

**BHARAT HEAVY ELECTRICALS LTD.  
(TRANSMISSION BUSINESS GROUP)**

**TERMS AND CONDITIONS FOR INDIGENOUS TENDER ENQUIRY**

This Format is to be submitted in original duly signed by bidder. Deviation, if any, is to be brought out clearly in Schedule of Commercial Deviation giving clause-wise deviation. Any condition / clarification / deviation mentioned elsewhere may not be accepted.

Sr. No.	Standard Terms & Conditions	Enquiry No.- 254E269 dated 27.03.15
1.	<p><b>INSTRUCTION TO BIDDERS:</b></p> <p>a) Sealed quotations are invited for the items mentioned in the enquiry. Quotations should be typed and free from over writing and erasures. Corrections or additions must be clearly written both in words and figures and attested, otherwise offer shall be liable for rejection.</p> <p>b) Bidder must ensure that their quotation is received / dropped in the tender box on or before 14:00 Hrs of the due date of opening.</p> <p><b><u>Material Management Division</u></b></p> <p><b><u>Transmission Business Group</u></b></p> <p><b><u>Tower A, 5th Floor, BHEL, Advant Navis IT Business Park</u></b></p> <p><b><u>Plot No 7, Sector - 142, Express way Noida</u></b></p> <p><b><u>Noida -201305</u></b></p> <p><b><u>DISTT- GAUTAM BUDH NAGAR, UP</u></b></p> <p>c) The same shall be opened at 14:30 Hrs. on the same day. Tenders received late may be rejected. Bidders sending tenders by courier or post, to ensure that it is delivered one day before as same day delivery may not reach above office by due time.</p> <p>d) Bids are to be submitted in Two parts:</p> <p style="padding-left: 20px;">i) Techno-commercial bid (Part-I): To be submitted in duplicate. A copy of price bid (Part-II) "without prices" is also to be enclosed in Part-I bid.</p> <p style="padding-left: 20px;">ii) Bidder to strictly ensure submitting the price bids in BHEL format of Rate Contract or as per project requirement.</p> <p style="padding-left: 20px;">iii) Price bid (Part-II): To be submitted only in one copy in a separate sealed envelope. This should not contain any Technical or Commercial Terms. The rates should be quoted both in figures and words. In case of any difference between figures and words, the quoted rate in words shall prevail over figure. Further in case of difference between unit rate &amp; total price, unit rate in words shall prevail over total price.</p> <p>Both Part-I and Part-II bids are to be sealed in separate envelope and both envelopes to be kept in another common envelope. Each envelope should be sealed and superscribed with enquiry no., item / package name, project name (if any) and due date of opening.</p> <p>e) For any technical clarification please contact :</p>	

Sr. No.	<p style="text-align: center;"><b>Standard Terms &amp; Conditions</b> <span style="float: right;">Enquiry No.- 254E269 dated 27.03.15</span></p>
	<p>Shri P L Kadhala, DGM (TBEM)  <b>BHARAT HEAVY ELECTRICALS LIMITED</b>  <b>TRANSMISSION BUSINESS GROUP</b>  <b>TOWER A, 5TH FLOOR, ADVANT NAVIS IT BUSINESS PARK,</b>  <b>PLOT NO-7, SECTOR-142, EXPRESSWAY NOIDA,</b>  <b>NOIDA-201305,</b>  <b>DISTT- GAUTAM BUDH NAGAR, UP, INDIA</b>  <b>Phone : 0120 – 6748552</b>  <b>E-mail : plkadhala@bhel.in</b></p> <p><b><u>For any Commercial clarification, please contact:</u></b></p> <p><b>SH. S.C. SHIVHARE, SR. MGR.(TBMM)</b>  <b>BHARAT HEAVY ELECTRICALS LIMITED</b>  <b>TRANSMISSION BUSINESS GROUP</b>  <b>TOWER A, 5TH FLOOR, ADVANT NAVIS IT BUSINESS PARK,</b>  <b>PLOT NO-7, SECTOR-142, EXPRESSWAY NOIDA,</b>  <b>NOIDA-201305,</b>  <b>DISTT- GAUTAM BUDH NAGAR, UP, INDIA</b>  <b>Phone : 0120-6748473 / 0120-6748471</b>  <b>Email: <a href="mailto:shashirai@bhel.in">shashirai@bhel.in</a> / <a href="mailto:scshivhare@bhel.in">scshivhare@bhel.in</a> / <a href="mailto:a.kumar@bhel.in">a.kumar@bhel.in</a></b></p> <p>f) Price bid should contain only rates / prices, otherwise bid shall be liable for rejection.</p> <p><b>g) Price bid submitted along with the bid shall remain valid up to validity of offer. Unsolicited Supplementary / Revised price bid submitted during validity period of offer, unless asked by BHEL, shall not be considered. Withdrawal of quotation by the bidder, at any stage after its opening, may entail blacklisting of vendor.</b></p> <p>h) Enquiry condition for where the scope against this tender includes Installation and Commissioning of the equipment / material:</p> <p>There will be separate contract awarded for Supply portion and Site execution portion. For Supply portion Commercial Terms and Conditions mentioned herein shall be applicable &amp; for Site execution portion Terms and Conditions for Installation services shall be applicable. However, any breach in either of the contracts shall be deemed as the breach of other contract also.</p>
2.	<p><b>PRICES:</b></p> <p>A. The prices to be quoted are with PVC with following formula :</p> <p><b>PVC as per IEEMA as applicable as on date of dispatch. Present PVC formula as per Annexure – II.</b></p> <p>The base indices in the formula shall be of first notification of IEEMA of the month one Month prior to Scheduled Techno – Commercial Bid opening. The date of delivery shall be P. O. Delivery Date or Date of Actual Dispatch, whichever is earlier.</p> <p>B. The prices shall be quoted by the vendors considering below:</p> <p>ED exempted against PAC (Project Authority Certificate by RRVUNL) and Mega Power Status certificate issued by GOI).</p> <p>B1. Excise Duty: Exempted against PAC.</p>

Sr. No.	Standard Terms & Conditions	Enquiry No.- 254E269 dated 27.03.15
	<p>C. The prices are to be quoted on Ex-works basis. The break-up of prices shall be as under : -</p> <ol style="list-style-type: none"> <li>a) <b>Ex-works Price:</b> Ex-Works price including packing &amp; forwarding Charges.</li> <li>b) <b>Excise Duty:</b> Exempted against EDE.</li> <li>c) <b>Sales Tax:</b> ST / VAT / CST (against C form) as applicable to be quoted extra as percentage in un-priced and price bid. In case of inter-state sale-in-transit supplier/vendor will have to provide E1/E2 form.</li> <li>d) <b>Entry tax / Octroi Charges:</b> Any Entry tax / Octroi applicable at destination / destination state shall be paid extra on proof of such payment.</li> <li>e) <b>Freight &amp; Insurance:</b> Freight and Transit Insurance for door delivery up to destination/site is to be quoted.</li> </ol> <p>Note: The purchase order shall be placed on Ex-works basis.</p> <p><b>“BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.</b></p> <p><b>In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit ‘online sealed bid’ in the Reverse Auction. Non-submission of ‘online sealed bid’ by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.”</b></p> <p>Further to above clause, please refer attached Annexure II for Terms &amp; Conditions Of Reverse Auction Page 1 &amp; 2)</p>	
3.	<p><b>TERMS OF PAYMENT:</b></p> <p>a)100% payment along with taxes, duties, Freight &amp; Insurance within 60 days (45 days for MSE Vendor) from the date of receipt of complete invoice <b>in TBG, BHEL</b> with following documents in 3 sets (Original + 2 copies).</p> <ul style="list-style-type: none"> <li>• LR duly endorsed in the name of Customer by BHEL-Site</li> <li>• Material Receipt certificate issued by Site as per attached format</li> <li>• Excise invoice (where ED re-imburement is required)</li> <li>• Packing List (Case-wise)</li> <li>• Copy of Performance Bank Guarantee</li> <li>• Transit insurance Certificate from insurance Comp or intimation of Transit Insurance duly endorsed by insurance Comp.</li> </ul>	

Sr. No.	Standard Terms & Conditions	Enquiry No.- 254E269 dated 27.03.15
	<ul style="list-style-type: none"> <li>• MICC issued by BHEL</li> <li>• Guarantee Certificate</li> </ul> <p>b) <u>Terms of payment for Type test charges:</u> 100% payment with taxes and duties on acceptance of test reports by BHEL on certification by BHEL engineering within 60 days from the date of receipt of clear invoice.</p>	
4.	<p><b>INTEREST LIABILITY:</b> In case of any delay in payment due to any reason, BHEL shall not pay any interest on delayed payment.</p>	
5.	<p><b>GUARANTEE:</b> The equipment / material shall be guaranteed for 18 months from the date of delivery or 12 months from the date of commissioning, whichever is earlier. The defective material / component shall be replaced free of cost at site.</p>	
6.	<p><b>PERFORMANCE BANK GUARANTEE:</b> Supplier shall submit BG within 30 Days of P.O. placement for a value of 2% of Ex-works value of Purchase Order Rev-0 and valid for a period of 18 months + 3 months claim period (i.e. Total 21 months) from the date of last delivery. Further BG shall be released only after ensuring submission of documents as per clause 3.5 of Technical specification (Final Engineering Documentation).</p>	
7.	<p><b>FINAL ENGINEERING DOCUMENTATION:</b> Final Engineering Documentation (clause No. 3.5 of Tech Spec No. TB 360 618-006 Rev 00) as called in the specification is to be submitted within 3 months from the date of dispatch of material. Bank Guarantee pertaining to Purchase Order shall be released only after certification of documents submission as per Clause No. 3.5 of Tech Spec No. TB 360 618-006 Rev 00.</p>	
8.	<p><b>INSPECTION:</b> BHEL / customer / Third party shall inspect equipment / material before despatch. Stage inspection during manufacturing may also be carried out. Material to be despatched only after getting Despatch Clearance from BHEL.  Supplier shall send inspection call on prescribed format only, with an advance notice of 15 days. Vendor shall forward all inspection and test reports for issue of MICC by BHEL.  Road Permit Form request should also be given along with Inspection call.</p>	
9.	<p><b>DESPATCH DOCUMENTS:</b> Following despatch documents are to be immediately sent to purchaser on despatch:</p> <ul style="list-style-type: none"> <li>• Copy of LR</li> <li>• Packing List (Case-wise)</li> <li>• Insurance Certificate</li> <li>• Guarantee Certificate</li> </ul>	

