in the switchyard area shall be buried at a depth of at least 800 mm from top level of foundations unless stated otherwise.

(iii) Earthing conductor around any building shall be buried in earth at a minimum distance of 1500 mm from the outer boundary of the building.

(iv) In case high temperature is encountered at any location, the earthing conductor shall be laid at a minimum distance of 1500 mm away from such location.

(v) Earthing conductors, if embedded in the concrete, shall have approximately 50 mm concrete cover.

(vi) Earthing conductors laid in cable trenches, ladder columns, beams, walls, etc. shall be supported by suitable welding / cleating at intervals of 750 mm.

(vii) The earthing conductors shall be clamped with the equipment support structures at 1000 mm interval.

(viii) Transformer / Railway tracks within the switchyard area shall be earthed at a spacing of 30 meters and also at both ends.

(ix) Flexible earthing connectors shall be provided for the moving parts of equipment’s such as earthing switches and operating handles of isolators, etc.

(x) All lighting panels, lighting fixtures, junction boxes, receptacles, conduits, etc. shall be earthed.

(xi) Earthing risers shall be run from the peaks of structures to the main earth mesh. The earthing bonds of the earth wire tension hardware shall be connected at the top of this earthing riser with bolts and nuts.

(xii) Bending of earthing rod and flat shall preferably be done by gas heating.

(xiii) Fencing should be separately earthed. Independent earthing conductor for earthing of fencing, buried at a depth of 600 mm, shall be provided 2 meters outside the switchyard fence. All the gates and every alternate post of the fence shall be connected to this earthing conductor at the corners and at every 20 meters.

3.3 EARTH ELECTRODES:

(i) The length of earth electrodes shall not be less than 3250 mm and shall be of one piece.

(ii) Except where rock is encountered, Rods shall be driven to a depth of at least 3000 mm.

(iii) Where rock is encountered at a depth of less than 3600 mm, the electrodes can be buried inclined to the vertical at an angle not more than 30° from the vertical. In all other cases, drilling shall be done for providing the pit for the electrode.

(iv) To reduce the depth of burial of an electrode in case of rocky soil without increasing the resistance, a number of rods shall be connected together in parallel as advised by the work-In-charge. The distance between two electrodes in such a case shall preferably be not less than twice the length of the electrode.

3.4 JOINTS:

(i) Minimum joints shall be made in the earth mat conductor as well as in preparing the risers.

(ii) All joints in the steel earthing system, except those where earth mat may have to be separated from equipment, etc. for testing, shall be made by electric arc welding. Welded surfaces should be painted with bitumen compound and afterwards coated with bitumen tape to protect them from rusting and corrosion.

(iii) Joints in the earthing conductor between the switchgear units and such other points which may be required to be subsequently opened for testing should be bolted type. The bolted connections, after being checked and tested, shall be painted with anticorrosive paint / compound. These joints should be accessible for supervision.

(iv) Earthing connections with equipment earthing pads shall be bolted type. Contact surfaces shall be free from scale, paint, enamel, grease, rust or dirt.

(v) Steel to copper connections shall be first bolted, then brazed and shall be coated with bitumen tape to avoid moisture ingress.

(vi) All welded joints shall be allowed to cool down gradually to atmospheric temperature. Artificial cooling should not be used.
3.5 PLACING OF EARTH ELECTRODES:

3.5.1 Cut M. S. Rod of the applicable diameter to approximate lengths of 3.25 meters and, if required, prepare one end as spike for placing / driving into the ground.

3.5.2 Earth Electrode in Loose / Sandy Soil:
   (i) Excavate a pit approximately 1 M. x 1 M up to 0.6 meter depth.
   (ii) Place the earth electrode in the excavated pit and drive it in the ground with a sledgehammer such that the top of the electrode is 0.55 meter below the foundation top level. This will leave 0.25 meters of the electrode above the ground for connecting it to the earth mat rods.

3.5.3 Earth Electrode in Hard Soil:
   (i) Excavate a pit approximately 1 M. x 1 M up to 0.6 meter depth.
   (ii) Augur a hole in the ground to a depth of 3 meters inside this pit.
   (iii) Place the electrode in the augured hole such that the top of the electrode is 0.55 meter below the foundation top level.
   (iv) Backfill the excavation and compact the soil after completion of the work.

3.5.4 Earth Electrode in Rocky Soil (Normal Depth):
   (i) Where rock is encountered at a depth of less than 3600 mm below the foundation level, excavate a trench which is inclined to the vertical at an angle not more than 30° from the vertical.
   (ii) In all other cases, carry out drilling of the rocky soil for providing the pit for the electrode.
   (iii) For connecting the electrode to the earth mat, clamp / hold the M. S. Rods of the electrode and the earth mat together. First weld these together at the crossing point.
   (iv) Fabricate four cleats in the shape of M. S. Angles from M. S. Flat of size to be used for earthing risers and of length equal to 10 times the diameter of the M. S. Rod. Weld these at all the corners of the joint. A typical joint is shown in Annexure – A, (II): JOINT OF M.S. ROD TO M.S. ROD AT EARTH ELECTRODE AND AT MESH CROSSINGS.
   (v) After welding, apply bituminous compound to the hot joints, and cover the joints with bitumen impregnated tape.
   (vi) Backfill the excavation and compact the soil after completion of the work.
   (vii) If advised by the Engineer – In-Charge, the backfilling shall also have to be done with Bentonite, or a combination of bentonite and black cotton soil in the ratio of 1:6, to reduce the resistance to earth. The Bentonite & black cotton soil shall be arranged by RVPN in such case.

3.5.5 Earth Electrode in Rocky Soil (8 Meter Depth):

   (i) Drill the earth pit having a throughout bore of 200mm dia to a depth of 8.0 meters from the top level of the foundations. This is to be done in all type of rocks by DTH system and over burden to be arranged by contractor.
   (ii) Cut M.S. rod of applicable diameter to approximate length of 7.5 meters.
   (iii) Place the earth electrode in the excavated pit such that the top of the electrode is 0.55 meters below the foundation top level.
   (iv) For connecting the electrode to the earth mat, clamp / hold the M. S. Rods of the electrode and the earth mat together. First weld these together at the crossing point.
   (v) Fabricate four cleats in the shape of M. S. Angles from M. S. Flat of size to be used for earthing risers and of length equal to 10 times the diameter of the M. S. Rod. Weld these at all the corners of the joint. A typical joint is shown in Annexure – A, (II): JOINT OF M.S. ROD TO M.S. ROD AT EARTH ELECTRODE AND AT MESH CROSSINGS.
(vi) After welding, apply bituminous compound to the hot joints, and cover the joints with bitumen impregnated tape.

(vii) Back fill the pit with Bentonite slurry (to be arranged by the Contractor) and compact it after completion of the work.

3.6 LAYING OF EARTH MAT:

(i) Excavate trenches along the specified alignments to a depth of 0.80 meter below the foundation top level.

(ii) Where different ground levels are provided in the switchyard, uniformly increase the depth of excavation in the higher level from a distance of 5 metres from the lower level so as to attain the required depth of excavation in the lower level.

(iii) Wherever the earth mat is to cross cable trenches, underground service ducts, pipes, transformer tracks, etc., increase the depth of excavation so that it can be laid at a minimum depth of 300 mm below them.

(iv) Wherever the earth mat is to cross a road, increase the depth of excavation so that it can be laid 300 mm below the road or at a greater depth to suit the site conditions.

(v) Lay the M. S. Rod in the excavated trenches.

3.7 JOINTS IN EARTHING:-

3.7.1 Straight Joints of M. S. Rods in the Earth Mat:

(i) Place the rods so that they overlap each other by 4 times their diameter, e.g., 100 mm in case of M. S. Rod of 25 mm diameter. Clamp / hold these two lengths of M.S. Rods together and weld them on both sides.

(ii) Thereafter, place two pieces of M. S. Flat of size to be used for earthing risers and length 4 times the diameter of the rods on both sides of this joint, and weld these pieces on the rods. A typical joint is shown in Annexure – A, (III): JOINT OF M.S. ROD TO M.S. ROD IN EARTH MAT.

(iii) After welding, apply bituminous compound to the hot joints, and cover the joints with bitumen impregnated tape.

3.7.2 Cross Joints of M. S. Rods in the Earth Mat:

(i) Clamp / hold together the two M. S. Rods crossing each other. First weld these together at the crossing point.

(ii) Fabricate four cleats in the shape of M. S. Angles from M. S. Flat of size to be used for earthing risers and of length equal to 10 times the diameter of the M. S. Rod. Weld these at all the corners of the joint. A typical joint is shown in Annexure – A, (II): JOINT OF M.S. ROD TO M.S. ROD AT EARTH ELECTRODE AND AT MESH CROSSINGS.

(iii) After welding, apply bituminous compound to the hot joints, and cover the joints with bitumen impregnated tape.

3.7.3 Joint of M. S. Rod and Earth Electrode:

(i) Clamp / hold together the M.S. Rod and the earth electrode. First weld these together at the crossing point.

(ii) Fabricate two cleats in the shape of M. S. Angles from M. S. Flat of size to be used for earthing risers and of length equal to 10 times the diameter of the M. S. Rod. Weld these at the joint. A typical joint is shown in Annexure – A, (IV): JOINT OF M.S. ROD TO M.S. ROD AT EARTH ELECTRODE.

(iii) After welding, apply bituminous compound to the hot joints, and cover the joints with bitumen impregnated tape.

(iv) Backfill the excavation and compact the soil after completion of the work.
3.8 PREPARATION AND FITTING OF RISERS:

(i) Excavate trench from the equipment / structure foundation to the nearest rod of the earth mat. The depth shall be 0.80 meter below the foundation top level.

(ii) Cut M. S. Flat of the required length and form / bend it, by heating if required, to form a smooth and regular shape to match with the shape / form of the equipment / structures / foundation. The shape of the risers should be same / similar for the same type of equipment / structure.

(iii) Lay the prepared M. S. flat riser from the equipment / structure / peak of the structure (for grounding of earth wire) to the rod of the earth mesh in the excavated trench and then connect it to the equipment or structures or structure peak. The fitting to the equipment / structure may be bolted type (earthing terminal / pad of the equipment) or welded type (structure). For bolted type fitting, drill necessary holes in the riser and fix it with bolts & nuts. For welded type fitting, weld a length equal to at least twice the width of the M. S. Flat.

(iv) In case joints are required to increase the length of the M. S. Flat risers, the two lengths of the M. S. Flat should overlap each other by twice the width of the M. S. Flat. After placing the M. S. flats one above the other as above, clamp / hold them together to provide good surface contact. Weld the two sides of the joint as well as the part between the flats on the top surface. A typical joint is shown in Annexure – A, (V): JOINT OF M.S. FLAT TO M.S. FLAT.

(v) Weld the M. S. Flat riser to the rod of the earth mat after fitting / welding it to the equipment / structure / structure peak. Place the M. S. Flat below the rod, clamp / hold them together, and weld on both sides of the rod. Then form a piece of M. S. Flat 50 x 6 mm into a stirrup (as shown in the drawing) and place on the joint of the rod and flat. Alternatively, cut two pieces of M. S. Angle 50 x 50 x 6 mm of length equal to the width of the M. S. Flat and place these on both sides of the joint of the rod and flat. Weld these to both the rod and the flat. A typical joint is shown in Annexure – A; (VI) JOINT OF M.S. FLAT TO M.S. ROD OF EARTH MAT.

(vi) After welding, apply bituminous compound to the hot joints and cover the joints with bitumen impregnated tape.

(vii) Clamp the earthing risers with the equipment support structures at 1000 mm intervals.

(viii) Backfill the excavation and compact the soil after completion of the work.

(ix) Apply red oxide paint and then green enamel paint on the portion of the risers above ground level.

(x) A drawing showing the typical arrangement for earthing of equipment and its structure is given at Annexure–B
JOINT OF M.S. FLAT TO M.S. FLAT

SECTION: C - C

PLAN

M.S. FLAT
50 mm WIDTH

LENGTH OF WELDING
250 mm

10/12
30

100

C
TYPICAL EXAMPLE OF EARTHING OF SUB-STATION EQUIPMENT
4.0 ERECTION OF SUB STATION STEEL STRUCTURES

4.1 General Instructions

(i) The structure material shall be stacked member / item wise.
(ii) The following shall be made available by VPN to the contractor for erection of Sub Station structures / beams and equipment structures:
    a) Drawings and bills of material of structures / beams / equipment structures.
    b) Templates of structures.

4.2 Type of Structures:

The types of structures generally used at Sub Stations are given below:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Name of Structure</th>
<th>Type of Structure</th>
<th>Height of Column / Height of Conductor (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>220 kV Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>AT1</td>
<td>Column with Peak</td>
<td>20.0 / 14.5</td>
</tr>
<tr>
<td>2</td>
<td>AT3</td>
<td>Column without Peak</td>
<td>15.0 / 14.5</td>
</tr>
<tr>
<td>3</td>
<td>AT4</td>
<td>Column with Peak and Beams at two levels for Bus Bar stringing</td>
<td>20.0 / 14.5 and 9.5</td>
</tr>
<tr>
<td>4</td>
<td>AT6</td>
<td>Column without Peak</td>
<td>10.0 / 9.5</td>
</tr>
<tr>
<td>5</td>
<td>AT8</td>
<td>Column with Peak</td>
<td>15.0 / 9.5</td>
</tr>
<tr>
<td>6</td>
<td>AB</td>
<td>Beam</td>
<td>16.6 (Width)</td>
</tr>
<tr>
<td>B.</td>
<td>132 kV 132 KV Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>BT1</td>
<td>Column with Peak</td>
<td>16.0 / 11.5</td>
</tr>
<tr>
<td>2</td>
<td>BT3</td>
<td>Column without Peak</td>
<td>12.0 / 11.5</td>
</tr>
<tr>
<td>3</td>
<td>BT4</td>
<td>Column with Peak and Beams at two levels for Bus Bar stringing</td>
<td>16.0 / 11.5 and 7.5</td>
</tr>
<tr>
<td>4</td>
<td>BT6 8.0 / 7.5</td>
<td>Column without Peak</td>
<td>8.0 / 7.5</td>
</tr>
<tr>
<td>5</td>
<td>BT7</td>
<td>Column with Peak</td>
<td>12.0 / 7.5</td>
</tr>
<tr>
<td>6</td>
<td>BB</td>
<td>Beam</td>
<td>12.2 (Width)</td>
</tr>
<tr>
<td>7</td>
<td>P</td>
<td>Peak</td>
<td>2.5</td>
</tr>
<tr>
<td>8</td>
<td>Q</td>
<td>Column</td>
<td>7.5 / 7.5</td>
</tr>
<tr>
<td>9</td>
<td>R</td>
<td>Extension</td>
<td>3.0</td>
</tr>
<tr>
<td>10</td>
<td>GD</td>
<td>Beam</td>
<td>10.0 (Width)</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td><strong>33 kV and 11 kV Structures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------</td>
<td>----------------</td>
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</tr>
<tr>
<td>1</td>
<td>X</td>
<td>Peak</td>
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</tr>
<tr>
<td>2</td>
<td>Y</td>
<td>Column</td>
<td>5.5 / 5.5</td>
</tr>
<tr>
<td>3</td>
<td>Z</td>
<td>Extension</td>
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<tr>
<td>4</td>
<td>GF – 5.4</td>
<td>Beam for 33 kV</td>
<td>5.4 (Width)</td>
</tr>
<tr>
<td>5</td>
<td>GF – 4.6</td>
<td>Beam for 11 kV</td>
<td>4.6 (Width)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>D</strong></th>
<th><strong>Equipment Structures</strong></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>AO1</td>
<td>220 kV Isolators</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>AO1 (T)</td>
<td>220 kV Tandem Isolators</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>AO3</td>
<td>220 kV CT</td>
<td>--</td>
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<tr>
<td>4</td>
<td>AO4</td>
<td>220 kV CVT</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>AO5</td>
<td>220 kV LA &amp; 132 kV CT, CVT / PT, LA</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>BO1</td>
<td>132 kV Isolator</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>BO1 (T)</td>
<td>132 kV Tandem Isolator</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>X – 15</td>
<td>33 kV &amp; 11kV Isolators</td>
<td>--</td>
</tr>
<tr>
<td>9</td>
<td>X – 15(T)</td>
<td>33 kV &amp; 11kV Tandem Isolators</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>CT Structure</td>
<td>33 kV &amp; 11kV CT, PT</td>
<td>--</td>
</tr>
<tr>
<td>11</td>
<td>PI Structure</td>
<td>220 kV, 132kV, 33 kV &amp; 11 kV PI</td>
<td>--</td>
</tr>
</tbody>
</table>
### The Weights of Various Types of Structures Are Detailed Below for Reference:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Type of Structure</th>
<th>Unit Wt. of Structure along with Bolts &amp; Nuts &amp; Sp. Washers (MT)</th>
<th>Wt. of Structure in (MT)</th>
<th>Wt. of GI Bolts &amp; Nuts (KG)</th>
<th>Wt. of Step Bolts &amp; Nuts (KG)</th>
<th>Wt. of Spring. Washers (KG)</th>
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<td>3.51</td>
</tr>
<tr>
<td>13</td>
<td>PIS</td>
<td>0.1715</td>
<td>0.164</td>
<td>6.887</td>
<td>NIL</td>
<td>0.495</td>
</tr>
<tr>
<td>14</td>
<td>AO1</td>
<td>1.0972</td>
<td>1.0724</td>
<td>23.131</td>
<td>NIL</td>
<td>1.683</td>
</tr>
<tr>
<td>15</td>
<td>AO1(T)</td>
<td>0.237</td>
<td>0.229</td>
<td>6.963</td>
<td>NIL</td>
<td>0.513</td>
</tr>
<tr>
<td>16</td>
<td>AO3</td>
<td>0.2654</td>
<td>0.2551</td>
<td>9.568</td>
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<td>0.72</td>
</tr>
<tr>
<td>17</td>
<td>AO4</td>
<td>0.230844</td>
<td>0.22132</td>
<td>8.885</td>
<td>NIL</td>
<td>0.72</td>
</tr>
<tr>
<td>18</td>
<td>AO5</td>
<td>0.196</td>
<td>0.18300</td>
<td>12.7000</td>
<td>NIL</td>
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</tr>
<tr>
<td>19</td>
<td>BO1</td>
<td>0.5937</td>
<td>0.57460</td>
<td>17.7300</td>
<td>NIL</td>
<td>1.32</td>
</tr>
<tr>
<td>20</td>
<td>BO1(T)</td>
<td>0.1714</td>
<td>0.16420</td>
<td>6.6970</td>
<td>NIL</td>
<td>0.495</td>
</tr>
<tr>
<td>21</td>
<td>P</td>
<td>0.0895</td>
<td>0.08170</td>
<td>7.2960</td>
<td>NIL</td>
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</tr>
<tr>
<td>22</td>
<td>Q With stub</td>
<td>0.7133</td>
<td>0.68850</td>
<td>23.2260</td>
<td>Nil</td>
<td>1.602</td>
</tr>
<tr>
<td>23</td>
<td>Q W/O Stub</td>
<td>0.6164</td>
<td>0.5989</td>
<td>16.342</td>
<td>Nil</td>
<td>1.134</td>
</tr>
<tr>
<td>24</td>
<td>R</td>
<td>0.441</td>
<td>0.42850</td>
<td>11.6720</td>
<td>Nil</td>
<td>0.792</td>
</tr>
<tr>
<td>25</td>
<td>GD Beam</td>
<td>0.5403</td>
<td>0.51320</td>
<td>25.1700</td>
<td>Nil</td>
<td>1.90</td>
</tr>
<tr>
<td>26</td>
<td>X</td>
<td>0.05</td>
<td>0.04400</td>
<td>5.8590</td>
<td>NIL</td>
<td>0.423</td>
</tr>
<tr>
<td>27</td>
<td>Y With stub</td>
<td>0.385</td>
<td>0.36500</td>
<td>18.8500</td>
<td>Nil</td>
<td>1.37</td>
</tr>
<tr>
<td>28</td>
<td>Y W/O Stub</td>
<td>0.332</td>
<td>0.3130</td>
<td>17.8400</td>
<td>Nil</td>
<td>1.30</td>
</tr>
<tr>
<td>29</td>
<td>Z</td>
<td>0.298</td>
<td>0.28900</td>
<td>8.8830</td>
<td>Nil</td>
<td>0.63</td>
</tr>
<tr>
<td>30</td>
<td>GF 5.4 mtr.</td>
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<td>0.23000</td>
<td>18.7800</td>
<td>Nil</td>
<td>1.22</td>
</tr>
<tr>
<td>31</td>
<td>33KV CT &amp; PT Str.</td>
<td>0.196</td>
<td>0.19030</td>
<td>5.3300</td>
<td>Nil</td>
<td>0.4</td>
</tr>
<tr>
<td>32</td>
<td>X-15</td>
<td>0.248734</td>
<td>0.241314</td>
<td>6.9160</td>
<td>Nil</td>
<td>0.504</td>
</tr>
</tbody>
</table>

The weights mentioned above are indicative only. The actual weights shall be taken as per approved BOM of supplied structures for the purpose of payment.
4.3 SETTING OF STUB / FOUNDATION BOLTS, LEVELLING AND PREPARING FOR GROUTING:

(i) In case of structures with foundation bolts, the template, along with the foundation bolts tightened on it with nuts on both sides, shall be placed on the foundation. The length of the foundation bolts above the template shall be sufficient so that all parts of the base plate assembly of the structure, washers, nuts and lock nuts can be tightened fully and 2 – 3 threads are left above the lock nut.

(ii) The template shall be levelled & centered with reference to its location on the foundation. The foundation bolts shall thereafter be grouted ensuring that there is no displacement during the placing of the concrete and use of vibrator. (Grouting work i.e., concreting in the pockets of the foundations along with material, will be in the scope of RVPN)

(iii) In case of structures with stubs, the template with stubs shall be placed on the foundation. In case of structures in which the lowest member is used as a stub, the assembled lower part of the structure shall be placed on the foundation. This shall be levelled & centered with reference to its location on the foundation. The stubs / lowest member shall thereafter be grouted ensuring that there is no displacement during the placing of the concrete and use of vibrator. (Grouting work i.e., concreting in the pockets of the foundations along with material, will be in the scope of RVPN)

(iv) While leveling and centering the structure / template, the following points shall be checked:
   a) Level of structure / template with reference to the finished foundation level or the ground level.
   b) The level of the structure / template with reference to level of other similar structures.
   c) Distance of centre line of the structure from the center line of other structures or from a reference point.
   d) Centre to centre distance between structures, particularly structures which are to be connected together, for example, by a common beam.

4.4 ERECTION OF STRUCTURES:

4.4.1 Method of Erection:
The contractor shall be at liberty to choose any of the three methods of erection of structures which are as below:
   i) Ground assembly method.
   ii) Section method.
   iii) Built up method or Piecemeal method.
He shall however be responsible for any damage to the structures/structure material or any adjacent structures/equipment.

4.4.2 Ground Assembly Method:

(i) This method is used for erection of equipment structures and is the preferred method for erection of Sub Station structures when crane facility is available.
(ii) This method consists of assembling the structure on the ground and erecting it as a complete unit.
(iii) The complete structure is assembled in a horizontal position near its location. On sloping or uneven ground, suitable packing is provided in the lower level area before or during assembly, as required, to eliminate / minimize stress on the structure members.
(iv) After the assembly is complete, the structure is picked up from the ground with the help of a crane and set on its foundation.

4.4.3 Section Method:

(i) This method is used for large and heavy structures when crane facility is available.
(ii) A mobile crane is used for erecting the structures.
(iii) The two faces / sides of the complete structure are assembled on the ground and then erected. Alternatively, the two faces / sides of the major sections of the structure are assembled on the ground and the same are erected as units.
(iv) Each assembled side is then lifted clear of the ground with the crane and is lowered into position on its foundation or fitted on to stubs or foundation bolts which are already grouted. One side is held in place with props or rope guys while the other side is being erected. The two opposite sides are then connected together with cross members.
(v) In case where the major sections of the structure have been assembled, the first face of the second section is erected. After the two opposite faces have been erected, the bracings on the other two sides are bolted up. The last lift raises the top of the structure. After the structure top is erected and all side bracings have been bolted up, all the guys are thrown off.

4.4.4 Built up method or Piecemeal method:
(i) This method is used for large and heavy structures when crane facility is not available.
(ii) This method consists of erecting the structure member by member. The structure members are kept on ground serially according to erection sequence so that they can be sent up conveniently.
(iii) The erection progresses from the bottom upwards. The four main corner leg members of the first section of the structure are first erected.
(iv) The cross bracings of the first section are raised one by one and bolted to the already erected corner leg angles. If these have been assembled on the ground then they are lifted up as a unit.
(v) For assembling the second section of the structure, a derrick is placed on one of the corner legs. This derrick is used for raising parts of second section. The leg members and bracings of this section are then hoisted and assembled.
(vi) The derrick is then shifted to the corner leg members on the top of second section to raise the parts of third section of the structure in position for assembly. The derrick is thus moved up as the structure grows. This process is continued till the complete structure is erected.

4.5 ERECTION OF BEAMS:
(i) The two faces of the beam are assembled on the ground.
(ii) Each face of the beam is raised with the help of crane or using derricks which are placed on the top of the already erected structures on both the sides of the beam. Single or multi-way pulleys with polypropylene/steel ropes are used as per load requirement. The ends of the beam are connected to the column as per fixing arrangement provided on the columns.
(iii) The bracings of the upper and lower faces of the beam are then raised up and fitted.

4.5.1 The columns shall be truly vertical and the beams truly horizontal after erection. Measures taken to bring the column to verticality and beam to horizontality should not result in strain on the structure members so as to cause distortion/bending of the members.

4.5.2 The work of erection of beams on erected columns and erection of equipment on erected structures shall not be taken up until these have been checked for tightening of the bolts & nuts.

4.5.3 All bolted connections shall be well tightened using spring washers & then punched at three points on the circumference of the bolt.

5.0 STRINGING OF BUS BARS OF ACSR CONDUCTOR, STRINGING OF SHIELD/EARTH WIRE AND JUMPERING ETC.

5.1 General Instructions
Note: The binding wire to be used for these works shall be arranged by the Contractor.
(i) Care shall be taken during sagging operations so that no damage or deformation is caused to the structures.
(ii) The ends of the cut piece of conductor/earth wire shall be tied with at least two rounds of binding wire so that the strands do not open out. The tying of the binding wire shall be done such that the binding wire does not get tightened in the groove of the T-Clamps or the PG (Parallel Groove) - Clamps or the terminal connectors of the equipment.
(iii) Cut lengths of conductor and earth wire left after stringing of bus bars and earth wire can be used for jumpering work.
(iv) Compression machine, if required, shall be provided on rent free basis by RVPN.
5.2 BUS BAR MATERIAL:

The bus bar material generally used in 220 kV & 132 kV sub Stations is given below:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Description</th>
<th>Bus Bar and Jumper Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>220 kV Main Bus</td>
<td>Twin ACSR Zebra</td>
</tr>
<tr>
<td>2</td>
<td>220 kV Auxiliary Bus</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td>3</td>
<td>220 kV equipment interconnection</td>
<td>Twin ACSR Zebra / Single ACSR Zebra</td>
</tr>
<tr>
<td>4</td>
<td>220 kV overhead bus &amp; droppers in all bays</td>
<td>Twin ACSR Zebra / Single ACSR Zebra</td>
</tr>
<tr>
<td>5</td>
<td>132 kV Main Bus</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td>6</td>
<td>132 kV Auxiliary Bus</td>
<td>ACSR Panther</td>
</tr>
<tr>
<td>7</td>
<td>132 kV equipment interconnection</td>
<td>ACSR Zebra / ACSR Panther</td>
</tr>
<tr>
<td>8</td>
<td>132 kV overhead bus &amp; droppers in all bays</td>
<td>ACSR Panther</td>
</tr>
<tr>
<td>9</td>
<td>33 kV Main Bus</td>
<td>Twin ACSR Zebra / Single ACSR Zebra</td>
</tr>
<tr>
<td>10</td>
<td>33 kV Auxiliary Bus</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td>11</td>
<td>33 kV equipment interconnection, overhead bus and droppers:</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td></td>
<td>(i) Bus coupler &amp; transformer bay</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td></td>
<td>(ii) Feeder bay</td>
<td>ACSR Panther</td>
</tr>
<tr>
<td>12</td>
<td>11 kV Main Bus</td>
<td>Twin ACSR Zebra</td>
</tr>
<tr>
<td>13</td>
<td>11 kV Auxiliary Bus</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td>14</td>
<td>11 kV equipment interconnection, overhead bus and droppers:</td>
<td>Twin ACSR Zebra / Single ACSR Zebra</td>
</tr>
<tr>
<td></td>
<td>(i) Transformer bay</td>
<td>Twin ACSR Zebra / Single ACSR Zebra</td>
</tr>
<tr>
<td></td>
<td>(ii) Bus coupler</td>
<td>ACSR Zebra</td>
</tr>
<tr>
<td></td>
<td>(iii) Feeder bay</td>
<td>ACSR Panther</td>
</tr>
</tbody>
</table>

5.3 STRINGING OF CONDUCTOR BUS BARS:

(i) The conductor shall be handled with care to prevent scratches on it or damage to the strands of the conductor. When the conductor is to be taken from drums, small lengths can be unwound from the drum. For longer lengths, the conductor drum shall be placed on a turn table or jacked up on a suitable size of steel shaft. The conductor shall be paid out in a manner so that there are no scratches or damages caused to the conductor due to rubbing on the sides of the drum.
(ii) Disc insulators shall be cleaned and examined for any cracks / chipping, etc. Disc insulators having any hair cracks or chipping or defective glazing or any other defect shall not be used. The limits of the area of defective glazing are given by the following formulas.

\[
\text{a) Single Glaze Defect} = 0.5 + \frac{D \times F}{20000} \text{ Sq. cm}
\]

\[
\text{b) Total Glaze Defect} = 0.5 + \frac{D \times F}{20000} \text{ Sq. cm}
\]

where,

\[D = \text{Diameter of the disc in cm}\]
\[F = \text{Creepage distance in cm}\]

(iii) The disc insulators shall be assembled on the ground to form the suspension and tension strings as given below.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>System Voltage</th>
<th>Suspension String</th>
<th>Tension String</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>E &amp; M Strength (kN)</td>
</tr>
<tr>
<td>1</td>
<td>220 KV</td>
<td>13</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>132 KV</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>33 KV</td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>4</td>
<td>11 KV</td>
<td>3</td>
<td>45</td>
</tr>
</tbody>
</table>

(iv) After assembly of the strings, the mouth of the W – clips / R – clips shall be widened to prevent any inadvertent removal during service.