Sr. No.	Standard Terms & Conditions	Enquiry No.- 254E269 dated 27.03.15
10.	<p><b>DELIVERY PERIOD:</b> Bidder to specify the delivery period in weeks from the date of LOI / PO in the Activity Schedule Format enclosed with enquiry. Time for conduction of type test, if required, is to be separately indicated. Note: LR date or Invoice date whichever is later shall be considered as delivery date.</p>	
11.	<p><b>DELAYED DELIVERY:</b> In case of delay in execution of order beyond the lot wise contractual delivery, an amount of ½ % of total Ex-Works Value of Delayed Lot per week or part there-of subject to maximum of 10% Ex-Works Value of Delayed Lot will be levied.</p>	
12.	<p><b>VALIDITY:</b> The offer shall be valid for 120 days from the due date of opening.</p>	
13.	<p><b>QUANTITY VARIATION:</b> <b>As per Technical Specification TB 360 618-006 Rev 00 clause No. 1.3</b></p>	
14.	<p><b>ACCEPTANCE / REJECTION OF TENDER:</b> BHEL reserves the right to reject in full or part, any or all tender without assigning any reason thereof. BHEL also reserves right to vary the quantities mentioned in the tender.</p>	
15.	<p><b>EVALUATION:</b> Comparative statement shall be prepared based on total quantity basis unless otherwise indicated in the enquiry. Evaluation of offers shall be done on the basis of delivered cost to BHEL.</p>	
16.	<p><b>DEVIATION:</b> The bids having deviation(s) w.r.t. tender are liable for rejection. However, BHEL, at its discretion, may load the prices for evaluation of offer as per Loading Criteria for identified deviations mentioned in clause No. 25.</p>	
17.	<p><b>ARBITRATION:</b> All cases of disputes emanating from and relating to this contract shall be referred to the sole arbitration of Unit Head / GM, BHEL or any other person nominated by him(including an employee of BHEL, even though he had to deal with the matter relating to this contract in any manner) to act as sole arbitrator. The arbitration shall be in accordance with 'The Arbitration and Conciliation Act 1996' and the rules there under as amended from time to time. The arbitrator shall give a reasoned award. The decision of the arbitrator shall be final &amp; binding upon both the parties.  The venue of arbitration shall be Delhi.</p>	
18.	<p><b>LEGAL SETTLEMENT:</b> Subject to clause 17 hereinabove this contract shall be subject to exclusive jurisdiction of courts at Delhi.</p>	

Sr. No.	Standard Terms & Conditions <span style="float: right;">Enquiry No.- 254E269 dated 27.03.15</span>
19.	<p><b>SUBCONTRACTING :</b> In case further subcontracting of BHEL order or part thereof is envisaged by supplier, the same can be done after written permission is obtained from BHEL. However it shall not absolve the supplier of the responsibility of fulfilling BHEL purchase order requirements.</p>
20.	<p><b>RISK PURCHASE :</b> In case the successful bidder fails to supply or fails to comply with the terms &amp; conditions of the purchase order, BHEL reserves the right to source such material/ component / equipment/ system from any other agency at the risk and cost of the successful bidder.</p>
21.	<p><b>ADJUSTMENT OF RECOVERY :</b> Any amount payable by the supplier under any of the condition of this contract shall be liable to be adjusted against any amount payable to the supplier under any other works / contract awarded to him by any BHEL unit. This is without prejudice to any other action as may be deemed fit by BHEL.</p>
22.	<p><b>FORCE MAJEURE CONDITION :</b> If by reason of war, civil commotion, act of god, Government restrictions, strike, lockout which are not in control of supplier the deliveries are delayed, supplier shall not be held responsible.</p>
23.	<p><b>TECHNICAL SPECIFICATION :</b> <b>G. I .Structures for Transmission Line : TB 360 618-006 Rev 00</b></p>
24.	<p><b>QUALITY PLAN :</b> For Projects from PGCIL &amp; NTPC, the standard QAP of G.I. Lattice Structures of respective customer would be applicable. For other projects supplier to take confirmation from BHEL regarding applicability of quality plan.</p>
25	<p><b>LOADING CRITERIA FOR DEVIATIONS TAKEN BY BIDDER ON:</b></p> <p><b><u>25.1.TERMS OF PAYMENT:</u></b> If a bidder asks for payment within specified no. of days from the date of receipt of invoice with complete documents as per “Terms of Payment” at sr. No. 3 above, loading to be done as follows:  a) Base rate of SBI (as applicable on the date of techno commercial bid opening) + 6 % shall be considered for loading for the period of relaxation sought by the bidder.  b) 60 days - No loading</p> <p><b><u>25.2. DELAYED DELIVERY / PENALTY DUE TO DELAYED DELIVERY:</u></b> Loading for not accepting this clause / accepting only on un delivered portion shall be the maximum amount specified in this clause.</p> <p><b><u>25.3 GUARANTEE:</u></b> Normally BHEL will not accept deviation against this clause and offer may be ignored on this deviation, however If the offered guarantee period is less than the tender guarantee period the ex- works prices shall be loaded for the difference in the period ( higher of the difference with respect to guarantee required from date of delivery and date of commissioning) @ 2.5 % per year for number of months( fractional months to be rounded off to next higher)</p>
26	<p>“MSE suppliers can avail the intended benefit only if they submit along with offer, attested copies of either EM II certificate having deemed validity (Two years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed as per Annexure - III) applicable for the year, certifying</p>

Sr. No.	Standard Terms & Conditions <span style="float: right;">Enquiry No.- 254E269 dated 27.03.15</span>
	<p>quantum of investment in plant and machinery within the permissible limit as per the act for relevant status (Micro or Small) where the deemed validity of EM II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bid at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents”.</p>
27	<p><b>Pre- Qualification Criteria:</b></p> <ul style="list-style-type: none"> <li>a) Previous Purchase orders executed.</li> <li>b) End use certificate.</li> <li>c) Performance certificate: Documentation in the form of certificate that the equipment /system has been operating satisfactorily for two years as on 03/11/2012.</li> <li>d) Vendor should follow Technical specification.</li> </ul> <p>You are requested to submit supporting documents along with offer pertaining to above mentioned points.</p>
28	<p><b><u>Inspection &amp; Testing (Indigeneous / offshore) :</u></b> Cost towards the inspection of equipment by owner / consulting Engineer or inspector will be to vendor's account which will include to and fro Airfare / Railway / Road fare charges, boarding and lodging, local transportation and other related expenses. The cost shall be included in the price.</p>

**Terms & Conditions of Reverse Auction**

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to “REVERSE AUCTION PROCEDURE” i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit ‘online sealed bid’ in the Reverse Auction. Non-submission of ‘online sealed bid’ by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at “Total Cost to BHEL” like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

**Terms & Conditions of Reverse Auction**

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

**SCHEDULE OF COMMERCIAL DEVIATION**

Ref: TBMM/GILS-TRANSMISSION LINE / SURATGARH ENQUIRY NO. 254E269

This Format is to be submitted in original duly signed by bidder.

The following are the deviations/variations/exceptions from the Terms and Conditions :-

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the Terms and Conditions.

If there is NIL deviation,even then the format to be filled as NIL DEVIATION.

**Note :** Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place : .....  
Date : .....

Signature of the authorised representative of

Bidder's name :.....  
Designation:.....  
Company Seal:.....

**SCHEDULE OF TECHNICAL DEVIATION**

Ref: TBMM/GILS-TRANSMISSION LINE / SURATGARH ENQUIRY NO. 254E269

This Format is to be submitted in original duly signed by bidder.

The following are the deviations/variations/exceptions from the Terms and Conditions :-

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the Terms and Conditions.

If there is NIL deviation,even then the format to be filled as NIL DEVIATION.

**Note :** Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place : .....  
Date : .....

Signature of the authorised representative of  
Bidder's name :.....  
Designation:.....  
Company Seal:.....

**SCHEDULE OF PRICE**

PROJECT :- RRVUNL SURATGARH  
ITEM:- LATTICE STRUCTURE (TRANSMISSION LINE)

Enquiry No \*254E269      Date:- 27.03.15

SL. NO.	DESCRIPTION OF ITEM (As per Tech Spec. TB 360 618 006 Rev -00)	UNIT	QUANTITY	UNIT PRICE EX. WORKS (Rs.)	TOTAL EX. WORKS (Rs.)	UNIT FREIGHT & INSURANCE UP TO SITE (Rs.)	TOTAL FREIGHT & INSURANCE UP TO SITE (Rs.)	ED (EXEMPTED/ NOT APPLICABLE) (Rs.)	CST/VAT/ST @.....% OF COL 6 (Rs.) AGAINST FORM "C"	F.O.R. DESTINATION PRICE (Rs.) COL (6+8+10)
1	2	3	4	5	6	7	8	9	10	11
1	Preparation of shop drawings based on fabrication drawings (Line diagram) provided by BHEL, fabrication of 400 kV and 11 kV line towers (mild steel and HT steel as required), proto assembly, submission of proto corrected drawings/BOMs, mass fabrication, galvanising, inspection and supply of lattice, type galvanized steel structures including stub assembly. (Zinc coating 610 gms/sq.m)	-	-							
a	Mild steel (Galvanized)	MT	244					EXEMPTED AGAINST PAC		
b	HT (High Tensile) steel (Galvanized)	MT	159							
2	Type Testing of towers of each type including destruction testing as per IS:802 Pt-III including all material fabrication, loading, unloading, transportation to and fro testing lab/test bed, testing and all balance activities required for conducting the tests are included in the scope of vendor. All tower materials after testing shall be property of bidder.									
a	400 kV tower- DA Type	Lot	1					NOT APPLICABLE		
b	400 kV tower- DD Type	Lot	1							
c	11 kV tower- DA Type	Lot	1							
d	11 kV tower- DB Type	Lot	1							
e	11 kV tower- DD Type	Lot	1							
3	Supply of MS templates made of channels,angles etc. for stub setting	MT	6.5					EXEMPTED AGAINST PAC		
<b>TOTAL COST TO BHEL (TOTAL EX-WORKS + TOTAL CST + TOTAL F &amp; I)</b>										

NOTE:

- PLEASE NOTE THAT UNPRICED COPY OF PRICE BID (i.e. WITH ALL PRICES BLANKED) SHALL BE FURNISHED ALONG WITH TECHNO-COMMERCIAL BID.
- REQUIRED COPIES OF FORMAT BE MADE & DETAILS MAY BE ANNEXED.
- THE PRICES MUST BE QUOTED IN THE PRESCRIBED UNIT ONLY.
- SALES TAX RATE AS APPLICABLE FOR SPECIFIED DESTINATION SHALL BE QUOTED. IN CASE OF CST, RATE AGAINST "C" FORM SHALL BE QUOTED.
- IN CASE OF VARIED ED SLAB RATES, CONFIRM YOUR OPTION FOR "X" OR "Y". (STRIKE OFF WHICH IS NOT APPLICABLE)  
IF NO OPTION IS MENTIONED "X" SHALL BE TAKEN.