(v) The suspension and tension hardware shall be assembled as per their respective drawings to be provided by RVPN and the disc insulator string shall be fitted in the requisite portion of the hardware assembly.

(vi) For stringing of bus bars, the conductor shall be fixed and tightened in the clamp of the tension hardware on one side of the bus. Thereafter, the complete hardware assembly with the conductor shall be hoisted up and fixed on the beam at this end. Sagging arrangement shall be made on the other end of the bus and the conductor shall be tensioned.

(vii) Measurement of length of conductor required for the bus shall be made thereafter and the conductor shall be released so that it returns to the ground. The conductor shall be cut to the marked length after deducting the length of the tension hardware with insulators and fixed in the clamps of the tension hardware. The conductor along with tension hardware set shall then be again pulled up and connected to the beam.

(viii) Equalizing of tension in the different sub – conductors of the same phase and in the different phases shall be done, if required, to ensure equal sag of all the sub – conductors or between phases of the bus section as well as that of adjacent or parallel sections.

(ix) The spacers shall be fitted on the twin conductor bus bars at the spacing shown in the drawing (to be provided by RVPN). The spacers shall also be provided at points where jumpers are taken from the bus bar using T – clamps and / or P. G. clamps. Spacers are not used at jumper points in case T – Spacers are used for taking jumpers from multi conductor bus bars.
5.4 JUMPERING:

5.4.1 Jumpering of Conductors:

(i) The jumpers connecting different sections of the bus bars as well as those connecting equipment to bus bars shall be of Y– type.
(ii) A typical diagram of Y– type jumpering is given below.

(iii) For making Y– type jumpers, the jumper conductor(s) shall be first connected to the bus bar conductor(s) using T– Clamp / Spacer T– Clamp which is suitable for clamping the respective conductors, i.e., bus bar conductor(s) and the jumper conductor(s). Thereafter, the bus bar conductor(s) shall be again connected with the jumper conductor(s) using properly curved & shaped Y– conductor(s) and 2 nos. PG– clamps as shown in the diagram above.

(iv) The jumpering between equipment shall be done with single / twin conductors as per the terminal connectors provided on the equipment.

(v) In case of jumpers for twin conductors, the spacers shall also be fitted at a suitable spacing on the jumpers in order to maintain their shape.

5.4.2 Jumpering Of Busbars:

(i) For jumpering of different sections of bus bars on the beam, the suspension hardware set along with disc insulators shall first be hoisted and fitted on the beam.
(ii) Conductor of approximately the length required for the jumper shall be cut and straightened so that kinks are removed. This shall be connected to the bus bar conductor on one side of the beam after taking into consideration the natural curve of the conductor.
(iii) This shall then be passed through the clamps on the suspension hardware so that the proper curve is obtained. The other end of the conductor shall then be taken up to the bus bar conductor on the other side and measurement of the length shall be taken. The conductor shall be cut to the appropriate length and then connected to the bus bar conductor on the other side. The length of the conductor used and its natural curve should be such that a neat and proper curve is obtained in the jumper without any kinks or bends. The clamp of the suspension hardware shall then be tightened after ensuring proportional lengths of the conductor on both sides of the beam.

5.4.3 Jumpering from Busbar to Equipment:

(i) Approximate length of the conductor required for the jumper shall be cut and then connected to the bus bar conductor.
(ii) In case the jumper is to be connected to equipment near or under a beam, the suspension hardware along with disc insulators is first fitted on the beam. The conductor shall be passed through the clamp of the suspension hardware.

(iii) The end of the conductor shall be taken up to the terminal connector of the equipment. The measurement of length of the conductor up to the equipment shall be made.

(iv) After cutting the conductor to the required length, it shall be connected to the equipment.

(v) The clamps of the suspension hardware shall be tightened thereafter.

5.4.4 JUMPERING BETWEEN EQUIPMENTS:

(i) The distance between terminal connector of one equipment and terminal connector of other equipment is first measured. The appropriate length of the conductor shall be cut and then straightened so that curves and kinks are removed.

(ii) The jumper conductor shall then be connected to the terminal connectors of both the equipments and straightened or shaped as per site condition to give a neat and proper look.

(iii) Vertically supported insulators of equipments and Post Insulators should be checked for verticality again after jumpering on both sides and corrected if required.

5.5 STRINGING OF SHIELD / EARTH WIRE:

(i) The shield / earth wire shall be handled with care to prevent scratches on it or damage to the strands of the wire. When the shield / earth wire is to be taken from drums, small lengths can be unwound from the drum. For longer lengths, the earth wire drum shall be placed on a turn table or jacked up on a suitable size of steel shaft. The shield / earth wire shall be paid out in a manner so that there are no scratches or damages caused to the shield / earth wire due to rubbing on the sides of the drum.

(ii) The earth wire shall be strung from one peak to another peak of the structures as per layout of the GSS.

(iii) The tension hardware shall be assembled as per the relevant drawings to be provided by RVPN.

(iv) The shield / earth wire shall be fitted and tightened in the clamp of the tension hardware on one side. Thereafter, the complete hardware assembly along with the shield / earth wire shall be hoisted up and fixed on the peak of the structure at one end.

(v) Sagging arrangement shall be made on the other end and the shield / earth wire shall be tensioned. Measurement of length of shield / earth wire required shall be made thereafter and the shield / earth wire shall again be released so that it is returned to the ground. The shield / earth wire shall be cut to the marked length after adding the length of the wire required for jumpering and fitted in the clamp of the tension hardware at the marked point. The shield / earth wire along with tension hardware set shall then be pulled up again and connected to the peak of the structure.

(vi) Adjustment of tension in the earth wire may be done, if required, to ensure equal sag of all the earth wires in adjacent or parallel sections.

5.6 JUMPERING OF SHIELD / EARTH WIRE:

(i) The lengths of the earth wire which remain outside the tension hardware on the peak of the structures shall be cut, if required, so that these lengths when joined together form a smooth and proper curve. These shall be connected together using a PG-Clamp.
(ii) The earth bond provided with the earth wire tension clamp shall be connected to the specified point on the peak of the structure and to the earthing riser, which is used as a down conductor from the peak, for the purpose of connecting the shield/earth wire to the earth mesh of the Sub Station.

6.0 ERECTION ACTIVITIES IN RESPECT OF VARIOUS EQUIPMENTS.

A. STATION TRANSFORMER:
   I) ERECTION OF STATION TRANSFORMERS
      i) Transportation of the station transformer and accessories, (if any provided loose) along with clamps and connectors from the site store to location carefully.
      ii) Cleaning of the transformer and the bushings.
      iii) Erecting the transformer on existing masonry platform by placing it properly, i.e., HV side towards 33 KV or 11 KV as the case may be.
      iv) Fitting of the accessories, (if any which have been provided loose).
      v) Checking that all the accessories as per the bill of material have been provided and the same are in position.
      vi) Making arrangements for locking the wheels of the transformer.
      vii) Fitting of the terminal connectors/ clamps, etc.
      viii) Tightening of nuts, bolts, etc. complete in all respect.

II) ERECTION OF HORN GAP FUSE SET:
Transportation of Horn Gap fuse set and its accessories along with clamps and connectors and structures from site store to location.
   i) Assembling (if required) of structure of Horn Gap fuse set
   ii) Fixing of structure of Horn Gap fuse set and leveling thereof.
   iii) Assembling of Horn gap fuse set as per drawing.
   iv) Mounting of Horn Gap fuse set on the structure.
   v) Fitting of clamps and connectors, etc.
   vi) Tightening of nuts, bolts, etc. complete in all respect.

III) JUMPERING FROM ISOLATOR TO HORN GAP FUSE & HORN GAP FUSE TO SUB STATION TRANSFORMER.
   i) Transportation of conductor from site store to location.
   ii) Carrying out jumpering between Isolator to Horn Gap fuse set and then from Horn Gap fuse set to Sub Station Transformer as detailed in clause 5.4.4 “JUMPERING BETWEEN EQUIPMENTS”.

B. CURRENT TRANSFORMERS:
   I) GENERAL INSTRUCTIONS
      i) While erecting the current transformers, the P1 terminal of the current transformer shall be kept as per the instructions of Engineer-In-Charge.

II) ERECTION
   i) Transportation of complete current transformers and their accessories, etc. along with clamps & connectors, etc. from site store to location.
   ii) Carrying out leveling of already erected structure(s) and minor fabrication work, if required, for erection of the Current Transformer.
   iii) Cleaning of the insulator of the Current Transformer.
   iv) The IR values of primary terminals to earth will be measured by RVPN with 5 kV Megger.
   v) Erecting of the Current Transformer on the structure.
   vi) Fitting of the terminal connectors on the Current Transformer.
   vii) Tightening of the nut, bolts, etc. complete in all respect.
C. CAPACITOR VOLTAGE TRANSFORMERS (CVT) / POTENTIAL TRANSFORMERS (PT)
   i) Transportation of complete CVT/PT and its accessories along with terminal connectors, etc. from site store to location.
   ii) Carrying out leveling of already erected structure(s) and minor fabrication work, if required, for erection of the Capacitor Voltage Transformers / Potential Transformers.
   iii) Cleaning of the insulators of the VTs.
   iv) Assembling the different units of the same serial number of the CVT, if applicable.
   v) The IR values of primary terminal to earth will be measured by RVPN with 5 kV Megger.
   vi) Erecting the Capacitor Voltage Transformer / Potential Transformer on the structure.
   vii) Fitting of the covers on the joints between different units of the CVT, if applicable.
   viii) Fitting of the terminal connectors on the VT”s.
   ix) Tightening of the nuts, bolts, etc. complete in all respect.

D. SERIES REACTORS / RESIDUAL VOLTAGE TRANSFORMER/ NEUTRAL CURRENT TRANSFORMER.
   i) Transportation of complete Series Reactor / RVT/ NCT and its accessories along with terminal connectors, etc. from site store to location.
   ii) Carrying out leveling of already erected structures and minor fabrication work if required for erection of the equipments.
   iii) Cleaning of the insulators of the Series Reactors / Residual Voltage Transformers/ Neutral Current Transformers.
   iv) The IR values to earth of Series Reactors will be measured by RVPN with 5 KV Megger.
   v) The IR values between primary terminal to earth and primary terminal to secondary terminals of Residual Voltage Transformers/ Neutral Current Transformers will be measured by RVPN with 5 KV megger.
   vi) Erecting the Series Reactors / Residual Voltage Transformers/ Neutral Current Transformers.
   vii) Fitting of the terminal connectors.
   viii) Tightening the nuts, bolts, etc. complete in all respect.

E) LIGHTNING ARRESTERS

I) GENERAL INSTRUCTIONS:
   i) The serial number of all the units of a multi- unit Lightning Arrester (LA) should be the same.
   ii) The units of a multi- unit Lightning Arrester should be assembled in the sequence shown on the rating plate of the LA or in the catalogue of the manufacturer to be provided by the Engineer-In-Charge.
   iii) The insulated base unit should be erected in case of Lightning Arresters provided with surge monitors.
   iv) The installation of the Lightning Arresters should be such that the direction of the open end of the explosion release vent (at top and bottom) is away from adjacent expensive equipment such as transformers.

II) ERECTION OF LAs OF 132 KV CLASS & 220 KV CLASS:
   i) Transportation of complete LAs along with accessories, clamps and connectors, etc. from site store to location.
   ii) Leveling of the already erected supporting structure(s) and carrying out minor fabrication work thereon for erection of the Lightning Arresters and surge monitors, as required.
   iii) Cleaning of the insulators of the Lightning Arresters.
iv) Assembling the different units of the same serial number of the Lightning Arresters, if applicable. Also, fitting of the corona rings between different units, if provided.
v) Erecting the Lightning Arresters on the already erected and leveled supporting structure(s).
vi) Fitting of the Surge Monitor on the structure and connecting it to the lowest unit of the Lightning Arrester above the base insulator.
vii) Fitting of the corona / grading ring on the top of the Lightning Arrester, if provided.
viii) Fitting of the terminal connectors on the Lightning Arresters.
ix) Tightening of the nuts, bolts, etc. complete in all respect.

III) ERECTION OF 33 KV & 11 KV LAs:
i) Transportation of complete LAs along with accessories, clamps and connectors, etc from site store to location.
ii) Making of the mounting arrangements on the beam of the already erected Sub Station structures.
iii) Cleaning of the insulators of the Lightning Arresters.
iv) Erecting the Lightning Arresters on the already prepared arrangement on the beam of the Sub Station structures.
v) Fitting of the terminal connectors on the Lightning Arresters.
vi) Tightening of the nuts, bolts, etc. complete in all respect.

F. ISOLATORS
I) ERECTION OF ISOLATORS:
i) Transportation of complete isolator with accessories, Post Insulators operating mechanism box, clamps and terminal connectors, etc. from site store to location.
ii) Leveling of already erected structure(s) and carrying out minor fabrication works, if required, for erection of the Isolator and operating mechanism(s).
iii) Erecting the 3 nos. base frames of individual phases on the structure(s).
iv) Carrying out leveling and centering of the base frames.
v) Fixing of the link pipes on the rotating parts of the base frames of the individual phases.
vi) Cleaning and assembling of the polycone insulator / insulator stack, as applicable. For single break isolators, there will be six polycone insulators / insulator stacks whereas for double break Isolators, the quantity will be nine.
vii) Fitting of the male and female contact arms on the polycone insulators / insulator stacks in case of single break Isolator. In case of double break Isolator, 6 nos. fixed contacts and 3 nos. moving contacts are fitted on the polycone insulators / insulator stacks.
viii) Fitting of the fixed contacts of earth blades in case of Isolator with Earth Switch.
ix) Fixing of the arcing horns (make before & open after the main contacts) or corona rings, as applicable.
x) Erecting the above assemblies on the rotating parts of the base frames.
xii) Carrying out adjustment / alignment of individual phases for smooth opening and closing and proper making of contacts.
xi) Fitting of the inter-phase connecting pipes between the rotating parts of the base frames of the individual phases, including fixing of hardware for interlocking with earth switch wherever provided.
xxii) Fitting of the operating mechanism box for the Isolator.
xiv) Fitting of the main operating down pipe to operating mechanism for the Isolator.

3) Checking of the operation and final adjustment / alignment of all the three phases of main Isolator for smooth, synchronized and complete operation as one unit.

3vi) Adjustment of the mechanical end stoppers on the base channel for both the closed and open positions.
xx) Fitting of the terminal connectors on the Isolator.
xxi) Tightening of the nuts, bolts, etc. complete in all respect.

\[55\]
II ERECTION OF EARTH SWITCHES:

i) Transportation of complete Earth Switch along with accessories and operating mechanism box, clamps and connectors, etc. from site store to location.

ii) Fixing of the earth blade mounting arrangements on the base frames of all the three phases.

iii) Fitting of the moving contact (earth blade) of the earth switches and counterweights, wherever provided.

iv) Carrying out the operation and adjustment / alignment of earth switch of each phase for smooth opening and closing and proper making of contacts.

v) Fitting of the inter-phase connecting pipes between the earth switches of the individual phases, including fixing of hardware for interlocking with main Isolator.

vi) Fitting of the operating mechanism box for the earth switches.

vii) Fitting of the main operating down pipe to operating mechanism for the earth switch.

viii) Checking the operation and final adjustment / alignment of all the three phases of the earth switch for smooth, synchronized and complete operation as one unit.

ix) Carrying out the adjustment and setting of mechanical interlock between main Isolator and earth switch to ensure that earth switch does not operate if the main Isolator is closed, and that main Isolator does not operate if the earth switch is closed.

x) Carrying out the adjustment of mechanical end stoppers for the OPEN and CLOSED positions of earth switch.

xi) Fitting of the earth bonds and other accessories as provided.

xii) Tightening of the nuts, bolts, etc. complete in all respect.

III ERECTION OF OPERATING MECHANISM:

i) Carrying out the adjustment and setting of auxiliary switches.

ii) Carrying out the adjustment of limits switches in CLOSED and OPEN positions of isolators in case of motor operated mechanism.

iii) Carrying out the adjustment of mechanical end stoppers for both the CLOSED and OPEN positions.

iv) Carrying out the adjustment of interlocking coil and plunger in CLOSED and OPEN positions.

v) Rechecking the adjustment/alignment of the isolator main contacts for smooth opening and closing and proper making of contacts after jumpering on both sides.

G. WAVE TRAPS

I GENERAL INSTRUCTIONS:

i) The Wave Traps are erected as below.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Line</th>
<th>Type of coupling</th>
<th>Phases on which Wave Traps are to be erected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Circuit</td>
<td>Phase to Phase</td>
<td>Two phases of the line</td>
</tr>
<tr>
<td>2</td>
<td>Double Circuit</td>
<td>Inter – circuit</td>
<td>Same phase of both the circuits</td>
</tr>
</tbody>
</table>

ii) For single circuit lines, the Wave Traps are generally erected on R & B phases.

iii) For double circuit lines, the Wave Traps are generally erected on the Y phase of both the circuits.
iv) The Wave Traps may be required to be erected on phases different from those mentioned at para (ii) and para (iii) above in case the end to end return loss is not found satisfactory during testing of the PLCC Carrier Sets.

II ASSEMBLY:
   i) Transportation of complete Wave Trap and its accessories, Hardwares, clamps and connectors, etc. from site store to location.
   ii) Cleaning of the Wave Trap and its associated equipment.
   iii) Fitting of the tuning pot and associated equipment in the Wave Trap by RVPN.
   iv) Fitting of the end covers on the wave traps, and positioning them correctly by RVPN.
   v) Fitting of the terminal connectors on the Wave Traps.
   vi) Tightening of the nuts, bolts, etc. complete in all respect.

III ERECTION OF SUSPENSION TYPE WAVE TRAPS:
   i) Fitting of the hardware for fixing the Wave Trap to the suspension string assemblies of the designated phases.
   ii) Hoisting the Wave Trap through lifting arrangement on the beam of the Sub Station structure.
   iii) Fitting of the Wave Trap on the already erected suspension string assemblies through suitable attachment.
   iv) Tightening of the nuts, bolts, etc. complete in all respect.

IV ERECTION OF PEDESTAL TYPE WAVE TRAPS:
   i) Leveling of the top plate of the already erected structure for wave trap.
   ii) Assembling of the parts of the Polycone Insulators, if applicable.
   iii) Erecting the polycone insulator(s) on the supporting structure.
   iv) In case three Polycone Insulators are provided for each Wave Trap and these are in parts, then the connecting plate between the joints of the parts of the Polycone Insulators are also to be fitted.
   v) Erecting the Wave Trap on the polycone insulators.
   vi) Tightening of the nuts, bolts, etc complete in all respect.

H. CAPACITOR BANKS

I GENERAL INSTRUCTIONS:
   i) DURING ERECTION WORK ON CAPACITOR BANKS, THE CAPACITOR UNITS SHALL BE KEPT SHORTED AND EARTHED TO PREVENT ELECTRIC SHOCK DUE TO ACCUMULATED CHARGE.

II ERECTION OF STRUCTURES:
   i) Transportation of Complete structure members, etc from site store to location.
   ii) Assembling the structures for the Capacitor Banks, Series Reactors and Residual Voltage Transformers / Neutral Current Transformers, if the members are received in loose condition.
   iii) Erecting the supporting structures on the foundation, carrying out their leveling, centering and preparation for grouting. (Grouting work, including, material, will be in the scope of RVPN).
   iv) Leveling the top of the above erected supporting structures and checking their verticality.

III ERECTION OF CAPACITOR BANKS:
   i) Transportation of Capacitor Banks with accessories, clamps & connectors, etc. from site store to location.
   ii) Leveling the top plate of already erected structures.
   iii) Cleaning of the post insulators/ Assembling of the post insulators, if required.
   iv) Erecting the post insulators on the already erected structure(s).
v) In case individual structures are provided for each phase, erecting the frame of each phase of the Capacitor Bank on the post insulators.

vi) In case only one structure is provided for all the three phases, erecting the frame of the first phase on the post insulators. Erecting the frame of the second phase after erecting post insulators on the frame of the first phase. Similarly, erecting the frame of the third phase after erecting post insulators on the frame of the second phase.

vii) Erecting the capacitor units on the already erected frames as per the erection plan of the manufacturer so that the capacitances of all the phases are balanced. In case no erection plan is provided, measurement of the capacitance of all the units shall be done by RVPN and phase wise combinations will be advised to the contractor so that the capacitances of all the phases are balanced.

viii) Interconnecting the capacitor units and phases as per manufacturer's general arrangement drawing, including fitting of external fuses if provided. (Drawing will be provided by the Engineer-In-Charge)

ix) Fitting of the post insulators and connecting strips for jumpering as per manufacturer's general arrangement drawing.

I. POST / POLYCON INSULATORS

i) Transportation of complete Insulators & their accessories, clamps and connectors from site store to location.

ii) Leveling the top plate of the already erected structure for Post / Polycone Insulators.

iii) Cleaning the Post / Polycone Insulators.

iv) Assembling the parts of Post / Polycone Insulators, if required.

v) Erecting the Post / Polycone Insulators on the already erected supporting structure.

vi) Fitting the corona ring on the Post / Polycone Insulators, if provided.

vii) Fitting the clamps on the Post / Polycone Insulators.

viii) Tightening the nuts, bolts, etc. complete in all respect.

J. CONTROL & RELAY PANELS

i) Transportation of Control and relay panels complete in all respect from site store to control room.

ii) Placing the panels at their designated locations on the trenches in the Control Room as per layout / instructions of Engineer-In-Charge.

iii) Fixing or bolting the panels (as per requirement of installation of the panels) on the channel / M.S. Angle fitted on the top of the walls of the trench or on the base frame, as provided, in the Control Room.

iv) Leveling the panels and checking their verticality.

v) In the case of Duplex type of panels, connecting the control panel to the relay panel across the corridor using the fittings provided with the panels. Also fitting the covers for the corridor portion.

vi) Where a number of panels are to be placed adjacent to each other to form a Board or where a panel is to be placed adjacent to an existing Panel / Board, these shall be bolted together. There shall be no gap between panels which are placed adjacent to each other.

vii) Connecting the Bus wiring / interconnecting wiring between the control & relay panels of the Duplex type. Also connecting the similar wiring between control panel to control panel and / or relay panel to relay panel where a Board formation is made or where panels are connected to an existing Board / panel as per their relevant schematic drawings to be made available by the Engineer-In-Charge.

viii) Connection of earthing to existing earth strip in control room.

K. LT PANELS

i) Transportation of L.T. Panel complete in all respect from site store to control room.

ii) Checking the LT Panel for any mechanical damage before installation.

iii) The insulation resistance of panel wiring and the LT Bus Bar (phase to phase and phase to earth) will be measured by RVPN with 500 V Megger before connecting any cable.
iv) Placing the LT Panel at its designated location in the control room as per layout/instructions of the Engineer-In-Charge.
v) Fixing /bolting the LT Panel on the trench provided in the floor of the control room.
vi) Connection of earthing to existing earth strip in control room.

L. DC PANELS:
i) Transportation of D.C. Panel complete in all respect from site store to control room.
ii) Checking the DC Panel for any mechanical damage before installation.
iii) Placing the DC Panel at its designated location in the control room as per layout/instructions of the Engineer-In-Charge.
iv) Fixing /bolting the DC Panel on the trench provided in the floor of the control room or on the base frame if provided.
v) Connection of earthing to existing earth strip in control room.

M. PLCC PANEL
i) Transportation of PLCC Panel complete in all respect from site store to control room.
ii) Fabricating the structure/frame as per the fixing dimensions of the Carrier sets. The structure/frame should have a height of at least 150 mm from floor level to facilitate cable entry into the panel.
iii) Placing the structure/frame near the cable trenches in the PLCC room in such a manner that sufficient space is available for accessing the Carrier sets from the rear for maintenance as well as from the front for setting up test instruments. Preparing for grouting of the structure/frame(grouting work, i.e., concreting in the pocket of the foundation along with material, will be in the scope of RVPN).
iv) Checking the Carrier sets for any mechanical damage during transportation.
v) Erecting the Carrier sets at their locations on the fabricated structures/frames. (A minimum spacing of 30 mm between two carrier sets on both the sides shall be maintained for proper ventilation.)
vi) Leveling of the Carrier Sets and fixing them on the structure/frame.
vii) Cleaning the interior of the rack of the Carrier sets.
viii) Inserting the modules, if received separately, in their designated locations in the Carrier Terminal by RVPN.
ix) Connection of earthing to existing earth strip in control room.

N. RTCC PANEL:
i) Transportation of RTCC Panel complete in all respect from site store to control room.
ii) Checking the RTCC panel for any mechanical damage before installation.
iii) The insulation resistance of panel wiring will be measured by RVPN with 500 V Megger before connecting any cable.
iv) Placing the RTCC Panel at its designated location in the control room as per layout/instructions of the Engineer-In-Charge.
v) Fixing /bolting the RTCC Panel on the trench provided in the floor of the control room.
vii) Connection of earthing to existing earth strip in control room.

O. MARSHALLING KIOSKS:
i) Transportation of Marshalling Kiosks complete in all respect from site store to location.
ii) Placing the Marshalling Kiosks on the foundation/cable trench as per the instructions of Engineer-In-Charge.
iii) Carrying out centering and leveling of the Marshalling Kiosks including preparation for grouting work (grouting work, i.e., concreting in the pockets of the foundation along with material, will be in the scope of RVPN)
iv) After grouting, tightening of the nuts, bolts, etc. complete in all respect.
P. LINE MATCHING UNIT (LMU) / LINE MATCHING DISTRIBUTION UNIT (LMDU)
   i) Transportation of Line Matching Unit / Line Matching Distribution unit & its
      accessories from site store to location.
   ii) Making arrangements / carrying out minor fabrication work (if required) on
      the supporting structure of the 2 nos. designated Capacitor Voltage Transformers
      (as per coupling requirement) for fixing of Line Matching Unit (LMU) / Line Matching
      Distribution Unit (LMDU). These CVTs shall be of the same phase on which the
      wave traps have been / are to be erected.
   iii) Fitting of the LMU / LMDU on the already erected structure.
   iv) Connecting the HF terminal of the Capacitor Voltage Transformer to the HF
      terminal of the LMU / LMDU.
   v) Tightening of the nuts, bolts, etc. complete in all respect.

Q. BATTERY CHARGERS
   I. GENERAL INSTRUCTIONS:
      i) Maintain a minimum spacing of 15 cm. between the battery charger and other panels on
         both sides for proper ventilation.
   II ERECTION:
      i) Transportation of battery charger along with accessories if any from the site store to
         control room.
      ii) Checking the Battery Charger for any mechanical damage before installation.
      iii) Placing the Battery Charger at its designated location in the control room as per layout /
           instruction of Engineer-In-Charge.
      iv) Fixing / bolting the Battery Charger on the trench provided in the floor of the control
          room.
      v) Tightening the nuts, bolts, etc. complete in all respect.

R. BATTERY SETS (VALVE REGULATED LEAD ACID / VRLA)
   I ERECTION:
      i) Transportation of cells, battery stand, accessories, clamps & connectors, etc. from site
         store to battery room.
      ii) Assembling if required, and installing the mounting frame / stand in the battery room.
      iii) Erecting the modules containing the cells on the mounting frame / stand as per the
           Manufacturer's manual and erection drawings to be made available by the Engineer-In-
           Charge.
      iv) Cleaning terminal surfaces of the cells with clean dry cotton cloth.
      v) Making inter cell connections as per manufacturer’s general arrangement drawings using
         the inter cell connectors after applying a thin layer of petroleum jelly on the bolts (only the
         bolts supplied with the Battery Set should be used).
      vi) Tightening of the terminals and inter cell connectors.
      vii) Fitting of battery identification label (serial no.), front cover, top cover and instruction
           labels, as supplied, on the cells.