- THE VENDORS MUST INDICATE THE APPLICABLE TARIFF NOS. UNDER WHICH ED AND / OR CST WOULD BE PAID BY THEM TO THE TAX AUTHORITIES.
- IF A VENDOR SUBMITS AN OFFER WITH REDUCED ED AND OR CST APPLICABLE THAN NORMALLY PAID ON SUCH ITEMS, THEY SHOULD SUBMIT NECESSARY DOCUMENTARY PROOF FOR THE SAME.  
"X" THE MAXIMUM ED SLAB RATE BE CONSIDERED FOR PRICE COMPARISON. IN THE EVENT OF ORDER ED AT ACTUAL BE PAID.  
"Y" THE QUOTED ED RATE BE CONSIDERED FOR PRICE COMPARISON. IN THE EVENT OF ORDER ED AT ACTUAL RATE LIMITED TO QUOTED RATE BE PAID.

SIGNATURE & SEAL OF TENDERER

**Certificate by Chartered Accountant on letter head**

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

Further verified from the Books of Accounts that the investment of the company as on  
date..... as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost  
excluding land and building and the items specified by the Ministry of Small Scale Industries vide its  
notification No.S.O.1722(E) dated October 5, 2006 :  
Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and  
furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED  
Act, 2006:  
Rs.....Lacs

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

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant





**BHARAT HEAVY ELECTRICALS LIMITED**  
**TRANSMISSION PROJECTS ENGINEERING MANAGEMENT**  
**NEW DELHI**

DOCUMENT No.	<b>TB 360 618 006</b>	Rev 00	Prepared	Checked	Approved
TYPE OF DOC.	<b>TECHNICAL SPECIFICATION</b>	NAME	<b>AKM</b>	<b>PLK</b>	<b>NSR</b>
TITLE  <b>G I LATTICE STRUCTURES FOR TRANSMISSION LINE</b>		SIGN	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
		DATE	<b>10.02.15</b>	<b>12/2/15</b>	<i>[Signature]</i>
		GROUP	<b>TBEM</b>		
		W.O. No	83001		
CUSTOMER/ CONSULTANT	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAL LTD. , JAIPUR / TATA CONSULTING ENGINEERS LTD. , BANGALORE				

<b>PROJECT</b>	<b>2X660 MW SUPER-CRITICAL THERMAL POWER STATION STAGE 5 UNIT 7 &amp; 8 – 400 KV SWITCHYARD</b>
----------------	---

**Contents:**

Section No.	Description	No of Pages
<b>SECTION-1</b>	<b>SCOPE, SPECIFIC TECHNICAL REQUIREMENTS and QUANTITIES</b>	<b>02</b>
<b>SECTION-2</b>	<b>STANDARD SPECIFICATION</b>	<b>09</b>
	<b>Customer Specification for Overhead Transmission Lines</b>	<b>42</b>
<b>SECTION-3</b>	<b>PROJECT DETAILS AND GENERAL SPECIFICATION</b>	<b>02</b>
<b>SECTION-4</b>	<b>GUARANTEED TECHNICAL PARTICULARS (Not Applicable)</b>	<b>....</b>
<b>SECTION-5</b>	<b>MANUFACTURING QUALITY PLANS</b>	
<b>SECTION-6</b>	<b>CHECK LIST</b>	<b>01</b>

COPYRIGHT & CONFIDENTIAL  
 The information in this document is the property of BHARAT HEAVY ELECTRICALS LIMITED  
 This must not be used directly or indirectly in anyway detrimental to the interest of the company.

Rev	Date	Altered	Checked	Approved	
Distribution				To	
				Copies	

## SECTION - 1

### SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & QUANTITIES

#### 1.1 SCOPE

The scope of this specification is to specify all details required by a supplier for preparation detailed fabrication drawings (structure assembly drawings), fabrication, destructive testing, proto assembly, galvanising and supply of galvanized steel structures for 400kv and 11kv transmission line at 2x660 Suratgarh STPP stave –V being executed by BHEL on turnkey basis for RRVUNL.

The detailed scope of work is preparation, submission and approval of detailed fabrication drawings (structure assembly drawings), fabrication, galvanizing, testing and supply of all type of transmission line towers including stub assembly and stub templates made of channels, angles, etc., base plates, stiffener plates and other such items required to complete the job excluding all fixtures, such as nuts, bolts, step bolts and washers. However, detailed and accurate bill of quantities for nuts, bolts, step bolts and washers shall be given by the supplier in the drawings submitted by him. The detailed structure assembly drawing shall be prepared based on input/line sketches provided by BHEL.

**Design drawings and type test reports of the type tested towers shall be copy right of BHEL.**

#### 1.2 SPECIFIC TECHNICAL REQUIREMENTS

The specific technical requirements shall be as per Standard Technical Specification (Refer Section 2).

#### 1.3 QUANTITIES

The quantities indicated are tentative & it may change to any extent during detailed engineering at contract stage.

S.No	Item description	Unit	Quantity
1	Preparation of shop drawings based on fabrication drawings (Line diagram) provided by BHEL, fabrication of 400 kV and 11 kV line towers (mild steel and HT steel as required) , proto assembly, submission of proto corrected drawings/BOMs, mass fabrication, galvanising, inspection and supply of lattice type galvanized steel structures including stub assembly. (Zinc coating 610 gms/sq.m)		
a	Mild steel (Galvanized)	MT	244
b	HT (High Tensile) steel (Galvanized)	MT	159

**GI LATTICE STRUCTURES FOR TRANSMISSION LINE**

2	Type Testing of towers of each type including destruction testing as per IS:802 Pt-III including all material fabrication, loading, unloading, transportation to and fro testing lab/test bed, testing and all balance activities required for conducting the tests are included in the scope of vendor. All tower materials after testing shall be property of bidder.		
a	400kV tower - DA Type	Lot	1
b	400kV tower - DD Type	Lot	1
c	11kV tower - DA Type	Lot	1
d	11kV tower - DB Type	Lot	1
e	11kV tower - DD Type	Lot	1
3	Supply of MS templates made of channels, angles etc. for stub setting	MT	6.5

## **SECTION - 2**

### **2.0 GENERAL**

This section covers the standard technical specification for GI Structures.

(In case any variance in Section-2 , Customer specification shall prevail.)

### **2.1 STEEL MATERIAL**

Mild Steel (MS) and High Tensile (HT) Steel materials shall be tested quality and shall conform to IS:2062, IS:8500 and other relevant standards. Steel material (Both HT and MS) should be procured from Customer approved source.

Steel shall not be pitted and should be free from scales and rust. If the rolled section and plates are bent or distorted, bend or distortion shall normally be removed by the cold treatment. Straightening under hot stage shall be resorted to only under specific permission from BHEL. If any rolling defects viz., laminations, cracks etc. are discovered in the steel during the processing, it is to be rejected.

TOLERANCE:

The dimensional and weight tolerances for rolled shapes shall be in accordance with IS:1852-1985.

No rolled or fabricated member shall deviate from straightness by more than 1/1000 of the axial length or 10mm which ever is smaller.

### **2.2 FABRICATION**

GENERAL:

All the workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined true and square where so specified. All holes and edges shall be free of burrs. Shearing and cropping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Material at the shops shall be kept clean and protected from weather.

The fabrication of galvanized steel structures shall be carried out generally in accordance with IS:802 part. II, IS:800-1984. All materials shall be completely shop fabricated. Normally, butt splices shall be used. The components constituting the joint shall have a total strength greater than the heavier of the members connected. Lap splices may be used for connecting members of unequal sizes. The inside angle of lap splice shall be grounded at the heel to fit the fillet of the outside angle. The splices shall develop full strength of the members connected through bolts. Butt as well as lap splices shall be made as close to the main panel points as possible.

**GI LATTICE STRUCTURES FOR TRANSMISSION LINE .**

Joints shall be so designed and detailed as to avoid eccentricity as far as possible. However, where joints are such that the elimination of gusset plates would result into eccentric joints, gusset plates and spacer plates may be used in conformity with modern practices.

The use of filler in the connections shall be avoided as far as possible. The diagonal members in tension may be connected entirely to the gusset plate where necessary to avoid the use of fillers. Each diagonal shall be in one piece without splices or center gussets, and it shall be connected at the point of intersection by one or more bolts.

The gap between the ends of two connected members in butt joints shall not be more than 6 mm and less than 4mm.

The tower structure members shall be accurately fabricated to bolt together easily at site without any undue strain on them or the bolts.

Drain holes shall be provided at all points where pockets or depressions are likely to hold water.

For designing of towers, preferably rationalized steel sections shall be used. During execution, if any particular section is not available same shall be substituted by immediate next higher section or next to next section at no extra cost to owner and the same shall be borne by the bidder. However design approval for such substitution shall be obtained from owner before submission.

**STRAIGHTENING:**

For rolled steel material, if straightening or flattening is necessary, it shall be done by methods that will not injure the materials.

**CUTTING:**

Cutting may be affected by chopping, cropping, sawing or machine flame cutting. Sheared or cropped edges shall be dressed to a neat workmanlike finish and shall be free from distortion and burrs.

**PUNCHING AND DRILLING:**

Holes in members may be punched full size through material not over 12mm thick. Holes must be cleaned of burrs and ragged edges. Drilled holes shall be preferred. Holes made by drilling shall also be cleaned of burrs and ragged edges. Where several parts are to be drilled, they shall be first assembled, tightly clamped together and drilled through.

Punched holes must be square with plates and the walls of the holes shall be parallel. The following maximum allowance in accuracy of punched holes is permissible:

- i) Holes must be perfectly circular and no tolerance in this respect is permissible.

**GI LATTICE STRUCTURES FOR TRANSMISSION LINE .**

- ii) The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8 mm, i.e. the allowable taper in punched holes should not exceed 0.8 mm in diameter.
- iii) Holes must be square with the plates. Holes at angle or slant shall not be permitted.

The minimum spacing of bolts and edge distances shall be as given below:

Bolt Diameter (mm)	Minimum Bolt Spacing (mm)	Maximum edge distance	
		Hole center To rolled Edge (mm)	Hole center to cut/ flame edge (mm)
16	40	20	23

**WELDING:**

The work shall be done as per approved fabrication drawings, qualified welding procedure specifications (WPS) and by qualified welders. Procedure qualification records (PQR) shall be maintained. Electrodes for shielded arc manual welds shall comply with the requirements of IS:814 - 1991. All welds shall be free from defects like blow holes, slag inclusions, lack of penetration, under cutting, cracks etc. All welds shall be cleaned of all slag or flux before galvanizing.

**MARKING OF MEMBERS FOR IDENTIFICATION.**

All members shall be marked for identification during erection. This mark shall correspond to distinguishing marks on approved erection drawings and shall be legibly painted and stamped on. The erection mark shall be stamped with a metal dye with figures at least 16 mm high and to such optimum depth as to be clearly visible, even after a member is galvanized. All erection marks shall be on outer surface of all sections and near one end, but clear of bolt holes. Marking shall be so stamped that they are easily discernible when sorting out members. The stamped marking shall be encircled boldly by a distinguishable paint to facilitate easy location.

Erection marks on like pieces shall be in identical locations. Members having lengths of 3.0 M or more shall have the erection mark at both ends.

**PROTOTYPE ASSEMBLY:**

Towers shall be trial assembled at shop before galvanizing i.e. prototype assembly keeping in view the actual site condition prior to dispatch to testing station/erection sites. The prototype assembly of each structure shall be got approved from BHEL/Customer as directed. Necessary match marks shall be made on each components before dismantling the prototype assembly and galvanizing. Any error shall be rectified at the expense of the contractor.

No extra charge on account of erecting the assemblies or getting them inspected will be permissible. It is however to be mentioned that the responsibility for proper fitting of various members for the erection of the structure in the field will rest with the supplier and any discrepancy found at the time of erection will have to be rectified by the contractor at his cost.

### **2.3 GALVANISING:**

All structural steel works shall be hot dip galvanized after fabrication. Galvanizing of each members shall be carried out in one complete immersion and double dipping shall not be permitted.

Zinc required for galvanizing will have to be arranged for by the Contractor. Purity of zinc to be used for galvanizing shall be 99.5% as per IS:209-1992.

All burrs and irregular edges shall be ground smooth before galvanizing.

After all shop work is complete, all structural materials shall be punched with the Erection Mark and be hot dip galvanized. Before galvanizing the steel section shall thoroughly be cleaned of any paint, grease, rust, scale, acid/alkali or such other foreign matters as are likely to interfere with the galvanizing process or with the quality and durability of the zinc coating. Pickling shall be carefully done and shall be proper.

Minimum weight of zinc coating shall be 610gms/sqm. However, higher coating may be provided as per requirement.

The galvanized surface shall consist of a continuous and uniformly thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discolored patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel, globules, spiky deposits, blistered surface flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

There shall be no flaking or loosening when struck squarely with a chisel faced hammer. The galvanized steel member shall withstand minimum four one minute dips in copper sulphate solution as per IS: 2633 - 1986.

When the steel section is removed from the galvanizing kettle excess spelter shall be removed by 'bumping'. The processes known as 'wiping' or 'scrapping' shall not be used for this purpose.

Defects in certain members indicating presence of impurities in the galvanizing bath in quantities larger than that permitted by the specification, or lack of quality control in any manner in the galvanizing plant shall render the entire production in the relevant shift liable to rejection.

All the galvanized structural steel members and accessories shall be treated with sodium dichromate or an approved equivalent solution after galvanizing, so as to prevent white storage stains.

If the galvanizing of any member is damaged, BHEL shall be shown of the extent of damage and if so directed the galvanizing may have to be redone in the similar manner as stated above at no extra cost.

Contractor shall also furnish sufficient quantity of appropriate paint, free of cost, for repairing galvanized surfaces damaged in transit, and minor modifications done at site during erection.

Galvanizing tests shall be made from time to time on as many samples as may be considered necessary. The supplier shall supply all samples and equipment and carry out the tests without any extra cost.

## **2.4 INSPECTION OF MATERIALS**

### **GENERAL:**

Contractor shall give notice to BHEL/ Customer in advance for inspection of materials. All rejected material shall be promptly removed from the shop and replaced with new material for BHEL/ Customer approval/ inspection. The fact that certain material has been accepted at Contractor's shop shall not invalidate final rejection at site by BHEL/ Customer if it fails to be in proper condition or has fabrication inaccuracies which prevent proper assembly. No materials shall be painted, galvanized or dispatched to site without the inspection and approval by BHEL/ Customer unless such inspection is waived off in writing by BHEL/ Customer.

Shop inspection by BHEL/ Customer, for submission of test certificates and acceptance there of by BHEL// Customer shall not relieve contractor from the responsibility of furnishing material conforming to the requirements of these specifications, nor shall it invalidate any claim which BHEL/ Customer may make because of defective or unsatisfactory material and workmanship.

Contractor shall provide all the testing and inspection services and facilities for shop work. For fabrication work carried out in the field the standard of supervision and quality control shall be maintained as in shop fabricated work. The inspection and testing shall be conducted in a manner satisfactory to BHEL/ Customer.

The supplier shall submit QP (Quality Plan) detailing each stage of manufacturing i.e. raw-material , in process and final inspection for approval by BHEL/Customer in the prescribed format. The final Quality plan shall approved by BHEL/ Customer

### **MATERIAL TESTING**

If mill test reports are not available for any steel materials the same shall be got tested by the contractor and demonstrate conformity with the relevant specification to the full satisfaction of BHEL/ Customer. The cost of such tests shall be borne by the contractor.

#### DIMENSIONS AND WORKMANSHIP:

The Structural Steel members shall be inspected at all stages of fabrication and assembly to verify that dimensions, tolerances, alignment and surface finish, are in accordance with the requirements shown in Contractor's approved shop drawings.

#### INSPECTION OF TEST FAILURE:

In the event of any failure of structural steel members to meet an inspection or test requirement, contractor shall inform BHEL/ Customer and must obtain permission from the BHEL/ Customer before repair is undertaken. The quality control procedures to be allowed to ensure satisfactory repair shall be subject to approval by BHE/ Customer.

### **2.5 PACKING TRANSPORTATION AND DELIVERY**

After completion of final inspection and marking, the fabricated galvanized structural items shall be packed and loaded for transportation.

Packing must be adequate to protect items against bending and any mechanical injuries and damage to galvanized film during loading and unloading. As far as possible, like member should be bundled together and tied.

Proper lifting devices shall be used for loading at shop and unloading at site in order to protect items against bending, mechanical injuries and damage to galvanized film.

Loading, transporting and unloading shall be done in compliance with transportation rules.

Slender and projected parts shall be braced properly with additional spacer steel bars, spacer wood etc, before loading for transportation, to protect against bending or any other damages during transportation.

If certain parts cannot be transported in the lengths stipulated in the design drawing, the position and type of additional splice joints shall be got approved from BHEL/ Customer.

Items must be carefully loaded and tied up properly to prevent bending, falling etc. during transportation.

The small parts such as plates, gussets, cleats etc. shall be securely tied with the wire, and packed in wooden boxes and properly identified.

As far as possible the delivery of fabricated galvanized structural steel shall be as per the order stipulated by BHEL/ Customer and to suit the erection sequence.

Contractor shall make good/ replace at his own cost any damage occurred during loading, transporting, unloading and stacking of fabricated galvanized

steel structures as directed by BHEL/ Customer. No extra payment on this account shall be entertained under any circumstances.

## 2.6 APPLICABLE STANDARDS

Unless otherwise specified, materials, and workmanship shall conform to the following standards of their latest editions:

1. IS : 209 - Zinc Ingot.
2. IS : 228 - Method of chemical analysis of pig iron, cast iron, plain carbon and low alloy steel.
3. IS : 406 - Methods of analysis of zinc (Spelter).
4. IS : 800 - Code of practice for general construction.
5. IS : 802 - Part1 - - Code of Practice for use of structural  
Part1/Sec.2 in over head Transmission line  
- Part 2 towers.  
- Part 3
6. IS : 806 - Code of practice for use of steel tubes in general building construction.
7. IS : 808 - Dimensions for hot rolled steel beam, column, channel and angle sections.
8. IS : 814 - Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
9. IS : 816 - Code of Practice for use of metal arc welding for general construction in mild steel.
10. IS : 817 - Code of practice for training & testing of Metal Arc welders.
11. IS : 1161 - Steel tubes for structural purposes.
12. IS : 1599 - Method of bend test
13. IS : 1608 - Method of tensile testing of steel

**GI LATTICE STRUCTURES FOR TRANSMISSION LINE .**

- products.
- |     |           |   |
|-----|-----------|---|
| 14. | IS : 1852 | - Rolling and cutting tolerances for hot rolled steel products.                           |
| 15. | IS : 1978 | - Line pipe   |
| 16. | IS : 2062 | - Steel for general structural purposes.  |
| 17. | IS : 2074 | - Ready Mixed Paint, air drying red oxide zinc, chrome, priming.                          |
| 18. | IS : 2629 | - Recommended practice for hot dipped galvanising on Iron & Steel.                        |
| 19. | IS : 2633 | - Methods for testing uniformity of coating on zinc coated articles.                      |
| 20. | IS : 3502 | - Steel chequered plates.   |
| 21. | IS : 4759 | - Hot dip zinc coating on structural steel and other allied products.                     |
| 22. | IS : 6745 | - Method for determination of mass of zinc coating on zinc coated iron and steel articles |
| 23. | IS : 8500 | - Specification for micro-alloyed structural steel  |

# **CUSTOMER SPECIFICATION FOR OVERHEAD TRANSMISSION LINE**

**(In case of any variance in Section -2 , Customer specification shall prevail.)**

# **SECTION D30**

## **OVERHEAD TRANSMISSION LINES**

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 1 of 41

1.0 **INTRODUCTION**

- The major equipment/system covered under scope of work shall be as follows:
- 11 kV Overhead transmission lines including lattice structures for stringing the conductor, fuses, air break switch, insulators, lightning arrestors, shield wire, hardwares, etc., (Stringing hardware for 11 kV lines at both the end is also included in the scope.). The transmission line shall be laid along with the road.
- Installation & erection accessories.
- Clamps & connectors required for the erection of transmission line.
- Earthing and lightning protection.
- For pole structure at sending and receiving ends.
- Civil works for electrical equipment such as foundation of towers/Structures etc.
- Essential spares and special tools and tackles required for installation, operation and maintenance of electrical equipment/transmission lines.
- The route plan indicating the number and location of various Towers like Tangent towers, angle towers etc are to be furnished by the Contractor.
- Preliminary drawing indicating the route and location of towers are to be submitted by the bidder.
- Design Calculation for all electrical system such as Sag Calculation , OH conductor sizing etc. is included in the Contractor's scope.
- Drawings such as Layout Drawings, plan & section of the structures & interconnection with towers, detailed SLD, etc are included in the scope.
- Number of tower, span, height and angle of the towers etc. shall be planned considering route portfolio, sag/tension calculation, terrain etc. It shall be as per Indian slandered (IS).