II FRESHENING CHARGE
   i) Give a freshening charge to the Battery Set by gradually increasing the voltage. The
      current should not be allowed to exceed 20 % of the 10 hour capacity of the Battery Set or
      the capacity of the battery charger. The voltage should not be allowed to exceed 2.30 volts /
      cell.
   ii) The duration of the freshening charge and the voltage at which the Battery Set is to be
      charged, with reference to the ambient temperature, are given below. Either of the two
      options given in the table below can be adopted.
### III DISCHARGE / CAPACITY TEST:

i) The Battery Set shall be discharged after keeping it open circuit for not less than 2 hours and not more 24 hours from the completion of full charge.

ii) Discharge the Battery Set at its 10 hour rate, i.e., at a current equal to 10% of its rated ampere hour capacity till the voltage of any one cell reaches 1.75 volts or the total battery close circuit voltage reaches $1.75 \times n$ (where $n$ is the number of cells in the Battery Set), whichever is earlier.

   a) Maintain the discharge current within $\pm 1\%$ of the specified rate of discharge.
   b) Record the voltmeter and ammeter readings every 5 minutes for the first 15 minutes, and thereafter every 15 minutes up to the end voltage.
   c) Note the time in hours elapsing between the beginning and end of the discharge. This shall be taken as the period of discharge.
   d) The average temperature of the electrolyte during discharge shall be the average of the temperature readings noted at hourly intervals during discharge. The temperature of the battery terminal shall be measured as it will be almost the same as the electrolyte.

iii) During the above discharge test, the cell voltages shall not be less than the following values.

   a) After six minutes from the start of discharge: 1.98 Volts
   b) After six hours of discharge: 1.92 Volts
   c) At ten hours of discharge: 1.75 Volts

iv) The capacity of the Battery Set is obtained by multiplying the discharge current in amperes by the time in hours as observed above. This capacity is corrected to 27 Deg. C by the formula:

$$C_{27} = \frac{C_t \times 0.43 \times (27 - t)}{100},$$

where

- $t_1$ is the average ambient temperature of the battery room,
- $C_{27}$ is the Capacity of the Battery Set at 27 Deg. C, and
- $C_t$ is the measured Capacity of the Battery Set at $t^n$ Deg. C.

v) If 100% or more capacity is achieved at any time during the above discharge test, equalize the voltage of all the cells as given at sub para (vii) below. Finally charge the Battery Set as per para IV and put it in operation in the floating mode as per para VI.

vi) The minimum acceptable capacity of the Battery Set (corrected to 27°C) which is to be achieved during the above discharge test is 85% of the rated capacity. If this is not achieved, the matter should be referred to the manufacturer.

vii) If 85% or more capacity is achieved during the above discharge test, then equalize the voltage of all the cells as given below.

   a) Bypass the cell that has first reached 1.75 V.
b) Continue discharging the Battery Set at its 10 hour rate.
c) Keep bypassing the cells that reach 1.75 V until the voltage of all the cells reaches 1.75V.

viii) Charge and discharge the Battery Set until 100% capacity is achieved. If 100% capacity is achieved within another four discharges, finally charge the Battery Set and put it in operation in the floating mode.

IV CHARGING / RECHARGING:
i) Immediately after the discharging is completed, the Battery Set should be charged by gradually increasing the voltage. The current should not be allowed to exceed 20% of the 10 hour capacity of the Battery Set or the capacity of the battery charger. The voltage should not be allowed to exceed 2.30 volts / cell.
ii) Continue the charging till the charging current reduces to a negligible value.

V DISCHARGING:
i) Discharging of the Battery Set is to be done as per procedure given at paras III (i) and III (ii).
ii) If this discharge is a capacity test, note the time in hours elapsing from the beginning to the end of the discharge. Calculate the capacity as given at para III and take necessary action as required.

VI
(i) If the Battery set has achieved 100% capacity, then charge the Battery set as per para IV (i).
(ii) After the Battery Set has been fully charged as per para IV (ii), switch off the boost charger. Switch on the float charger after setting its output voltage as per manufacturer’s recommendations.
(iii) Measure the voltages of all the cells of the Battery Set and record for future reference.

S. CABLE LAYING AND TERMINATIONS:

Note: The cable tags/marking strips, G.I. wire, cable glands, thimbles/lugs, ferrules, PVC perforated strips, sand and bricks are in the scope of supply of the Contractor.

I GENERAL INSTRUCTIONS:
i) The number of cables of each size and their lengths shall be assessed and intimated to the contractor by the Engineer In-charge. The cable laying schedule shall then be prepared by the Engineer In-charge so that maximum length of the cable in a drum can be utilized, leaving minimum scrap lengths.
ii) Cable drums shall be unloaded, handled and stored properly.
iii) Rolling of drums shall be avoided as far as possible. The drums may be rolled for short distances provided they are rolled slowly and in the direction marked on the drum. In the absence of any indication, the drums may be rolled in the same direction as it was rolled during winding.
iv) Pulling out of cables from stationary drums shall not be permitted.
v) Cables shall not be bent below the minimum permissible limits given below:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Type of cable</th>
<th>Minimum bending radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Power cable</td>
<td>12 D</td>
</tr>
<tr>
<td>2.</td>
<td>Control cable</td>
<td>10 D</td>
</tr>
</tbody>
</table>

Where „D” is overall diameter of the cable.
vi) Cut lengths of cable which are available as surplus / left over material from other works should preferably be used first. Small cut lengths of cable left after laying long lengths can be used for bus wiring and looping.
II PAYING OUT OF CABLES:
  i) Transportation of cable drums from the site store to location.
  ii) Handle the cable with care to prevent forming of kinks and damage to the insulation of the cable.
  iii) When the cable is to be taken from drums, small lengths can be unwound from the drum.
  iv) For longer lengths, place the cable drum on a turn table or jack up the drum on a suitable size of steel shaft. The cable shall be laid in a manner so that there are no scratches or damages caused to the cable due to rubbing on the sides of the drum.
  v) The required lengths of cables are to be laid between the following equipments:
      a) C&R Panels in Control Room to Marshalling Kiosk.
      b) Marshalling Kiosk to Equipment.
      c) Marshalling Kiosk to Marshalling Kiosk.
      d) Equipment to Equipment in switchyard.
      e) C&R Panel to C&R Panel / other panels in Control room, etc.
  vi) The cables shall be cut after taking into account the length required for connecting to the farthest terminals of the terminal block in the Control & Relay Panel / MK / equipment at both the ends.

III LAYING OF CABLES IN TRENCHES:
  i) The removing of trench covers and the refixing after completion of work will be done by the contractor.
  ii) The cables shall be placed in the racks in cable trenches. Power and control cables shall be laid in separate tiers. The order of placing cables (other than those directly buried) in cable trenches shall be as follows:
      a) Bottom tiers: Power Cables / Cables having A. C. supply.
      b) Middle tiers: Cables from CT / CVT / PT.
      c) Upper most tiers: Cables having D.C. supply.
  iii) The cables shall be securely fixed on the racks in the cable trenches. Particular care shall be taken when cables are laid in vertical & inclined cable trenches / galleries / vaults or supports.

IV MARKING AND TAGGING:
  i) Cable tag / marking strip shall be provided on all cables at both ends (just before entry into the equipment enclosure), on both sides of a wall / floor crossing & on each duct / conduit entry for identification of the cable. Cable tags shall also be provided inside the switchgear, control and relay panels, etc., wherever required for cable identification.
  ii) The numbering of cables on the tags shall be done as per cable schedule. Generally Cable size, identification of initial point and terminating end of equipment / Panel and a cable number shall be punched on the cable tag / marking strip by the Contractor.
  iii) Rectangular shaped cable tag / marking strip of 1.0 mm thick aluminum with the description punched on it shall be securely attached to the cable by not less that two turns of 20 SWG GI wire

V LAYING OF UNDERGROUND POWER CABLES:
  i) Excavation of trench of 30 cm width and 75 cm depth along the proposed route / alignment. The width may be increased in case a number of cables are to be laid. At crossings of cable trenches / roads / transformer tracks / pipes / earth mat conductor, etc., the depth shall be increased such that the bottom of the trench is 40cm below them.
  ii) Covering the bottom of the trench with a layer of sand 25 cm thick.
  iii) Laying the cable in the excavated trench.
iv) Covering the cable with bricks and backfilling the trench with the excavated sand. Compacting the sand by ramming. (Supply of sand & bricks are in the scope of work of the contractor)

v) Securing the cables on the supports above ground level.

VI MARKING AND TAGGING:

i) Directly buried underground cables shall be clearly identified with cable marker made of iron plate (Cable marker will be provided by RVPN).

ii) Location of underground cable joints shall also be indicated with cable marker with an additional inscription "Cable joints". (Cable marker will be provided by RVPN).

iii) The markers shall project 150 mm above ground and shall be placed at intervals of 30 meters and at every change in direction. They shall also be located on both sides of road and drain crossings.

VII CABLE TERMINATION:

i) Drilling the required holes in the gland plates of the panels / equipment, etc. for fixing the cables.

ii) Stripping off the insulation of the cable for sufficient length so that any wire of the cable can be terminated at the farthest terminal in the terminal blocks.

iii) For unarmoured cable, stripping off the outer and inner insulation sheaths of the cable. Fixing the cable gland on the cable end and then fixing the cable gland on the gland plate of the equipment / panel.

iv) For armoured cables, stripping off the outer and inner insulation sheaths of the cable including cutting off the armouring for the stripped off length keeping a small length for fitting in the cable gland. Fitting the gland nut in the cable. Bending the armouring to fit the gland. Fitting the gland nut and tightening. Fitting the cable gland on the gland plate of the equipment/ panel.

v) Sealing all unused openings for cables in the cable gland plate to prevent entry of vermin and dust.

VIII WIRE TERMINATION:

i) Identification of each core of the cable either by its physical location / marking / numbering or by testing continuity from both ends.

ii) Marking each core of the cable at both ends with a tag / ferrule as per cable schedule / schematic drawing as per instructions of Engineer-In-Charge. In panels in which a large number of cables are terminated, wire identification may be difficult, therefore, the complete cable number shall also be included in the tag / ferrule on each core if advised by the Engineer In-charge.

iii) Cutting each wire at the length required for terminating it on the terminal block. This should be done after proper dressing of the wire in the wiring trough.

iv) Stripping off the insulation of each core of the cable which is to be connected. Crimping the termination end / thimble / lug (pin or ring type, as required) of appropriate size on the wire as approved by the Engineer-In-Charge.

v) Connecting the wire to its terminal on the terminal block and tightening to ensure secure and reliable connection.

vi) Marking all the spare cores of the cables with tags / ferrules indicating the cable number.
APPENDIX

Annexure –A: Compliance with The Code of Integrity and No Conflict of Interest

Any person participating in a procurement process shall –

(a) not offer any bribe, reward or gift or any material benefit either directly or indirectly in exchange for an unfair advantage in procurement process or to otherwise influence the procurement process;

(b) not misrepresent or omit that misleads or attempts to mislead so as to obtain a financial or other benefit or avoid an obligation;

(c) not indulge in any collusion, Bid rigging or anti – competitive behaviour to impair the transparency, fairness and progress of the procurement process;

(d) not misuse any information shared between the procuring Entity and the Bidders with an intent to gain unfair advantage in the procurement process;

(e) not indulge in any coercion including impairing or harming or threatening to do the same, directly or indirectly, to any party or to its property to influence the procurement process;

(f) not obstruct any investigation or audit of a procurement process;

(g) disclose conflict of interest, if any; and

(h) disclose any previous transgressions with any Entity in India or any other country during the last three years or any debarmment by any other procuring entity.

Conflict of Interest:-

The Bidder participating in a bidding process must not have a conflict of interest.

A conflict of interest is considered to be a situation in which a party has interests that could improperly influence that party’s performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations.

(i) A Bidder may be considered to be in conflict of interest with one or more parties in a bidding process if, including but not limited to:

a). have controlling partners/shareholders in common; or

b). receive or have received any direct or indirect subsidy from any of them; or

c). have the same legal representative for purposes of the Bid; or

(d). have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the Bid of another Bidder, or influence the decisions of the Procuring Entity regarding the bidding process; or

e). the Bidder participates in more than one Bid in a bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which the Bidders is involved. However, this does not limit the inclusion of the same subcontractor, not otherwise participating as a Bidder, in more than one Bid; or

f). the Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the Goods, Works or Services that are the subject of the Bid; or

g). Bidder or any of its affiliates has been hired (or is proposed to be hired) by the procurement Entity as engineer-in-charge/consultant for the contract.
Annexure –B: Declaration by the Bidder regarding Qualifications

Declaration by the Bidder

In relation to my/our Bid submitted to ........................................ for Contract of ........................................ in response to their Notice Inviting Bids No ........................................ Dated ........................................ I/we hereby declare under Section 7 of Rajasthan Transparency in Public Procurement Act, 2012 that:

1. I/we possess the necessary professional, technical, financial and managerial resources and competence required by the Bidding Document issued by the Procuring Entity;

2. I/we have fulfilled my/our obligation to pay such of the taxes payable to the union and the State Government or any local authority as specified in the Bidding Document;

3. I/we are not insolvent, in receivership, bankrupt or being wound up, not have my/our affairs administered by a court or a judicial officer, not have my/our business activities suspended and not the subject of the legal proceedings for any of the foregoing reasons;

4. I/we do not have, and our directors and officers do not have, been convicted of any criminal offence related to my/our professional conduct or the making of false statements or misrepresentations as to my/our qualifications to enter into procurement contract within a period of three years preceding the commencement of this procurement process, or not have been otherwise disqualified pursuant to debarment proceedings;

5. I/we do not have a conflict of interest as specified in the Act, Rules and the Bidding Document, which materially affects fair competition;

Date:

Place

Signature of bidder

Name:

Designation:

Address:

[Signature]

[Signature]
Annexure –C: Grievance Redressal during Procurement process

The designation and address of the First Appellate Authority is………………………………………………………………………………………………………………………………………………………………………..
The designation and address of the Second Appellate Authority is……………………………………………………………………………………………………………………………………………………………………………..
as nominated vide order No.RVPN/AAO/F&R/F.98/D.53 dated 30.06.2016.

(1). Filling an Appeal

If any Bidder or prospective bidder is aggrieved that any decision, action or omission of the Procuring entity is in contravention to the provisions of the Act or the Rules or the Guidelines issued thereunder, he may file an appeal to First Appellate Authority, as specified in the Bidding Document within a period of ten days from the date of such decision or action, omission, as the case may be, clearly giving the specific ground or grounds on which he feels aggrieved.

Provide that after the declaration of a Bidder as successful the appeal may be filed only by a Bidder who has participated in procurement proceedings:

Provided further that in case a Procuring Entity evaluates the Technical Bids before the opening of the Financial Bids, an appeal related to the matter of financial Bids may be filed only by a Bidder whose Technical Bid is found to be acceptable.

(2) The officer to whom an appeal is filled under para (1) shall deal with the appeal as expeditiously as possible and shall endeavour to dispose it of within thirty days from the date of appeal.

(3) If the officer designated under para (1) fails to dispose of the appeal filed within the period specified in para (2), or if the Bidder or prospective bidder or the procuring Entity is aggrieved by the order passed by the First Appellate Authority, the Bidder or prospective bidder or procuring Entity, as the case may be, may file a second appeal to Second Appellate Authority specified in the Bidding Document in this behalf within fifteen days from the expiry of the period specified in para (2) or of the date of receipt of the order passed by the First Appellate Authority, as the case may be.

(4) Appeal not to lie in certain cases

No appeal shall lie against any decision of the Procuring Entity relating to the following matters, namely:-

(a) determination of need of procurement;

(b) provisions limiting participation of Bidders in the Bid process;

(c) the decision of whether or not to enter into negotiations;

(d) cancellation of procurement process;

(e) applicability of the provisions of confidentiality.

(5) Form of Appeal

(a) An appeal under para (1) or (3) above shall be in the annexed form along with as many copies as there are respondents in the appeal.

(b) Every appeal shall be accompanied by an order appealed against, if any, affidavit verifying the facts stated in the appeal and proof of payment of fee.
(c) Every appeal may be presented to First Appellate Authority or Second Appellate Authority, as the case may be, in person or through registered post or authorised representative.

(6) **Fee of filing Appeal**

(a) Fee of first appeal shall be rupees two thousand five hundred and for second appeal shall be rupees ten thousand, which shall be non-refundable.

(b) The fee shall be paid in the form of bank demand draft or banker's cheque of the Scheduled Bank in India payable in the name of Appellate Authority concerned.

(7) **Procedure for disposal of Appeal**

(a) The First Appellate Authority or Second Appellate Authority, as the case may be, upon filing of appeal, shall issue notice accompanied by copy of appeal, affidavit and documents, if any, to the respondents and fix date of hearing.

(b) On the date fixed for hearing, the First Appellate Authority or Second Appellate Authority, as the case may be, shall:

   (i) Hear all the parties to appeal present before him; and

   (ii) Peruse or inspect documents, relevant records or copies thereof relating to the matter.

(c) After hearing the parties, perusal or inspection of documents and relevant records or copies thereof relating to the matter, the Appellate Authority concerned shall pass an order in writing and provide the copy of order to the parties to appeal free of cost.

(d) The order passed under sub-clause(c) above shall also be placed on the State Public Procurement Portal.
Annexure -D

FORM No. 1
[See rule 83]

Memorandum of Appeal under the Rajasthan Transparency in Public Procurement Act, 2012

Appeal No................................... of..........................................

Before the ...........................................(First/Second Appellate Authority)

(A). A Bidd

1. Particulars of appellant:
   (i) Name of the appellant:
   (ii) Official address, if any:
   (iii) Residential address:

2. Name and address of the respondent(s):
   (i)
   (ii)
   (iii)

3. Number and date of the order appealed against and name and designation of the officer/authority who passed the order (enclosed copy), or a statement of a decision, action or omission of the Procuring Entity in contravention to the provisions of the Act by which the appellant is aggrieved:

4. If the Appellant propose to be represented by a representative, the name and postal address of the representative:

5. Number of affidavits and documents enclosed with the appeal:

6. Grounds of appeal.................................................................
   (Supported by an affidavit)

7. Prayer..................................................................................

   Place.............................................................

   Date.............................................................

Appellant's Signature

[Signature]
SECTION – IV
SCHEDULE-1 (Safety Instructions)

SAFETY ASPECTS AND INSTRUCTIONS TO BE COMPLIED WITH DURING ERECTION WORKS AT EHV SUB STATIONS

RVPN SAFETY INSTRUCTIONS
WORK AT EXTRA HIGH VOLTAGE SUB STATIONS

1.0 POLICY, PHILOSOPHY, PRINCIPLES AND AUDIT

1.1 POLICY
   i) The RVPN Safety Rules & Safety Instructions are drawn up to comply with the requirement of the Indian Electricity Rules, 1956.
   ii) The RVPN recognizes and accepts its statutory and moral responsibilities for ensuring safe design, construction, operation and maintenance of equipment and for the provision of safe methods of work and healthy working conditions. These requirements rank equally with other objectives of the Company.
   iii) The success of the Policy relies on all employees complying with safety requirements relevant to their responsibilities.

1.2 PHILOSOPHY
   i) Transmission of electrical power at Extra High and High Voltage is carried out using the RVPN’s electrical and mechanical items of equipment, interconnected to form electro-mechanical systems. These systems contain inherent dangers but are designed so that they are safe when operated normally.
   ii) When work or testing is to be carried out on or near to these systems, rules need to be specified to achieve safety from the inherent danger.
   iii) These Safety Rules are based on a philosophy that persons will be protected from the inherent dangers. This is achieved by making persons “safe from the system”.
   iv) The inherent dangers are those arising from a system. The RVPN Safety Rules and Safety Instructions define the procedures and responsibilities for achieving safety of persons from inherent dangers.
   v) The Safety Rules are supplemented by the RVPN Safety Instructions which define the actions to be taken to apply the provisions of the Safety Rules.
   vi) The Safety Rules and Safety Instructions together form a system to provide a safe procedure for work or testing on the system and can be summarized as follows:
      a) Making available the equipment concerned for the maintenance work or testing work.
      b) Establishing safe conditions for maintenance work or testing work. This can be achieved by either limiting the area of work or testing or by isolating and discharging the contents to a safe working level.
      c) Authorizing the maintenance work or testing to commence.
      d) Receiving the authority to carry out maintenance work or testing, carrying out the work or testing while maintaining those safe conditions.
      e) Cancelling the authority to work or test on completion of the work or testing
      f) Restoring the system to normal.

vii) Further dangers are those arising from the environment in which persons undertake work. The way in which these dangers are managed is specified in the Safety Rules and Safety Instructions.
1.3 PRINCIPLES
The principles supporting the Policy and Philosophy for the Safety Rules and Safety Instructions are as follows:-

i) The Safety Rules and Safety Instructions are only designed to protect people.

ii) The primary method of achieving safety from the system is by isolation, followed by earthing for EHV and HV equipment. In the case of mechanical equipment, this shall be followed by draining, venting, purging and discharging stored energy systems (as appropriate). Where reasonably practicable, all points of isolation, vents and earths should be locked.

iii) The application of specific instructions / procedures where these Rules cannot be applied (e.g., Live / Hot Line Working).

iv) The safety precautions for all work and testing shall be maintained across all internal and external control boundaries.

v) Training of all staff and monitoring / authorizing certain staff that will carry out specific duties in the application of the Rules.

vi) Ensuring compliance by a regular and systematic audit.

2.0 DEFINITIONS

Additional Earth(s): Temporary, portable Earth(s) which are issued to the recipient of the Permit To Work or Permit To Test and are included in an Earthing Schedule. They are applied within an Isolated Zone in order to discharge any induced voltage. Additional Earth(s) shall be minimum 35 sq. mm copper equivalent.

Approved Procedure: RVPN Safety Instructions or other specialized procedures authorized by CE / SE.

Authorized Person: Maintenance / Testing Engineer.

Maintenance Engineer: Responsible for carrying out maintenance works of EHV & HV equipments, transmission lines & LT systems.

Testing Engineer: Responsible for carrying out testing of protective systems, P/LCC panels and other related equipments.

Caution Notice: A notice in prescribed form to be applied at all points of isolation, or attached to all vents and drains and to Primary Earths where practicable and to control and operating devices to indicate that work or testing is being carried out.

Certificate of no back feed: A certificate which records the details of Isolation carried out at a remote substation in order to achieve safety from EHV/HV systems and from test supplies.

Certificate of Earthing: A certificate which records the details of Isolation & earthing carried out at a remote substation in order to achieve safety from EHV / HV systems and from test supplies.

Company: RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LTD. (RRVPNL, or, in short, RVPN).

Competent Person: A person not below the level of Supervisor or Technician.

Danger: A risk to health, or of bodily injury, or to life.

Danger Notice: An approved notice reading “Danger”.

Dead: Not electrically Live or Charged.

Earthing Device: An approved means of providing a connection between an electrical conductor / equipment and earth, being either a “Primary Earth” or an “Additional Earth”.

Earthing Schedule: A schedule indicating the requirements of Additional Earth(s) for each stage of the work or testing. It must show the number of earths required and either describe or show pictorially their position in the Isolated Zone.
Equipment: Electrical and mechanical apparatus / equipment used to protect, control, measure, generate, transmit and distribute electricity to which the Safety Rules apply.

Extra High Voltage (EHV): Any voltage in excess of 33,000 volts (AC/DC).

General Safety: Those actions required to maintain a safe environment / place for work / testing, e.g., safe access and safe methods of work & testing and the correct use of personal protective equipment.

High Voltage (HV): A voltage between 650 volts and 33,000 volts.

Isolated: Disconnected from associated Equipment by Isolating Device(s) in the isolated position, or by adequate physical separation.

Isolating Device: A device for rendering Equipment Isolated.

Isolated Zone: All items of equipment contained within a work / testing area for which isolation has been achieved at all points of supply.

Keys:

Safety Key: The key from a unique lock (at a location) which is used for locking / interlocking an Isolating Device, Earth or Drain / Vents.

Key Safe: A designated lockable cabinet for the safe custody of all Safety Keys.

L D: Load Dispatch Center – The center where the operations of the GSS / Power Stations and the RVPN Electricity grid constituting the RVPN power system are monitored & coordinated.

Live: Charged / Energized at a voltage by being connected to a source of electricity.

Lock / Locks: A device used for immobilization of an item of Equipment.

Lock Closed: To secure an item of Equipment with padlocks or other device such that it is immobilized in the closed position.

Lock Open: To secure an item of Equipment with padlocks or other device such that it is immobilized in the open position.

Low Voltage (LV): A voltage not exceeding 250 volts.

Medium Voltage (MV): A voltage between 250 and 650 volts.

N R L D C: Northern Region Load Dispatch Center – The center where the operations of Northern Electricity grid constituting the power systems of the partner States are monitored & coordinated.

Point(s) of Isolation: The point(s) at which Equipment has been Isolated and, when practicable, the isolation Point immobilized and Locked. Caution Notices shall be attached to all Points of Isolation.

PRASAN NIGAM: RRVPNL - Rajasthan Rajya Vidyut Prasaran Nigam Limited.

Primary Earth(s): Earth(s) [Either fixed earth Switch(es) or Portable Earth(s) with sufficient / suitable electrical capacity] applied between the point of work and all points of EHV / HV isolation before the Permit To Work or Permit To Test is issued. Primary earth(s) shall be minimum 95 sq. mm copper equivalent.

Permits To Test (PTT): A safety Document specifying the EHV / HV Equipment and the testing to be carried out and the actions taken to safeguard the disturbance of the system during the testing. Form of document is shown in Section 4.0 B.

Permits To Work (PTW): A Safety Document specifying the Equipment / Area and the work / testing to be carried out and the actions taken to achieve Safety from the system. Form of document is shown in Section 4.0 A.

Purged: A condition of Equipment from which any dangerous contents have been removed.

RSI: RRVPNL Safety Instructions.

Safety Electrical: That distance from the nearest Extra High Voltage or High Voltage Exposed Conductor or part of equipment not Primary Earthed, or from its support insulator, which must be maintained to avoid danger.

Safe Electrical clearance: A distance of 1.5 meters minimum which must be maintained by lineman from the conductors or jumpers of a de-energized overhead line which has been Isolated & Primary earthed and for which a Safety Document has been...
issued before connection of Additional Earths under the terms of that Safety Document.

Safety Document: A Document specifying the Equipment / Area and the work / testing to be carried out and the actions taken to achieve Safety from the system (Permit To Work), or to safeguard the disturbance of the system during the testing (Permit To Test).

Safety from the system: That condition which safeguards persons working on or near to Equipment from the Dangers which are inherent in a System.

Senior Authorized Person / Shift In charge: Engineer responsible for all operations and activities in substations.

Supervision: Supervision, Personal / direct, by an Authorized Person who is available at the point of work or testing at all times during the course of that work or testing.

System: Items of Equipment which are used either separately or in combination to generate, transmit or distribute electricity.

Vented: Allowing a closed space to have an outlet to atmosphere so that the pressure has equalized to atmospheric.

3.0 GENERAL PROVISIONS.

3.1 GENERAL SAFETY.

i) In addition to the requirements for establishing Safety from the System specified in these Safety Rules and Safety Instructions, General Safety shall be established and maintained at all times.

ii) General Safety shall be established by the person holding the Safety Document before work / testing starts. The person responsible for establishing General Safety shall be specified in the Safety Instructions.

iii) During the course of work, the person in charge of the work / testing shall ensure that each & every member of the working party maintains General Safety.

iv) It is the responsibility of all members of the working party, overseen by the person in charge of the work / testing, to ensure that their activities do not affect other work areas.

3.2 SAFETY RULES, SAFETY INSTRUCTIONS AND PROCEDURES.

i) These Safety Rules, Safety Instructions and Procedures are mandatory.

ii) Relevant Safety Rules issued by other Authorities should also be considered mandatory when designated as in Basic Safety Rules.

3.3 SPECIAL INSTRUCTIONS.

Construction Work or testing carried out on or near to a System to which these Safety Rules cannot be applied, or for special reasons should not be applied, shall be carried out in accordance with an Approved Procedure. (e.g., EHV / HV Live Line / Hot Line working which cannot be covered in these Safety Rules).

3.4 OBJECTIONS ON SAFETY GROUNDS.

Any person who has objections on safety grounds in the application of these Safety Rules and Safety Instructions shall explain their reasons to the person holding the Safety Document. If their objections cannot be resolved immediately, then the matter should be referred to the Site - In - Charge. If the objections are still not resolved then the matter should be referred to the Site - In - Charge.

4.0 THE BASIC SAFETY RULES

4.1 APPLICATION OF RULES.

i) The Rajasthan Rajya Vidyut Prasaraj Nigam Limited Safety Rules and Safety Instructions shall be applied when working on or near to items of Equipment which are part of a System described in 4.1(ii).
ii) The System to which these Safety Rules and Safety Instructions apply is all those items of Equipment owned by RVNP Limited and located within the Company’s Sub Station fences or on its transmission lines.

4.2 APPROACH TO EXPOSED EXTRA HIGH VOLTAGE AND HIGH VOLTAGE CONDUCTORS AND INSULATORS.

i) Persons shall not allow any part of their body or objects / tools & plant to approach within the specified Safety Clearance to exposed EHV / HV conductors which are Live. The only exception to this is during Live / Hot line work carried out on EHV / HV equipment in accordance with Approved specialized procedure.

ii) SAFETY CLEARANCES:

<table>
<thead>
<tr>
<th>Highest System Voltage (kV)</th>
<th>Safety Working Clearance (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2.6</td>
</tr>
<tr>
<td>36</td>
<td>2.8</td>
</tr>
<tr>
<td>72.5</td>
<td>3.1</td>
</tr>
<tr>
<td>145</td>
<td>2.7</td>
</tr>
<tr>
<td>245</td>
<td>4.3</td>
</tr>
<tr>
<td>420</td>
<td>0.4</td>
</tr>
</tbody>
</table>

iii) When Points of Isolation have been established and exposed conductors could be subject to Extra High Voltage or High Voltage, the only object permitted to approach within Safety Clearance shall be Approved voltage measuring devices or Earthing Devices.

iv) When Points of Isolation have been established and Danger has been excluded by the application of Earthing Devices, approach is allowed under an appropriate Safety Document within the specified Safety Clearance.