1.1 The technical specifications are covered under the following sub-sections:

- Transmission Tower
- Four pole structure
- 11kV Isolators
- 11kV Lightning Arrestors
- Conductor and Shield Wire
- Insulator assemblies and Line Accessories
- Shield wire Insulator assemblies and Line Accessories

<b>ISSUE R1</b>
---------------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 2 of 41
<ul style="list-style-type: none"> <li>• Tower Grounding</li> <li>• Stringing of Conductor</li> <li>• Stringing of Overhead Shield Wire</li> </ul> <p>1.2 All designs and details shall be subject to approval of the PURCHASER / CONSULTANT. The PURCHASER / CONSULTANT shall have the right to instruct the CONTRACTOR, without additional cost to the PURCHASER, to make any changes in designs and details necessary to make the construction conform to the contract documents.</p> <p>1.3 The CONTRACTOR shall assume full responsibility for designing and detailing of steel towers and for their satisfactory performance. No omission or ambiguity on the drawings or in these specifications will relieve the CONTRACTOR from furnishing first class materials and workmanship. Should any inaccuracy be found, any further work done before these discrepancies are corrected will be at the CONTRACTOR's risk.</p> <p>1.4 The transmission line and the equipment/materials for the same shall conform to the latest edition of applicable standards mentioned in this document. In case of conflict between this specification and the applicable standards, the Contractor shall bring the matter to the notice of the Engineer /Purchaser, who shall resolve the matter and issue appropriate directions to the Contractor. Should the Contractor/vendor during the execution of his work, find discrepancies in the information furnished by the Purchaser, he shall refer such discrepancies to the Purchaser before proceeding with such work.</p> <p>1.5 All materials of construction shall be brand new and free of pittings, dents, bends and other defects.</p> <p>2.0 <b><u>11KV ISOLATORS</u></b></p> <p>11kV Isolators to be used for line connection/isolation on no load shall be double break rotating type with earth switch. Isolators shall be triple pole gang operated suitable for outdoor installation mounted on structure under the specified site conditions. Clearance (P-P &amp; P-E) shall be maintained as per relevant IS standard. Proper interlocks shall be provided between isolator and earth switch. DC supply required for indication and electrical interlock shall be arranged by the contractor. Speed of operation during opening and closing shall ensure minimum arcing. Isolator shall be manufactured as per IS: 9921 ( Part - I to V). All type tests shall be conducted as per IS: 9921 on one Isolator and earth switch, which shall be witnessed by purchaser. Type test reports &amp; certificates shall be furnished by the contractor for approval. Routine tests as per IS-9921 shall be conducted on all Isolators and earth switches.</p>		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 3 of 41

General technical particulars are mentioned as below:

### 2.1 Technical Requirements of 11kV Isolators

The isolators shall comply with the requirement indicated in the following table:

1.0	Make	As per Approved vendor list
1.1	Application	Outdoor ( Transmission Line )
1.2	Quantity	As required
1.3	Voltage class	12 kV
1.4	Frequency	50 Hz
1.5	No. of phases	3 Phase
1.6	Rated current for site conditions	400A
1.7	Short time Current	
	(a) Rating and duration	40 kA for 1.0 sec.
1.8	Rated peak short circuit current	105 kA (Peak)
2.0	<b>Design Requirements</b>	
2.1	Ambient temperature	50°C
2.2	Insulation level	75 kV peak
2.4	Type of break	Horizontal center break
2.5	Type of mounting	Horizontal upright
2.6	Operating device	
	(a) For isolator	Motor driven (Both local & remote) (Emergency Manual)
	(b) For earth switch	Manual with electrical / Mechanical interlocks
3.0	<b>Insulation Data</b>	
3.1	1.2 / 50 micro sec. lightning impulse withstand	75 kV peak
3.2	Total creepage distance	31 mm/ kV

ISSUE  
R1

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 4 of 41

3.3	Minimum cantilever strength	* kg
3.5	Switching Impulse Withstand Voltage	NA
3.6	Corona Extinction voltage	*
4.0	<b>Miscellaneous</b>	
4.1	Auxiliary supply	
	Electrical	220 V DC for control and interlock. Battery and battery charger in Contractor's scope as per Section D-10.
4.2	Interlocks with circuit breakers	NA
5.0	Applicable standards	
5.1	Insulators	IS : 2544
5.2	Isolators	IS : 9921.
	* - To be furnished by bidder	

### 3.0 **LIGHTNING ARRESTOR**

12kV, 10kA, long duration discharge class-III heavy duty, non linear resistance , metal oxide type gapless surge arrestors shall be provided. Surge arrestors of single pole & self supporting type shall be provided. It shall be suitable for pole mounting outdoor type and shall be designed to provide maximum protection against lightning and switching surges. The arrester shall be mounted on an insulating base. Surge monitor shall be inserted between the lightning arrester and earth.

Surge arrester shall comply with IEC-60099-4 & IS:3070-1993 Part-III for all technical particulars. General technical particulars are as follows :

### 3.1 **Technical Requirements**

1.0	<b>Make</b>	As per Approved vendors list.
1.1	Quantity	As required
1.2	Installation, class	Outdoor, station
1.3	System Voltage	
	(a) Nominal	11 kV

ISSUE  
R1

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 5 of 41

	(b) Highest	12 kV
1.4	Type of earthing	Effectively earthed
1.5	Type of arrester	Gap less
2.0	<b>RATING</b>	
2.1	Rated arrester voltage / maximum continuous operating voltage	9 kV / 8 kV
2.2	Rated frequency	50 Hz
2.3	Nominal Discharge current of 8 / 20 Micro second wave shape	10 kA
3.0	<b>Performance Data</b>	
3.1	Impulse current withstand	
(a)	Long duration discharge class (as per IEC 99)	Class III
(b)	Long duration current impulse	As per IEC-99
(c)	Virtual duration of rectangular wave	As per IEC-99
(d)	Maximum residual voltage at rated nominal discharge current	As per IEC – 99 – 4
4.0	<b>Arrester Housing</b>	
4.1	Withstand Test Voltages	
(a)	One minute power frequency dry & wet	28 kV
(b)	1.2 / 50 micro second Impulse withstand voltage	75 kV
4.2	Minimum total creepage distance of whole insulator-mm	31 mm/kV
5.0	<b>Additional requirements</b>	
5.1	Minimum cantilever strength of arrester assembly	* kg
5.2	Pressure relief class (As per IEC – 99)	As per IEC
5.3	Minimum prospective symmetrical fault current (as per IEC – 99)	40 kA
6.0	<b>Applicable Standards</b>	
6.1	Lightning arrester	IS : 3070

ISSUE  
R1

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 6 of 41

	For alternating current systems	IEC – 99
6.2	Insulators	IS – 2544

#### 4.0 **TRANSMISSION TOWER**

##### 4.1 **General**

The towers shall be of the self supporting type and designed to carry the line conductors with the necessary insulators, earth conductors and all fittings under the defined cases of loading conditions. Tower design and material shall be as per IS-802 Part-I,II&III.

##### 4.2 **Configuration**

4.2.1 The Transmission towers shall be configured to give an economical design.

##### 4.2.2 **Types of Towers**

The towers will be normally of the following types:

Type	Position in Use	Angle of deviation or entry	Type of Insulator
A	Straight line	0° - 2°	Suspension
B	Angle	2° - 15°	Tension
C	Angle	15° - 30°	Tension
D/DE	Angle/	30° - 60°/	Tension
	Dead End	Dead End with 0° - 30° deviation both on line and sub-station side slack spans.	

**Notes:**

ISSUE  
R1

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 7 of 41

1. The above towers may also be used for longer spans with smaller angles of deviation, based on design charts prepared by the Contractor and approved by the Engineer.

In addition to the above, Contractor may be required to supply and erect some special towers (like transposition towers, towers for river crossing etc.) depending on final route alignment.

**5.0 CONDUCTOR AND SHIELD WIRE**

- 5.1 The conductor and shield wire - material, size etc. shall be as specified in the Data Sheet and conform to the requirements of the relevant standard specified.
- 5.2 The CONTRACTOR shall furnish 3 copies each of time creep curves for the conductor at specified every day temperature for tension ranging in 10 percent increment from 10 percent to 30 percent of its ultimate strength and stress-strain creep curves showing at least one hour, six months, one year, ten years and twenty years creep for the conductors furnished under this specification.

**6.0 INSULATOR ASSEMBLIES AND LINE ACCESSORIES**

**6.1 Insulator Assemblies**

- 6.1.1 The insulator assemblies shall consist of the identical number of porcelain insulator discs, hardware, suspension clamps, compression type dead end clamps and arcing horns. An insulator assembly complete with all hardware fittings shall not exhibit excessive corona formation and discharge likely to cause radio interference at voltages less than the flashover voltage. Insulators shall be designed to avoid excessive concentration of electric stresses in any section or across leakage surfaces.
- 6.1.2 The insulator disc shall be of the cap and pin, ball and socket type with zinc sleeve, radio interference free and shall have characteristics as specified in technical requirements. Each insulator disc shall comply with the following requirements.
- 6.1.3 The insulators shall be made of the highest grade, dense, homogenous, wet-process porcelain, completely and uniformly vitrified throughout to produce uniform mechanical and electrical strength and long life service. All porcelain surfaces exposed to the weather shall be smoothly glazed with a good lustre and of uniform brown colour.
- 6.1.4 The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type provided with non-ferrous metal or stainless steel cotter pins and

ISSUE R1
-------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 8 of 41

shall provide, positive locking of the coupling. The insulator pins shall be made of malleable iron or drop/forged or machine steel free from cracks and airholes. All bearing surfaces shall be smooth and uniform so as to distribute the loading stresses evenly.

**6.2 Line Accessories**

- 6.2.1 All hardware, except where otherwise specified, shall be malleable iron or steel for forging, metal mould casting or drop forging, hot dip galvanised, and shall have an ultimate strengths not less than the mechanical and electrical strengths of the insulator discs for each type of insulator assembly. Where parallel insulators are used yoke plates at the end and bottom and the connecting hardware shall be of sufficient strength.
- 6.2.2 Fittings intended to connect two dissimilar metals shall be designed to avoid harmful bimetallic corrosion under service conditions.
- 6.2.3 All fittings shall be such that corona visual voltage of the insulator string with fittings shall not exceed that of the string without any fittings. The radio interference voltage of the insulator shall be lower when measured with the fittings than without the fittings.
- 6.2.4 The suspension clamps for the ACSR conductor shall be made of aluminium alloy suitable for use on the conductor with preformed armour rods installed. The suspension clamps shall have smooth surfaces free from burrs and the edges and fillets shall be rounded to minimise corona concentration and radio interference.
- 6.2.5 The clamps shall be designed to minimise magnetic loss with maximum permissible 50 Hz current flowing through the conductor with armour rods. If dissimilar metals are used in making the clamps, suitable precautions shall be taken to minimise corrosion due to electrolytic action. Each suspension clamp shall have a suitable bellmouth and shall be capable of holding the conductor with preformed armour rods without slipping under an unbalanced tension of 25% of the rated ultimate strength of the conductor and shall have ultimate strength equal to or exceeding the mechanical and electrical strength of the insulator disc. Each suspension clamp shall be furnished with bolts, two U-Bolts with lock washers, a keeper piece and other required parts. The degree of U-Bolt tightening shall be in accordance with the recommendation of the suspension clamp manufacturer.
- 6.2.6 The strain clamps shall be dead-end compression type and shall have ultimate strength equal to that of the conductor.
- 6.2.7 The compression type dead end clamps shall be suitable for use on specified conductor and shall consist of galvanised steel clevis end or steel oval eye end,