4.3 SAFETY PRECAUTIONS FOR WORK OR TESTING ON OR NEAR TO EXTRA HIGH VOLTAGE OR HIGH VOLTAGE EQUIPMENT.

i) When work or testing is to be carried out on or near to EHV / HV equipment,
   a) Means of achieving safety must be assessed according to Safety Instruction 01.
   b) The EHV / HV equipment must be identified.

ii) Safety Documents.
   a) When work or testing is to be done on the normally energized part / primary side of the EHV / HV equipment and it is necessary to provide Primary Earths, a Permit To Work (PTW) shall be issued. In case it is required to remove the Primary Earth for the purpose of testing (such as meggering), this shall be done after taking due precautions as required.
   b) When work or testing is to be done on the normally not energized part / secondary side of the EHV / HV equipment, such as for relay testing or CB operation testing or work on secondary side of CT’s / PT’s, and does not require the dc – energization of the equipment or the providing of Primary Earths, Permit To Test (PTT) shall be issued.
   c) The Safety Document must show the Safety Precautions taken to achieve safety from the EHV / HV system and also further precautions required to protect persons from inherent dangers in other systems. (e.g., purging for the removal of substance injurious to health, venting, draining and removal of stored energy as quoted in safety rule 4.5(iii) and LV / MV supplies).
   d) Within any Isolated Zone, any number of PTWs may be issued after consideration of 4.3(iii)(g).
   e) Within any Isolated Zone, only one Permit To Test shall be in force at any time. PTWs may be permitted in the same Isolated Zone at the same time as the Permit To Test is in force in case the different scopes of work or testing do not pose any danger to the
working personnel and the equipment(s). The recipients of the PTT and PTW shall concur and be informed of the status.

(f) When the restoration of motive power is required for work or testing, the supplies required must be stated on the Safety Document in accordance with Safety Instruction 01.

(g) If motive power supplies have been made available, no other PTWs shall be issued on the same equipment.

iii) When Danger from induced voltages could arise during the course of work or testing, Additional Earths shall be applied.

4.4 SAFETY PRECAUTIONS FOR WORK ON OR NEAR TO MEDIUM AND LOW VOLTAGE EQUIPMENT

i) Where reasonably practical, work on or near to Medium and Low voltage equipment should be carried out with that equipment in Dead condition.

ii) When work or testing is to be carried out on or near to MV / LV Equipment, then the means of achieving safety must be assessed according to Safety Instruction 04 and shall also comply with the following rules.

(a) The MV / LV Equipment shall be identified.

(b) The MV / LV Equipment shall be Isolated and those Points of Isolation secured.

(c) The method of instructing how the work or testing is to take place can be either a Safety Document or Personal Supervision.

iii) When it is unavoidable to carry out work or testing on MV / LV equipment which is not Dead, then suitable precautions to avoid Danger must be followed as detailed in Safety Instructions 04.

4.5 SAFETY PRECAUTIONS FOR WORK OR TESTING ON OR NEAR TO MECHANICAL EQUIPMENT

i) When work or testing is to be carried out on or near to mechanical equipment, the means of achieving safety must be assessed according to Safety Instructions 01.

ii) Safety Documents.

(a) For work or testing with the Equipment Isolated and either non-operational or with limited restoration of motive power supplies, the Safety Document issued will be a Permit To Work.

(b) When testing of mechanical Equipment involves the application of test pressures, the Safety Document issued will be a Permit To Test.

iii) When the work or testing requires the issue of a Permit To Work according to Safety Rules 4.5(ii)(a), the precautions will be specified in the Permit To Work and must include the following:

(a) The Mechanical equipment must be Isolated and Points of Isolation established for the work.

(b) Further precautions taken to protect persons from inherent dangers in mechanical systems. This must include draining, venting, purging and removal of stored energy.

(c) Venting emissions shall be dissipated so as to avoid Danger. Where reasonably practicable, vents shall be locked open and Caution Notices fixed.

(d) The removal of the stored energy must be carried out in a manner to contain or dissipate that stored energy safely.

(e) Where internal access is required and the residue of the contents could cause Danger, the mechanical equipment must be purged and that residue disposed of safely according to an Approved Procedure.
iv) Where work or testing is to be carried out on mechanical Equipment and it is essential to restore motive power for that work or testing while the Permit To Work is in force, then the following additional precautions shall be applied.

(a) All supplies required must be stated on the Permit To Work in accordance with the Safety Instructions 01.

(b) If motive power supplies have been made available, no other PTWs shall be issued on the same Equipment.

v) When the testing requires the issue of a Permit To Test according to Safety Rule 4.5 (ii) (b) then the procedures will be as described in Safety Instructions 01 and 10.

It is essential that the risks of testing are properly assessed by the Maintenance / Testing Engineer. This procedure should only be used when such testing is an operational necessity.

4.6 OPERATION OF EQUIPMENT

The operation of any Equipment to achieve Safety from the system shall never involve pre-arranged signals or the use of time intervals.

The operation of the equipment and / or its isolation and / or earthing shall be confirmed by the issue of Permit To Work or Permit To Test.

4.7 DEMARCATION OF WORK AND TESTING AREAS.

i) The work and testing area shall be clearly demarcated.

ii) Where necessary, physical protection must be provided to prevent Danger to persons in a demarcated area from adjacent System hazards.

4.8 IDENTIFICATION OF EQUIPMENT

Equipment shall be clearly marked with a unique code and / or description, which must be the information used on Safety Documents and in switching instructions.
RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LTD.

___ KV Grid Sub Station, ___

PERMIT TO WORK

A. REQUEST:
1. Work Area:
2. Work to be done:
3. Period of PTW: (From) Date ______ (To) Date ______
   Time ______
   Time ______
4. Details of isolation required:

5. PTW Requested by:
   Name: 
   Designation: 
   Date ______
   Time ______
   Signature

B. ISSUE:
1. Precautions taken to achieve Safety:
   i) 
   ii) 
   iii) 
2. Work area is isolated / earthed and it is safe to work on. Additional earths may be provided at the place of work.
3. Further precautions to be taken to achieve Safety:
   i) 
   ii) 
4. "No Back Feed" / "Earthing" certificate No.____ dt._____ issued by
   ______ at (Time) ______
5. PTW allowed: (From) Date ______ (To) Date ______
   Time ______
   Time ______
6. Entry made in PTW register on page No. ______
7. PTW Approved by:
   Name: 
   Designation of Shift – In - Charge:
   Date ______
   Time ______
   Signature

C. RECEIPT:
I hereby declare that I have inspected and have satisfied myself that such equipment where the work is to be carried out has been switched off and isolated / earthed. I also accept responsibility for carrying out work only on equipment detailed on this permit and that no attempt will be made by me or by any man under my control, to carry out work on any other equipment.
   Name: 
   Designation: 
   Date ______
   Time ______
   Signature

D. RETURN OF PERMIT TO WORK:
1. Details of work done:
2. Restrictions / changes, if any, on the equipment being returned to service:
3. CLEARANCE CERTIFICATE:
I hereby declare that all men, material & earthing have been withdrawn and all personnel
warned that it is no longer safe to work on the equipment specified in this permit and all tools
and additional earths are clear and equipment is ready for charging.
Name:
Designation:
Date Time
Signature

E. CANCELLATION OF PERMIT TO WORK:
1. PTW cancelled and entry made in PTW register on page No. ______.
2. SEQUENCE OF NORMALIZATION:
   i)
   ii)
   iii)
Name:
Designation of Shift – In – Charge:
Date Time
Signature

[Handwritten signatures]
PERMIT TO TEST

A. REQUEST:
   1. Test Area:
   2. Testing to be carried out:
   3. Period of PTT: (From) Date _______ (To) Date _______
      Time _______   Time _______
   4. Details of isolation if required:
   5. PTT Requested by:
      Name: 
      Designation: 
      Date _______  Time _______
      Signature

B. ISSUE:
   1. Precaution(s) taken to safeguard the system:
      i) 
      ii) 
   2. Further precautions to be taken to safeguard the system:
   3. Test area is identified and it is safe to carry out test.
   4. PTT allowed: (From) Date _______ (To) Date _______
      Time _______   Time _______
   5. Entry made in PTT register on page No. _____.
   6. PTT Approved by:
      Name: 
      Designation of Shift – In – Charge:
      Date: _______  Time _______
      Signature

C. RECEIPT:
   I hereby declare that I have personally inspected and have satisfied myself that such equipments
   where the test(s) are to be carried out has been switched off and isolated. I also accept
   responsibility of carrying out test(s) on equipment detailed on this PTT and that no attempt will
   be made by me or by any man under my control to carry out tests on any other equipment.
   Name: 
   Designation: 
   Date: _______  Time _______
   Signature

D. RETURN OF PERMIT TO TEST:
   1. Details of tests carried out:
   2. Restrictions / changes, if any, on the equipment being returned to service:

   3. CLEARANCE CERTIFICATE:
      I hereby declare that all men and material have been withdrawn. The original settings of
      equipment/ relays have been restored. Relays have been put in their cases with covers. Test
      plugs have been restored. CT, PT & DC circuits have been made through.
      The following exceptions are recorded:
      i) 
      ii) 
      Name: 

   [Signature]
E. CANCELLATION OF PTT:
1. PTT cancelled and entry made in PTT register on Page No. _______.
2. SEQUENCE OF NORMALIZATION:
   i)
   ii)
   iii)
   iv)
   Name
   Designation of Shift - In - Charge:
   Date  Time
   Signature

5.0 RVPN SAFETY INSTRUCTIONS 01 (RSI - 01)
EHV AND HV SWITCHING, EARTHING AND SAFETY DOCUMENT PROCEDURE.

5.1 PURPOSE
When maintenance or testing is to be carried out on RVPN's EHV / HV System, procedures need to be specified to achieve safety from the system.

5.2 SCOPE
This RVPN Safety Instructions set down the procedure to be adopted when carrying out EHV/ HV switching, isolation from other supplies, earthing, issue of Safety Document and control on RVPN's EHV / HV Transmission System.

5.3 PROCEDURE
i) When work is to be carried out on or near EHV / HV equipment, the Maintenance Engineer and the Shift - In - Charge will assess the means of achieving safety from the system. Refer Safety Rule 4.3(i) (a).
ii) When the work on the substation equipment / transmission line requires the providing of primary earths, then the safety document issued must be a Permit To Work. Refer Safety Rule 4.3(ii) (a).
iii) When the work / testing on the substation equipment/ transmission line does not require the providing of primary earths, then the safety document issued must be a Permit To Test. Refer Safety Rule 4.3(ii) (b).
iv) Within any isolated zone, any number of PTWs may be issued at the discretion of the Shift - In - Charge. Refer Safety Rule 4.3(ii) (d).
v) Within any isolated zone, only one PTT shall be in force at any time. No PTWs are permitted at the same time as the PTT is in force in the same isolated zone. Refer Safety Rule 4.3(ii) (e).
vi) After agreement has been reached between the Sub Station Shift - In - Charge and the SLDC that the shutdown on the specified substation equipment / transmission line can be availed, the Maintenance Engineer requests the shutdown by completing all items of Request for the Permit To Work or Permit To Test (Part A).
vii) The SLDC will confirm with the Shift - In - Charge that the shutdown can be availed and both will record the instructions in their log sheet(s) together with the message number, date and time that the instruction was given.
viii) The Shift - In - Charge will carry out switching operations as per the instructions of SLDC. He shall also give a message to the Shift - In - Charge of the Sub Station at the other end for carrying out such switching operations as are necessary for isolation of the
work / test area. These switching operations will be recorded in the substation log sheet(s) together with message number, the date and time.

ix) If, during a switching operation, a piece of equipment shows any sign of distress, switching must cease immediately and the Sub Station – In – Charge notified. All persons must be warned that a potential hazard exists.

x) In the case of lines or of equipment where isolation and / or earthing is required from the other end, the Shift – In – Charge of the Sub Station where PTW / PTT has been applied for shall obtain the ‘Earthing Certificate’ / ‘No Feed Back Certificate’ / PTW / PTT from the other end(s).

xi) The Shift – In – Charge of the Sub Station where the PTW / PTT has been applied for will then carry out all isolation and will Lock Open these points of isolation. In case of Line, the Shift – In – Charge shall give a message to the Shift – In – Charge of the Sub Station at the other end for carrying out isolation and locking open the points of isolation. The Shift – In – Charge of the Sub Station at the remote end will then isolate and Lock Open all points of isolation and confirm back to the Shift – In – Charge of the Sub Station where the PTW / PTT has been applied for. Any isolation of the secondary side of voltage transformers and auxiliary transformers (tertiary winding where applicable) will also be carried out including locking. These switching operations will be recorded in the substation log sheet(s) together with message number, date and time.

xii) Once all isolation including voltage transformers and auxiliary transformers (tertiary winding where applicable) has been completed, including remote ends where necessary, and confirmation has been received that the isolation has been completed at the remote end, earth switches shall closed and Locked. Caution Notices shall be fixed on all control handles on the control panel and also attached to the padlocks used to Lock Open all points of Isolation and Lock Closed all earth switches. These switching operations will be recorded in the Sub-station log sheet together with message number, date and time.

xiii) ‘No Back Feed Certificate’ / ‘Earthing Certificate’ must be obtained from all concerned Sub Stations. All details of the ‘No Back Feed Certificate’ / ‘Earthing Certificate’ must be entered in the Sub Station log sheet along with message number, date and time. The message number, date and time must also be recorded on the PTW / PTT.

xiv) The Shift – In – Charge at the Sub Station(s) where the Permit(s) to Work or Permit(s) To Test are to be issued shall record the isolation and earthing in Part B.1 of the Permit To Work or Permit To Test (Sequence of Isolation).

xv) All Safety Keys, fuses and links, etc. which have been used to Lock all points of isolation and earth switches, etc. will be Locked in a Key Safe under the safe custody of the Shift – In – Charge.

xvi) The Shift – In – Charge will specify the following in Part B of the Permit To Work or Permit To Test before issue:

   a) Any further precautions which are required to be taken later by the In – Charge holding the Permit To Work or Permit To Test to achieve Safety (Refer Safety Rule 4.3(ii) (c)).

   b) The power supplies that can be restored for the particular work being carried out (Refer Safety Rule 4.3(ii) (f)) and issue the Approved written procedure.

   c) The number of Additional Earths required. The use of these Additional Earths will be specified on an Earthing Schedule drawn up by the Maintenance Engineer.

xvii) The Shift – In – Charge will issue the Permit To Work or Permit To Test to the Person requesting for PTW / PTT who will retain the Safety Document in his possession until all work has been completed. The Shift – In – Charge will record all the details in the
substation log book and Permit To Work or Permit To Test register. In cases where PTW / PTT has been requested over telephone, the confirmation of conveying the approval of the PTW / PTT shall be recorded by the Shift – In – Charge.

xviii) The Person requesting for PTW / PTT will sign Part C (Receipt) to accept the responsibility for carrying out the work / testing on the Sub Station equipment / transmission line. The Person responsible for the work / testing will draw up the Earthing Schedule, if required, to show the position and use of Additional Earths. In cases where PTW / PTT has been requested over telephone, the person responsible for the work / testing shall give confirmation of receipt of the approval of the PTW / PTT by giving a “code name” which shall not be recorded by the Shift – In – Charge. The Shift – In – Charge shall verbally convey the “code name” to the next Shift – In – Charge.

xix) a) In substations, Additional Earths must be applied in a manner similar to primary portable earths using the same earthing equipment.

b) On overhead transmission lines, Additional Earths can be applied within Safety Clearance but at not less than Safe Electrical Clearance as specified in Safety Instructions 05.

xx) On completion of the work, the person who has obtained the PTW / PTT will sign the Return of Permit To Work or Permit To Test (Part D) to declare that all work / testing is completed. The person who has obtained the PTW / PTT over telephone shall convey the above along with the “code name” given by him at the time of obtaining the PTW / PTT. The person returning the PTW / PTT shall describe any restrictions applicable / changes made and confirm that all men, tools, plant and Additional Earths have been removed.

xxi) The Shift – In – Charge will receive / accept the cleared Permit To Work or Permit To Test and record receipt in the substation log sheet. He will also record the receipt / acceptance in the Permit To Work or Permit To Test register together with date and time, and mention this in Part E.1 of the PTW / PTT.

xxii) The Shift – In – Charge will verify the local status and then carry out the removal of all the Primary Earthing and switching operations after consultation with SLDC and remote end(s), recording these in the substation log sheet together with date and time. He will complete Part E.2 of the Permit To Work / Permit To Test to describe the sequence of normalization.

xxiii) The Shift – In – Charge shall cancel the PTW / PTT by signing in Part E. The PTW / PTT shall then be kept for record.

6.0 RVPN SAFETY INSTRUCTIONS 02 (RSI – 02).

DEMARCATON OF WORK AND TESTING AREAS IN SUB STATIONS.

6.1 PURPOSE.
Before any work / testing is carried out in or adjacent to a charged substation area, the work or test area is to be clearly demarcated. (Refer Safety rule 4.7).

6.2 SCOPE.
This RVPN Safety Instructions sets down the procedures to be adopted for the demarcation of work / test areas in substations.

6.3 EQUIPMENT IDENTIFICATION.
Equipment on which work or test is to be carried out must be readily identifiable. Where necessary, a means of identification must be fixed to it. This will remain effective throughout the course of the work.

6.4 DANGERS.
The main Dangers to personnel working in substations are electric shock, burns or falls arising from:  

[Handwritten notes]
i) The possibility of mistaking Equipment on which it is unsafe to work for that on which it is safe to work.

ii) Inadvertently infringing Safety Clearance.

iii) Taking inadequate precautions to suppress or safely discharge any induced or other impressed voltages on the Equipment.

iv) Insecure hand and footholds.

v) Failure to make proper use of personal protective equipments.

vi) Sudden rush of flying insects, viz., Bees, flying ants, etc.

6.5 **WORK / TESTING.**

i) When work or testing is to be carried out on or near to Equipment in a substation, the area demarcation is to be determined by the Maintenance Engineer / Testing Engineer to the satisfaction of the Shift - In - Charge.

ii) Work / testing in a substation must be carried out under the supervision of a Maintenance Engineer / Testing Engineer.

6.6 **DEMARCATION OF WORK / TESTING AREAS.**

i) Where work is to be carried out near to Equipment which may be Live, or must be regarded as Live, then the limits of the work area must be defined as per Rule 6.5 (i) above and followed for Safety Distance as per Rule 4.2 (ii) of the Safety Rules.

ii) Boundary marks must be clearly identifiable and easy to see. They must be fixed or moved by maintenance personnel under the supervision of the Maintenance Engineer / Testing Engineer and Shift – In – Charge.

iii) Boundary marking
   a) should be properly fixed / supported.
   b) may be attached to any structure supporting Equipment.
   c) should not carry any notice.

iv) In general, the boundary marking must be arranged so that it is impossible to climb from within the work area, on structures supporting Equipment which is Live. Where this is not possible, red Danger notices must be attached at working level, before work commences, to identify the structures.

v) The boundary of the work / test area must be identified by using red and white plastic chain or nylon rope / tape of about 12 mm diameter / width.

vi) Safety Distance must be maintained at all times to Equipment on which it is unsafe to work. This includes any overhead conductors that pass over the work area or adjacent live equipment on which work is not to take place.

vii) The demarcation equipment can be erected after safety precautions have been established but must not be erected before the issue of the PTW / PTT.

viii) The demarcation equipment shall be removed only after the clearance of the PTW / PTT.

ix) Consideration should be given, if thought necessary by the Maintenance Engineer / Testing Engineer, for providing physical protection to personnel from hazards in the System adjacent to the demarcated area.

6.7 **DANGER NOTICES.**

i) Danger Notices must be placed to inform personnel that adjacent Equipment is not included in the specified work area. The notices must be attached to or fixed adjacent to adjoining Equipment in sufficient numbers to be visible from the work area at all times.

ii) Danger Notices must only be fixed or moved by maintenance personnel under the supervision of Maintenance Engineer / Testing Engineer and Shift – In – Charge.

6.8 **HAZARD AREAS.**

Hazard Areas may be barricaded off by using yellow black plastic / nylon chain / rope / tape.

7.0 **RVPN SAFETY INSTRUCTIONS 03 (RSI – 03).**

**TESTING OF EXTRA HIGH VOLTAGE AND HIGH VOLTAGE EQUIPMENT.**

7.1 **PURPOSE.**
When testing is to be carried out on EHV / HV Equipment, procedures need to be specified to achieve safety from inherent dangers.

7.2 **SCOPE.**
This safety instruction applies the principles established by the safety precautions to achieve safety from the system for personnel during the testing of EHV / HV Equipment.

7.3 **EQUIPMENT IDENTIFICATION.**
Equipment on which testing is to be carried out must be readily identifiable. Where necessary, a means of identification must be fixed to it that will remain effective throughout the course of testing.

7.4 **DANGERS.**
The main dangers to personnel during the course of testing are electric shock, burns and other injuries arising from
i) Accidental contact with LIVE Equipment.
ii) Electrical energy, mechanical pressures and forces derived from testing sources.

7.5 **PREPARATIONS FOR TESTING.**
i) Testing must be carried out by competent trained Personnel.
ii) Testing which requires the application of primary earth must be carried out under a Permit To Work.
iii) Testing which does not require the application of primary earth may be carried out under a Permit To Test.
iv) Further precautions, e.g., “Fire Fighting equipment to be immobilized”, must be stated on the Safety Document in accordance with RVPN Safety Instruction 01 (RSI – 01).
v) The test area and its boundaries and limits must be identified in accordance with the Safety Instruction 02 (RSI – 02) “Demarcation of Work and Testing Areas in Substations.”
vi) Points of Isolation must be maintained from all supplies other than those required for the tests.

7.6 **TESTING**
i) The Competent Person in receipt of the appropriate Safety Document is responsible for all matters of safety concerned with the test and for the control functions within the test area. He may operate or instruct others to operate the equipment within the test area.
ii) If specified on the Permit To Test, the Competent Person may remove, replace or instruct others to remove or replace Primary Earths.
iii) Connections used for test purposes must be of adequate capacity and easily visible to prevent accidental access / contact.
iv) The application of the test supplies must be done under the supervision of the competent person who has received the safety document.
v) Equipment which is associated with a test and likely to have retained an electrical charge must be discharged to earth before and after the application of the test supply.
vi) Where a test voltage is to be applied to equipment which has a remote end that may become live, then that end must be safeguarded / got isolated so as to prevent danger. A ‘No Back Feed Certificate’ / Permit To Test must be obtained from such remote end.
vii) If the remote end of the equipment which may become live by the test voltage is accessible, then it is the responsibility of the competent person carrying out the test to ensure that it is barricaded off and under the control of a competent person at the remote end before a test voltage is applied. It is the responsibility of the person at the remote end to ensure that no one including himself approaches the equipment unless instructed to do so by the competent person in-charge of the testing at the other end.

7.7 **COMPLETION OF TESTING.**
When a safety document which includes testing as part of the work activity is to be cleared, the competent person must ensure that any safety precautions that were varied / modified for the testing and are not restored to the original state are listed as exceptions.

8.0 **RVPN SAFETY INSTRUCTIONS 04 (RSI – 04)**
**LOW VOLTAGE AND MEDIUM VOLTAGE EQUIPMENT**
8.1 PURPOSE
When work or testing is being carried out on LV / MV Equipment, procedures need to be specified to achieve safety from inherent danger.

8.2 SCOPE
These RVPN Safety Instructions apply the principles established by the Safety Rules to achieve Safety from the System for personnel working or testing on Low / Medium Voltage (LV / MV) Equipment.

8.3 EQUIPMENT IDENTIFICATION
Equipment on which work or testing is to be carried out must be readily identifiable. Where necessary a means of identification must be fixed to it which will remain effective throughout the course of the work. Refer Safety Rule 4.4(ii) (a).

8.4 DANGERS
The main Dangers to personnel working or testing on LV / MV Equipment are electric shock or burns arising from
i) The possibility of personnel mistaking Equipment on which it is unsafe to work for that on which it is safe to work.
ii) The possibility of the Equipment being worked on accidentally or inadvertently being made Live.
iii) Dangerous voltages on open - circuited current transformer.
iv) Vicinity of the LV / MV circuit / conductor due to less clearance specially in LT switch gear.

8.5 GENERAL REQUIREMENTS.
i) Where reasonably practicable, the preferred method is to work on or near to LV / MV Equipment which is Dead. Refer Safety Rule 4.4 (i). Work on Live LV / MV Equipment should rarely be permitted, but where no alternative method is possible, work can be carried out as in section 5 of this Safety Instruction. Refer Safety Rule 4.4(iii).
ii) A Sub Station – In – Charge must carry out an assessment to determine under what conditions the work is to take place and if a Safety Document is to be issued. When Safety Document is issued, type & shape of Safety Document shall be as per Safety Rule 4.4(ii) (c).
iii) When work is to be carried out on LV / MV Equipment which is part of Extra High Voltage / High Voltage Equipment, adequate precautions must be taken to achieve Safety of such LV / MV equipments from the EHV / HV Equipment.
iv) When tests are to be carried out on LV / MV Equipment which is in proximity to exposed EHV / HV Equipment which may be Live, or may become Live, the relevant requirements of RVPN Safety Instruction 02 (RSL - 02) “Demarcation of work and testing areas in Substations” must be met.
v) When work on live equipment requires portable instruments to be used for voltage or resistance measurements, the instruments must be provided with insulated probes.
vi) When working on protection or metering equipment, extreme care must be taken not to open circuit the secondary winding of current transformers. These must be short - circuited before work is carried out.

8.6 Work/Testing on / or Near to Dead LV / MV Equipment.
i) Sub Station – In – Charge must assess the work required on / or near to the dead LV / MV equipment and decide whether it must be carried out under:
a) Permit To Work, or
b) Personal supervision
Refer Safety Rule 4.4(ii) (c).
ii) Equipment must be isolated. Time switches, float switches, thermostats, sequence switching devices or similar automatic switching devices are not isolating devices.
ii) Points of isolation must be established. Any fuses and links and/or safety keys used to secure the points or isolation must be retained in a key safe. Refer Safety Rule 4.2 and Rule 5.3 (xv).

iv) Where work is to be done on portable or hand held LV / MV equipment, isolation must be achieved by the removal of the plug from the socket outlet.

v) The work must be carried out by a competent person.

vi) Before commencing work, the competent person must check, by means of an approved voltage testing device that the LV / MV equipment on which he is to work is not live. The device must be tested immediately before and after use.

vii) If the work is interrupted, the competent person who is to continue the work must recheck, as described in 8.6(vi) above, that the equipment is not live.

viii) Before commencing work on exposed LV / MV overhead conductors which have been isolated, in addition to proving that they are not live, the conductors including the neutral, must be short circuited and earthed.

8.7 WORK OR TESTING NEAR TO LIVE LV / MV EQUIPMENT

i) Work near to live LV / MV equipment must only proceed after a satisfactory assessment by Sub Station – In Charge.

ii) The work must only be done by a competent person.

iii) The competent person who is to do the work must first remove all metallic objects such as wrist watch, rings, bracelets, earrings and pendants, etc. from his/her body.

iv) When necessary to prevent injury, approved insulated tools, insulating stands, mats or gloves as appropriate must be used.

v) Only suitable test instrument with insulated test probes must be used.

vi) Consideration must be given to the competent person being accompanied by another competent person if the presence of such a person could contribute significantly for ensuring that injury is prevented. Any accompanying competent person must be trained to recognize danger and if necessary to render assistance in the event of an emergency.

vii) Before commencing work in areas where there is a possibility of the presence of gas which might be inadvertently ignited by electric sparks, the Sub Station – In Charge must be consulted.

8.8 WORK ON LIVE LV / MV EQUIPMENT

Refer Safety Rule 4.4(ii)

i) Work on live LV / MV equipment is to be avoided as far as practicable.

ii) "If there is no alternative to working live", then the following procedure must be adopted:

a) The Sub Station – In Charge and the Maintenance Engineer must thoroughly review the requirement of the work.

b) A written procedure for the live work must be drawn by the Sub Station – In Charge and the Maintenance Engineer in such a way that the procedure will comprehensively describe the precautions required to carry out the work.

c) Approved insulated tools and equipment must be specified and provided.

d) The work will be carried out only under the direct supervision of the Maintenance Engineer.

ii) When this work also involves working on or near to EHV / HV or mechanical equipment, the requirements of Safety Rules 4.2, 4.3, 4.5 and 4.7 must be met.

9.0 RVPN SAFETY INSTRUCTIONS 05 (RSI – 05)
WORK ON EXTRA HIGH VOLTAGE OVERHEAD LINES.
(9.1 to 9.8 and 9.10 to 9.14 are not included as they pertain to lines)

9.9 SCHEME 4
PAINTING OF STRUCTURES WHICH DOES NOT INVOLVE ANY DISCONNECTIONS AND ANY ACCESS TO CONDUCTOR

A Work
For work on the dc - energized circuit which does not require any contact with insulators, associated fittings or conductors. This scheme is to be followed after earthing for works of painting.

**B Procedure**

1) The work area and its boundaries and limits must be identified in accordance with the Safety Instruction 02 (RSI – 02) “Demarcation of Work and Testing Areas in Substations.”

2) Apply general precautions as given below.