<b>ISSUE R1</b>
---------------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 9 of 41
<p>aluminium dead end body, aluminium jumper connection with bolted connection between the jumper connector and the dead end.</p> <p>6.2.8 The compression dead end clamp and jumper connection shall have an electric conductivity of not less than that of the conductor, and shall be free from all defects and shall not damage the conductor when attached.</p> <p>6.2.9 Materials not specifically covered herein by detailed specifications shall be of standard commercial quality suitable for the intended use.</p> <p>7.0 <b><u>OVERHEAD SHIELD WIRE ASSEMBLIES &amp; ACCESSORIES</u></b></p> <p>7.1 The overhead shield wire assemblies shall consist of the indicated hardware and suspension clamps, compression type dead end clamps suitable for specified steel wire and shall meet the requirements hereafter described.</p> <p>7.2 All line accessories to be furnished shall be made of aluminium or aluminium alloy, malleable iron or steel. All ferrous metals (except stainless steel) shall be galvanised by hot dip process.</p> <p>8.0 <b><u>GROUNDING OF TOWER</u></b></p> <p><b>8.1 Grounding Materials</b></p> <p>8.1.1 Unless described hereinafter, all materials shall be of standard commercial quality suitable for the intended use.</p> <p>8.1.2 The ground electrodes shall be GI earth pipe of not less than 36 mm and 1.0 Meter long.</p> <p>8.1.3 The ground connecting strip shall be galvanised mild steel strip of suitable size.</p> <p>8.1.4. The connection between ground electrodes or stub angle and the strip shall be made by galvanised steel bolts, nuts and lock washers. The bolts shall be of sufficient length to grip steel angle and lock washers.</p> <p>8.1.5 The counter poise if required, shall be galvanised mild steel strip of suitable size.</p> <p><b>8.2 Ground Electrode</b></p> <p>CONTRACTOR shall install ground electrode for all towers to required depth by acceptable method of hand driving. If the soil is hard for hand driving, the CONTRACTOR shall use mechanically operated hammers either electric, pneumatic or petrol engine driven.</p> <p><b>8.3 Installation of Counterpoise</b></p> <p>Where required, radial or continuous counterpoise shall be installed.</p> <p><b>8.4 Improvement of Tower Ground Resistance</b></p>		
		<b>ISSUE R1</b>

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 10 of 41

Where the initial ground resistance is higher than 10 Ohms, CONTRACTOR shall notify PURCHASER and carry out improvement as directed by him by either of the following or both.

- a) Driving additional ground electrodes;
- b) Installing radial or continuous counterpoise;

The revised ground resistance shall be measured and submitted for PURCHASER's approval.

## 9.0 **STRINGING OF CONDUCTOR**

### 9.1 **General**

Conductor shall be strung with utmost care during handling and transportation. Quantity furnished will be the actual horizontal distance of the section to be installed after check survey and staking have been performed plus a fixed extra 1.5% to cover sag, terrain irregularities and wastage.

### 9.2 **Stringing Plan**

Not later than 2 months before commencing installation work, the CONTRACTOR shall submit the stringing plan to the PURCHASER for approval. The plan shall describe the work schedule, method of stringing, temporary guying, scaffolding, personnel required in performing the work and list of tools and equipment to be employed together with printed instruction.

In addition, not later than 2 weeks before commencing stringing work of any section of the line, the CONTRACTOR shall submit the details of unreeling section, location of reel, winch, temporary guying and scaffolding and length of conductor to be strung to the PURCHASER for approval.

### 9.3 **Tools and Equipment**

9.3.1 Tools and equipment shall be inspected at the site by the PURCHASER after the approval of the stringing plan but prior to commencing the stringing work.

9.3.2 BIDDER shall clearly mention in his offer the method of stringing proposed to be adopted and the list of stringing equipment which will be mobilised by him for the purpose.

9.3.3 Stringing of conductor shall, in no case, be performed until 28 days after concrete foundation has been placed and until assembly and tightening of bolts of tower have been completed and inspected by the PURCHASER. Stringing of conductor and related operation shall be performed during daylight hours.

9.3.4 The CONTRACTOR shall repair or replace the damaged sections, including the furnishing of necessary additional materials, in a satisfactory manner and at no additional cost to the PURCHAER.

ISSUE R1
-------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 11 of 41

9.3.5 The snatch-blocks, when suspended on the towers for sagging, shall be so adjusted that the conductor will lie in the sheave at the same level as the suspension clamps to which the conductor is to be secured.

9.3.6 Jointing and repairing shall not be permitted in single span of tension towers and crossing and adjoining the following objects.

- a) Highways
- b) Railroads
- c) Rivers, major canals and creek water ways
- d) Public utility lines
- e) Telecommunication lines

**9.4 Sagging of Conductor**

9.4.1 All conductor sagging shall be performed during daylight hours. Sagging operations shall not be permitted during high wind, or other adverse weather conditions which would impair the accuracy of the sagging.

9.4.2 The conductor shall be installed in accordance with the stringing sag and tension tables furnished by the CONTRACTOR and as approved by the PURCHASER. The stringing sag and tension calculation shall be based on the equivalent span method and shall cover the prevailing temperatures and span. The 10 years creep shall be considered and the effect of creep during paying out and during hanging in snatch blocks before sagging shall be taken into account.

9.4.3 After being pulled into the sheaves, the conductor shall not be allowed to hang in the snatch-blocks for more than 48 hours, before being pulled to the specified sag. The length of the conductor sagged in one operation shall be limited to the length that can be sagged satisfactorily. After the conductors have been pulled to the required sag, intermediate spans shall be checked to determine the sags are correct.

9.4.4 Where the distance between tension type towers is too great to permit the conductors to be sagged in one operation, temporary intermediate dead ends shall be established.

**9.5 Measurement of Sag**

For several spans in each sagging section, the sag shall be measured selecting one near each end and one or two near the centre. The total number of spans to be measured shall be as follows:

<u>Sagging Section Span</u>	<u>Number of Measurements</u>
1	1

<b>ISSUE R1</b>
---------------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 12 of 41

2-6	2
7-15	3
16 or more	4

The sag of all spans in excess of 500 m shall be measured. At any sharp vertical dip angle spans, the sag shall be measured on both sides of the angle of the spans. The CONTRACTOR shall provide suitable dynamometer, sighting boards, theodolites, and other suitable devices to measure sagging, as well as thermometers to measure the ambient temperature to determine the conductor sag. Dynamometers are to be tested and if necessary recalibrated.

**9.6 Tolerance of Sag**

A tolerance of plus or minus 15 cm in the sag in any one span will be permitted, provided that -

- a) The maximum difference in sag between the phase in any span shall not exceed 15 cm.
- b) The necessary ground clearance is obtained.
- c) The conductor tension between successive sagging operations is equalised so that the suspension insulator assemblies will hang in the vertical position in the transverse plane to the tower when the conductor is clipped-in.

**10.0 STRINGING OF OVERHEAD SHIELD WIRE**

**10.1 General**

Overhead shield wire(s) shall be strung for the entire length of the transmission line, and shall be attached to the towers. The equipment, methods, and limitations used for installing the overhead shield wire shall be the same as for installing the conductor except otherwise specified.

**10.2 Stringing of Overhead Shield Wire**

The overhead shield wire shall be strung in advance of the conductors, and the method shall be the same as specified for conductor stringing. The same degree of care shall be exercised to avoid damage or injury of the overhead shield wire. If damaged, they shall be replaced by the CONTRACTOR in a manner approved by the PURCHASER.

**10.3 Sagging of Overhead Shield Wire**

The overhead shield wires shall be sagged in place in advance of the conductors and shall be in accordance with the sag and tension tables for the overhead shield wire furnished by the CONTRACTOR and approved by the PURCHASER. Sagging of the overhead shield wire shall comply with the requirements specified for conductor.

ISSUE  
R1

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 13 of 41

11.0 **TEST**

- 11.1 The Tower supplied by the Contractor shall be type-tested towers and shall be fabricated as per the design and drawing approved by the Purchaser/Consultant.
- 11.2 Same type of towers which has already been type tested shall be offered by the Contractor and necessary Type testing certificate shall be produced for Purchaser/Consultant's acceptance.
- If type tested tower are not available, then the proto type tower shall be type tested. Proto-model test, on each type of suspension tower to be supplied, shall be made at the manufacturer's plant or at such location as may be mutually agreed. The tests shall be in accordance with IS:802 : Part-III "CP FOR USE OF STRUCTURAL STEEL IN OVERHEAD TRANSMISSION LINE TOWERS", Part-III "TESTING", latest revision.
- 11.3 For all other equipment , type, routine and acceptance tests shall be conducted as per relevant standards in the presence of purchaser and certificates shall be furnished. Type tests shall be carried out on one piece of each type and rating of equipment.
- 11.4 Routine test certificates for all the materials including structural steel used in the work shall be furnished for approval.
- 11.5 The ACSR conductor / earth wire shall undergo all the tests as specified in the relevant IS with latest amendments if any, at any Government approved Laboratory in the presence of Purchaser's representative at Contractor's cost.
- 11.6 Sampling of Insulators for testing shall be as per applicable standards. Tests shall include vibration test on complete assembly as an Acceptance test apart from those specified in relevant applicable standards.
- 11.7 The CONTRACTOR shall furnish certified copies of all tests whether or not inspection is waived.
- 11.8 PURCHASER/ENGINEER will attend type and Routine tests on all the units and Acceptance tests on samples drawn from the lots as per standards.
- 11.9 Type tests, all routine and sample tests shall be done in the presence of the PURCHASER's representative. All tests for hardware's and fittings shall be carried out in accordance with the applicable standards.
- 11.10 The PURCHASER reserves the right to inspect and test the finished material as per standard specifications. The notice of the proposed date of such inspection shall be advised to the PURCHASER one month in advance.
- 11.11 Any inspection and tests whether carried out or waived, by the PURCHASER shall not relieve the CONTRACTOR from his responsibility to supply the

ISSUE R1
-------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V,          Units 7 &amp; 8, at Suratgarh, Rajasthan          OVERHEAD TRANSMISSION LINES</b>	Sheet 14 of 41

hardware's and fittings in accordance with the specification and/or from any of his obligations under the Contract.

**DATA TO BE FURNISHED BY THE CONTRACTOR AFTER AWARD OF CONTRACT**

The Contractor shall furnish copies of the following document to the Purchaser for the approval.

- 1.0 Report on survey including soil investigation.
- 2.0 Plan and profile of the transmission line route indicating the spotting of towers and ground clearance of conductor as per statutory requirements.
- 3.0 Detailed design, drawings for all types of towers including their extension and stubs.
- 4.0 Profile of Transmission line.
- 5.0 Soil investigation report along the transmission line route.
- 6.0 Detailed design, drawing for all types of foundations for all the types of towers.
- 7.0 Drawings for insulators/insulator strings hardware's /fittings and accessories for transmission line.
- 8.0 Test certificates for materials such as structural steel, bolts, nuts, spring washers, insulators, hardware's/fittings, accessories, conductors, ground wire, earth conductor, step bolts, ladders, barbed wire etc. as per specifications and applicable standards.
- 9.0 Test report on tower.

<b>ISSUE R1</b>
---------------------

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 15 of 41

### TECHNICAL REQUIREMENTS

1.0	<b>GENERAL</b>		
1.1	Line Designation		11 kV transmission lines
1.2	No, of circuits in each tower	No.	two
1.3	Approximate length of each circuit	Km	6
1.4	Nominal system voltage		11 kV
1.5	Highest system voltage		12 kV
1.6	Design of tower to suit hot line washing required	Yes/	No
1.7	<b>Spans</b>		
	a) Normal (ruling) span	m	As per IS-5613-2-1 .
	b) Wind span		1.1 x normal span
	c) Weight span		
	i. Maximum		1.5 x normal span
	ii. Minimum for suspension		0.65 x normal span
	iii. Minimum for tension		(-) 0.65 x normal span
1.8	Diameter of bolts for connection of tower members		12 / 16 / 20 mm
1.9	Configuration of phase conductors for each circuit		By bidder
1.10	No. of conductors per phase	No.	One

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 16 of 41

1.11	Route survey carried out by the PURCHASER	Yes/	No
2.0	<b>TOWER</b>		
2.1	<b>Design Loads</b>		As per IS 802 (Part 1/Sec 1)
3.0	<b>CLEARANCE IN AIR</b>  Minimum clearance in air		As per IS 5613
4.0	<b>INSULATOR STRINGS</b>		
4.1	Type		Suspension / Tension anti fog type
4.2	size of each insulator disc (Dia x Height)	mm	254x146
4.3	Weight of each insulator disc	kg	5.8
4.4	Creepage distance protected/ total	mm/ mm	420/840
4.5	Electro-mechanical strength of each disc	kN	90
4.6	Power frequency voltage withstand  Dry wet	KV	70 75

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 17 of 41

4.7	Power frequency voltage puncture	KV	1.3 times the dry flash over voltage
4.8	Impulse voltage withstand	KV	75
4.9	Visible discharge frequency test	KV (rms)	9
4.10	No. of insulators per string  a) Suspension  b) Tension	No.  No.	By bidder  By bidder
5.0	CONDUCTOR		
5.1	Material		ACSR
5.2	Code name		DOG

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 18 of 41

5.3	Size and no, of steel strands	mm/n	1.57/7
5.4	Size and no. of aluminium strands	mm/n	4.72/6
5.5	Overall diameter	mm	14.15mm
5.6	Resistance	/km	0.272 ohms
5.7	Weight	kg/km	395.9
5.8	Ultimate tensile strength	kg	1150
5.9	Modulus of elasticity	Kg/sq	0.75
5.10	Coefficient of linear expansion	/degC	19.8
5.11	Number of conductors per phase	No.	One
5.12	Maximum operating temperature of conductor	°C	50

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 19 of 41

6.0	<b><u>OVERHEAD GROUND WIRE</u></b>		
6.1	Material		GI
6.3	Size and no. of strands	mm/n	3.66/7
6.4	Overall diameter	mm	10.98
6.5	Weight	kg/km	574
6.6	Ultimate tensile strength	kg	7700
6.7	Modulus of elasticity	kg/	$1.965 \times 10^6$
6.8	Coefficient of linear expansion	/degC	$11.5 \times 10^{-6}$
6.9	Number of ground wires	No.	One
6.10	um temperature of ground wire	°C	50

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 20 of 41

<u>APPLICABLE STANDARDS</u>					
1.	Site Investigation	<input type="checkbox"/> IS	<input type="checkbox"/> BS 5930		
2.	Methods of test for stabilised soils	<input type="checkbox"/> IS 4112	<input type="checkbox"/> BS 1924		
3.	Code of practice for site investigation	<input type="checkbox"/> IS	<input type="checkbox"/> CP 20 01		
4.	Code of practice for safety precautions in the construction of large dia bore holes for piling and other purpose	<input type="checkbox"/> IS	<input type="checkbox"/> CP 20 11		
5.	Method of subsurface sounding Static cone penetration test	<input type="checkbox"/> IS 4968 P3	<input type="checkbox"/> BS		
6.	Methods of test for soils for Civil Engineering purposes.	<input type="checkbox"/> IS 2720 P7 P8	<input type="checkbox"/> BS 1377		
7.	Core drilling equipment	<input type="checkbox"/> IS	<input type="checkbox"/> BS 4019		
8.	11 grade ordinary Portland Cement	<input type="checkbox"/> IS 269	<input type="checkbox"/> BS		

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 21 of 41

9.	Recommended guidelines for concrete mix	<input type="checkbox"/> IS 10262	<input type="checkbox"/> BS	<input type="checkbox"/> ACI 613	
10.	Code of practice for plain and reinforced concrete	<input type="checkbox"/> IS 456	<input type="checkbox"/> BS		
11.	Foundation bolts	<input type="checkbox"/> IS 5624	<input type="checkbox"/> BS		
12.	Steel for general structural purposes	<input type="checkbox"/> IS 2062	<input type="checkbox"/> BS 15	<input type="checkbox"/> ASTM A36	
13.	Structural steel -microalloyed (medium and high strength qualities)	<input type="checkbox"/> IS 8500	<input type="checkbox"/> BS 4360	<input type="checkbox"/> ASTM A441	
14.	Tolerance for fabrication of steel structures	<input type="checkbox"/> IS 7215	<input type="checkbox"/> BS		
15.	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel	<input type="checkbox"/> IS 814	<input type="checkbox"/> BS	<input type="checkbox"/> ASTM A 5.1	
16.	Recommended practice for hot dip galvanising of iron and steel	<input type="checkbox"/> IS 2629	<input type="checkbox"/> BS 729		
17.	Hot dip zinc coatings on structural steel and other allied products	<input type="checkbox"/> IS 4759	<input type="checkbox"/> BS		

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 22 of 41

18.	Method of testing uniformity of coating of zinc coated articles	<input type="checkbox"/> IS 2611	<input type="checkbox"/> BS 729	<input type="checkbox"/> ASTM A 239
19.	Method of determination of mass of zinc on zinc coated iron and steel	<input type="checkbox"/> IS 6745	<input type="checkbox"/> BS 443	<input type="checkbox"/> ASTM A3
20.	Hexagon bolts for steel structures	<input type="checkbox"/> IS 6639	<input type="checkbox"/> BS 4190	
21.	Hexagon head bolts, screws and nuts of product grade C.	<input type="checkbox"/> IS 1363	<input type="checkbox"/> BS 916	
22.	Step bolts for steel structures	<input type="checkbox"/> IS 10238	<input type="checkbox"/> BS	
23.	Fasteners - single coil rectangular section spring washers.	<input type="checkbox"/> IS 3063	<input type="checkbox"/> BS	
24.	Plain washers	<input type="checkbox"/> IS 2016	<input type="checkbox"/> BS	<input type="checkbox"/> ASTM A 363
25.	Hot dip galvanised coating on fasteners		<input type="checkbox"/> BS	<input type="checkbox"/> ASTM A 153
26.	Hot dip galvanised coatings on threaded fasteners	<input type="checkbox"/> IS 1367 (Part 13)	<input type="checkbox"/> BS	
27.	Disc insulators	<input type="checkbox"/> IS 731	<input type="checkbox"/> BS 177	<input type="checkbox"/> IEC

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 23 of 41

28.	Insulators fittings	<input type="checkbox"/> IS 2486	<input type="checkbox"/> BS 3288 PI, II	<input type="checkbox"/> IEC
29.	Fittings for aluminium and steel cored Al conductors for overhead lines.	<input type="checkbox"/> IS 2121	<input type="checkbox"/> BS 3288 PI. II	<input type="checkbox"/> IEC
30.	AAC/ACSR conductors	<input type="checkbox"/> IS 398	<input type="checkbox"/> BS	<input type="checkbox"/> IEC 209
31.	Copper conductors	<input type="checkbox"/> IS 282	<input type="checkbox"/> BS 125	<input type="checkbox"/> IEC
32.	Electric power connectors	<input type="checkbox"/> IS 5561	<input type="checkbox"/> BS 159	<input type="checkbox"/> IEC 30 5/ 383
11.	Galvanisation of steel wires	<input type="checkbox"/> IS 4826	<input type="checkbox"/> BS	<input type="checkbox"/> IEC
34.	Reels and drums for bare conductors	<input type="checkbox"/> IS 1778		

AST

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 24 of 41

35.	Tower tests	<input type="checkbox"/> IS 802		
		P3		

NOTE : Materials, equipment, accessories,  IS       BS       IEC       AST  
parts, tests, etc. shall in general conform to :

REV. NO.	R0	R1		JOB NO.	CLIENT: RRVUNL
PPD.BY	UM	SK		TCE.	
CKD.BY	MSVM	MSVM		5750A	PROJECT: 2x660 MW STAGE V SURTGARH
DATE	DEC 09	JUN 12			TPS, RAJASTHAN

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 25 of 41

**DATA SHEET**

(To be filled by the Bidder)

<b><u>GALVANISED STEEL TOWERS</u></b>			
1.0	Name and country of tower fabricator		
2.0	Name and location of tower test facility		
7.0	Tower Particulars	Type	A B C D/DE
7.1	Overall height from GL	m	
7.2	Height of bottom cross arm from GL	m	
7.3	Cross arm length from Centre line of tower		
	a) Top	m	
	b) Bottom	m	
7.4	Vertical spacing between cross-arms		
7.5	Approximate weight of normal tower including bolts, nuts, gussets, stub etc.		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 26 of 41

7.7	Overall base width of normal tower		
-----	------------------------------------	--	--

	<b><u>INSULATOR ASSEMBLIES</u></b>		
1.0	<b><u>INSULATOR STRINGS</u></b>		
1.1	Manufacturer		
	a) Insulator b) Hardware		
1.2	Applicable Standard		
1.3	Type of insulators		
	a) Ball & Socket/other b) Normal/antifog		
1.4	Insulating Material		
1.5	No. of units per string		
1.6	Size of each unit		

<b>NOTE TO BIDDER</b> 1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS) 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	<b>SIGNATURE</b>	
	<b>OF BIDDER</b>	
	<b>DATE</b>	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 27 of 41

	a) Diameter of disc	mm	
	b) Spacing between adjacent units	mm	
1.7	Weight		
	a) Each disc	Kg	
	b) Complete string	Kg	
1.8	Creepage distance		
	a) Each disc total/protected	mm/mm	
	b) Complete string total/protected	mm/mm	
1.9	Power frequency withstand voltage		
	a) Each Disc		
	i) Dry	KV	
	ii) Wet	KV	
	b) Complete String		
	i) Dry	kV	
	ii) Wet	kV	

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE

OF BIDDER

DATE

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 28 of 41

1.10	Impulse withstand voltage		
	a) Each Disc		
	i) Positive	KVp	
	ii) Negative	KVp	
	b) Complete string		
	i) Positive		
	ii) Negative		
1.11	Power frequency puncture withstand voltage of each disc.	KV (rms)	
1.12	Electro mechanical strength of each disc/ complete string	Kg.	
1.13	R.I.V. at 10 kV and 1000 KHz	V	
1.14	Visual Discharge voltage	kV	
2.0	<b><u>INSULATOR HARDWARE</u></b>		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 29 of 41

2.1	Manufacturer		
2.2	Applicable Standards		
2.3	Material :		
	a) Ferrous parts b) Nuts and bolts c) Cotter pins d) Split pins e) Strain and suspension clamps		
2.4	Ultimate Strengths :		
	a) Complete assembly b) Suspension clamp c) Dead end compression type clamp d) D - Shackle e) Ball eye f) Ball clevis g) Clevis eye h) Socket eye i) Socket clevis j) Yoke plate	Kg. Kg. Kg. Kg. Kg. Kg. Kg. Kg. Kg. Kg.	