**GENERAL PRECAUTIONS TO BE TAKEN BEFORE CLIMBING OR WORKING ON STRUCTURES.**

i) One responsible Officer (Supervisor/ Engineer) should always be present at the site of work.

ii) The “CIRCUIT UNDER SHUT DOWN” as per PTW should be identified at the working location(s) with the help of a circuit plate or any other reliable method.

iii) All Linemen who work on the structures shall wear and make use of all safety belts / harnesses and other safety equipment provided for their safety and protection.

iv) Additional earths shall be carried on the structure in gunny / suitable bags to avoid any damage to the additional earths. Alternatively, the additional earths can be carried manually by the Linemen on their shoulders or raised up using a rope.

v) Safe electrical clearance shall be maintained by all Linemen until all the additional earths are correctly connected to conductors or jumpers of circuits under shut down.

vi) All earth end clamps of additional earths shall be connected first to the structure at the point where the Lineman is standing or sitting in order to apply the additional earths. This earth end clamp shall, as far as possible, be connected at a point between the Lineman and the line end clamp.

vii) After connection of the earth end clamps with the structure, all line end clamps shall be connected to conductor or jumper from the point where lineman is sitting or standing.

**NOTE:** To ensure that a proper connection of the line end clamps with the conductor or jumper has been made, a check of the tightness by attempting to rotate the line end clamps on the conductor or jumper should be made by use of the earthing pole.

viii) The earthing pole / bridging pole shall be kept suitably on the structure after connection of the line end clamps until disconnection of all additional earths.

ix) If during working on conductors, jumpers, insulators or fittings, an earth end clamp or line end clamp of an additional earth becomes disconnected for any reason, the Lineman must shift away from structure to maintain safe electrical clearance. He must not touch the disconnection end of the additional earth and should maintain safe electrical distance from the disconnected end of the additional earth. In such a case, an extra additional earth shall be fitted in parallel with the faulty / disconnected earth. Then the disconnected additional earth shall be removed by the use of the earthing pole.

x) After completing the work, all tools, plant and men shall be removed from the conductors and fittings. The last Lineman shall remove the line end clamps from the conductors / jumpers while sitting or standing at the point of or behind the connection of these additional earths to the structure. After this, the earth and clamps shall be removed. This procedure shall be repeated for the disconnection of all other additional earths.

xi) On completion of work, the additional earths shall be carried to the ground from the structure in gunny / suitable bags or lowered to ground using rope to avoid any damage to the additional earths. To avoid damage, the additional earths should not be thrown from the structure.

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xii) One No. spare additional earth should be carried to the working structure to provide a spare in case of any contingencies.

xiii) Isolation of line reactors: To reduce induced voltage on the dead circuit of transmission lines, isolate line reactors at both ends of lines (wherever provided) in the dead circuit. This shall be done before closing earth switch at line ends of the dead circuit.

3) Apply additional earths on all phases on sub conductors (wherever applicable) of the de-energized circuit. The additional earths shall also be connected to the jumpers.

4) Carry out the painting work on structure as per normal procedure.

10.0 RVPN SAFETY INSTRUCTIONS 06 (RSI – 06)
ACCESS TO EHV / HV COMPARTMENTS AND STRUCTURES

10.1 Purpose
To control the access of personnel to EHV / HV compartments and structures.

10.2 Scope
These RVPN Safety Instructions set down the procedures to control the access of personnel to enclosures, chambers, cubicles, cells containing exposed extra high voltage / high voltage conductors. It also includes access to towers, gantries or other means of supporting or giving access to such conductors.

10.3 Definitions
Access key: A unique key for locking a device for preventing access to a compartment or structure.
Compartment: An enclosure, chamber, cubicle or cell designed to prevent and control access to equipment having exposed EHV / HV conductors.
Structure: A tower, gantry or other means of supporting or giving access to EHV / HV equipment / conductor.

10.4 Equipment Identification
Each compartment or structure must be readily identifiable.

10.5 Dangers
The main dangers to personnel working in compartments and on structures are electric shock, burns or falling. These can arise from accidental or unauthorized access and proximity to live EHV / HV conductors.

10.6 Access to Compartments.
i) Devices designed to prevent access to compartments must normally be kept locked.
ii) Access keys for the locks must normally be kept locked in a box or cupboard under the control of Shift – In – Charge.
iii) Only the Shift – In – Charge or operating personnel under his personal supervision must have access to a compartment in which the exposed EHV / HV conductors are live.
iv) When work is to be done on EHV / HV equipment in a compartment, all the exposed EHV / HV conductors must have been isolated, points of isolation established, primary earths applied and a Permit To Work or Permit To test issued for the work. The lock controlling access to the compartment must be unlocked by the Shift - In - Charge.

10.7 Access to structures
i) Devices designed to prevent the climbing of structures must normally be kept locked or bolted.
ii) Access devices must be opened only by the Shift – In – Charge under a specific PTW / PTT.

11.0 RVPN SAFETY INSTRUCTIONS 07 (RSI – 07)
EQUIPMENT CONTAINING SULPHUR HEXAFLUORIDE (SF₆)
11.1 Purpose
To control inherent dangers involved in equipment containing SF₆.

11.2 Scope
These VPN Safety Instructions apply the principles established by the Safety Rules to achieve safety from the system for personnel working on equipment which contains or has contained sulphur hexafluoride (SF₆) gas.

11.3 Definitions
Gas zones: Discrete pieces of equipment which may be independently isolated and drained of SF₆. A gas zone may comprise of:
- A single phase enclosure.
- A single enclosure containing the three phases of an item of equipment.
- Three single phase enclosures of a common item of equipment connected by inter phase pipe work.

"Point of Access" Notice: An approved notice identifying initial points of entry to isolated and vented equipments (relevant to GIS only).

11.4 Equipment Identification

i) Equipment on which work is to be carried out must be readily identifiable. Where necessary, a means of identification must be fixed to it which will remain effective throughout the duration of the work.

ii) Gas zones must be identified as per the layout of GIS.

11.5 Dangers
The main dangers to personnel from equipment containing SF₆ gas are:

i) Asphyxiation or suffocation.
ii) Electric shock.
iii) Burns.
iv) The release of stored mechanical energy or pressure.
v) Toxic breakdown products which can be formed within the equipment.

11.6 Preparation For Work

i) Demarcation of work area:
The boundaries of the equipment on which it is safe to work must be clearly identified. This must be done in accordance with the requirements of VPN Safety Instructions 02 (RSI – 02): “Demarcation of Work / Testing Areas in Sub Stations”.

ii) When depressurization is not required:
If depressurization is not required to allow work to be done, necessary precautions must be taken to achieve safety from the System by applying appropriate safety precautions followed by the issue of a Permit To Work or Permit To Test.

iii) When depressurization is required:
When depressurization is required, the following precautions must be taken to achieve safety from the system.

a) The equipment must be drained of SF₆. This must be carried out in accordance with the approved procedures relating to sulphur hexafluoride (SF₆) gas.

b) A point of access notice must be displayed at each initial entry point (applicable for GIS). These notices must be fixed or moved only by maintenance personnel under the supervision of a Maintenance / Testing Engineer (Refer RSI – 02).

c) A Permit To Work or Permit To Test must be issued for the work to proceed and, where appropriate, the recommendations for general safety report must specify the further precautions to be taken to deal with any arc products which may be present. The removal and disposal of any arc products must be in accordance with the approved procedure relating to sulphur hexafluoride (SF₆) gas.

12.0 VPN SAFETY INSTRUCTIONS 08 (RSI - 08)
MOVEMENT AND OPERATION OF MOBILE ACCESS EQUIPMENT, VEHICLES, CRANES AND LONG OBJECTS IN SUB STATIONS.
12.1 Purpose
To provide safety from the hazards arising from movement of mobile cranes, vehicles, etc., within a charged switchyard.

12.2 Scope
These VPN Safety Instructions apply the principles established by the Safety Rules to achieve safety from the system when mobile access equipment, vehicles, cranes and long objects are being moved or used within Sub Stations containing exposed live EHV / HV equipment.

12.3 Definitions
Field equipment earths: Approved connections for bonding items of field and access equipment such as scaffold, hydraulic platform, mobile crane, winches, etc. to earth. The earths are coloured orange to identify them from additional earths and not included on an earthing schedule. They shall have a minimum cross sectional area of 25 mm sq. copper equivalent.

Long objects: Items of equipment such as ladders, scaffold, poles, ropes, measuring tapes, etc. which, if not controlled during handling, could infringe safety clearance.

Operator: A person trained, assessed and appointed to use specific type of mobile access equipment, vehicle or cranes within energized Sub Stations.

12.4 Equipment identification
Equipment on which work is to be carried out must be readily identifiable. Wherever necessary, a means of identification must be fixed to it which will remain effective throughout the duration of work.

12.5 Dangers
The main dangers to personnel during the movement and use of access equipment, vehicles, cranes and long objects in Sub Stations containing exposed live EHV / HV conductors are electric shock, burns or falling arising from:

- Infringing safety clearance.
- Induced voltages.

12.6 USE OF MOBILE ACCESS EQUIPMENT, VEHICLE AND CRANES IN SUB STATIONS.
i) When mobile access equipment, vehicles or cranes are to be used in Sub Stations, Maintenance / Testing Engineer on site must assess the risks.

ii) The Maintenance / Testing Engineer shall ensure that the mobile access equipment is operated by a trained operator only.

12.7 MOVEMENT OF MOBILE ACCESS EQUIPMENT VEHICLES AND CRANES TO AND FROM THE DEMARCATED WORKING AREA.
i) When mobile access equipment, vehicles or cranes are to be moved to and from the safe working area, and any part of this equipment in the transport position is higher than 2.3 meters from ground level, then a Maintenance / Testing Engineer must assess the risks.

ii) The Maintenance / Testing Engineer must specify on site the route to be followed with adequate protection.

iii) The Maintenance / Testing Engineer may also specify when during the movement, the mobile access equipment, vehicle or crane must be bonded to earth using field equipment earths.

iv) The Maintenance / Testing Engineer, when deciding on the route to be taken, must also ensure that the bus bar zone protection wherever provided and adjacent circuit protection is in service.

v) The Maintenance / Testing Engineer must provide personal supervision during the whole period of movement.

vi) At no time must safety clearance be infringed.

12.8 OPERATION OF MOBILE ACCESS EQUIPMENT, VEHICLES AND CRANES WITHIN THE DEMARCATED WORKING AREA.
i) Working area must be identified in accordance with RVPN Safety Instructions RSI – 02 'Demarcation of work / testing areas in Sub Stations'.

ii) Approach to within safety clearance of equipment by mobile access equipment, vehicle or crane is only allowed under Permit To Work or Permit To Test.

iii) The operator must ensure that effective use is made of any equipment stabilizing devices or outriggers.

iv) The Maintenance / Testing Engineer holding the safety document must consider whether it is necessary to consult an appropriate qualified specialist (e.g., Civil Engineer) to ensure that safe ground bearing pressures will not be exceeded. This is particularly important where wheels, stabilizing legs or outriggers may need to be positioned over ducts. Where necessary, load spreading devices must be used.

v) The recipient of the safety document must ensure that, as soon as practicable after reaching the demarcated working area, a field equipment earth is connected to the equipment.

vi) The recipient of the safety document must satisfy himself that the operator knows what work is to be done and that the equipment's controls are operating correctly.

vii) The recipient of the safety document must consider whether to select member(s) of his working party as Safety Observer(s). He must assess the risks in relation to the work being done, the equipment being used, the field of vision of the operator and the proximity of exposed live EHV / HV equipment.

viii) The Safety Observer(s) must use agreed signal for halting the movement of crane to avoid danger.

ix) Equipment provided for personnel access must be electrically bonded to the earthed EHV / HV equipment as near to the point of work as practicable to provide an equipotential zone. This can be achieved by connecting the access equipment through a field equipment earth to the same point as the primary earth or additional earth attached to the EHV / HV equipment. It is essential that there is an adequate bond between the access platform and the vehicle chassis.

12.9 SCAFFOLDING

i) The Maintenance / Testing Engineer must finalize, on the site, the movement route of scaffolding.

ii) Subsequent movement of scaffolding to the required location must be carried out under the personal supervision of the Maintenance / Testing Engineer.

iii) When moved in a Sub Station, long scaffolding components must be carried in a horizontal position and as near to the ground as possible.

iv) Before scaffolding is erected or dismantled, the Maintenance / Testing Engineer must assess the risks in relation to the proximity to exposed live EHV / HV equipment.

v) Field equipment earths must be applied to scaffolding erected near to the live EHV / HV equipment as soon as it is practicable to do so. As erection proceeds, Field Equipment Earths must be applied at approximately 5 metres (15 feet) intervals, vertically or horizontally or as determined by the Maintenance / Testing Engineer.

vi) The recipient of the safety document must assess the risks in relation to the method of erection and the proximity to exposed live EHV / HV equipment. He must consider whether to select Safety Observer(s).

vii) No bamboo / wooden scaffolding is to be used.

13.0 RVPN SAFETY INSTRUCTIONS 09 (RSI – 09)
EXTRA HIGH VOLTAGE / HIGH VOLTAGE STATIC CAPACITOR BANKS

13.1 Purpose
The safety of personnel working on or testing EHV / HV static capacitor banks has to be ensured by the removal of stored energy.

13.2 Scope
These VPN Safety Instructions apply the principles established by the Safety Rules to achieve safety from the system including the removal of stored energy for personnel working on EHV / HV static capacitor banks.

13.3 Definitions

**Rack:** An individual framework containing capacitors connected together.

**Capacitor Bank:** A group of capacitors consisting of a number of racks connected together. If the equipment consists of only one rack, the term capacitor bank will also apply.

**Shorting switch:** A fixed device for short circuiting the capacitors in racks to dissipate stored energy safely. It may also provide a direct connection to earth.

**Short Circuiting Lead:** An approved (6 sq. mm, 1.1 KV insulation) lead with insulated clips or a standard lead supplied by the manufacturer for this purpose. This is used for short-circuiting an individual capacitor. This can be a clip-on type lead used during the disconnection of a capacitor or a bolt-on type lead used during removal and temporary storage.

**Continuity Lead:** An approved lead or a standard lead supplied by the manufacturer which is used as a temporary means of maintaining continuity of the connections between other capacitors during the disconnection of a capacitor.

**Discharge Stick:** An approved device used for the purpose of discharging any residual charge in a capacitor.

13.4 Equipment Identification

Equipment on which work is to be carried out must be readily identifiable. Wherever necessary, a means of identification must be fixed to it which will remain effective throughout the duration of work.

13.5 Dangers

The main dangers to personnel are electric shock or burns arising from:

- The discharge of electrical energy retained by the static capacitors after they have been isolated.
- Inadequate precautions to guard against any induced voltages in the conductors or associated fittings.

13.6 Preparation of Work / Testing

i) The capacitor bank must be isolated, points of isolation established and primary earths applied.

ii) Shorting switches, where installed on the racks must be closed. The control of shorting switches is the responsibility of the Maintenance / Testing Engineer.

iii) A Permit To Work or Permit To Test must be issued.

13.7 Work / Testing

i) No capacitor must be handed unless it is short-circuited.

ii) The Maintenance Engineer requesting the safety document must specify the position for application of clip-on short circuiting leads and continuity leads. Short circuiting leads and continuity leads must be applied to the appropriate capacitors under the personal supervision of the Maintenance / Testing Engineer.

iii) Before the application of short circuiting leads to a capacitor provided with external fuse, it must be discharged using the discharge stick under the personal supervision of the Maintenance / Testing Engineer.

iv) Before an individual capacitor is removed from a rack,

   a) The clip-on short circuiting lead must be replaced by a bolt-on short circuiting lead.

   b) The bolt-on connection must be made before the clip-on lead is disconnected.

   c) The continuity of the connections of adjacent capacitors must be maintained using the continuity leads.

   d) During storage and transport, capacitors must be short-circuited using at least two complete turns, between terminals, of tinned copper fuse wire of not less than 30 ampere rating.

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c) When work activity requires the opening or removal of shorting switches and specifies special requirements for subsequent access to capacitors, these actions must be carried out under the personal supervision of the Maintenance / Testing Engineer.

14.0 RVPN SAFETY INSTRUCTIONS 10 (RSI - 10)
PRESSURE SYSTEMS

14.1 Purpose
To protect all personnel against the dangers of pressurized systems.

14.2 Scope
These RVPNL Safety Instructions apply the principles established by the Safety Rules to achieve safety from the system for personnel working on pressure systems.

14.3 Definitions
Pressure system: a) A system comprising of one or more pressure vessels of rigid construction, any associated pipe work, protective devices and associated equipments.
   b) The pipe work with its protective devices to which a portable gas container is, or is intended to be, connected.
   c) A pipe line in its protective devices which contains or is liable to contain a relevant fluid / gas at some pressure.

Safe operating limit: The operating limits (incorporting a suitable margin of safety) beyond which system failure is liable to occur.

14.4 Equipment Identification
Equipment on which work is to be carried out must be readily identifiable. Wherever necessary, a means of identification must be fixed to it which will remain effective throughout the duration of work.

14.5 Dangers
The main dangers from pressure systems arise from:
- The uncontrolled release of pressurized substances, e.g., compressed air / gas / fluids, etc.

14.6 Work / Testing
i) When work is to be carried out on pressure systems, a competent person (Maintenance / Testing Engineer) must assess the means of achieving safety from the system. Work may be carried out under one of the following conditions:
   a) With the system isolated and points of isolation established, pressure drained, air / gas / fluids vented and purged, and cooled, where necessary.
   b) With the system isolated and points of isolation established but containing pressurized substances, e.g., SF6 gas / hydraulic oil in case of circuit breakers.
   c) With the equipment operational.
   d) With the equipment partly isolated and partly in its operational mode.
ii) All equipment must be clearly demarcated according to RVPN Safety Instructions 02 (RSI – 02) while a safety document is in force.

14.7 Work with the Equipment Isolated and Non Operational.
i) The equipment must be isolated from all external sources of energy and points of isolation established.
ii) A non-return valve must not be considered as a shut off valve unless it is capable of being locked in the closed position.
iii) Electrically and manually operated valves must be adjusted to the required position and locked. The electrical supply to electrically operated valves must be isolated or the mechanical drive disconnected.
iv) Hydraulic and pneumatic control valves must be locked in the appropriate position.
v) The contents of the equipment must be adjusted to a safe level, which will avoid danger.
vi) The equipment must be Vented and Purged as appropriate.
vii) Pressure vessels must be regarded as confined spaces. When access is necessary the requirement of RVPN Safety Instructions 16 (RSI - 16) 'General Confined Spaces' must be applied.
viii) A Permit To Work must be issued. Refer Safety Rule 4.5 (ii) (a).

14.8 WORK / TESTING WITH THE EQUIPMENT IN AN OPERATIONAL OR PARTLY OPERATIONAL MODE
i) The following work can be carried out with the equipment in a fully operational or part operational mode:
- On load repairs of leaks: On load repair of leaks on compression joints (e.g., ermetto / threaded / flange joint etc.) may be carried out under the supervision of Maintenance / Testing Engineer.

ii) If the work of testing requires the limited restoration of motive power (e.g., compressor motor electrical supplies), then the safety document issued will be a Permit To Work. Refer Safety Rule 4.3 (ii) (f).

iii) The requirements and precautions for the restoration of those supplies will be as described in RVPN Safety Instructions 01 (RS - 01).

iv) The following activities may be carried out by the issue of a Permit To Test. Refer Safety Rule 4.3 (ii) (b).
   a) Testing of safety valves:
      The testing of safety valves or hydraulic testing must be carried out under the personal supervision of the Maintenance / Testing Engineer.
   b) Testing of pressurized air / gas / fluid:
      The testing of quality of compressed air / gas / fluid, pressurized system and testing equipments shall be carried out under the personal supervision of a Maintenance / Testing Engineer.

14.9 Inspection and Hydraulic Testing
A hydraulic test at a pressure in excess of the safe operating limit is an over pressure test. Such a test must only be done in accordance with a written procedure approved by the Sub Station – In Charge and with the issue of a Permit To Test.

15.0 RVPN SAFETY INSTRUCTIONS 11 (RSI – 11)
STATION STORAGE BATTERY

15.1 Purpose
To specify procedures needed to achieve safety from inherent dangers when testing / maintenance is being carried out on station storage batteries.

15.2 Scope
These RVPN Safety instructions apply the principles established by the Safety Rules to achieve safety from the system for personnel working on station storage batteries.

15.3 Definitions
A battery bank: All battery cells, connections and stands comprise a battery bank

15.4 Equipment Identification
Equipment on which work is to be carried out must be readily identifiable. Wherever necessary, a means of identification must be fixed to it which will remain effective throughout the duration of work.

15.5 Dangers
The main dangers to personnel working on a battery bank are electric shock or burns arising from:
- The possibility of personnel inadvertently shorting battery terminals.
- Dangers spilling of electrolyte on body.
- Asphyxiation or suffocation due to the fumes of storage battery acid.

15.6 General requirements
i) The Sub Station – In – Charge must carry out an assessment to determine the conditions under which the work is to take place and if a safety document is required to be issued.
ii) When work is to be carried out on a battery bank, adequate precautions must be taken to achieve safety from the danger of DC voltage and spilling of electrolyte.

iii) When work on live equipment requires portable instruments to be used for impedance or voltage measurements, the instruments must be provided with insulated probes.

iv) When handling acid, extreme care must be taken and personnel protective equipment like face shield, apron, gloves, etc. must be used before work is undertaken.

v) Proper ventilation along with water supply in washbasin shall be ensured in or near the battery room.

vi) While preparing electrolyte, always ADD ACID TO WATER. NEVER ADD WATER TO ACID.

vii) Always clean spilled acid immediately.

viii) During handling of acid, sufficient quantity of water must be available nearby.

15.7 Working / Testing on Station Battery Bank

i) Wherever required, points of isolation must be established. Any fuses and links and / or safety keys used to secure the points of isolation must be retained in key safe.

ii) Sub Station – In – Charge must assess the work required to be done on a battery bank and decide whether it must be carried out under:

   a) Permit To Work, and / or
   b) Personal supervision.

iii) The work must be carried out by competent person(s).

iv) The competent person(s) who shall do the work must first remove all metallic objects such as wrist watch, rings, wristlets, cufflinks, pendants, etc. on their person.

v) Where necessary to prevent injury, approved insulated tools, insulating stands, mats, gloves, and apron, face shields, as appropriate, must be used.

vi) Only suitable testing instruments with insulated test probes must be used.

vii) Consideration must be given to a competent person being accompanied by another competent person if the presence of such a person could contribute significantly to ensuring that injury is prevented. Any accompanying competent person must be trained to recognize danger and if necessary to render assistance in the event of an emergency, e.g., accidental spilling of acid on eyes, unconsciousness due to inhalation of toxic gases, etc.

16.0 RVPN SAFETY INSTRUCTIONS 12 (RSI – 12)
FIRE PROTECTION AREAS

16.1 Purpose
To ensure safety of personnel from the effects of fixed automatic fire protection / fighting systems.

16.2 Scope
These RVPN Safety Instructions apply the principles established by the Safety Rules to achieve safety from the system for personnel working in, or entering areas protected by fixed fire protection / fighting systems.

16.3 Equipment Identification
Equipment on which work is to be carried out must be readily identifiable. Wherever necessary, a means of identification must be fixed to it which will remain effective throughout the duration of work.

16.4 Dangers
The main dangers to personnel from the operation of fixed fire protection / fighting systems are:

- Asphyxiation / suffocation as a result of operation of fixed fire fighting systems.
- Falling or striking against objects due to poor visibility after the release of contents of fire extinguishers.

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16.5 PRESSURIZED SYSTEMS (HYDRANT / HIGH VELOCITY WATER SPRAY SYSTEMS)

i) Before work commences in an area protected by a water emulsifier fire protection system, the system must be isolated.

ii) The following precautions must be taken:
   a) The automatic control of the fire protection system must be rendered inoperative and the control kept on ‘Manual’. Valves should be closed for the particular equipment for which PTW / PTT is being issued in order to isolate it from the rest of the system. These actions must be recorded in accordance with RVPNL Safety Instructions 01 (RSI – 01), 03 (RSI – 03) and 10 (RSI – 10).
   b) Notice(s) indicating that the control is on ‘Manual’ must be fixed to the automatic/manual selector switch and at point(s) of access to the area.
   c) Precautions taken to render the automatic control inoperative must be noted on any Permit To Work/ Permit To Test issued for work / testing in the protected area.

ii) Automatic control of the fire protection system can be restored after all persons have withdrawn from the area / all access doors have been locked.

16.6 Access to Areas Following Operation of Fire Protection Systems
Before persons are permitted to enter an area into which a fire protection system has been discharged, whether following a fire or accidentally, the area must be thoroughly checked and verified as safe by the Shift – In - Charge. If the atmosphere cannot be verified as safe and it is essential to enter the area, approved breathing equipment and protective apparel must be worn.

17.0 RVPN SAFETY INSTRUCTIONS 13 (RSI – 13)
PROCEDURE FOR WORKING ON SF6 GAS FILLED EQUIPMENT

17.1 Purpose
To protect all personnel against inherent hazards / dangers while working on SF6 gas filled equipments.

17.2 Scope
These RVPN Safety instructions lay down procedures for working on SF6 gas filled equipments and to protect all personnel against inherent dangers / hazards of SF6 gas.

17.3 Definitions
Impurities: Impurities, toxic or non toxic, contained in SF6 gas filled in EHV equipments.
Decomposition products: Electrical discharge decomposes SF6 gas into SF4, SF2, etc. These are called decomposition products. In some cases, sulphur fluoride gas is also formed due to electric discharges.

17.4 Equipment Identification
Equipment on which work is to be carried out must be readily identifiable. Wherever necessary, a means of identification must be fixed to it which will remain effective throughout the duration of work.

17.5 Dangers
Following are the dangers which the personnel may be subjected to while working on SF6 gas filled equipments:
   • Since SF6 gas is heavier than air, there is danger of asphyxiation (suffocation) in the storage / work area in the absence of proper ventilation.
   • Decomposition products, e.g., sulphur fluorides and other toxic gases having pungent or unpleasant odour may cause irritation in nose, mouth and eyes.

17.6 Working Procedures
i) A Permit To Work must be issued before starting the work.
ii) The work equipment must be electrically isolated from other equipments.
iii) The equipment must be earthed at two points.
iv) Using gas evacuation trolley, SF6 gas should be taken out from the equipment and evacuation up to about 50 mbar should be achieved.

v) After ensuring that total gas has been evacuated / removed, then only the equipment should be opened / dismantled.

vi) In general, a mask or other protective measures are not necessary when no appreciable amount of dust (fluoride powder) or odor exists. However, during internal inspection of the interior path of apparatus, personnel should take precautions to avoid exposure to the break down products and suitable protective equipment like gas mask (preferably incorporating molecular filter, etc.), industrial type goggles (SF6 gas dust can sometimes attack the glass of goggles, spectacles, etc.) and rubber gloves shall be used.

vii) After completing the work on the equipment, the equipment should be reassembled.

viii) Before refilling SF6 gas, evacuation up to 5 m bar should be carried out for about two hours. Thereafter, SF6 gas should be filled in the equipment.

18.0 VPN SAFETY INSTRUCTIONS 14 (RSI – 14)

18.1 Purpose
To define guidelines for appointing persons for carrying out maintenance works in EHV Sub Stations or on transmission lines.

18.2 Scope
These VPN Safety Instructions set down procedures for appointment of personnel such as Maintenance Engineer, Testing Engineer, Shift - In - Charge, Sub Station – In – Charge, Line – In – Charge, Operator and Authorized Person.

18.3 Definitions

| Maintenance Engineer: | Engineer responsible for carrying out maintenance works of EHV equipments, transmission lines and HV / MV / LT systems. |
| Testing Engineer: | Engineer responsible for carrying testing of protective relays & systems, PLCC panels and other related equipments. |
| Shift – In – Charge: | Engineer responsible for all operations / activities in Sub Stations. |
| Sub Station – In Charge: | Engineer responsible for all operation and maintenance activities being done / to be done in the Sub Station. |
| Line – In – Charge: | Engineer responsible for patrolling of and maintenance activities being done or to be done on the transmission line. |
| Lead Shift – In – Charge: | Shift - In - Charge of the Sub Station where PTW / PTT has been applied for and who shall be responsible for coordination of operation activities involved for carrying out line maintenance. |
| Operator: | Person authorized to carry out operations of EHV equipment or to use specific type of vehicles or cranes within Sub Station. |
| Authorized Person(s): | Person(s) authorized to carry out operation / maintenance work on EHV equipments / transmission lines. |

18.4 Procedures
i) Only appointed persons shall be allowed to carry out operation and maintenance activities in Sub Stations / on transmission lines.

ii) Safety guidelines during O&M of Sub Stations shall be issued by Sub Station – In – Charge. All operation and maintenance activities shall be carried out under the control of Sub Station – In – Charge.

iii) For carrying out maintenance work, issue of safety document (PTW / PTT) shall be approved by Sub Station – In – Charge.

iv) Sub Station – In – Charge shall appoint Shift – In – Charge & Maintenance Engineer for carrying out O&M activities. Maintenance Engineer shall also be Testing Engineer for local testing. Engineers of the Protection Wing & other fields who have been assigned specific testing tasks shall also be designated as Testing Engineers. Sub Station safety documents, i.e., PTW / PTT shall be filled by Maintenance Engineer /
Testing Engineer for carrying out maintenance / testing activities in Sub Stations. PTW / PTT are to be approved by Sub Station – In – Charge before being issued by Shift – In – Charge.

vi) All operations including isolation and earthing of equipments shall be carried out by the Operator in the presence of Shift – In – Charge.

vii) Only after personally confirming isolation and earthing in the work area, the Shift – In – Charge shall issue the PTW / PTT. After receipt of PTW / PTT, the Maintenance Engineer / Testing Engineer shall advise the Authorized Persons for carrying out maintenance / testing activities. All Authorized Persons shall be appointed by Maintenance Engineer / Testing Engineer. Maintenance Engineer / Testing Engineer shall be responsible for taking all safety precautions during maintenance testing works including use of Personnel Protective Equipment (PPEs).

19.0 VPN SAFETY INSTRUCTIONS 15 (RSI – 15)
PROCEDURE FOR ADDING TO / REMOVING FROM THE EHV / HV SYSTEM

19.1 Purpose
To define procedure for safely adding / removing equipments (new / old) to / from the EHV / HV system.

19.2 Scope
These VPN Safety Instructions define procedures to achieve safety of personnel and / or transmission system safety while adding / removing equipments to / from the EHV system.

19.3 Definitions
Bay:
An array of switching and protective equipments (such as circuit breaker, current transformer, isolators, wave trap, control and relays panels, etc.) for control and protection of a feeder, i.e., transmission line or transformer / reactor, etc. which are to be commissioned or added to / removed from the transmission system.

Bay equipment:
Circuit breaker, current transformer, wave trap, control and relay panels, etc. which are part of the bay.

Inter Linking Transformer (ILT):
Transformer used to step up / step down the system voltage and are synchronized with the system on both the HV and LV sides.

Reactor:
Line or bus reactor used for controlling the system voltage.

Maintenance Engineer:
Engineer responsible for carrying out maintenance works of EHV equipments, transmission lines and HV/ MV / LT systems.

Erection Engineer:
Engineer responsible for all erection activities related to addition / removal of equipment to / from the bay.

Sub Station – In – Charge:
Engineer responsible for erection, operation and maintenance activities being done / to be done in the Sub Station.

19.4 Procedures
i) Adding Bay to EHV / HV System.
   a) When a new bay is to be added to existing EHV / HV system, safety precautions as per RSI – 08, including maintaining safe electrical clearance, need to be taken during movement of crane for carrying out erection / dismantling work.
   b) Before connecting the new equipment, pre-commissioning checks are to be completed first.
   c) Once pre-commissioning checks are completed, necessary PTW / PTT is to be requested by Erection Engineer which shall be approved by Sub Station – In – Charge. Work of connecting jumpers, etc. is to be completed taking safety precautions as per RSI – 01. After connecting to the existing EHV system, all commissioning checks are to be performed.
   d) All control cables & protection relays are to be connected while taking all safety precautions.
ii) Adding Bay Equipment to EHV / HV System
   a) When old bay equipment is to be replaced by new type / design of equipment, then work shall be carried out only after issue of safety documents, i.e., PTW / PTT duly approved by Sub Station – In – Charge and taking safety precautions as per RSI – 01.

iii) Removing Bay from EHV / HV System
   a) When any bay is to be removed from EHV / HV system, then PTW / PTT is to be issued which shall be approved by Sub Station – In – Charge. Safety precautions as per RSI – 01 are to be taken during dismantling work.
   b) The bay which is to be removed shall be identified / isolated from the rest of the system.
   c) Safety precautions as per RSI – 08, including maintaining safe electrical clearance, need to be taken during movement of crane for carrying out dismantling work.

iv) Removing Bay Equipment from EHV / HV System
   a) When any bay equipment is to be removed from EHV / HV system, then PTW / PTT is to be issued which shall be approved by Sub Station – In – Charge. Safety precautions as per RSI – 01 are to be taken during dismantling work.
   b) Bay Equipment which is to be removed shall be identified/ isolated from the rest of the system.
   c) Safety precautions as per RSI – 08, including maintaining safe electrical clearance, need to be taken during movement of crane for carrying out dismantling work.

20.0 RVPN SAFETY INSTRUCTIONS 16 (RSI – 16)
PROCEDURE FOR WORK IN GENERAL CONFINED SPACES

20.1 Purpose
To define procedures for precautions to be taken to prevent Danger when entry into a confined space is required.

20.2 Scope
These RVPN Safety Instructions define procedures to achieve safety of personnel when it is necessary to enter a confined space either for inspection or work.

20.3 Definitions
Confined space is one of the following:
   i) A normally sealed tank for which entry is gained via a manhole or inspection window or similar point of access, e.g., as in transformer tank, shunt reactor tank, GIS, etc.
   ii) Open topped pits, sumps or trenches which may contain dangerous substances.
   iii) Inverted bottom spaces which may contain dangerous substances.
   iv) Rooms, buildings or other enclosures which contain gases that have displaced air.

20.4 Dangers
   i) The main Dangers to personnel in confined spaces are:
      a) Asphyxiation or suffocation.
      b) Poisoning due to toxic atmosphere.
      c) Fire causing an explosion or burns to personnel.
      d) Effect of excessive noise.
      e) Falling or getting trapped within the confined space.
   ii) Danger in confined spaces can also be caused by work such as application of heat to the surface which may cause ignition of the contents or cause a chemical reaction between the contents or the residue.
   iii) Danger in confined spaces can also be present in open topped pits, sumps or trenches which may contain trapped gases which are heavier than air, e.g., SF₆, LPG, Chlorine or sump solvents. Similarly, inverted open bottom spaces may contain gases which are lighter than air, e.g., Hydrogen.
iv) Danger in confined spaces can also be due to gases which have density similar to air, e.g., Nitrogen and CO₂, but which displace air.

20.5 Procedures

i) CONFINED SPACES WHICH HAVE NOT CONTAINED TOXIC OR ASPHYXIATING / SUFFOCATING AIR OR FLAMMABLE SUBSTANCES.
   a) In case of EHV / HV / MV / LV equipment and where considered necessary in other cases, a Permit To Work shall be issued specifying the precautions to be taken to achieve safety and any additional precautions to be taken during the duration of the work.
   b) Before any work is commenced, all supplies of gases, liquids, etc. must be isolated and the confined space vented to atmosphere.
   c) Maintenance Engineer shall give consideration to the provision of forced ventilation within the confined space for the duration of the work.
   d) Oxygen should not be used to "sweeten" the atmosphere in the confined space. Oxygen enriched atmosphere can make substances such as grease liable to spontaneous combustion.
   e) If it is essential to use gas or electrical welding equipment inside the confined space, additional precautions must be taken to eliminate Danger from the heat or flame or electrical sparks and / or gases caused by such operations.
   f) If entry to or access within the confined space is restricted or there is possibility of slipping or falling within the confined space, provision must be made to safely evacuate any personnel who are overcome by fumes or are injured. The provision of a suitable harness (safety belt) with ropes and staff stationed outside the confined space shall be provided.

ii) CONFINED SPACES WHICH HAVE CONTAINED TOXIC OR ASPHYXIATING / SUFFOCATING AIR OR FLAMMABLE SUBSTANCES.
   a) In case of EHV / HV / MV / LV equipment and where considered necessary in other cases, a Permit To Work shall be issued specifying the precautions to be taken to achieve safety and any additional precautions to be taken during the duration of the work.
   b) Before any work is commenced, all supplies of gases, liquids, etc. must be isolated and the confined space vented to atmosphere.
   c) A suitably qualified person, e.g., a Chemical Engineer should be consulted and requested to test the atmosphere to ensure that no toxic, asphyxiating / suffocating or flammable substances are present within the confined space and that there is a sufficient quantity of air to support life.
   d) The suitably qualified person should specify at what regular intervals such tests as at 20.5 (ii) (c) above should be repeated for the duration of the work.
   e) The provisions of 20.5 (i) (c) to 20.5 (i) (f) shall be followed.
   f) If it is not possible to exclude all the Dangers, then breathing apparatus must be used by all persons entering the confined space. Only staff trained to use such apparatus shall be permitted to enter the confined space.

21.0 RVPN SAFETY INSTRUCTIONS 17 (RSI – 17)
PROCEDURE FOR WORK INSIDE TRANSFORMER / REACTOR TANKS

21.1 Purpose
To define procedures for precautions to be taken to prevent Danger when entry into the tank of a transformer / reactor is required.

21.2 Scope
These RVPN Safety Instructions define procedures to achieve safety of personnel when it is necessary to enter the tank of a transformer / reactor for the purpose of internal inspection or for erection.
21.3 Dangers

i) The main Dangers to personnel inside the tank of a transformer / reactor are:
   a) Asphyxiation or suffocation.
   b) Fire causing an explosion or burns to personnel.
   c) Falling or getting trapped within the tank of a transformer / reactor.

ii) Danger inside the tank of a transformer / reactor can also be caused by work such as application of heat to the surface which may cause ignition of the oil vapours present in the tank.

iii) Danger inside the tank of a transformer / reactor can also be present in inverted open bottom spaces which may contain gases which are lighter than air, e.g., Hydrogen.

iv) Danger inside the tank of a transformer / reactor can also be due to gases which have density similar to air, e.g., Nitrogen and CO₂, but which displace air.

21.4 Procedures

i) A Permit To Work shall be issued specifying the precautions to be taken to achieve safety and any additional precautions to be taken during the duration of the work.

ii) Before any work is commenced, all possible inspection windows and man holes shall be opened and the tank of the transformer / reactor vented to atmosphere.

iii) Maintenance Engineer shall give consideration to the provision of forced ventilation (and injection of dry air where required for limiting effect of moisture on winding insulation) within the tank of the transformer / reactor for the duration of the work.

iv) Oxygen should not be used to “sweeten” the atmosphere in the tank of the transformer / reactor. Oxygen enriched atmosphere can make substances such as grease liable to spontaneous combustion.

v) If it is essential to use gas or electrical welding equipment inside the tank of the transformer / reactor, additional precautions must be taken to eliminate Danger from the heat or flame or electrical sparks and / or gases caused by such operations.

vi) If entry to or access within the tank of the transformer / reactor is restricted or there is possibility of slipping or falling within the tank of the transformer / reactor, provision must be made to safely evacuate any personnel who are overcome by fumes or are injured. The provision of a suitable harness (safety belt) with ropes and staff stationed outside the tank of the transformer / reactor shall be provided.
<table>
<thead>
<tr>
<th>NO</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>QTY</th>
<th>RATE (ROPE)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laying of Earth mesh with 25mm / 28mm dia M.S. Rod at a depth of 0.80 metre from top level of foundation, including excavation of trench of required depth and backfilling of the same, transportation of M.S. Rod from the store to location, welding of M.S. Rod to M.S. Rod along the length, at crossings and on earth electrodes as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes &amp; M.S. Flat as required shall be made available by the Contractor).&lt;br&gt;Note: In case diesel generator is arranged by the contractor at his own cost.&lt;br&gt;(i) Normal dry soil</td>
<td>Mtr.</td>
<td>5200</td>
<td>9</td>
<td>105600</td>
</tr>
<tr>
<td>2</td>
<td>Laying of earth mesh of 25mm / 28mm dia M.S. Flat at a depth of 0.80 metre from top level of foundations, including excavation of trench of required depth and backfilling of the same, transportation of M.S. Flat from the store to location, preparation of M.S. Flat as per requirement after heating if necessary, fixing on &amp; bedding / bolting of equipment / structure &amp; peaks of structure, laying in the trench, welding to earth mesh of M.S. Rod as per drawing, including welding of extra length of M.S. Flat if required, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, painting of all surfaces of parts above ground level with red oxide and green paint, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes &amp; M.S. Flat as required shall be made available by the Contractor).&lt;br&gt;Note: In case diesel generator is arranged by the contractor at his own cost.&lt;br&gt;(i) Normal dry soil</td>
<td>Mtr.</td>
<td>1900</td>
<td>38</td>
<td>73200</td>
</tr>
<tr>
<td>3</td>
<td>Fixing / Driving of earth electrodes of 35/28 MM dia. M.S. Rod at length 1.50 metres (approx.) to a depth of 0.80 metres from the top level of foundations, including excavation of pit as required and backfilling of the same, transportation of M.S. Rod from the store to location, fixing of M.S. Rod to drive length, preparation of one end as a spike if necessary, welding of earth electrode to earth mesh of M.S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 0.80 metres below top level of foundations (M.S. Rod of above sizes &amp; M.S. Flat as required shall be made available by the Contractor).&lt;br&gt;Note: In case diesel generator is arranged by the contractor at his own cost.&lt;br&gt;(i) Normal dry soil</td>
<td>NOS.</td>
<td>70</td>
<td>283</td>
<td>19810</td>
</tr>
<tr>
<td>4</td>
<td>Erecting of Sub-station steel structures (columns, beams, lighting mast and equipment structures (excluding Circuit Breakers and Capacitor Banks) of all types including transportation of structure members, nuts &amp; bolts, washers etc from the store to locations, their assembly, placing on foundation, fixing of template, with foundation bolts as required, leveling and preparing for grouting as required, but excluding grouting, erection after grouting and tightening &amp; punching of nuts &amp; bolts. (Maximum height of structures up to 20 metres).</td>
<td>MT</td>
<td>100</td>
<td>3221</td>
<td>322100</td>
</tr>
<tr>
<td>5</td>
<td>BUS BARR WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Code</td>
<td>Description</td>
<td>Amount</td>
<td>Rate</td>
<td>Total</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>-------------</td>
<td>--------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>A</td>
<td>Single ACSR Panther</td>
<td>Single ACSR Panther</td>
<td>4</td>
<td>3155</td>
<td>12620</td>
</tr>
<tr>
<td>B</td>
<td>Single ACSR Zebra</td>
<td>Single ACSR Zebra</td>
<td>14</td>
<td>2356</td>
<td>18288</td>
</tr>
<tr>
<td>C</td>
<td>Earth Wire / Panthes Copper</td>
<td>Earth Wire / Panthes Copper</td>
<td>Set</td>
<td>70</td>
<td>333</td>
</tr>
<tr>
<td>D</td>
<td>Earth Wire</td>
<td>Earth Wire</td>
<td>Each</td>
<td>27</td>
<td>252</td>
</tr>
<tr>
<td>E</td>
<td>Erection of Sub-Station Equipments</td>
<td>Erection of Sub-Station Equipments</td>
<td>Each</td>
<td>70</td>
<td>333</td>
</tr>
<tr>
<td>F</td>
<td>Erection of Transformer</td>
<td>Erection of Transformer</td>
<td>NOS.</td>
<td>21</td>
<td>1415</td>
</tr>
<tr>
<td>G</td>
<td>Erection of Lightning Arrester</td>
<td>Erection of Lightning Arrester</td>
<td>NOS.</td>
<td>21</td>
<td>1415</td>
</tr>
<tr>
<td>H</td>
<td>Erection of Wave trap</td>
<td>Erection of Wave trap</td>
<td>NOS.</td>
<td>4</td>
<td>599</td>
</tr>
</tbody>
</table>

**Notes:**
- ACSR: Aluminum Conductor Steel Reinforced.
- PAN: Panthes Copper.
- Earthing: Earth Wire, Earth Cable, Earthing Wire, Earthing Cable.
- Transformer: KVA, MVA, etc.
- Lightning Arrester: Units.
- Wave trap: Units.
<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Quantity Code</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erection of 110 KV or 220 KV Circuit Breaker including transportation of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>equipment, structure members, nuts &amp; bolts, clamps &amp; connectors etc from</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>site to location, assembly of support structure, their placing on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>foundation, leveling and knocking / pegs, mechanism box / control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cubicle, and other accessories as per manufacturer's drawings, fitting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of terminal connectors as required, but excluding commissioning of CB for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all types of operating mechanism as required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 132 KV</td>
<td>4</td>
<td>15213</td>
<td>6092</td>
</tr>
<tr>
<td>Erection of 33 KV or 11 KV Circuit Breaker including transportation of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>equipment, structure members, nuts &amp; bolts, clamps &amp; connectors etc from</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>site to location, assembly of support structure, their placing on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>foundation, leveling and knocking / pegs, mechanism box / control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cubicle, and other accessories as per manufacturer's drawings, fitting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of terminal connectors as required, but excluding commissioning of CB for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all types of operating mechanism as required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 33 KV or 11 KV</td>
<td>6</td>
<td>7408</td>
<td>44424</td>
</tr>
<tr>
<td>Erection of Post Insulators on already erected structure including</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transportation of P. I. nuts &amp; bolts, clamps &amp; connectors etc from site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to location, assembly of support structure, their placing on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>foundation, leveling and knocking / pegs, mechanism box / control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cubicle, and other accessories as per manufacturer's drawings, fitting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of terminal connectors as required, but excluding commissioning of CB for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all types of operating mechanism as required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 110 KV or 33 KV</td>
<td>1</td>
<td>311</td>
<td>665</td>
</tr>
<tr>
<td>Nos. 33 KV or 11 KV</td>
<td>1</td>
<td>370</td>
<td>75</td>
</tr>
<tr>
<td>Erection of 110 KV Class ENW Transformer (tank already placed on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>foundation with wheels) including transportation of accessories from site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to location, erection of HV, LV, LV &amp; Neutral bushings, main &amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTC conservators, radiators, equilibrating pipe line, marshalling in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>klax etc as per manufacturer's drawings, preparation of oil, oil filling,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>demagnetization of transformer (filter machine, oil tank &amp; operating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>staff shall be provided by RVPM, electrical wiring from individual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>equipment e.g. Buchholz Relay, MOVIC, OSH etc to marshalling klax etc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>but excluding testing &amp; commissioning of transformer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In case electricity is made available by RVPM without charges.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 1</td>
<td>1</td>
<td>40109</td>
<td>40109</td>
</tr>
<tr>
<td>ERECTION OF CONTROL &amp; RELAY PANELS complete in all respects including</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transportation from site store to control room, placing on foundation /</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cable trench as per layout, interconnection between Control &amp; relay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>panels and with existing panels, fixing of side / top covers and doors,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>warping to existing earth slip in control room, connection of bus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wiring to existing panel and between control and relay panel as</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) 110 KV Panel</td>
<td>4</td>
<td>3165</td>
<td>5060</td>
</tr>
<tr>
<td>(ii) Simplex Panel, DC Panel, RTCC Panel, PECC Panel etc.</td>
<td>7</td>
<td>632</td>
<td>4424</td>
</tr>
<tr>
<td>(iii) LT Panel</td>
<td>1</td>
<td>1738</td>
<td>1739</td>
</tr>
<tr>
<td>ERECTION OF MARSHALLING KISH / Line Matching Unit (LMU) / Line</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Matching &amp; Distribution Unit (LMDU) complete in all respects including</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transportation from site to location, placing on foundation / cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>trench as per layout, preparing for grounding of foundation bolts but</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>excluding grounding etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 2</td>
<td>3</td>
<td>374</td>
<td>3222</td>
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<tr>
<td>Nos. 33 KV or 11 KV Marshalling Kish</td>
<td>4</td>
<td>182</td>
<td>768</td>
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<tr>
<td>ERECTION OF BATTERY CHARGERS complete in all respects including</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transportation from site store to battery room, placing on foundation /</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cable trench as per layout,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 1</td>
<td>1</td>
<td>3266</td>
<td>3266</td>
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<tr>
<td>BATTERY SET:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembling, erection and commissioning of Maintenance free VRML type</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Battery Set including transportation of cells, battery stand, nuts &amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bolts etc from site store to battery room, assembly of stand, placing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the cells on stand, making their interconnection, initial charging,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>discharging and final charging as per procedure recommended by battery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>manufacturer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In case electricity is made available by RVPM without charges.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nos. 550 Volt DC, 700 Ah</td>
<td>1</td>
<td>24621</td>
<td>24621</td>
</tr>
<tr>
<td>Description</td>
<td>Unit</td>
<td>Rate</td>
<td>Total</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>a) Shownoured control cable</td>
<td>Mns</td>
<td>1500</td>
<td>5.00</td>
</tr>
<tr>
<td>i) Fixing of control cable in position with single compression nickel plated brass cable glands conforming to IS 12943 &amp; having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plates etc as required &amp; including cost of cable glands for each cable gland size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) 19 mm Shownoured control cable</td>
<td>Nos.</td>
<td>100</td>
<td>44.00</td>
</tr>
<tr>
<td>b) 25 mm Shownoured control cable</td>
<td>Nos.</td>
<td>50</td>
<td>69.00</td>
</tr>
<tr>
<td>ii) termination of wires of cables with copper conductor using copper terminal end (pin or ring type as required of Duttah's or equivalent make as approved by the Engineer - In - Charge) duly cramped with crimping tool, including making wire ends ready for crimping, terminating &amp; dressing of wires etc as required including cost of terminal ends for all wires for each cable at both ends for cables of the following sizes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) 3x 2.5 sq. mm.</td>
<td>Each</td>
<td>50</td>
<td>39.00</td>
</tr>
<tr>
<td>ii) 4x 2.5 sq. mm.</td>
<td>Each</td>
<td>200</td>
<td>43.00</td>
</tr>
<tr>
<td>iii) 5 x 2.5 sq. mm.</td>
<td>Each</td>
<td>85</td>
<td>64.00</td>
</tr>
<tr>
<td>iv) 12 x 2.5 sq. mm.</td>
<td>Each</td>
<td>70</td>
<td>128.00</td>
</tr>
<tr>
<td>v) 18 x 2.5 sq. mm.</td>
<td>Each</td>
<td>80</td>
<td>191.00</td>
</tr>
<tr>
<td>L.T. Power Cables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Fixing of power cables in position with single compression, heavy duty nickel plated brass cable glands conforming to IS 12943 &amp; having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plates etc, including cost of cable glands if required, for each end of cable of size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) 3.5 x 300 sq. mm.</td>
<td>Mns</td>
<td>200</td>
<td>52.00</td>
</tr>
<tr>
<td>ii) Fixing of power cables in position with single compression, heavy duty nickel plated brass cable glands conforming to IS 12943 &amp; having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plates etc, including cost of cable glands if required, for each end of cable of size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) 3.5 x 300 sq. mm.</td>
<td>Nos.</td>
<td>1</td>
<td>124.00</td>
</tr>
<tr>
<td>ii) Termination of wires of cables with aluminium conductor using ISI marked tubular aluminium terminal ends as per IS:8309 duly cramped with crimping tool, including making cable ends ready for crimping and avoiding insulation tape with colour coded dressing of wires etc, including cost of terminal ends if required for each end of cable (in nos. per end) for the following size of cables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) 3.5 x 300 sq. mm.</td>
<td>Set</td>
<td>1</td>
<td>384.00</td>
</tr>
<tr>
<td>Total</td>
<td>In.</td>
<td></td>
<td>1024874</td>
</tr>
</tbody>
</table>

(Notes: Ten Lacs Twenty Four Thousand Eight Hundred Seventy Four Only)

(Uwe is hereby accepted the above rates.)

[Contractor Signature With Seal]

EXECUTIVE ENGINEER (T&C)
RRVPNLE Hindau City
RAJASTHAN RAJYA VIDHUT PRASARAN NIGAM LTD

SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1) The rates for the erection works given in this BSR are inclusive of all types of labour charges, but exclusive of service, tax, sales tax & insurance charges etc.
2) The base date for rates given in this schedule is 1.04.2017.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs): 1.4.2015</th>
<th>Rate (Rs): 2017</th>
</tr>
</thead>
</table>
| A-1      | Laying of earth mesh with 25mm/28mm dia. M.S. Rod at a depth of 0.80 metre from top level of foundations, including excavation of trench of required depth and backfilling of the same, transportation of M.S. Rods from site store to locations, welding of M.S. Rod to M.S. Rod along the length, at crossings and with earth electrodes as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes & M.S. Flat as required shall be made available by RVPN).
|          | (a) In case electricity is made available by RVPN without charges. |
|          | i) Normal dry soil | Metres | 22.00 | 24.00 |
|          | ii) Hard soil / Murram / Black cotton soil | Metres | 24.00 | 26.00 |
|          | iii) Soft rock | Metres | 33.00 | 35.00 |
|          | iv) Hard rock (with blasting) | Metres | 51.00 | 54.00 |
|          | v) Hard rock (backing prohibited) | Metres | 32.00 | 34.00 |
|          | (b) In case diesel generator is arranged by the Contractor at his own cost. |
|          | i) Normal dry soil | Metres | 31.00 | 33.00 |
|          | ii) Hard soil / Murram / Black cotton soil | Metres | 33.00 | 35.00 |
|          | iii) Soft rock | Metres | 43.00 | 45.00 |
|          | iv) Hard rock (with blasting) | Metres | 61.00 | 63.00 |
|          | v) Hard rock (backing prohibited) | Metres | 58.00 | 60.00 |
| A-2      | Laying of earth mesh with 40 mm. dia. M.S. Rod at a depth of 0.80 metre from top level of foundations, including excavation of trench of required depth and backfilling of the same, transportation of M.S. Rods from site store to locations, welding of M.S. Rod to M.S. Rod along the length, at crossings and with earth electrodes as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes & M.S. Flat as required shall be made available by RVPN).
|          | (a) In case electricity is made available by RVPN without charges. |
|          | i) Normal dry soil | Metres | 45.00 | 48.00 |
|          | ii) Hard soil / Murram / Black cotton soil | Metres | 45.00 | 48.00 |
|          | iii) Soft rock | Metres | 66.00 | 69.00 |
|          | iv) Hard rock (with blasting) | Metres | 80.00 | 83.00 |
|          | v) Hard rock (backing prohibited) | Metres | 96.00 | 104.00 |
|          | (b) In case diesel generator is arranged by the Contractor at his own cost. |
|          | i) Normal dry soil | Metres | 59.00 | 63.00 |
|          | ii) Hard soil / Murram / Black cotton soil | Metres | 59.00 | 63.00 |
|          | iii) Soft rock | Metres | 78.00 | 82.00 |
|          | iv) Hard rock (with blasting) | Metres | 95.00 | 101.00 |
|          | v) Hard rock (backing prohibited) | Metres | 110.00 | 117.00 |
| B-1      | Laying of earthing risers of 50x66mm / 50x10mm / 50x12mm size M.S. Flat at a depth of 0.80 metre from top level of foundations, including excavation of trench of required depth and backfilling of the same, transportation of M.S. Flat from site store to locations, preparation of risers, bending as per requirement (after heaving if necessary), fixing on and welding & bolting to equipment / structure and peaks of structures, laying in the trench, welding to the earth mesh of M.S. Rod as per drawing, including welding of extra length of M.S. Flat if required, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, painting of all surfaces of risers above ground level with red oxide and green paint, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes & M.S. Flat as required shall be made available by RVPN).
|          | (a) In case electricity is made available by RVPN without charges. |
|          | i) Normal dry soil | Metres | 25.00 | 27.00 |
|          | ii) Hard soil / Murram / Black cotton soil | Metres | 26.00 | 28.00 |
|          | iii) Soft rock | Metres | 36.00 | 38.00 |
|          | iv) Hard rock (with blasting) | Metres | 55.00 | 58.00 |
|          | v) Hard rock (backing prohibited) | Metres | 61.00 | 65.00 |
|          | (b) In case diesel generator is arranged by the Contractor at his own cost. |
|          | i) Normal dry soil | Metres | 36.00 | 38.00 |
|          | ii) Hard soil / Murram / Black cotton soil | Metres | 38.00 | 40.00 |
|          | iii) Soft rock | Metres | 46.00 | 51.00 |
|          | iv) Hard rock (with blasting) | Metres | 66.00 | 70.00 |
|          | v) Hard rock (backing prohibited) | Metres | 73.00 | 78.00 |
RAJASTHAN RAJYA VIDHUT PRASARAN NIGAM LTD

SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1) The rates for the erection works given in this S.R are exclusive of all types of labour charges, but exclusive of service tax, sales tax & insurance charges etc.