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 30 of 41

	<b><u>OVERHEAD SHIELD WIRE SUSPENSION AND TENSION ASSEMBLIES</u></b>		
1.0	Manufacturer		
2.0	Applicable Standards		
3.0	Material :		
	a) Ferrous parts b) Nuts and bolts c) Cotter pins d) Split pins e) Strain and suspension clamps		
4.0	Ultimate Strength		
	a) Complete Assembly b) Suspension Clamp c) Strain Clamp d) D - Shackle		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 31 of 41

	e) Clevis eye		
	<b><u>ACSR CONDUCTOR</u></b>		
1.0	Conductor code name and stranding		
2.0	Manufacturer's name and country		
	a) Aluminium rods b) Steel wire/rods c) Complete conductor		
3.0	Applicable Standards		
4.1	Purity of Aluminium	%	
4.2	Percentage of carbon, sulphur, phosphorous in steel wire/rod		
	a) Carbon	%	
	b) Sulphur	%	

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 32 of 41

	c) Phosphorous	%	
	d) Combined sulphur and phosphorous	%	
5.0	Overall diameter of conductor	mm	
6.0	Guaranteed ultimate breaking strength	Kg.	
7.0	Weight	Kg/km	
8.0	Resistance	Ohms/k m	
9.0	Coefficient of linear expansion	°C	
10.0	Equivalent modulus of elasticity (average value from actual stress-strain curve)	Kg/cm <sup>2</sup>	
11.0	<b><u>GALVANISING</u></b>		
11.1	Minimum weight of coating	gm/m <sup>2</sup>	
11.2	Uniformity of coating (Preece Test)		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 33 of 41

	No. of dips for duration in minutes :		
	a) ½ minute b) 1 minute		
12.1	Maximum permissible temperature which the conductor may be allowed to reach without appreciably reducing the ultimate strength of the conductor	°C	
12.2	Current rating based on specified ambient temperature and maximum temperature as per 12.1 above	A	
13.0	Standard length of conductor on one drum	m	
14.0	<b><u>DRUM</u></b>		
14.1	Material		
	a) Flanges b) Barrel c) Hub		
14.2	Diameter of flanges	mm	

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 34 of 41

14.3	Diameter of drum	mm	
14.4	Width of drum	mm	
14.5	Spindle hole diameter	mm	
14.6	Weight of empty drum	kg.	
14.7	Gross weight of drum including weight of conductor	kg	

	<b><u>OVERHEAD SHIELD WIRES</u></b>		
1.0	Manufacturer		
2.0	Applicable Standard		
3.0	Stranding - No. of Strands/ Diameter of each strand	mm	
4.0	Overall diameter	mm	
5.0	Cross-Section (Total)	sq.mm	

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 35 of 41

6.0	Percentage of -		
	a) Carbon	%	
	b) Sulphur	%	
	c) Phosphorous	%	
	d) Combined sulphur and Phosphorous	%	
7.0	Galvanising		
	a) Minimum weight of coating	gm/sq.m	
	b) Uniformity of coating (Preece Test)		
	i. No. of ½ minute dips	No.	
	ii. No. of 1 minute dips	No.	
8.0	Weight	Kg/km	
9.0	D.C. Resistance at 20° C	Ohms/k m	
10.0	Coefficient of Linear Expansion	°C	
11.0	Equivalent Modulus of Elasticity	Kg/sq.c m	
12.0	Guaranteed ultimate breaking strength	Kg.	

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 36 of 41

13.0	Standard length	m	
14.0	Drum :		
	a) Diameter of Flanges	mm	
	b) Width of drum	mm	
	c) Spindle hole dia	mm	
	d) Weight of empty drum	Kg.	
	e) gross weight of drum including weight of ground wire	Kg.	
	<b><u>ACCESSORIES FOR ACSR AND STEEL WIRES</u></b>		
1.0	<b><u>MID SPAN JOINT (COMPRESSION TYPE)</u></b>		
			<b><u>ACSR</u></b> <b><u>Steel Ground Wire</u></b>
1.1	Suitable for (Conductor size)		
1.2	Manufacturer's Name and Country		
1.3	Applicable standards		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 37 of 41

1.4	Ultimate Strength	Kg.	
1.5	Conductivity as percentage of conductivity of conductor	%	
1.6	Corona and R I Performance		
1.7	Weight :		
	AL Sleeves	Kg.	
	ST Sleeves	Kg.	
	Total	Kg.	
1.8	Standard Specification to which materials manufactured and tested		
1.9	Dimensioned Drawing showing AL and ST sleeves before and after compression enclosed (Give reference)	Yes/No	
1.10	Details of Filler compound		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 38 of 41

2.0	<b><u>ARMOUR RODS</u></b>		
2.1	Type	Perform e d t y p e	
2.2	Applicable Standards		
2.3	Suitable for conductor diameter	mm	
2.4	Overall Diameter of conductor with armour rods	mm	
2.5	Weight of Armour rod set	Kg.	
2.6	Size of Corona sphere	mm	
2.7	Total weight of armour rods with Corona spheres	Kg.	
2.8	Corona and RI Performance		
2.9	Standard specification to which materials manufactured and tested		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 39 of 41

2.10	Dimensioned drawings enclosed		
3.0	<b><u>VIBRATION DAMPERS</u></b>		
3.1	Type		
3.2	Make		
3.3	Applicable standards		
3.4	Total weight of each damper		
3.5	Weight of each Balancing Weight		
3.6	Tolerance in Balancing Weight		
3.7	Mechanical Resistance		
3.8	Mechanical Reactance		
3.9	Natural Frequency		
	Upper		
	Lower		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 40 of 41

3.10	Corona and RI Performance		
3.11	No. of Dampers Recommended by Bidder per Span		
3.12	Distance of Damper from clamp mouth		
	At Tension Point		
	i) First Damper ii) Second Damper iii) Third Damper		
	At Suspension Point		
	i) First Damper ii) Second Damper iii) Third Damper		
3.13	Diagram showing power dissipated by Damper in watts for various frequencies and amplitudes enclosed		
3.14	Standard to which materials will be manufactured and tested		

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC. NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME IV SECTION: D30
PART B	<b>RRVUNL, 2 x 660 MW Super-Critical TPS, Stage- V, Units 7 &amp; 8, at Suratgarh, Rajasthan OVERHEAD TRANSMISSION LINES</b>	Sheet 41 of 41

<b><u>EARTHING</u></b>			
1.0	Size of electrode		
2.0	Size of steel conductor from electrode to tower footing.		
3.0	Whether galvanised or not		
	a) Electrode	Yes/No	
	b) Steel conductor in 2.0 above	Yes/No	
4.0	Size of conductor for counter poise		
5.0	Whether conductor for counterpoise is galvanised	Yes/No	

**Note :- The specifications are indicative only and cover minimum functional requirements. It is total responsibility of Contractor to ensure full functionality of the system and all essential equipment / installation shall be deemed to be in the scope of the Contractor.**

**NOTE TO BIDDER**

- ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK(\*) (DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS)
- THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE	
OF BIDDER	
DATE	

## SECTION - 3

### PROJECT DETAILS AND GENERAL SPECIFICATIONS

#### **3.0 GENERAL**

This section stipulates the General Technical Requirements under the contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections and is not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

#### **3.1 QUALIFYING REQUIREMENT**

The contractor shall have adequate galvanizing facilities to galvanize the longest single steel member of 7.0m length in one dip.

All structural assembly drawings shall be prepared in Auto Cad 2008 or Later.

#### **3.2 SITE INFORMATION**

<b>SL.NO.</b>	<b>DESCRIPTION</b>	
<b>3.2.1</b>	<b>PROJECT INFORMATION</b>	
	a) Customer	
	b) Project	
	c) Project location	
	d) Transport facilities Nearest Railway Station/Gauge Distance from Railway Station	
	e) Access roads	

#### **3.3 STANDARDS**

All materials shall comply in all respect with the requirement of the latest edition of the relevant codes as listed in Section 2.

#### **3.4 UNIT**

Metric (System International) units of measurements shall be used in all drawings.

#### **3.5 DRAWINGS, BILL OF MATERIALS AND CDs**

At each stage following set of fabrication drawings/Bill of materials shall be submitted.

- i) Fabrication Drawings : 4 sets
- ii) Bill of Materials : 4 sets

After final approval of proto –type assembly of structures, the drawings shall be updated as per proto and marked “PROTO CORRECTED”. The following sets of

**GI LATTICE STRUCTURES FOR TRANSMISSION LINE**

fabrication drawings/shop drawings/bill of materials/CDs shall be submitted for distribution:

- |      |                      |          |
|------|----------------------|----------|
| i)   | Fabrication Drawings | : 4 set  |
| ii)  | Shop Drawings        | : 1 set  |
| ii)  | Bill Of Materials    | : 4 set  |
| iii) | CDs                  | : 2 sets |

**3.6 CATEGORIES OF APPROVAL**

CATEGORY I This means that the documents/drawings is approved.

CATEGORY II This means that the document/drawing is approved with comments i.e, some corrections are required but the contractor can go ahead with the manufacture after incorporating comments.

CATEGORY III This means that the document/drawing is not approved i.e major revisions are required and the contractor can not proceed with the manufacture.

**3.7 ERRORS**

Any error in fabrication work preventing proper assembly and fitting up of parts in the field, shall be classified as defective workmanship. All changes incurred by BHEL either directly or indirectly because of this shall be deducted from the amount due to the contractor.

**3.8 PURCHASE ORDER NUMBER**

The P.O No. shall be mentioned on all documents and drawings.

## **SECTION – 5**

### **MANUFACTURING QUALITY PLAN**

- 5.1** Material shall be inspected in accordance to the QP duly approved by BHEL/Customer

## SECTION-6

### **CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED**

The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

**BHEL ENQUIRY. NO:**

**BIDDER:OFFER REFERENCE:**

**6.1 Deviations**

Tick

YES

NO

If yes,

S.No.	Deviation	Clause No.
1		
2		
3		
4		

(Signature & Seal of Bidder)