2) The base date for rates given in this schedule is 1.04.2017.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs)</th>
<th>updated Rates (Rs)</th>
</tr>
</thead>
</table>
| B-2      | Laying of earthing risers of 75 x 12mm size M.S. flat at a depth of 0.80 metre from top level of foundations, including excavaation of trench of required depth and backfilling of the same, transportation of M.S. flat from site store to locations, preparation of risers, bending as per requirement (after heating if necessary), fixing on and welding / bolting to equipment / structure and peaks of structures, laying in the trench, welding to the earth mesh of M.S. Rod as per drawing, including welding of extra length of M.S. flat if required, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, painting of all surfaces of risers above ground level with red oxide and green paint, for the type of soil prevalent at 0.50 metre below top level of foundations (M.S. Rod of above sizes & M.S. flat) as required shall be made available by RVPN.
| (a) in case electricity is made available by RVPN without charges.
| i. Normal dry soil | Metres | 46.00 | 51.00 |
| ii. Hard soil / Murram / Black cotton soil | Metres | 48.00 | 51.00 |
| ii. Soft rock | Metres | 69.00 | 73.00 |
| iv. Hard rock (with blasting) | Metres | 84.00 | 89.00 |
| v. Hard rock (blasting prohibited) | Metres | 100.00 | 106.00 |
| (b) in case diesel generator is arranged by the Contractor at his own cost.
| i. Normal dry soil | Metres | 63.00 | 67.00 |
| ii. Hard soil / Murram / Black cotton soil | Metres | 63.00 | 67.00 |
| iii. Soft rock | Metres | 83.00 | 88.00 |
| iv. Hard rock (with blasting) | Metres | 98.00 | 104.00 |
| v. Hard rock (blasting prohibited) | Metres | 112.00 | 120.00 |
| C-1 | Placing / Driving of earth electrode of 25 / 28mm dia. M.S. Rod of length 3.30 meters (approx.) to a depth of 3.80 meters from the top level of foundations, including excavation of pit as required and back filling of the same, transportation of M.S. Rod from site store to locations, cutting of M.S. Rod to required length, preparation of one end as spike if necessary, welding of earth electrode to earth mesh of M.S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 3.80 metres below top level of foundations (M.S. Rod of above sizes & M.S. flat as required shall be made available by RVPN).
| (a) in case electricity is made available by RVPN without charges.
| i. Normal dry soil | Nos. | 158.00 | 209.00 |
| ii. Hard soil / Murram / Black cotton soil | Nos. | 313.00 | 333.00 |
| iii. Soft rock | Nos. | 500.00 | 532.00 |
| iv. Hard rock (with blasting) | Nos. | 675.00 | 732.00 |
| v. Hard rock (blasting prohibited) | Nos. | 995.00 | 1057.00 |
| (b) in case diesel generator is arranged by the Contractor at his own cost.
| i. Normal dry soil | Nos. | 266.00 | 283.00 |
| ii. Hard soil / Murram / Black cotton soil | Nos. | 391.00 | 416.00 |
| iii. Soft rock | Nos. | 579.00 | 616.00 |
| iv. Hard rock (with blasting) | Nos. | 954.00 | 1016.00 |
| v. Hard rock (blasting prohibited) | Nos. | 1070.00 | 1138.00 |
| C-2 | Placing / Driving of earth electrode of 40 mm dia. M.S. Rod of length 3.30 meters (approx.) to a depth of 3.80 meters from the top level of foundations, including excavation of pit as required and back filling of the same, transportation of M.S. Rod from site store to locations, cutting of M.S. Rod to required length, preparation of one end as spike if necessary, welding of earth electrode to earth mesh of M.S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 3.80 metres below top level of foundations (M.S. Rod of above sizes & M.S. flat as required shall be made available by RVPN).
| (a) in case electricity is made available by RVPN without charges.
| i. Normal dry soil | Nos. | 308.00 | 328.00 |
| ii. Hard soil / Murram / Black cotton soil | Nos. | 474.00 | 505.00 |
| iii. Soft rock | Nos. | 626.00 | 673.00 |
| iv. Hard rock (with blasting) | Nos. | 1170.00 | 1246.00 |
| v. Hard rock (blasting prohibited) | Nos. | 1496.00 | 1593.00 |
| (b) in case diesel generator is arranged by the Contractor at his own cost.
| i. Normal dry soil | Nos. | 413.00 | 446.00 |
| ii. Hard soil / Murram / Black cotton soil | Nos. | 579.00 | 615.00 |
| iii. Soft rock | Nos. | 979.00 | 1042.00 |
| iv. Hard rock (with blasting) | Nos. | 1274.00 | 1356.00 |
| v. Hard rock (blasting prohibited) | Nos. | 1560.00 | 1704.00 |
RAJASTHAN RAJYA VIDHUT PRASARAN NIGAM LTD
SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1) The rates for the erection works given in this BSR are inclusive of all types of labour charges but exclusive of service tax, sales tax & insurance charges etc.

2) The base date for rates given in this schedule is 1.4.2015.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>RATE (Rs.) 1.4.2015</th>
<th>UPDATED RATE (Rs.) 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.1</td>
<td>Placing of earth electrode of 25/38 mm dia. M. S. Rod of length 7.50 meters (approx.) to a depth of 8.00 meters from the top level of foundations, including drilling of 200 mm dia. earth pit having a throughout bore of 200 mm dia to a depth of 8.00 meters from the top level of the foundations, in all types of rocks by DTH system and overburden, including back filling of pit with Bentonite slurry (with cost of Bentonite slurry), including its preparation, transportation of M. S. Rod and Bentonite from site store to location, cutting of M. S. Rod to desired length, welding of earth electrode to earth mesh of M. S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints (M. S. Rod of above sizes &amp; M. S. Flat as required shall be made available by RVPN).</td>
<td>Nos.</td>
<td>10548.00</td>
<td>11230.00</td>
</tr>
<tr>
<td>D.2</td>
<td>Placing of earth electrode of 40 mm dia. M. S. Rod of length 7.50 meters (approx.) to a depth of 8.00 meters from the top level of foundations, including drilling of 200 mm dia. earth pit having a throughout bore of 200 mm dia to a depth of 8.00 meters from the top level of the foundations, in all types of rocks by DTH system and overburden, including back filling of pit with Bentonite slurry (with cost of Bentonite slurry), including its preparation, transportation of M. S. Rod and Bentonite from site store to location, cutting of M. S. Rod to desired length, welding of earth electrode to earth mesh of M. S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints (M. S. Rod of above sizes &amp; M. S. Flat as required shall be made available by RVPN).</td>
<td>Nos.</td>
<td>10625.00</td>
<td>11312.00</td>
</tr>
<tr>
<td>E.1</td>
<td>Placing of earth electrode of 25/38 mm dia. M. S. Rod of length 7.50 meters (approx.) to a depth of 8.00 meters from the top level of foundations in already bored hole, including back filling of pit with Bentonite slurry (with cost of Bentonite slurry), including its preparation, transportation of M. S. Rod and Bentonite from site store to location, cutting of M. S. Rod to desired length, welding of earth electrode to earth mesh of M. S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints (M. S. Rod of above sizes &amp; M. S. Flat as required shall be made available by RVPN).</td>
<td>Nos.</td>
<td>1243.00</td>
<td>1323.00</td>
</tr>
<tr>
<td>E.2</td>
<td>Placing of earth electrode of 40 mm dia. M. S. Rod of length 7.50 meters (approx.) to a depth of 8.00 meters from the top level of foundations in already bored hole, including back filling of pit with Bentonite slurry (with cost of Bentonite slurry), including its preparation, transportation of M. S. Rod and Bentonite from site store to location, cutting of M. S. Rod to desired length, welding of earth electrode to earth mesh of M. S. Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints (M. S. Rod of above sizes &amp; M. S. Flat as required shall be made available by RVPN).</td>
<td>Nos.</td>
<td>1230.00</td>
<td>1408.00</td>
</tr>
</tbody>
</table>

2) ERECTION OF SUB-STATION STEEL STRUCTURES columns, beams, lighting mast and equipment structures (excluding Circuit Breakers and Capacitor Banks) of all types including transportation of structure members, nuts & bolts, washers, etc. from site store to locations, their assembly, placing on foundation, fixing of template, with foundation bolts as required, levelling and preparing for grouting as required, but excluding grouting, erection after grouting and tightening & punching of nuts & bolts. (Maximum height of structures up to 20 meters)

3) BUS-BAR WORK

A. STRINGING of 220 KV, 132 KV, 33 KV & 11KV Bus Bar of ACSR & Tarantula conductor, including transportation of conductor, disc insulators and tension hardware from site store to location, laying and cutting required length of conductor, cleaning and assembly of disc insulators as required along with fitting of bolted type or compression type tension hardware as made available (compression machine shall be provided by RVPN on rent free basis), marking up at one end, stringing of conductors between the beams with specified sag and tension, also equalizing sag and fitting spacers and spacer T-clamps for twin conductor, for three phases of conductors in each bus-section.

(i) Single ACSR Panther
Section | 1094.00 | 1185.00 |
(ii) Single ACSR Zebra
Section | 1274.00 | 1365.00 |
(iii) Double ACSR Zebra
Section | 1836.00 | 1926.00 |
(iv) Single Tarantula
Section | 1145.00 | 1219.00 |
(v) Double Tarantula
Section | 1691.00 | 1758.00 |
RAJASTHAN RAJYA VIDHUT PRASARAN NIGAM LTD

SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1) The rates for the erection works given in this BSR are inclusive of all types of labour charges but exclusive of service tax, sales tax & insurance charges etc.

2) The base date for rates given in this schedule is 1.04.2017.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs.)</th>
<th>updated Rates (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>JUMPERS of AC/AC and Tarantula conductor (3 nos. Y-type) between bus to equipment, or between equipment to equipment or between bus to bus, including transportation of conductor, disc insulators and hardware from site stores to locations, cleaning and assembly of disc insulators as required along with fitting of suspension hardware and erection as required, cutting required length of conductor, making connections, fixing of spacers &amp; spacer T-clamps as required, tightening of clamps / connectors, dressing, etc., for three phases.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Single AC/AC Zebra / Panther conductor</td>
<td>Set</td>
<td>313.00</td>
<td>333.00</td>
<td></td>
</tr>
<tr>
<td>ii) Double AC/AC Zebra conductor</td>
<td>Set</td>
<td>626.00</td>
<td>666.00</td>
<td></td>
</tr>
<tr>
<td>iii) Single Tarantula</td>
<td>Set</td>
<td>338.00</td>
<td>360.00</td>
<td></td>
</tr>
<tr>
<td>iv) Double Tarantula</td>
<td>Set</td>
<td>675.00</td>
<td>719.00</td>
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</tr>
<tr>
<td>4</td>
<td>STRINGING of Earth wire (size 7 / 3.15 mm or 7 / 4.00 mm), including transportation of earthwire, tension hardware, etc., from site store to locations, layout and cutting required length of earthwire, fitting of bolted type or compression type hardware as made available (compression machine shall be provided by RVPN on rent free basis), making up at one end, stringing of earthwire between structure peaks with specified sag and tension, jumpersing and connecting earths for single earthwire.</td>
<td>Each</td>
<td>274.00</td>
<td>292.00</td>
</tr>
<tr>
<td>5</td>
<td>ERECTION OF SUB-STATION EQUIPMENTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Erection of 330 kV or 110 kV Station Transformer up to 500 KVA on existing mastory platform including transportation of transformer &amp; accessories from site store to location, erection of Horn Gap fuse set, jumpersing from isolator to Horn Gap to transformer.</td>
<td>Each</td>
<td>3726.00</td>
<td>3947.00</td>
</tr>
<tr>
<td>B.</td>
<td>Erection of Current Transformer / Potential Transformer / Capacitive voltage Transformer / Series Reactor / Residual Voltage Transformer / Neutral Current Transformer with clamps &amp; connectors on already erected steel structure including transportation from site store to locations, fabrication of base frame, fixing of terminal connectors, tightening of nuts &amp; bolts etc., complete in all respects.</td>
<td>Each</td>
<td>1243.00</td>
<td>1323.00</td>
</tr>
<tr>
<td>i) 220 kV CT / PT / CTV</td>
<td>Nos.</td>
<td>2175.00</td>
<td>2529.00</td>
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</tr>
<tr>
<td>ii) 33 kV or 11 kV CT / PT</td>
<td>Nos.</td>
<td>320.00</td>
<td>315.00</td>
<td></td>
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<tr>
<td>iii) 33 kV or 11 kV BR / RVT / NCT</td>
<td>Nos.</td>
<td>450.00</td>
<td>332.00</td>
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</tr>
<tr>
<td>C.</td>
<td>Erection of Lightning Arrester on already erected steel structure including transportation of Lightning Arrester, clamps &amp; connectors, surge counter, etc., from site store to locations, fabrication of base frame, fixing of terminal connectors, surge counter, tightening of nuts &amp; bolts etc., complete in all respects.</td>
<td>Each</td>
<td>954.00</td>
<td>1016.00</td>
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<tr>
<td>i) 220 KV</td>
<td>Nos.</td>
<td>1875.00</td>
<td>1995.00</td>
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<tr>
<td>ii) 110 KV</td>
<td>Nos.</td>
<td>1236.00</td>
<td>1422.00</td>
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<tr>
<td>iii) 33 KV or 11 KV</td>
<td>Nos.</td>
<td>268.00</td>
<td>317.00</td>
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</tr>
<tr>
<td>D.</td>
<td>Erection of isolators on already erected steel structure including transportation of base frame, P. I. As, contacts, mechanism box, clamps &amp; connectors, etc., from site store to locations, minor labours as required, fixing of terminal connectors, etc., adjustment alignment of isolator and its earth blade, if provided, for their smooth operation and final adjustment if required after jumpersing.</td>
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<td></td>
</tr>
<tr>
<td>i) 220 KV</td>
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</tr>
<tr>
<td>a) Without Earth Blade</td>
<td>Nos.</td>
<td>4133.00</td>
<td>4600.00</td>
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<tr>
<td>b) With Single Earth Blade</td>
<td>Nos.</td>
<td>4601.00</td>
<td>4899.00</td>
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<tr>
<td>c) With Double Earth Blade</td>
<td>Nos.</td>
<td>5219.00</td>
<td>5587.00</td>
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<tr>
<td>d) Tandem</td>
<td>Nos.</td>
<td>4601.00</td>
<td>4899.00</td>
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<tr>
<td>ii) 132 KV</td>
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</tr>
<tr>
<td>a) Without Earth Blade</td>
<td>Nos.</td>
<td>2438.00</td>
<td>2586.00</td>
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<tr>
<td>b) With Single Earth Blade</td>
<td>Nos.</td>
<td>2960.00</td>
<td>3045.00</td>
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<tr>
<td>c) Tandem</td>
<td>Nos.</td>
<td>2580.00</td>
<td>3045.00</td>
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<tr>
<td>iii) 33 KV or 11 KV</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>a) Without Earth Blade</td>
<td>Nos.</td>
<td>960.00</td>
<td>916.00</td>
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</tr>
<tr>
<td>b) With Single Earth Blade</td>
<td>Nos.</td>
<td>1281.00</td>
<td>1384.00</td>
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</tr>
<tr>
<td>E.</td>
<td>Erection of Wave trap on already erected structure beam, including transportation of wave trap, disc insulators, hardware, clamps and connectors, etc., from site store to locations, cleaning &amp; assembly of disc insulators alongwith fitting of suspension arrangement and erection, fixing of terminal connectors, etc.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>i) 220 KV</td>
<td>Nos.</td>
<td>758.00</td>
<td>807.00</td>
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<tr>
<td>ii) 132 KV</td>
<td>Nos.</td>
<td>563.00</td>
<td>589.00</td>
<td></td>
</tr>
</tbody>
</table>
RAJASTHAN RAYA VIDHUT PRASARAN NIGAM LTD

SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1) The rates for the erection works given in this BSR are inclusive of all types of labour charges, but exclusive of service tax, sales tax & insurance charges etc.

2) The base date for rates given in this schedule is 1st January, 2017.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>1.4.2015 Rate (Rs.)</th>
<th>Updated Rates (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.</td>
<td>Erection of 3x33 KV or 2x11 KV Capacitor Bank, with Series Reactors &amp; Residual Voltage Transformers / Neutral Current Transformers, including transportation of equipments, structure members, nuts &amp; bolts, washers, clamps &amp; connectors etc. from site store to location, assembly of structure, their placing on foundation, levelling and preparing for grounding as required, but excluding grounding, assembly of capacitor bank cells on frames as required &amp; their connections as per manufacturer's drawings, fixing of terminal connectors.</td>
<td>Each</td>
<td>17344.00</td>
<td>18466.00</td>
</tr>
<tr>
<td>G.</td>
<td>Erection of 220 KV or 132 KV Circuit Breakers, including transportation of equipment, structure members, nuts &amp; bolts, clamps &amp; connectors, accessories etc. from site store to location, assembly of support structure, their placing on foundation, levelling and preparing for grounding as required, but excluding grounding, assembly / placing of poles, mechanism box, etc. on support structure as per manufacturer's drawings, fitting of terminal connectors, etc. excluding commissioning of CB, for all types of operating mechanism, as required.</td>
<td>Nos.</td>
<td>18048.00</td>
<td>19221.00</td>
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<tr>
<td>H.</td>
<td>Erection of 33 KV or 11 KV Circuit Breakers including transportation of equipment, structure members, nuts &amp; bolts, clamps &amp; connectors, etc. from site store to location, assembly of support structure, their placing on foundation, levelling and preparing for grounding as required, but excluding grounding, assembly / placing of poles, mechanism box, etc. on support structure as per manufacturer's drawings, fitting of terminal connectors, etc. excluding commissioning of CB.</td>
<td>Nos.</td>
<td>6954.00</td>
<td>7464.00</td>
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</tr>
<tr>
<td>I.</td>
<td>Erection of Post Insulators on already erected structures including transportation of P. T. %, nuts &amp; bolts, clamps &amp; connectors, etc. from site store to locations, fabrication of base frame &amp; assembly if required, fixing of clamps, etc.</td>
<td>Nos.</td>
<td>829.00</td>
<td>883.00</td>
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<tr>
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<tr>
<td>J.</td>
<td>Erection of 132 KV Class EHV Transformer (tank already placed on foundation with wheels), including transportation of accessories from site store to locations, erection of HV, LV &amp; Neutral bushings, main &amp; OLTC conservators, radiators, equalising pipe line, marshalling kiosk, etc. as per manufacturer's drawing, preparation of oil, oil filling, dehydrating of transformer (filter machine, oil tank &amp; operating staff shall be provided by RVPN), electrical wiring from individual equipment, e.g., bushing relay, MOLG, OSS, etc. to marshalling kiosk, etc., but excluding testing &amp; commissioning of transformer.</td>
<td>Nos.</td>
<td>39531.00</td>
<td>42898.00</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>K.</td>
<td>Erection of 220 KV Class EHV Transformer (Gas filled tank already placed on foundation with wheels), including transportation of accessories from site store to locations, erection of HV, LV &amp; Neutral bushings, erection of cooler bank with associated pipe line, radiators, fans, pumps, main &amp; OLTC conservators, equalising pipe line, marshalling kiosk, etc. as per manufacturer's drawing, preparation of oil, oil filling, dehydrating of transformer along with cooler bank &amp; diverter switch (filter machine, oil tank &amp; operating staff shall be provided by RVPN), electrical wiring from individual equipment, e.g., Buchholz relay, MOLG, OSS, Fans, Pumps. Bushing CT's etc. to marshalling kiosk, etc., but excluding testing &amp; commissioning of transformer.</td>
<td>Nos.</td>
<td>120781.00</td>
<td>128596.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.</td>
<td>Erection of Control &amp; Relay Panels complete in all respects including transportation from site store to control room, placing on foundation / cable trench as per layout, interconnection between Control &amp; Relay panels and with existing panels, fixing of side / top covers and doors, earthling to existing earth strip in control room, connection of bus wiring to existing panel and between control and relay panel, as required.</td>
<td>Nos.</td>
<td>493438.00</td>
<td>525363.00</td>
</tr>
</tbody>
</table>

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*Note: The rates are subject to change without notice.*

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Page 3 of 8
### SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1. The rates for the erection works given in this BSR are inclusive of all types of labour charges, but exclusive of service tax, sales tax & insurance charges etc.

2. The base rates for rates given in this schedule is 1.04.2017.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs) 1.4.2015</th>
<th>Rate (Rs) updated 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Erection of Marshalling Kiosk/ Line Matching Unit (LMU) / Line Matching &amp; Distribution Unit (LMDU) complete in all respect including transportation from site store to location, placing on foundation / cable trench as per layout, preparing for grooving of foundation bolts but excluding grooving, etc.</td>
<td>Nos.</td>
<td>351.00</td>
<td>374.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>180.00</td>
<td>190.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>406.00</td>
<td>432.00</td>
</tr>
</tbody>
</table>

8. Erection of Battery Charger complete in all respect including transportation from site store to location, placing on foundation / cable trench as per layout, etc.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs) 1.4.2015</th>
<th>Rate (Rs) updated 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>1188.00</td>
<td>1245.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>1188.00</td>
<td>1245.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>1188.00</td>
<td>1245.00</td>
</tr>
</tbody>
</table>

9. BATTERY SET

A. Assembly, erection and commissioning of Lead Acid Battery Set including transportation of cells, battery stand, electrolyte, nuts & bolts and accessories from site store to battery room, assembly of wooden stand, placing the cells on stand, making their interconnection, filling of electrolyte, giving two cycle of charge and charge after initial charging as per procedure recommended by battery manufacturer.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs) 1.4.2015</th>
<th>Rate (Rs) updated 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>24688.00</td>
<td>26285.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>23125.00</td>
<td>24821.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>21465.00</td>
<td>22979.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Each</td>
<td>4208.00</td>
<td>4576.00</td>
</tr>
</tbody>
</table>

B. Assembly, erection and commissioning of Maintenance Free VRLA type Battery Set including transportation of cells, battery stand, nuts & bolts, etc. from site store to battery room, assembly of stand, placing the cells on stand, making their interconnection, initial charging, discharging and final charging as per procedure recommended by battery manufacturer.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs) 1.4.2015</th>
<th>Rate (Rs) updated 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>85546.00</td>
<td>91083.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>83985.00</td>
<td>89129.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nos.</td>
<td>43790.00</td>
<td>46981.00</td>
</tr>
</tbody>
</table>

10. LAYING AND TERMINATION OF CABLES

A. Control Cables

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs) 1.4.2015</th>
<th>Rate (Rs) updated 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>CODE NO.</td>
<td>DESCRIPTION</td>
<td>UNIT</td>
<td>Rate (Rs);</td>
<td>updated Rates (Rs)</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>------</td>
<td>-------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.4.2015</td>
<td>2017</td>
</tr>
</tbody>
</table>

(i) Fixing of control cables in position with single compression nickel plated brass cable glands confirming to IS: 12943 & having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plates, etc. as required & including cost of cable glands, for each cable gland of size.

| a) | 19 mm unarmoured control cable | Nos. | 41.00 | 44.00 |
| b) | 19 mm armoured control cable   | Nos. | 46.00 | 49.00 |
| c) | 25 mm unarmoured control cable | Nos. | 63.00 | 67.00 |
| d) | 25 mm armoured control cable   | Nos. | 59.00 | 73.00 |
| e) | 32 mm unarmoured control cable | Nos. | 90.00 | 96.00 |
| f) | 32 mm armoured control cable   | Nos. | 100.00 | 109.00 |

(ii) Termination of wires of cables with copper conductor using copper terminal ends (pin or ring type as required of Dowell's or equivalent make as approved by the Engineer – In – Charge) duly cramped with crimping tool, including making wire ends ready for crimping, ferruling & dressing of wires, etc., as required, including cost of terminal ends for all wires, for each cable at both ends for cables of the following sizes.

| a) | 2 x 2.5 sq. mm. | Each | 20.00 | 21.00 |
| b) | 3 x 2.5 sq. mm. | Each | 30.00 | 32.00 |
| c) | 4 x 2.5 sq. mm. | Each | 40.00 | 43.00 |
| d) | 5 x 2.5 sq. mm. | Each | 50.00 | 54.00 |
| e) | 10 x 2.5 sq. mm. | Each | 100.00 | 106.00 |
| f) | 12 x 2.5 sq. mm. | Each | 120.00 | 128.00 |
| g) | 16 x 2.5 sq. mm. | Each | 150.00 | 169.00 |
| h) | 18 x 2.5 sq. mm. | Each | 150.00 | 169.00 |

In case all the wires of any cable are not got terminated, then a deduction at the rate of Rs. 6.00 shall be made for each end of the wires not terminated.

(i) Fixing of power cables in position with single compression, heavy duty nickel plated brass cable glands as per IS: 12943 & having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plate, etc., including cost of cable gland if required, for each end of cable of size.

| a) | 3½ core x 70 sq. mm. | Metres | 41.00 | 44.00 |
| b) | 3½ core x 120 sq. mm. | Metres | 41.00 | 44.00 |
| c) | 3½ core x 185 sq. mm. | Metres | 50.00 | 53.00 |
| d) | 3½ core x 300 sq. mm. | Metres | 52.00 | 53.00 |

B. L.T. Power Cables

(i) Laying of P. V. C. insulated and P. V. C. sheathed armoured/unarmoured L.T. power cable of 1.1 KV grade with aluminium conductor as per IS: 1255 in ground / cable trench / wall / surface including transportation of cable drums from site store to locations and excavation of 30 cm x 75 cm size trenches, providing 25 mm thick under layer of sand & 2nd class brick covering & refilling earth in remaining portion, fixing as per approved / available spacing by means of M.S. U-clamps, etc. as per specification as required, including making necessary connections & testing, etc. as required, of the following sizes.

| a) | 3½ core x 70 sq. mm. | NOS. | 109.00 | 116.00 |
| b) | 3½ core x 70 sq. mm. | NOS. | 19.00 | 20.00 |
| c) | 50 mm. for 3½ core x 120 sq. mm. | NOS. | 156.00 | 169.00 |
| d) | 50 mm. for 3½ core x 185 sq. mm. | NOS. | 21.00 | 22.00 |
| e) | 50 mm. for 3½ core x 300 sq. mm. | NOS. | 226.00 | 241.00 |
| f) | 50 mm. for 3½ core x 300 sq. mm. | NOS. | 33.00 | 37.00 |
| g) | 50 mm. for 3½ core x 300 sq. mm. | NOS. | 418.00 | 442.00 |
| h) | 75/76 mm. for 3½ core x 300 sq. mm. | NOS. | 116.00 | 128.00 |
RAJASTHAN RAJYA VIDHUT PRASARAN NIGAM LTD

SCHEDULE OF RATES FOR ERECTION OF UNIT QUANTITY ITEMS OF SUB STATION ON LABOUR CONTRACT BASIS

1) The rates for the erection works given in this BSR are inclusive of all types of labour charges, but exclusive of service tax, sales tax & insurance charges etc.

2) The base data for rates given in this schedule is 1.04.2017.

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs): 1.4.2015</th>
<th>Updated Rates (Rs): 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Termination of wires of cables with aluminum conductors using ISI marked tubular aluminium terminal ends as per IS: 8309 duly crimped with crimping tool, including making cable ends ready for crimping and providing insulating tape with colour code, dressing of wires, etc., including cost of terminal ends if required, for each end of cable (4 nos. per end) for the following size of cables:</td>
<td>Set</td>
<td>219.00</td>
<td>233.00</td>
</tr>
<tr>
<td>a)</td>
<td>3 1/2 core x 70 sq. mm, cable with material</td>
<td>Set</td>
<td>136.00</td>
<td>147.00</td>
</tr>
<tr>
<td>b)</td>
<td>3 1/2 core x 70 sq. mm, cable without material</td>
<td>Set</td>
<td>310.00</td>
<td>320.00</td>
</tr>
<tr>
<td>c)</td>
<td>3 1/2 core x 120 sq. mm, cable with material</td>
<td>Set</td>
<td>186.00</td>
<td>195.00</td>
</tr>
<tr>
<td>d)</td>
<td>3 1/2 core x 120 sq. mm, cable without material</td>
<td>Set</td>
<td>465.00</td>
<td>495.00</td>
</tr>
<tr>
<td>e)</td>
<td>3 1/2 core x 185 sq. mm, cable with material</td>
<td>Set</td>
<td>286.00</td>
<td>306.00</td>
</tr>
<tr>
<td>f)</td>
<td>3 1/2 core x 185 sq. mm, cable without material</td>
<td>Set</td>
<td>770.00</td>
<td>830.00</td>
</tr>
<tr>
<td>g)</td>
<td>3 1/2 core x 300 sq. mm, cable with material</td>
<td>Set</td>
<td>361.00</td>
<td>384.00</td>
</tr>
<tr>
<td>h)</td>
<td>3 1/2 core x 300 sq. mm, cable without material</td>
<td>Set</td>
<td>361.00</td>
<td>384.00</td>
</tr>
</tbody>
</table>

11) PAINTING OF SUB-STATION EQUIPMENTS AND STEEL STRUCTURES

A. Aluminium painting of new steel structures at the GSS including paint and painting brush, emery paper, cloth & solvent, etc. The surface shall be first rubbed free of dust or any other deposits on erected M. S. steel structures & beams. One coat of red oxide paint shall be applied after carrying out cleaning and allowed to dry. Thereafter two coats of Aluminium paint shall be applied. Each subsequent cost shall be applied only after the previous cost has dried. The paint used shall be out of the following recognized manufactures only, namely, Asian / Nerolac / Berger / Johnson Nicholson / Dulux.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs): 1.4.2015</th>
<th>Updated Rates (Rs): 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>Sq. Mtr.</td>
<td>33.00</td>
<td>35.00</td>
</tr>
</tbody>
</table>

B. Aluminium painting of old painted steel structures at the GSS including paint and painting brush, emery paper, cloth & solvent, etc. The surface shall be first rubbed free of dust or any other deposits on erected M.S. steel structures & beams. Two coats of Aluminium paint shall be applied. Each subsequent cost shall be applied only after previous cost has dried. The paint used shall be out of the following recognized manufacturers, namely, Asian / Nerolac / Berger / Johnson Nicholson / Dulux.

C. Enamel painting on power transformers and other associated equipments using spray painting set, including supply of paint, emery paper, cloth & solvent etc. at GSS by cleaning surfaces thoroughly with soda / caustic solution to clean oily surfaces & thereafter washing with water. Thereafter two coats of smoke grey synthetic enamel paints shall be applied by spray method. Each coat shall be applied only after the previous coat has dried up. The paint used shall be out of the following recognized manufacturers namely, Asian / Nerolac / Berger / Johnson Nicholson / Dulux. In case of surface area of radiators, the fins will only be considered which are only feasible and approachable for painting by spray or by brush.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs): 1.4.2015</th>
<th>Updated Rates (Rs): 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.</td>
<td>Sq. Mtr.</td>
<td>29.00</td>
<td>31.00</td>
</tr>
</tbody>
</table>

12) Providing and laying in position specified grade of cement concrete for all RCC structural elements upto plinth level including curing, compaction, finishing with rendering in cement sand mortar 1:3 (1 cement : 3 coarse sand) and making good the joints and cost of plasterers (if required) excluding the cost of centering, shuttering and reinforcement. M20 grade Nominal Mix/ Design Mix.(The rates are as per PWD BSR 2014- Jaipur.)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Rate (Rs): 1.4.2015</th>
<th>Updated Rates (Rs): 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Cum</td>
<td>4112.00</td>
<td>4378.00</td>
</tr>
</tbody>
</table>

13) SWITCHYARD ILLUMINATION

As per Terms & Rates in the prevailing/applicable PWD BSR.
## SECTION-IV

### SCHEDULE-III (Price Schedule)

**Name of Work:-** Construction work of 132 KV GSS RIICO Dholpur.

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>QTY</th>
<th>RATE (Rupees)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EARTH MESH WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Laying of earth mesh with 25mm / 28mm dia M.S. Rod at a depth of 0.80 metre from top level of foundation, including excavation of trench of required depth and backfilling of the same, transportation of M.S. Rods from site store to location, welding of M.S. Rod to M.S. Rod along the length, at crossings and with earth electrodes as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes &amp; M.S. Flat as required shall be made available by RVPN). (b) In case diesel generator is arranged by the contractor at his own cost.</td>
<td>Mtrs</td>
<td>3200</td>
<td>33</td>
<td>105600</td>
</tr>
<tr>
<td>A-1</td>
<td>i) Normal dry soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Laying of earthing risers of 50x6mm / 50x10mm / 50x12mm size M.S. Flat at a depth of 0.80 metre from top level of foundations, including excavation of trench of required depth and back filling of the same, transportation of M.S. Flat from site store to locations, preparation of risers, bending as per requirement (after heating if necessary), fixing on &amp; bolting / bolting of equipment / structure &amp; peaks of structure, laying in the trench, welding to earth mesh of M.S. Rod as per drawing, including welding of extra length of M.S. Flat if required, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, painting of all surfaces of risers above ground level with red oxide and green paint, for the type of soil prevalent at 0.80 metre below top level of foundations (M.S. Rod of above sizes &amp; M.S. Flat as required shall be made available by RVPN). (b) In case diesel generator is arranged by the contractor at his own cost.</td>
<td>Mtrs</td>
<td>1900</td>
<td>38</td>
<td>72200</td>
</tr>
<tr>
<td>B-1</td>
<td>i) Normal dry soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Placing / Driving of earth electrode of 25 / 28 MM dia. M.S. Rod of length 3.30 metres (approx.) to a depth of 3.80 metres from the top level of foundations, including excavation of pit as required and back filling of the same, transportation of M.S. Rod from site store locations, cutting of M.S. Rod to desire length, preparation of one end as as spike if necessary, welding of earth electrode to earth mesh of M.S.Rod as per drawing, application of bitumen compound and covering with bitumen impregnated tape on all welded joints, for the type of soil prevalent at 3.80 mtrs below top level of foundations (M.S. Rod of above sizes &amp; M.S. Flat as required shall be made available by RVPN). (b) In case diesel generator is arranged by the contractor at his own cost.</td>
<td>Nos.</td>
<td>70</td>
<td>283</td>
<td>19810</td>
</tr>
<tr>
<td>C-1</td>
<td>i) Normal dry soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Signature of Tenderer
<table>
<thead>
<tr>
<th></th>
<th>ERECTION OF SUB-STATION STEEL STRUCTURES columns, beams, lighting mast and equipment structures (excluding Circuit Breakers and Capacitor Banks) of all types including transportation of structure members, nuts &amp; bolts, washers etc from site store to locations, their assembly, placing on foundation, fixing of template, with foundation bolts as required, levelling and preparing for grouting as required, but excluding grouting, erection after grouting and tightening &amp; punching of nuts &amp; bolts. (Maximum height of structures up to 20 metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BUS-BAR WORK</td>
</tr>
<tr>
<td>A</td>
<td>STRINGING of 220KV, 132KV, 33KV &amp; 11KV Bus Bar of ACSR conductor including transportation of conductor, disc insulator &amp; tension hardware from site store to location, laying &amp; cutting required length of conductor, cleaning &amp; assembly of disc insulators as required along with fitting of bolted type or compression type tension hardware as made available between the beams with specified sag and tension, also equilising sag and fitting spacers and spacer T-clamps for twin conductor for three phase of conductors in each sub-section.</td>
</tr>
<tr>
<td></td>
<td>i) Single ACSR Panther</td>
</tr>
<tr>
<td></td>
<td>ii) Single ACSR Zebra</td>
</tr>
<tr>
<td>B</td>
<td>JUMPERS of ACSR conductor (3 nos. Y-type) between bus to equipment or between equipment to equipment or between bus to bus, including transportation of conductor, disc insulators and hardware from site stores to locations, cleaning &amp; assembly of disc insulators as required along with fitting of suspension hardware and erection as required length of conductor, making connections, fixing of spacers &amp; spacer T-clamps as required, tightening of clamps / connectors, dressing etc for three phase.</td>
</tr>
<tr>
<td></td>
<td>i) Single ACSR Zebra / Panther conductor</td>
</tr>
<tr>
<td></td>
<td>STRINGING of earth wire (size 7/3.15 mm or 7/4.00 mm) including transportation of earth wire, tension hardwares etc from site store to locations, laying and cutting required length of earth wire, fitting of bolted type or compression type hardware as made available (compression machine shall be provided by RVPN on rent free basis) making up at one end, stringing of earthwire between structure peaks with specified sag and tension, jumpering and connecting earth bonds for single earthwire.</td>
</tr>
<tr>
<td>4</td>
<td>Each</td>
</tr>
<tr>
<td></td>
<td>ERECTION OF SUB-STATION EQUIPMENTS</td>
</tr>
<tr>
<td>A</td>
<td>i) Erection of 33/0.4 KV or 11/0.4 KV station transformer up to 500 KVA on existing masonry platform including transportation of transformer &amp; accessories from site store to location, erection of Horn Gap fuse set, jumpering from isolator to Horn Gap to transformer.</td>
</tr>
<tr>
<td></td>
<td>Each</td>
</tr>
<tr>
<td>B</td>
<td>Erection of Current Transformer / Potential Transformer / Capacitive Voltage Transformer / Series Reactor / Residual Voltage Transformer / Neutral Current Transformer with clamps &amp; connectors on already erected steel structure including transportation from site store to locations, fabrication of base frame, fixing of terminal connectors, tightening of nuts &amp; bolts etc, complete in all respects.</td>
</tr>
<tr>
<td></td>
<td>ii) 132 KV CT / PT / CVT</td>
</tr>
<tr>
<td></td>
<td>iii) 33 KV or 11 KV CT / PT</td>
</tr>
<tr>
<td>C</td>
<td>Erection of Lightening Arrester on already erected steel structure including transportation of Lightening Arrester, clamps &amp; connectors, surge counter etc from site store to locations, fabrication of base frame, fixing of terminal connectors, surge counter, tightening of nuts &amp; bolts etc, complete in all respects.</td>
</tr>
<tr>
<td></td>
<td>ii) 132 KV</td>
</tr>
</tbody>
</table>

Signature of Tenderer
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Nos.</th>
<th>15</th>
<th>317</th>
<th>4755</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Erection of Isolators on already erected steel structure including transportation of base frame, P T's contacts, mechanism box, clamps &amp; connectors etc from site store to locations, minor fabrication as required and fixing of terminal connectors etc, adjustment / alignment of isolator and its earth blade, if provided for their smooth operation and final adjustment if required after jumpering.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) 132 KV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Without Earth Blade</td>
<td>Nos.</td>
<td>10</td>
<td>2596</td>
<td>2596</td>
</tr>
<tr>
<td></td>
<td>b) With Single Earth Blade</td>
<td>Nos.</td>
<td>2</td>
<td>3045</td>
<td>6090</td>
</tr>
<tr>
<td></td>
<td>iii) 33 KV or 11 KV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Without Earth Blade, 800Amp</td>
<td>Nos.</td>
<td>13</td>
<td>916</td>
<td>11908</td>
</tr>
<tr>
<td></td>
<td>b) Without Earth Blade 1250Amp</td>
<td>Nos.</td>
<td>3</td>
<td>916</td>
<td>2748</td>
</tr>
<tr>
<td></td>
<td>b) With Single Earth Blade, 800Amp</td>
<td>Nos.</td>
<td>4</td>
<td>1364</td>
<td>5456</td>
</tr>
<tr>
<td>E</td>
<td>Erection of Wave trap on already erected structure beam including transportation of wave trap, disc insulators, hardware, clamps &amp; connectors etc from site store to locations, cleaning &amp; assembly of disc insulators alongwith fitting of suspension arrangement and erection, fixing of terminal connectors etc.</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) 132 KV</td>
<td>Nos.</td>
<td>4</td>
<td>599</td>
<td>2396</td>
</tr>
<tr>
<td>G</td>
<td>Erection of 220 KV or 132 KV Circuit Breaker including transportation of equipments, structure members, nuts &amp; bolts, clamps &amp; connectors etc from site store to locations, assembly of support structure, their placing on foundation, levelling and preparing for grouting as required, but excluding grouting, assembly / placing of support columns / poles, mechanism box / control cubicle, and other accessories as per manufacturer's drawings, fitting of SF6 gas pipeline, fabrication of air / oil pipeline as required, electrical wiring from pole to control cubicle, fixing of terminal connectors as required, but excluding commissioning of CB for all types of operating mechanism as required.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ii) 132 KV</td>
<td>Nos.</td>
<td>4</td>
<td>15223</td>
<td>60892</td>
</tr>
<tr>
<td>H</td>
<td>Erection of 33 KV or 11 KV Circuit Breaker including transportation of equipments, structure members, nuts &amp; bolts, clamps &amp; connectors etc from site store to locations, assembly of support structure, their placing on foundation, levelling and preparing for grouting as required, but excluding grouting, assembly / placing of poles, mechanism box etc on support structure as per manufacturer's drawings, fitting of terminal connectors as required, but excluding commissioning of CB.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) 33 KV or 11 KV outdoor type (VCB / SF6)</td>
<td>Nos.</td>
<td>6</td>
<td>7404</td>
<td>44424</td>
</tr>
<tr>
<td>I</td>
<td>Erection of Post Insulators on already erected structure including transportation of P. I.'s nuts &amp; bolts, clamps &amp; connectors etc from site store to locations, fabrication of base frame, assembly if required, fixing of clamps etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) 132 KV</td>
<td>Nos.</td>
<td>111</td>
<td>665</td>
<td>73815</td>
</tr>
<tr>
<td></td>
<td>iii) 33 KV or 11 KV</td>
<td>Nos.</td>
<td>370</td>
<td>75</td>
<td>27750</td>
</tr>
<tr>
<td>J</td>
<td>Erection of 132 KV Class EHV Transformer (tank already placed on foundation with wheels) including transportation of accessories from site store to locations, erection of HV, IV, LV &amp; Neutral bushings, main &amp; OLTC conservators, radiators, equilizing pipe line, marshalling kiosk etc as per manufacturer's drawing, preparation of oil, oil filling, dehydoration of transformer (filter machine, oil tank &amp; operating staff shall be provided by RVPN), electrical wiring from individual equipment e.g., Buchholz Relay, MOLG, OSR etc to marshalling kiosk etc but excluding testing &amp; commissioning of transformer.</td>
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</tr>
<tr>
<td></td>
<td>(a) in case electricity is made available by RVPN without charges.</td>
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</tr>
<tr>
<td></td>
<td>i) Transformer received Oil filled</td>
<td>Nos.</td>
<td>1</td>
<td>42089</td>
<td>42089</td>
</tr>
<tr>
<td>K</td>
<td>ERECTION OF CONTROL &amp; RELAY PANALS complete in all respects including transportation from site store to control room, placing on foundation / cable trench as per layout, interconnection between Control &amp; Relay panels and with existing panels, fixing of side / top covers and doors, earthing to existing earth strip in control room, connection of bus wiring to existing panel and between control and relay panel as required.</td>
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<td>---</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Duplex Panel</td>
<td>Nos. 4</td>
<td>1265</td>
<td>5060</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Simplex Panel, DC Panel, RTCC Panel, PLCC Panel etc</td>
<td>Nos. 7</td>
<td>632</td>
<td>4424</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) LT Panel</td>
<td>Nos. 1</td>
<td>1739</td>
<td>1739</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L</th>
<th>ERECTION OF MARSHALLING KIOSK / Line Matching Unit (LMU) / Line Matching &amp; Distribution Unit (LMDU) complete in all respect including transportation from site store to location, placing on foundation / cable trench as per layout, preparing for grouting of foundation bolts but excluding grouting etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) 220 KV or 132 KV Marshalling Kiosk</td>
<td>Nos. 3</td>
</tr>
<tr>
<td>ii) 33 KV or 11 KV Marshalling Kiosk</td>
<td>Nos. 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M</th>
<th>ERECTION OF BATTERY CHARGER complete in all respect including transportation from site store to location, placing on foundation / cable trench as per layout etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ii) 110 Volt DC. 200 AH</td>
<td>Nos. 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6</th>
<th>BATTERY SET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly, erection and commissioning of Maintenance free VRRA type Battery Set including transportation of cells, battery stand, nuts &amp; bolts etc from site store to battery room, assembly of stand, placing the cells on stand, making their interconnection, initial charging, discharging and final charging as per procedure recommended by battery manufacturer.</td>
<td></td>
</tr>
<tr>
<td>(a) In case electricity is made available by RVPN without charges.</td>
<td></td>
</tr>
<tr>
<td>ii) 110 Volt DC. 200 AH</td>
<td>Nos. 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>LAYING AND TERMINATION OF CABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL CABLES</td>
<td></td>
</tr>
<tr>
<td>i) Laying of PVC insulated unarmoured / armoured control cables of 1.1 KV grade with copper conductor in cable trenches as per specification as required, including transportation of cable drums from site store to locations, laying in cable trenches, cutting of required length, placing them on cable racks / cable trays / cable batten &amp; dressing, including removing and re-fixing trech covers as required, making necessary connections, testing, cable marking on both the terminating ends etc as required for all sizes from 2C x 2.5 sq. mm. to 20C x 2.5 sq. mm, 4C x 4 sq. mm and 4C x 6 sq. mm.</td>
<td></td>
</tr>
<tr>
<td>a) Unarmoured control cable</td>
<td>Mtrs 1500</td>
</tr>
<tr>
<td>ii) Fixing of control cable in position with single compression nickel plated brass cable glands confirming to IS: 12943 &amp; having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plates etc as required &amp; including cost of cable glands for each cable gland size</td>
<td></td>
</tr>
<tr>
<td>a) 19 mm unarmoured control cable</td>
<td>Nos. 100</td>
</tr>
<tr>
<td>c) 25 mm unarmoured control cable</td>
<td>Nos. 60</td>
</tr>
<tr>
<td>Description</td>
<td>Quantity</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>c) 3c x 2.5 sq. mm.</td>
<td>Each</td>
</tr>
<tr>
<td>d) 6c x 2.5 sq. mm.</td>
<td>Each</td>
</tr>
<tr>
<td>e) 12c x 2.5 sq. mm.</td>
<td>Each</td>
</tr>
<tr>
<td>f) 18c x 2.5 sq. mm.</td>
<td>Each</td>
</tr>
<tr>
<td>g) 19c x 2.5 sq. mm.</td>
<td>Each</td>
</tr>
<tr>
<td><strong>B. L.T. Power Cables</strong></td>
<td></td>
</tr>
<tr>
<td>i) Laying of PVC insulated unarmoured / armoured L.T. power cables of 1.1 KV grade with aluminium conductor as per IS:1255 in ground / cable trench / wall / surface including transportation of cable drums from site store to locations and excavation of 30 cm x 75 cm size trenches, providing 25 mm thick under layer of sand &amp; 2nd class brick covering &amp; refilling earth in remaining portion, fixing as per approved / available spacing by means of M.S.U - clamps etc as per specification as required including making necessary connections &amp; testings etc as required of the following sizes.</td>
<td>Mtrs</td>
</tr>
<tr>
<td>d) 3.5c x 300 sq. mm.</td>
<td></td>
</tr>
<tr>
<td>ii) Fixing of power cables in position with single compression, heavy duty nickel plated brass cable glands confirming to IS: 12943 &amp; having three metal washers and one rubber ring, including preparation of cable and drilling of corresponding holes in gland plates etc, including cost of cable gland if required, for each end of cable of size.</td>
<td></td>
</tr>
<tr>
<td>h) 75 / 76 mm for 3.5c x 300 sq. mm cable without material</td>
<td>Nos.</td>
</tr>
<tr>
<td>iii) Termination of wires of cables with aluminium conductor using ISI marked tubular aluminium terminal ends as per IS:8309 duly cramped with crimping tool, including making cable ends ready for crimping and providing insulation tape with colour code, dressing of wires etc, including cost of terminal ends if required for each end of cable (4 nos. per end) for the following size of cables.</td>
<td></td>
</tr>
<tr>
<td>h) 3.5c x 300 sq. mm cable with out material</td>
<td>Set</td>
</tr>
<tr>
<td><strong>TOTAL (Rs.)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NET TOTAL (Rs.)</strong></td>
<td></td>
</tr>
<tr>
<td>Rs. Ten Lacks Twenty Four thousand Eight hundred seventy Four only.</td>
<td></td>
</tr>
<tr>
<td>Bidder quote here (Excess/Less in %)</td>
<td>(+/-)</td>
</tr>
<tr>
<td>Quoted Amount (Excess/Less in % X BSR cost of work A):B</td>
<td>(+/-)</td>
</tr>
<tr>
<td>Total Quoted Price (BSR cost of work A+ Quoted amount B)</td>
<td></td>
</tr>
<tr>
<td>Rupees in words</td>
<td></td>
</tr>
</tbody>
</table>

Signature of Tenderer
SECTION-IV  
SCHEDULE-IV  

SCHEDULE OF PAST EXPERIENCE OF THE BIDDER IN RESPECT OF  
EHV LINES OR AT EHV GSS  

1. Details of orders obtained/executed  

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of order placing authority</th>
<th>Order No. &amp; Date</th>
<th>Name of work</th>
<th>Value of Work Order</th>
<th>Date of commencement of work</th>
<th>Date of completion of work</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<td>6</td>
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<td>7</td>
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</tr>
</tbody>
</table>

1. In support of above & of meeting the other qualifying requirements, copies of the Work Orders and satisfactory completion reports from the user or Order Placing Authority duly attested are enclosed.

Encl: As above

(Signature )  
Name & Designation  
With Seal of the firm.
SECTION-IV
SCHEDULE-V

DEPARTURE FROM SPECIFICATION.
The tenderer shall state under this schedule the departure from the purchaser's specification in respect of both technical and commercial terms & conditions :-

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Main Deviations from Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Technical Deviations:</td>
</tr>
<tr>
<td>2)</td>
<td>Commercial Deviations:</td>
</tr>
</tbody>
</table>

Certified that we agree to all Technical Specification and Commercial Terms and conditions as laid down in "General Conditions of Contract" except for the deviations to the extent indicated above.

(Signature)
Name & Designation
with Seal of the firm.
**SECTION-IV**

**SCHEDULE-VI**

Schedule of completion period construction work such as Earth Mesh, Erection of Sub Station Structure, Bus Bar stringing, Equipment erection and Cabling Work at 132 KV GSS RICCO Dholpur.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of work</th>
<th>Period of completion for erection &amp; commissioning of Substation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction work such as Earth Mesh, Erection of Sub Station Structure, Bus Bar stringing, Equipment erection and Cabling Work at 132 KV GSS RICCO Dholpur.</td>
<td>03 Months</td>
</tr>
</tbody>
</table>

Note:-- 1. There will be 15 days time for mobilization of resources in addition to the above mentioned completion time.
2. Above targeted completion period is inclusive of monsoon period.

(Signature)
Name & Designation
With seal of the firm

Signature of Tenderer
SECTION-IV
SCHEDULE-VII

(TO BE FILLED IN BY THE TENDERERS & UPLOAD WITH THE TENDER)

Contractors and/or their authorized agents who are quoting against this tender are requested to furnish the following information along with the tender. The Chief Engineer will have the discretion to ignore the tender without the under noted particulars and/or ignore the tender particulars.

1. Name and Address of the Contractor/Firm

2. Place where office of the firm exist

3. Details of staff employed in the works

4. List of available machinery, tools & tackles, name of engineers/persons etc, for erection work.

5. Statement of financial resources and Banking reference along with Balance Sheet/Income Tax returns furnished for previous two years.

6. Whether the firm is a Micro, Small or Medium enterprise as per the Micro, Small & Medium enterprise development act, 2006 (MSMED Act 2006) and registered with the authorities under the above Act for the items/services covered under this tender. If yes, then the firm has to indicate the Entrepreneurs Memorandum No. (Twelve Digit) and scanned copy of the certificate issued by the Authorities under the MSMED Act, 2006 should be uploaded along with the online bid.

7. Whether the firm is registered under D.G.T.D. State Industries Department.

If yes, give details along with copy of registration.

(Signature)
Name & Designation with Seal of the firm.

Signature of Tenderer
SECTION-IV

SCHEDULE-VIII

(Must be filled in by the tenderer and upload with Technical Bid)

To,
The SE (T&C),
Raj. Rajya Vidyut Prasaran Nigam Ltd.,
Hindaun.

Dear Sir,

With reference to your invitation to the TENDER SPECIFICATION NO.:-
RVPN/SE/HINDAUN/ BID NO /D- DATE, we agree to construct following
Transmission Line (s) on Labour contract Basis.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the Sub-Station</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

1. The percentage variation below / above for the cost of construction of Substation (s) indicated in price schedule (s) shall also be applicable in case of unit rate items detailed in Schedule-II (For the same Substation).

2. The prices are variable as per price variation formula mentioned at clause No.1.09 (c) ‘PRICES’ of section – I of the specification, without ceiling.

3. Any increase / decrease in the quantity of individual items mentioned in the price schedule shall be finalized on basis of the actuals. The cost of that item shall be increased / decreased in proportion to the % variation.

4. The offer is valid for a period of 120 days after the date of opening of Techno Commercial Bid.

5. We confirm that we agree to all the terms and conditions as well as the technical stipulations of your and there are no deviations other than as specified in the Schedule-V.

Yours faithfully,

(Signature)
Name & Designation with seal of the firm.

Signature of Tenderer
**ANNEXURE-I**

**PRE-BID QUERIES FORMAT**

Name of the company/Firm
Bidding document fee Receipt No ________ dated ________ for Rs ________
Name of Person(s) Representing the Company/Firm:

<table>
<thead>
<tr>
<th>Name of person</th>
<th>Designation</th>
<th>E-mail-ID(s)</th>
<th>Tel Nos &amp; Fax No</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Company/Firm Contacts

<table>
<thead>
<tr>
<th>Contact Person(s)</th>
<th>Address for correspondence</th>
<th>E-mail-ID(s)</th>
<th>Tel Nos &amp; Fax No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Query/Clarification Sought

MS(Excel Sheet Format)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Bidder Name</th>
<th>ITB/GCC/ Specification clause No</th>
<th>Bid document page No</th>
<th>Clause details</th>
<th>Query/Clarification/suggestion</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

(Signature)
Name & Designation
With seal of the bidder

Signature of Tenderer

124
CONTRACT AGREEMENT

This Agreement is made at Hindaun this day .......................between the ....................... ...............RRVPN, Hindaun (herein after called „NIGAM” which expression shall, where the context so admits include its successors and permitted assignees) and M/s. ....................... (herein after called “The Contractor” which expression shall, where the context so admits include their heirs, executors, administrators and legal representative as well as successors and permitted assignees) are hereby held and firmly bind to the Rajasthan Rajya Vidyut Prasaran Nigam Ltd. to execute the work of: ........................................ to be executed as per rate, terms and conditions of ............................................ awarded by the Nigam as per details given below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name of work</td>
</tr>
<tr>
<td>2</td>
<td>Name of order purchaser</td>
</tr>
<tr>
<td>3</td>
<td>Name of contractor</td>
</tr>
<tr>
<td>4</td>
<td>Estimated cost</td>
</tr>
<tr>
<td>5</td>
<td>Earnest Money deposited</td>
</tr>
<tr>
<td>6</td>
<td>Security Deposit</td>
</tr>
<tr>
<td>7</td>
<td>Tentative date of completion</td>
</tr>
<tr>
<td>8</td>
<td>Work order No. &amp; date</td>
</tr>
</tbody>
</table>

I/ we hereby assure and abide to fulfill all the conditions of the work order referred to above. I/we declare that I/we have read thoroughly and carefully all the terms & conditions, clauses of the work order/Bid specifications (Section- I to IV) and I/we hereby accept & abide with the terms and conditions of the said work order/Bid specifications for execution of the said work. I/we declare that, I/We will be fully responsible for safety of Nigam”s material issued to us for erection works as well as safety of our workers and confirm that, if any person get injured due to any accident during execution of work, the compensation if any, will be paid by me/us and RVPN shall not be responsible in any circumstances.

Signed and delivered by,
Signature of contractor..........................................

Witness:
Signature
Address..........................................

Notary attested:

Accepted on behalf of RVNP
Superintending Engineer (T&C)
RVPN, Hindaun.

Signature of Tenderer
INDEMNITY BOND

Know all men by these present that we ........................................ (herein after called 'The Contractor' which expression shall, where the context so admits include their, heirs, executors, administrators and legal representative as well as successors and permitted assignees) are hereby held and firmly bind to the Rajasthan Rajya Vidyut Prasar Nigam Ltd. (herein after called „NIGAM‟ which expression shall, where the context so admits include its successors and permitted assignees) to refund the full amount of owner supplied material made available by the Nigam under the terms and conditions of work order No. .................................................. for the work of.................................................. If any loss, damage or deterioration of what so ever nature occurs to such material which is held by us at our site stores at works site, in trust for and on behalf of the Nigam and or if any of such material or fabricated articles made there from are in inspection by any officer authorized by the Nigam in this behalf are found to be defective and rejected by such officer. We, hereby further bind ourselves that the amount of such refund may be deducted by the Nigam from any sum, which at any time thereafter may become due to us under said work order or any other contract entered into by us with the Nigam.

We bind ourselves firmly by these presents dated ........................................ and whereas the contractor do hereby agree to be responsible for the safe custody and protection of the said material against all risks (excluding war risks) and against loss, damage and deterioration of whatsoever nature in respect of the said material while it remains in the custudy and possession of the subcontractor / contractor.

AND WHEREAS the said material shall at all time remains open for inspection by any officer authorized by the Nigam. Now the conditions of the above written bond are such that:-

1. The said contractor shall refund the full amount against the material as has been supplied by the Nigam to them in respect of which loss, damage or deterioration of whatsoever nature, except due to circumstances arising out of war has occurred.
2. The contractor shall keep the said material open at any time for inspection by the officers authorized by the Nigam till the said material is utilized by the contractor on the said works and balance / surplus material is deposited with In-charge of the works. If the material account is settled than the above written bond shall be void and of no effects, otherwise the same shall be and remain in full force.

IN WITNESS WHEREOF we the said have here to signed at Hindaun in the presence of: -

Witness:

Authorized signatory

Sign
Name
Address

Notary attested:

Signature of Tenderer
ANNEXURE-IV

PERFORMA OF BID BANK GUARANTEE
(For Bid Security)

(Bank Guarantee in lieu of bid security on non-judicial Stamp Paper of Rajasthan Government of appropriate value as required under the Rajasthan Stamp duty act)

To,
The Superintending Engineer (T&C),
Rajasthan Rajya Vidyut Prasaran Nigam Ltd.
Hindaun.

1. Whereas ...................(name of the Bidder) (hereinafter called the Bidder) has submitted its bid dated...........(date of submission of bid) for the construction of ...........(name of contract)(hereinafter called "the Bid").

2. KNOW ALL PEOPLE by these presents that WE...........(name of bank) of ...........(name of country), having our registered office at...........(addresses of bank) (hereinafter called "the Bank"), are bound into...........(name of Purchaser)(hereinafter called "the Purchaser") in the sum of Rs.* for which payment well and truly to be made to the said Purchaser, the Bank bids itself, its successors, and assigns by these presents. Sealed with the Common Seal of the said Bank this ...........day of ...........20...........

3. THE CONDITIONS of this obligation are:

(i) If the Bidder withdraws its Bid during the period of bid. Validity specified by the Bidder in the Bid Form:
   or

(ii) If the bidder refuses to accept the correction of error in his Bid;
   or

(iii) If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity.
   (a) Fails or refuses to execute the Contract Agreement, if required:
   or
   (b) Fails or refuses to furnish the performance security, in accordance with the General Conditions of Contract.

4. We undertake to pay the purchaser up to the above amount upon receipt of its first written demand, without the purchaser having to substantiate its demand, provided that in its demand the Purchaser will note that the amount claimed by it is due to it owing to the occurrence of one or all of the three conditions specifying the occurred condition or conditions.

5. The decision of the CHIEF ENGINEER, RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM, JAIPUR shall be final whether breach has been committed on the right to demand the amount of guarantee from us which has accrued to the purchaser.

Signature of Tenderer
6. This guarantee shall not cease or determine, if the purchaser grants time or indulgence or vary the terms of the contract with the Contractor or without our consent or knowledge.

7. The guarantee herein contained shall not be affected by any change in the constitution of the Contractor.

8. We.........................further undertake not to evoke this guarantee during its currency except with the previous consent of the CHIEF ENGINEER, RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM, JAIPUR.

9. All disputes arising under the said guarantee between the Bank and the Nigam or between the Contractor and the Nigam pertaining to the guarantee, shall be subject to the jurisdiction of Courts in Hindaun, Rajasthan alone.

10. This guarantee will remain in force up to and including one hundred eighty (180) days after the date of the opening of bids, i.e. up to ................. with a further grace period of Ninety (90) days and any demand in respect thereof should reach ................. (Name of the Bank) and branch situated at ................. (address of Hindaun branch), HINDAUN Rajasthan not later than the above date.

Yours faithfully,

Bankers (EXECUTANT)

Signed by the above named Bank in presence of :-
(Signature with full Name and Address)

Witness :

1. ____________________________

2. ____________________________

Attested by Notary Public, First Class Magistrate or directly confirmed by the executing bank.

* The Bidder should insert the amount of the guarantee in words and figures denominated in the currency of bid.

[Signature of Tenderer]